Cisco Integrated Services Virtual Router

The Cisco® Integrated Services Virtual Router (ISRv) is a virtual form-factor Cisco IOS® XE Software router that delivers comprehensive WAN gateway and network services functions into virtual environments. Using familiar, industry-leading Cisco IOS XE Software networking capabilities (the same features present on Cisco 4000 Series ISRs and ASR 1000 Series physical routers), the Cisco ISRv enables enterprises to deliver WAN services to their remote locations using the Cisco Enterprise Network Functions Virtualization (Enterprise NFV) solution (Figure 1). Similarly, service providers can use it to offer enterprise-class networking services to their tenants or customers.

To save costs and become more agile, businesses small and large are increasingly virtualizing their data center infrastructures and applications. Now they can extend the benefits of virtualization to their remote locations to become more operationally efficient and spin up WAN services faster and dynamically.

Enterprises and service providers face the following challenges today to provide network services to remote locations:

- Remote location network services must be delivered on specialized dedicated hardware platforms that require local administration and dedicated rack space
- A network service failure requires a service call and local IT expertise to recover the network service
- Management and support are needed on separate physical appliances at the remote location

With Cisco ISRv, the challenges are addressed by taking advantage of the operational efficiency virtualization delivers.

- Run Cisco ISRv on a shared x86 compute platform
- Remotely configure the ISRv routing and traffic, redirecting technologies to service-chain other Virtual Network Function (VNF) services such as WAN optimization, intrusion prevention system (IPS), and Wi-Fi sharing the same x86 compute resources

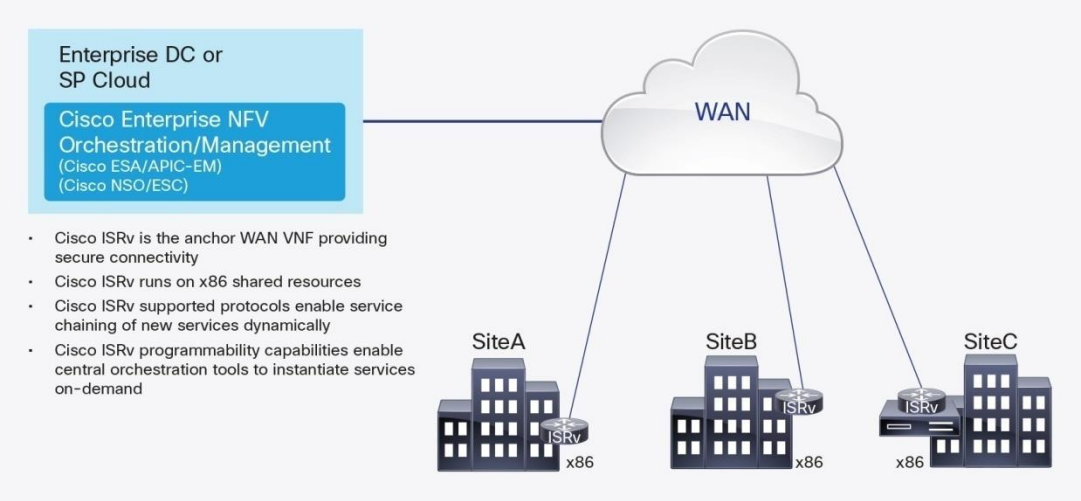
In addition to bringing enterprise-class networking services and security in a virtual form factor, the Cisco ISRv can be used as a building block for scalable network service offerings. The included Enterprise NFV components allow the ISRv to fill roles traditionally reserved for hardware-based devices, including routing and security devices. Virtualizing these complex functions allows service providers to consolidate numerous instances onto a single server, and to easily scale as new customers come on board or networks are expanded.

Built on the same proven Cisco IOS XE Software platform that powers the Cisco ISR and Aggregation Services Router (ASR) product families, it offers a rich set of features, including routing, VPN, firewall, Network Address Translation (NAT), quality of service (QoS), application visibility, and failover features.

Product Overview and Benefits

The Cisco ISRv is a software router that an enterprise or a service provider can deploy as a virtual machine in a provider-hosted Cisco NFVIS (Network Functions Virtualization Infrastructure Software) virtual environment. The physical underlying hardware can be Cisco Unified Computing System™ (Cisco UCS®) servers or Cisco Enterprise Network Compute System (ENCS) platforms

Figure 1. Cisco ISRv Positioned as a Branch WAN Services Router



There are several ways to use the Cisco ISRv:

- Highly secure VPN gateway: The ISRv offers route-based IP Security (IPsec) VPNs (Dynamic Multipoint VPN [DMVPN], Easy VPN, and FlexVPN), and Secure Sockets Layer (SSL) VPN, along with the Cisco IOS Zone-Based Firewall (ZBFW) and access control, meaning an enterprise can connect distributed sites securely **(Table 1)**.

Table 1. Cisco ISRv as a Highly Secure VPN Gateway

Customer Problem	Features	Benefits of Cisco ISRv
• A business needs to securely connect its remote site. A typical large enterprise has a central headquarters, a few regional hubs, two or more data centers, extensions into private/public cloud, and hundreds to thousands of branch-office sites. The network is either hub-and-spoke or fully meshed.	• IPsec • DMVPN • Easy VPN • FlexVPN • Border Gateway Protocol (BGP) • Open Shortest Path First (OSPF) • Enhanced Interior Gateway Routing Protocol (EIGRP) • ZBFW • Access control list (ACL) • Authentication, authorization, and accounting (AAA) • NAT • Dynamic Host Configuration Protocol (DHCP)	• Ownership: An enterprise can deploy an ISRv on off-the-shelf x86 servers, access its command-line interface (CLI) manually or through Enterprise NFV orchestration tools, and manage it using the Cisco Prime™ Infrastructure. • Smooth connectivity and enterprise-class scalability: With its range of VPN and routing features, the ISRv can fit into any enterprise network topology. An enterprise can directly and dynamically connect its distributed sites to its campus, data centers, and cloud sites, avoiding the latency caused by the typical backhaul through the data center while overcoming the management complexity of point-to-point IPsec VPNs. • Consistent WAN architecture: The Cisco IOS Software-based ISRv complements the widely deployed Cisco ISRs and ASRs. Enterprises can now deploy a Cisco endpoint at every node in their network, allowing for consistent network configuration and security policies across their distributed hybrid networks.

- Control point for networking services: The ISRv can redirect traffic to Cisco Virtual Wide Area Application Services (vWAAS) appliances deployed within the same x86 server. The Application Visibility and Control (AVC) feature of the ISRv offers end-to-end application visibility, performance monitoring, and control, allowing administrators to pinpoint application performance problems and offer performance SLAs that can be easily tracked **(Table 2)**.

Table 2. Cisco ISRv as a Traffic Control Point

Customer Problem	Features	Benefits of Cisco ISRv
• An enterprise or service provider needs to offer enterprise-class networking services: The network services team wants to offer networking services that help ensure secure access and optimized, uninterrupted delivery of applications to its customers.	• AppNav (redirection) • ZBFW • NAT • DHCP • Hot Standby Router Protocol (HSRP) • AVC	• Rich set of networking services: The ISRv can take full advantage of Cisco IOS Software security, application visibility, performance monitoring, and high-availability features to provide each tenant with a comprehensive networking experience.

The Cisco IOS XE Software Advantage

The Cisco ISRv runs the same operating system, Cisco IOS XE Software, as the Cisco 4000 Series ISRs and Cisco ASR 1000 Series. Providing control- and data-plane separation, multicore forwarding, and a modular architecture that allows for smooth insertion of networking features, Cisco IOS XE Software is well-suited for dynamic virtual environments. Cisco IOS XE Software is based on the stable, robust, and feature-rich Cisco IOS Software that has powered Cisco ISRs and other hardware routers in demanding enterprise, service provider, and government networks for more than two decades.

The key benefits of Cisco IOS XE Software follow:

- Proven functions: Industry-leading Cisco IOS Software networking and security features
- Operational efficiency: Rapid integration into any Cisco IOS Software environment, such as branch office, WAN, data center, or cloud
- Consistent user experience: Same Cisco IOS CLI and management tools across all Cisco IOS Software platforms, including the Cisco ISR, Cisco ASR, Cisco Cloud Services Router (CSR) 1000v, and Cisco ISRv

Product Specifications

Table 3 lists the features the Cisco ISRv offers in Cisco IOS XE Software Release 16.3.

Table 3. Cisco ISRv Features

Features	Description
Cisco IOS XE Software version	Cisco IOS XE Software Release 16.3 (CSR Edition with selected Cisco IOS XE Software features) The software is available in BIN and TAR/QCOW2 formats.
Supported hypervisors	• Cisco Enterprise NFVIS
Supported I/O modes	The ISRv supports several modes of communication between virtual network interface cards (vNICs) and the physical hardware: • Paravirtual • PCI pass-through • Single-root I/O virtualization (SR-IOV) • Cisco Virtual Machine Fabric Extender (VM-FEX)
Virtual-machine specifications	The ISRv can run on Cisco UCS servers and Cisco ENCS platforms The server must support at least the following: • Intel® Atom® or Xeon® CPU at 1.5 GHz or above • Gigabit Ethernet interfaces The ISRv requires the following from the virtualized server hardware: • CPU: 1 to 4 virtual CPUs (depending on the throughput and feature set) • Memory: 4 GB to 16 GB (depending on the throughput and feature set) • Disk space: 8 GB • Network interfaces: Two or more vNICs, up to maximum allowed by hypervisor (26)
Cisco IOS XE Software networking	• Routing: BGP, OSPF, EIGRP, Policy-Based Routing (PBR), IPv6, Virtual Route Forwarding (VRF)-Lite, Multicast, LISP, generic routing encapsulation (GRE), and Connectionless Network Services (CLNS) • Multiprotocol Label Switching (MPLS): MPLS VPN, VRF, and Bidirectional Forwarding Detection (BFD) • Addressing: DHCP, DNS, NAT, 802.1Q VLAN, Ethernet Virtual Connection (EVC), and VXLAN • High availability: HSRP, Virtual Router Redundancy Protocol (VRRP), Gateway Load Balancing Protocol (GLBP), and box-to-box high-availability for ZBFW and NAT • Traffic redirection: AppNav (to Cisco Wide Area Application Services [Cisco WAAS]) and Web Cache Communication Protocol (WCCP) • Application visibility, performance monitoring, and control: QoS and AVC • Hybrid cloud connectivity: Overlay Transport Virtualization (OTV), Virtual Private LAN Services (VPLS), and Ethernet over MPLS (EoMPLS)
Cisco IOS XE Software security	• VPN: IPsec VPN, DMVPN, Easy VPN, and FlexVPN • Firewall: ZBFW • Access control: ACL, AAA, RADIUS, and TACACS+
Management	• Virtual-machine creation and deployment: Cisco Network Services Orchestrator/Elastic Services Controller, Cisco Enterprise Service Automation (ESA) • Provisioning and management: Cisco IOS XE CLI, Secure Shell (SSH) Protocol, Telnet, NETCONF/YANG, RESTCONF, Cisco Prime Infrastructure, Cisco Enterprise Services Automation on APIC-EM • Monitoring and troubleshooting: Simple Network Management Protocol (SNMP), Syslog, NetFlow, IP SLA, and Embedded Event Manager (EEM)

Differences between Cisco ISRv and Cisco CSR 1000v

The Cisco ISRv runs on server platforms running the Cisco NFVIS virtualization software only. It can support the network interface module (NIM) when running on a Cisco ENCS hardware platform and can also accelerate VM-to-VM traffic using the hardware-based switching on Cisco ENCS platforms. The Cisco CSR1000v does not have these capabilities. The Cisco CSR 1000v and Cisco ISRv will maintain Cisco IOS XE feature parity, and the Cisco CSR 1000v will continue to be supported across multiple hypervisors (VMware vSphere, Microsoft Hyper-V, Citrix XEN, RHEL KVM, Ubuntu KVM, Amazon AWS, and Microsoft Azure).

Ordering and Support

The Cisco ISRv is licensed based on throughput and feature set and can be purchased for a term of 1, 3, or 5 years.

Cisco IOS XE Software Release 16.3 of the ISRv offers numerous throughput options: 50, 100, 250, and 500 Mbps and 1 Gbps. Upon activation of a particular option, the ISRv limits its aggregate bidirectional throughput to that speed.

The Cisco ISRv comes in four technology packages or feature sets, which are shown in **Table 4.**

Table 4. Cisco ISRv Packaging

Features	Description
Cisco ONE WAN Essentials	• Basic networking: BGP, OSPF, EIGRP, Routing Information Protocol (RIP), Intermediate System-to-Intermediate System (IS-IS), IPv6, GRE, VRF-Lite, NTP, QoS, and CLNS • Multicast: Internet Group Management Protocol (IGMP) and Protocol Independent Multicast (PIM) • High availability: HSRP, VRRP, and GLBP • Addressing: 802.1Q VLAN, EVC, NAT, DHCP, and DNS • Basic security: ACL, AAA, RADIUS, and TACACS+ • Management: Cisco IOS XE CLI, SSH, Flexible NetFlow, SNMP, EEM, and NETCONF
Cisco ONE WAN Foundation	**Essentials Plus** • Advanced networking: Layer 2 Tunneling Protocol Version 3 (L2TPv3), BFD, MPLS, VRF, and VXLAN • Application experience: WCCPv2, AppNAV, Network-Based Application Recognition Version 2 (NBAR2), AVC, and IP SLA • Hybrid cloud connectivity: LISP, OTV, VPLS, and EoMPLS • Subscriber management: Point-to-Point Protocol termination and aggregation (PTA), Layer 2 Tunneling Protocol Network Server (LNS), and Intelligent Services Gateway (ISG) • Advanced security: ZBFW, IPsec VPN, Easy VPN, DMVPN, and FlexVPN • Box-to-box high-availability for ZBFW and NAT

Table 5. ISRv Performance

Feature Description	ISRv-2vCPU, 4GB RAM	ISRv-4vCPU, 4GB RAM
CEF IMIX	1Gbps	1Gbps
IPSEC Single AES IMIX	600Mbps	800Mbps
NAT44 500 Translations IMIX	1Gbps	1Gbps
FW+NAT	1Gbps	1Gbps
FW+QoS+NAT IMIX	1Gbps	1Gbps
IWAN: Marking, HQOS, DMVPN + Crypto, ACL, PfR	350Mbps	450Mbps

The performance numbers are based off of the Cisco ENCS 5408 platform. Hardware configuration: Intel Xeon Processor D-1548 2.0GHz, 64GB RAM and 64GB of storage (Expandable to 4TB). The performance numbers are for reference only and not guaranteed. Performance will vary depending on hardware specifications and network I/O model (SR-IOV vs. vSwitch), as well as resource allocation across multiple VNFs

For Ordering information please refer to the ordering guide.

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