Cisco Cloud Services Router 1000V with Cisco IOS-XE® Software Release 3.10

Cisco IOS-XE® Software Release 3.10

The Cisco Cloud Services Router (CSR) 1000V is a single-tenant router in virtual form-factor that delivers comprehensive WAN gateway functionality to multi-tenant provider-hosted clouds. Using familiar, industry-leading Cisco IOS® Software networking capabilities, the CSR 1000V enables enterprises to transparently extend their Wide Area Networks into external provider-hosted clouds and cloud providers to offer enterprise-class networking services to their tenants.

Businesses, small and large, are increasingly virtualizing their data center infrastructures and applications, to save costs and become more agile. Many enterprises have started deploying IT applications in virtualized data centers that are built and managed by third-party service providers. These external data centers, known as provider-hosted clouds, allow enterprises to gain infrastructure and resources on demand and become even more operationally efficient.

However, the shared-infrastructure shared-resource cloud environment poses networking and security problems to enterprises. First, an enterprise does not have ownership of its cloud connectivity, so cannot extend its network configuration into the cloud. Next, it does not enjoy the same levels of privacy and security for its cloud deployment as it does in its premises. Third, it cannot directly connect its distributed sites to its cloud applications - having to instead backhaul all network traffic through its data center - because it lacks a network-aware endpoint in the cloud. The cloud also presents networking challenges to cloud providers. The primary concern is the scale limitations of the current network switching architecture. The cloud provider also lacks all the components of an end-to-end managed connectivity service offering to its customers, including Quality of Service (QoS), application visibility and Service Level Agreements (SLA).

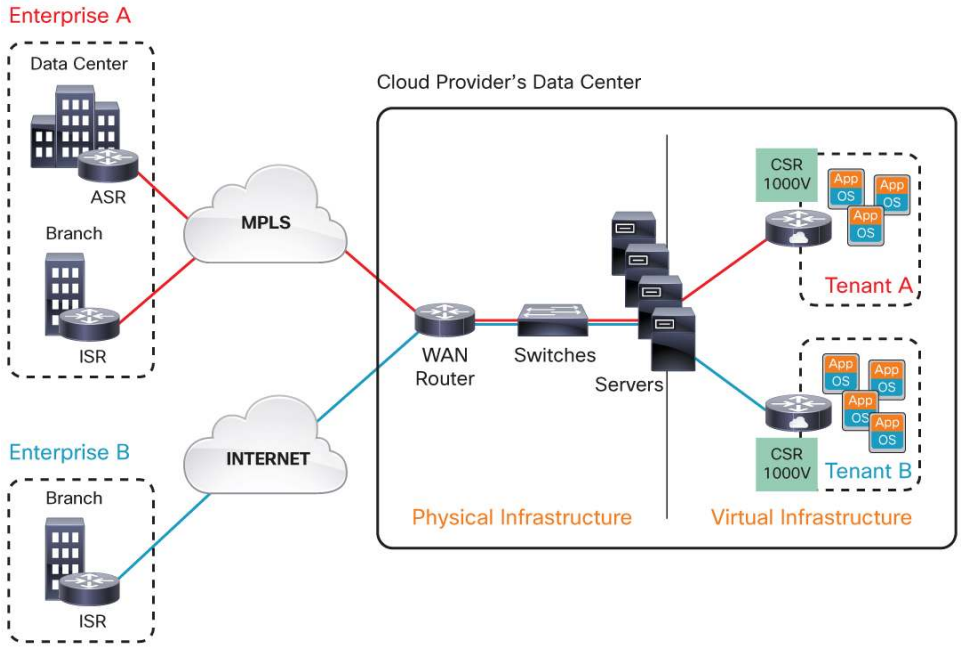
The Cisco CSR 1000V addresses these cloud-based networking and security constraints. Built on the same proven Cisco IOS® Software platform that is inside the Cisco Integrated Services Router (ISR) and Aggregation Services Router (ASR) product families, it offers a rich set of features, including routing, VPN, firewall, NAT, QoS, application visibility, failover and WAN optimization. These functions empower enterprises and cloud providers to build highly secure, optimized, scalable and consistent hybrid networks.

Product Overview and Benefits

The Cisco CSR 1000V is a software router that an enterprise or a cloud provider can deploy as a virtual machine (VM) in a provider-hosted cloud. It can run on Cisco UCS® servers or servers from leading vendors that support VMware ESXi, Citrix XenServer or Red Hat KVM virtualization. It contains Cisco IOS® Software networking and security features.

A typical cloud provides IT infrastructure and resources to multiple customers or tenants. The Cisco CSR 1000V serves primarily as a router per tenant (**Figure 1**). That is, each tenant gets its own routing instance, hence its own VPN connections, firewall policies, QoS rules, access control, and so on.

Figure 1. CSR 1000V - Positioned as a Single-Tenant WAN Gateway in a Multi-tenant Cloud



Following is how you could use the Cisco CSR 1000V in a cloud:

- **Secure VPN Gateway:** The CSR 1000V offers route-based IPSec VPNs (DMVPN, EasyVPN, FlexVPN), and in the future, SSL VPN, along with the Cisco IOS® Zone-based Firewall and access control, enabling an enterprise to connect distributed sites directly to its cloud deployment (**Table 1**).

Table 1. CSR 1000V as a Secure VPN Gateway

Customer Problem	Features	Benefits of CSR1000v
• **An enterprise needs to securely connect its premises with its off-premises cloud:** A typical large enterprise has a central headquarters, a few regional hubs, two or more data centers, and hundreds to thousands of branch office sites. The network is either hub-and-spoke or fully meshed. By extending the data center to the cloud, the enterprise wants the cloud to act as another node in its network.	• IPSec • DM VPN • Easy VPN • Flex VPN • BGP • OSPF • EIGRP • Zone-based Firewall • ACL • AAA • NAT • DHCP	• **Ownership:** An enterprise can deploy a CSR 1000V in the cloud, access its Command Line Interface (CLI), and manage it using the Cisco Prime Infrastructure. • **Seamless Connectivity and Enterprise-Class Scalability:** With its range of VPN and routing features, the CSR 1000V can fit into any enterprise network topology. An enterprise can directly and dynamically connect its distributed sites to its cloud deployment - 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 IOS®-based CSR 1000V 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.

- **MPLS WAN Endpoint:** The CSR 1000V can serve as an MPLS router that will enable a service provider to offer end-to-end managed connectivity (customer site to customer cloud deployment) with performance guarantees. Also, by extending the MPLS WAN deeper into the cloud network, the service provider can increase network scale - more tenants and more networks per tenant (**Table 2**).

Table 2. CSR 1000V as an MPLS WAN Endpoint

Customer Problem	Features	Benefits of CSR 1000V
• **A service provider needs to extend MPLS connectivity to its customers' cloud segments:** Service providers who offer managed connectivity service to businesses want to help their customers connect with off-premises clouds. In order to provide end-to-end connectivity, the service providers want to extend their private MPLS WANs into the clouds right up to the edge of the customers' segments within the clouds.	• MPLS VPN • VRF • BGP • GRE • QoS • IP SLA	• **MPLS Extension within a Cloud:** A service provider can manage the cloud connectivity of its customers and offer performance and reliability guarantees with the help of a dedicated CSR 1000V (serving as a Customer Edge (CE) router) per customer. • **Intra-Cloud Scale:** A typical cloud network is highly switched - a router hands off incoming traffic to a group of switches, which assign the traffic to customer VLANs. In this network architecture, the cloud provider cannot scale beyond 4.096 VLANs per router, limiting the number of customers it can support. The CSR 1000V, serving as a CE or as a Provider Edge (PE) extension, can help overcome these scale limitations by creating routing overlays within the cloud, minimizing the providers' dependence on VLANs.

- **Layer 2 (VM Migration) or Layer 3 Extension (IP Mobility) from Premise to Cloud:** The CSR 1000V offers features such as NAT and LISP that will enable an enterprise to maintain addressing consistency across premise and cloud as it moves applications back and forth or bursts compute capacity into the cloud. The CSR 1000V's OTV and VPLS features enable an enterprise to extend VLAN segments from its data center into the cloud for server backup, disaster recovery and compute scale (**Table 3**).

Table 3. CSR 1000V as a Layer 2 or Layer 3 Extension

Customer Problem	Features	Benefits of CSR 1000V
• **An enterprise needs to maintain IP addressing consistency when moving an application from its data center into an off-premises cloud:** An enterprise does not want to re-configure its application when it moves the application back and forth between its data center and external cloud. Change in the address of the application affects connectivity with the user accesing the application.	• NAT • LISP	• **IP Mobility:** The cloud-based CSR 1000V can serve as a LISP router, building a tunnel with a LISP-enabled router in the enterprise's data center that enables an application to be transported across the tunnel with a fixed identifier.
• **An enterprise needs to replicate its VMs (for e.g. application servers, web servers, etc.) in an off-premises cloud:** An enterprise wants to extend VLAN segments from its data center into an external cloud in order to migrate or back up VMs.		• **VM Migration:** The cloud-based CSR 1000V can serve as an OTV router, building a bridge with an OTV-enabled router in the enterprise's data center that enables a VLAN to be extended to the cloud.

- **Control Point for Networking Services:** The CSR 1000V can redirect traffic to Cisco vWAAS appliances deployed in the cloud. The Application Visibility & Control (AVC) feature of the CSR 1000V offers end-to-end application visibility, performance monitoring and control, allowing service providers to pinpoint application performance problems and offer performance SLAs that can be easily tracked (**Table 4**).

Table 4. CSR 1000V as a Traffic Control Point

Customer Problem	Features	Benefits of CSR 1000V
• **A cloud provider needs to offer enterprise-class networking services:** The cloud provider wants to offer networking services that ensure secure access and optimized, uninterrupted delivery of applications to its customers.	• AppNav (redirection) • Zone-based Firewall • NAT • DHCP • HSRP • AVC	• **Rich Set of Networking Services:** The cloud provider can take full advantage of the IOS® Software security, application visibility and performance monitoring, and high availability features to provide each tenant with a comprehensive networking experience.

The Cisco IOS-XE® Software Advantage

The CSR 1000V contains the same operating system, Cisco IOS-XE®, which runs inside the Cisco ASR 1000 product line. Providing control plane and data plane separation, multi-core forwarding, and a modular architecture that allows for smooth insertion of networking features, IOS-XE® Software is well-suited for dynamic cloud environments. IOS-XE® is based on the stable, robust and feature-rich Cisco IOS® Software that has powered Cisco's ISRs and other hardware routers in demanding enterprise, service provider and government networks for over two decades.

The key benefits of Cisco IOS-XE® Software are:

- **Proven Functionality:** Industry-leading Cisco IOS® networking and security features
- **Operational Efficiency:** Rapid integration into any IOS® environment (branch office, WAN, data center, cloud)
- **Consistent User Experience:** Same IOS® CLI and management tools across all IOS® platforms - Cisco ISR, Cisco ASR, and Cisco CSR 1000V

Product Specifications

Table 5 lists the features the Cisco CSR 1000V offers in IOS-XE® Release 3.10.

Table 5. Cisco CSR 1000V Features

Features	Description
IOS-XE® Version	IOS-XE® Release 3.10 (CSR Edition - selected IOS-XE® features) The software is available in ISO, BIN and OVA formats.
Hypervisors Supported	• VMware ESXi 5.1 • Citrix XenServer 6.1 • Red Hat KVM (Red Hat Enterprise Virtualization 3.1, Red Hat Enterprise Linux 6.3) • Amazon Machine Instance (beta)
Virtual Machine Specifications	The CSR 1000V can run on Cisco UCS servers or servers from leading vendors that support VMware ESXi, Citrix XenServer or Red Hat KVM. The server must support **at least** the following: • Intel Nehalem or AMD Barcelona CPU with clock frequency 2.0 GHz • Gigabit Ethernet interfaces The CSR 1000V requires the following from the virtualized server hardware: • **CPU:** 1 to 4 virtual CPUs (depending on the throughput and feature set) • **Memory:** 2.5 to 4 GB (depending on the throughput and feature set)

Features	Description
	• **Disk Space:** 8 GB • **Network Interfaces:** 3 or more virtual Network Interface Cards (vNICs), up to maximum allowed by hypervisor
IOS-XE® Networking	• **Routing:** BGP, OSPF, EIGRP, Policy-based Routing, IPv6, VRF-Lite, Multicast, LISP, GRE • **MPLS:** MPLS VPN, VRF, BFD • **Addressing:** DHCP, DNS, NAT, 802.1Q VLAN, EVC • **High Availability:** HSRP, VRRP, GLBP • **Traffic Redirection:** AppNav (to Cisco WAAS), WCCP • **Application Visibility, Performance Monitoring and Control:** QoS, AVC • **Hybrid Cloud Connectivity:** OTV, VPLS, EoMPLS
IOS-XE® Security	• **VPN:** IPSec VPN, DMVPN, EasyVPN, FlexVPN • **Firewall:** Zone-based Firewall • **Access Control:** ACL, AAA, RADIUS, TACACS+
Management	• **VM Creation and Deployment:** VMware vCenter, VMware vCloud Director • **Provisioning and Management:** IOS-XE® CLI, SSH, Telnet, Cisco Prime Infrastructure • **Monitoring and Troubleshooting:** SNMP, Syslog, NetFlow, IP SLA, Embedded Event Manager • **RESTful APIs:** License Install, Interfaces, Routing, IPSec VPN, Firewall, ACL, NAT, Configuration Import/Export, Reports (CPU Utilization, Interface Stats, Routing Table, VPN and Firewall Sessions, etc.)

Ordering and Support

The CSR 1000V is licensed based on throughput and feature set and can be purchased for a term of 1 or 3 years, or perpetual.

The IOS-XE® Software Release 3.10 of the CSR 1000V offers six throughput options - 10 Mbps, 50 Mbps, 100 Mbps, 250 Mbps, 500 Mbps and 1 Gbps. Upon activation of a particular option, the CSR 1000V limits its aggregate bi-directional throughput to that option.

The Cisco CSR 1000V comes in three technology packages or feature sets - shown in **Table 6**.

Table 6. Cisco CSR 1000V Packaging

Features	Description
Standard	• **Routing:** RIP, BGP, EIGRP, OSPF, IS-IS, GRE, IPv6, VRF-Lite • **Addressing:** DHCP, DNS, NAT, 802.1Q VLAN, EVC • **Basic Security:** ACL, AAA, RADIUS, TACACS+ • **High Availability:** HSRP, VRRP, GLBP • **Management:** SSH, Telnet, SNMP, Syslog, NetFlow, EEM
Advanced	• **Standard** features • **Advanced Security:** IPSec, Route-based VPNs (DMVPN, EasyVPN, FlexVPN), Zone-based Firewall
Premium	• **Advanced** features • **MPLS:** MPLS VPN, VRF, BFD • **Application Experience:** AppNav, WCCP, AVC, IP SLA • **IP Mobility:** LISP, OTV, VPLS, EoMPLS

Table 7 specifies the server resource requirements per CSR 1000V license

Table 7. Server Resource Requirements per CSR 1000V License

Throughput	Technology Package		
	Standard	**Advanced**	**Premium**
10 Mbps	1 vCPU, 2.5 GB RAM	1 vCPU, 2.5 GB RAM	1 vCPU, 2.5 GB RAM
50 Mbps	1 vCPU, 2.5 GB RAM	1 vCPU, 2.5 GB RAM	1 vCPU, 2.5 GB RAM
100 Mbps	1 vCPU, 2.5 GB RAM	1 vCPU, 2.5 GB RAM	1 vCPU, 2.5 GB RAM

Throughput	Technology Package		
	Standard	Advanced	Premium
250 Mbps	4 vCPU*, 4 GB RAM*	4 vCPU*, 4 GB RAM*	4 vCPU*, 4 GB RAM*
500 Mbps	4 vCPU*, 4 GB RAM*		
1 Gbps	4 vCPU*, 4 GB RAM*		

* Subject to change in future releases

Table 8 contains the ordering information for the IOS-XE® Release 3.10 of CSR 1000V.

Table 8. CSR 1000V Ordering Information

Product ID	Description
L-CSR-10M-STD-1Y=	CSR 1000V e-PAK 1-year subscription 10Mbps Standard Package
L-CSR-10M-STD-3Y=	CSR 1000V e-PAK 3-year subscription 10Mbps Standard Package
L-CSR-10M-STD=	CSR 1000V e-PAK 10 Mbps Standard Package
L-CSR-10M-ADV-1Y=	CSR 1000V e-PAK 1-year subscription 10Mbps Advanced Package
L-CSR-10M-ADV-3Y=	CSR 1000V e-PAK 3-year subscription 10Mbps Advanced Package
L-CSR-10M-ADV=	CSR 1000V e-PAK 10Mbps Advanced Package
L-CSR-10M-PRM-1Y=	CSR 1000V e-PAK 1-year subscription 10Mbps Premium Package
L-CSR-10M-PRM-3Y=	CSR 1000V e-PAK 3-year subscription 10Mbps Premium Package
L-CSR-10M-PRM=	CSR 1000V e-PAK 10Mbps Premium Package
L-CSR-50M-STD-1Y=	CSR 1000V e-PAK 1-year subscription 50Mbps Standard Package
L-CSR-50M-STD-3Y=	CSR 1000V e-PAK 3-year subscription 50Mbps Standard Package
L-CSR-50M-STD=	CSR 1000V e-PAK 50Mbps Standard Package
L-CSR-50M-ADV-1Y=	CSR 1000V e-PAK 1-year subscription 50Mbps Advanced Package
L-CSR-50M-ADV-3Y=	CSR 1000V e-PAK 3-year subscription 50Mbps Advanced Package
L-CSR-50M-ADV=	CSR 1000V e-PAK 50Mbps Advanced Package
L-CSR-50M-PRM-1Y=	CSR 1000V e-PAK 1-year subscription 50Mbps Premium Package
L-CSR-50M-PRM-3Y=	CSR 1000V e-PAK 3-year subscription 50Mbps Premium Package
L-CSR-50M-PRM=	CSR 1000V e-PAK 50Mbps Premium Package
L-CSR-100M-STD-1Y=	CSR 1000V e-PAK 1-year subscription 100Mbps Standard Package
L-CSR-100M-STD-3Y=	CSR 1000V e-PAK 3-year subscription 100Mbps Standard Package
L-CSR-100M-STD=	CSR 1000V e-PAK 100Mbps Standard Package
L-CSR-100M-ADV-1Y=	CSR 1000V e-PAK 1-year subscription 100Mbps Advanced Package
L-CSR-100M-ADV-3Y=	CSR 1000V e-PAK 3-year subscription 100Mbps Advanced Package
L-CSR-100M-ADV=	CSR 1000V e-PAK 100Mbps Advanced Package
L-CSR-100M-PRM-1Y=	CSR 1000V e-PAK 1-year subscription 100Mbps Premium Package
L-CSR-100M-PRM-3Y=	CSR 1000V e-PAK 3-year subscription 100Mbps Premium Package
L-CSR-100M-PRM=	CSR 1000V e-PAK 100Mbps Premium Package
L-CSR-250M-STD-1Y=	CSR 1000V e-PAK 1-year subscription 250Mbps Standard Package
L-CSR-250M-STD-3Y=	CSR 1000V e-PAK 3-year subscription 250Mbps Standard Package
L-CSR-250M-STD=	CSR 1000V e-PAK 250Mbps Standard Package
L-CSR-250M-ADV-1Y=	CSR 1000V e-PAK 1-year subscription 250Mbps Advanced Package
L-CSR-250M-ADV-3Y=	CSR 1000V e-PAK 3-year subscription 250Mbps Advanced Package
L-CSR-250M-STD=	CSR 1000V e-PAK 250Mbps Advanced Package
L-CSR-250M-PRM-1Y=	CSR 1000V e-PAK 1-year subscription 250Mbps Premium Package

Product ID	Description
L-CSR-250M-PRM-3Y=	CSR 1000V e-PAK 3-year subscription 250Mbps Premium Package
L-CSR-250M-PRM=	CSR 1000V e-PAK 250Mbps Premium Package
L-CSR-500M-STD-1Y=	CSR 1000V e-PAK 1-year subscription 500Mbps Standard Package
L-CSR-500M-STD-3Y=	CSR 1000V e-PAK 3-year subscription 500Mbps Standard Package
L-CSR-500M-STD=	CSR 1000V e-PAK 500Mbps Standard Package
L-CSR-1G-STD-1Y=	CSR 1000V e-PAK 1-year subscription 1Gbps Standard Package
L-CSR-1G-STD-3Y=	CSR 1000V e-PAK 3-year subscription 1Gbps Standard Package
L-CSR-1G-STD=	CSR 1000V e-PAK 1Gbps Standard Package

Software updates, 24x7 support from the Cisco Technical Assistance Center (TAC), and access to the cisco.com support website that includes technical documentation, can be purchased separately.

- The 1- and 3-year term licenses require purchase of corresponding 1- and 3-year Cisco SASU (Software Application Support plus Upgrades).
- The perpetual licenses do not require purchase of SASU - SASU can be purchased on an annual basis.

Please contact your local Cisco sales representative for more information.

For More Information

For more information about the Cisco Cloud Services Router 1000V, visit http://www.cisco.com/go/cloudrouter.

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