vMX 3D Universal Edge Router

Product Overview

Service providers, broadband network operators, cloud operators and enterprises need highly agile, scalable and automated networks in order to increase revenue, contain capital spending and achieve operational excellence. Network Function Virtualization (NFV), which decouples network functions from service-specific elements so they can run as software on x86 servers, is a critical technology for achieving these goals.

The vMX is a virtualized MX Series 3D Universal Edge Router that helps network operators of all types increase their network and service agility and speed time to market—and revenue—for new services. The vMX also increases control plane scale and performance and enables efficient service scale-out while streamlining the operations environment.

Product Description

The Juniper Networks vMX is a feature-rich virtual router that runs on x86-based servers and supports a broad set of broadband, cloud, cable, mobile, and enterprise applications. Closely aligned with emerging Network Function Virtualization (NFV) initiatives[1], the vMX is built on 15+ years of Juniper routing investment and experience. The vMX control plane is powered by Junos, the same operating system that powers the entire MX Series portfolio, and the forwarding plane is powered by vTrio, Juniper's programmable Trio chipset microcode optimized for execution in x86 environments. With Junos and vTrio, the vMX offers advanced IP/MPLS routing, hierarchical QoS, and switching features that ensure the agile and highly efficient delivery of the widest variety of applications and services.

The vMX eliminates the cost, complexity and delay associated with qualifying, maintaining and sparing physical routing elements, enabling rapid service deployment and scale-out of services—critical success factors when expanding into niche markets and new geographies. Importantly, these same attributes help overcome persistent issues related to equipment acquisition for lab trials and release certification.

The vMX increases service agility by enabling users to quickly implement and scale services by spinning up new routing instances on demand, and by supporting non-disruptive service introductions in parallel with current services. This approach eliminates the risk, complexity, and delay associated with reconfiguring and requalifying your current infrastructure for new services. Furthermore, the vMX has a granular licensing model that accommodates uncertain forecasts, enabling users to purchase only the amount of capacity they need, reducing the risk of stranded capital.

Importantly, the vMX offers feature consistency with the physical MX Series platforms, including advanced Broadband Network Gateway capabilities. Virtualized BNG support on the vMX gives operators the broadest range of advanced implementation options, including vLNS/L2TP, PPPoE, DHCPv4/DHCPv6, and PWHT support, static and dynamic (RADIUS) subscriber interfaces, DHCP local server and relay, QinQ subscribers, integrated firewall filters, and RPF check. These sophisticated features help service providers implement highly distributed broadband architectures, enabling them to profitably deliver innovative residential broadband services in both new and traditional markets.

Operational consistency between the vMX and MX Series routers reduces qualification and deployment time and risks. Current MX Series customers can use the vMX to scale-out their networks without impacting operations or staff training; similarly, customers can use the vMX to satisfy immediate needs and adopt MX Series routers for service scale-up at some future point, again without operational disruption. Virtual or physical, the vMX and MX Series routers are consistent, compatible and complementary.

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[1] The ETSI ISG NFV, which consists of over 230 individual companies, including 37 of the world's major service providers, is driving NFV work including work with key standards groups. See http://www.etsi.org/technologies-clusters/technologies/nfv.
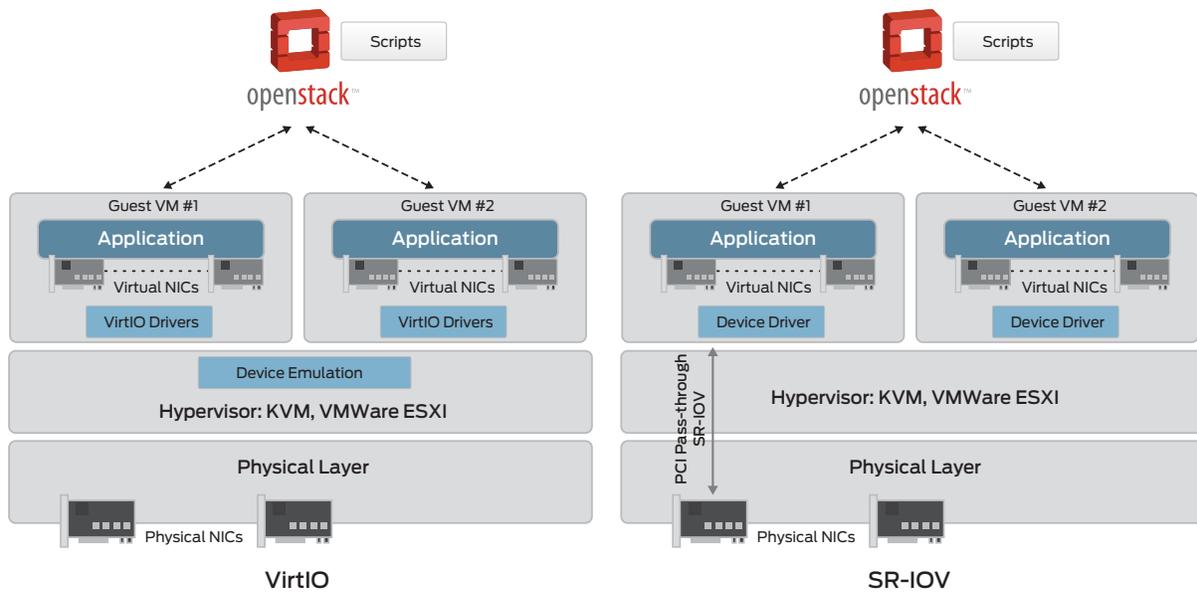
Figure 1: The vMX architecture for VirtIO and SR-IOV.

With control plane and forwarding plane virtualization, the vMX helps build the best network, increases ROI and streamlines the network operations environment with elastic, multi-dimensional resource scale and service agility.

Architecture and Key Components

The vMX runs on standard x86 servers and is offered as licensed software that can be distributed among multiple customer and service instances.

The vMX consists of the following:

- Virtual Control Plane (VCP), which is Junos OS hosted on a virtual machine (VM).

- The Virtual Forwarding Plane (VFP) runs the packet forwarding engine, which is the programmable Trio microcode optimized and compiled for x86 environments. Juniper also leveraged Intel toolkits, including DPDK and Single Root IO Virtualization (SR-IOV), to further enhance forwarding performance.

OpenStack provides virtual machine (VM) management and provisioning of infrastructure network connections, allowing vMX orchestration like any other cloud-based application and enabling users to non-disruptively add the vMX to their operational environment. Additionally, the vMX is fully integrated with the Juniper Networks Contrail Cloud Platform, a turnkey cloud management platform that is hardened with open source technologies including OpenStack, OpenContrail, Chef, and Puppet.

Features and Benefits

MX and vMX: Consistent, Compatible and Complementary

The vMX utilizes the same Junos operating system and programmable Trio chipset microcode as the MX Series portfolio, making it completely compatible and interoperable with all physical MX Series routers. The vMX and MX Series routers can be selected based on specific goals and objectives without any operational penalty or risk, so that users control the pace of their network evolution without disrupting established operating environments.

World Class Routing for World Class Networks

The vMX is a true carrier-class router that supports the same broad set of IPv4/IPv6 capabilities available on the MX Series portfolio. This includes comprehensive VPN support at Layer 2 (VPLS, L2 circuits, L2VPN and EVPN); Layer 2.5/MPLS (LDP, RSVP, P2MP LDP and RSVP, with CoS/QoS); Layer 3 (unicast and multicast L3VPNs with CoS/QoS); BNG/LNS; and a variety of multicast techniques (PIM, IGMP, MLD, multicast GRE).

Improve Services Scale

Provider Edge (PE) routers often run out of control plane resources before they run out of forwarding plane resources. As the network grows, the vMX allows users to efficiently scale the forwarding plane and control plane independently in order to accommodate very large forwarding tables and a high numbers of flows.

Accelerates Service Introduction and Modification

The vMX is easily deployed on standard x86 based servers, eliminating the time-consuming facility and platform qualification associated with physical routers. This is particularly valuable in locations that lack highly trained technical personnel and in facilities with space and power limitations. Because the vMX is distributed by software download, it also eliminates delays related to manufacturing, shipping and customs.

Low Risk Market Entry and Expansion

Uncertain forecasts, facility costs and pressure from incumbents can be formidable barriers to new market entry and geographic expansion. The vMX reduces these risks by running on standards-based servers that can be deployed in data centers or co-location facilities instead of dedicated Telco facilities. The vMX also provides an easy and low-risk way to increase or decrease network capacity in response to disparity between forecast and actual service uptake: you can start small and, as demands grow, the vMX is easily scaled up; conversely, if a service or market underperforms, vMX licenses and servers can be easily re-deployed without stranding assets.

Minimum Hardware Requirements

Description	Value
Sample system configuration	For low-bandwidth applications, the minimum CPU requirement is Nehalem Intel processor generation or newer For high-bandwidth applications, the minimum Intel CPU generation required is Ivy-Bridge Intel processor generation or newer.
Memory	Minimum: 8 GB
Storage	Local or NAS
Other requirements	VT-d capability

Minimum Software Requirements

Description	Value
Operating System	Ubuntu 14.04 LTS Linux 3.13.0-32-generic RedHat 7.2
Virtualization	QEMU-KVM 2.0.0 VMware ESXi 5.5

Download information

The vMX is downloaded at https://www.juniper.net/support/downloads/?p=vmx. Release notes and documentation are also available at this site.

All vMX images come with a default license that limits the forwarding plane to 1 Mbps with base feature set.

Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing costs and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit www.juniper.net/us/en/products-services.

vMX Ordering Information

Bandwidth-based licenses are available for each application package for the following processing capacity limits: 100 MB, 250 MB, 500 MB, 1 GB, 5 GB, 10 GB and 40 GB. Note: for 100 MB, 250 MB and 500 MB, there is a combined SKU with all applications included.

Product Number	Description
VMX-100M	100M Perpetual license. Includes PREMIUM package. Scale: 50 VPN instances (both L2 and L3 VPN technologies), 128K RIB and FIB
VMX-250M	250M Perpetual license. Includes PREMIUM package. Scale: 50 VPN instances (both L2 and L3 VPN technologies), 128K RIB and FIB
VMX-500M	500M Perpetual license. Includes PREMIUM package. Scale: 50 VPN instances (both L2 and L3 VPN technologies), 128K RIB and FIB
VMX-BASE-1G	1G Perpetual license. BASE package. Scale: 16 L3VPN instances and no other VPN features; 256K RIB and FIB.
VMX-BASE-5G	5G Perpetual license. BASE package. Scale: 16 L3VPN instances and no other VPN features; 256K RIB and FIB.
VMX-BASE-10G	10G Perpetual license. BASE package. Scale: 16 L3VPN instances and no other VPN features; 256K RIB and FIB.
VMX-BASE-40G	40G Perpetual license. BASE package. Scale: 16 L3VPN instances and no other VPN features; 256K RIB and FIB.
VMX-ADV-1G	1G Perpetual license. ADVANCE package. Scale: 1M RIB, 16 L3VPN instances, 250 VPN instances (both L2 and L3 VPN technologies).
VMX-ADV-5G	5G Perpetual license. ADVANCE package. Scale: 1M RIB, 16 L3VPN instances, instances (both L2 and L3 VPN technologies).
VMX-ADV-10G	10G Perpetual license. ADVANCE package. Scale: 1M RIB, 16 L3VPN instances, VPN instances (both L2 and L3 VPN technologies) up to system scale
VMX-ADV-40G	40G Perpetual license. ADVANCE package. Scale: 1M RIB, 16 L3VPN instances, VPN instances (both L2 and L3 VPN technologies) up to system scale
VMX-PRM-1G	1G Perpetual license. PREMIUM package. Scale: 2M RIB, 250 VPN instances (both L2 and L3 VPN technologies)
VMX-PRM-5G	5G Perpetual license. PREMIUM package. Scale: 2M RIB, 250 VPN instances (both L2 and L3 VPN technologies)
VMX-PRM-10G	10G Perpetual license. PREMIUM package. Scale: 2M RIB. VPN instances (both L2 and L3 VPN technologies) up to system scale
VMX-PRM-40G	40G Perpetual license. PREMIUM package. Scale: 2M RIB. VPN instances (both L2 and L3 VPN technologies) up to system scale

Virtual BNG Ordering Information

Using the vMX as a virtual broadband network gateway (BNG) requires a vMX Premium bandwidth license for each virtual BNG instance (1GB, 5GB, 10GB or 40GB) and a perpetual or annual Broadband Subscriber Scale license that is applied network wide. Broadband Subscriber Scale licenses are available in packages that support the following specific features:

Package	Description	Potential Use Cases
Introductory	L2TP feature set: · L2TP LNS Services · Secure Policy/Lawful Intercept · Service Activation/ Deactivation via Radius · RE-based HTTP Redirect	· LNS wholesale (retailer) · Business wholesale (LNS) · Walled garden (e.g. billing)
Preferred	All Introductory features, plus: · DHCP Subscriber Services · PPP/LAC Subscriber Services · DHCP Relay and Local Server	· Residential BBE (PPP, DHCP) · Broadband business services · L2TP LAC (wholesale)
Elite	All Preferred features, plus: · Wireline Policy Management via Gx (PCEF) · Wireline online charging via Gy (PCEF) · Pseudo-wire Headend Termination · Advanced Multicast Video QoS	· Advanced multicast video · IP/MPLS PWHT and subscriber management · Fixed/Mobile policy convergence

The Broadband Subscriber Scale SKUs are as follows:

Product Number	Description
VBNG-INTR-1K	Perpetual Introductory vBNG license for up to 1,000 subscriber sessions
VBNG-INTR-10K	Perpetual Introductory vBNG license for up to 10,000 subscriber sessions
VBNG-INTR-100K	Perpetual Introductory vBNG license for up to 100,000 subscriber sessions
VBNG-INTR-1M	Perpetual Introductory license for up to 1 million subscriber sessions

VBNG-INTR-1K-1YR	Annual Introductory vBNG license for up to 1,000 subscriber sessions
VBNG-INTR-10K-1YR	Annual Introductory vBNG license for up to 10,000 subscriber sessions
VBNG-INTR-100K-1YR	Annual Introductory vBNG license for up to 100,000 subscriber sessions
VBNG-INTR-1M-1YR	Annual Introductory vBNG license for up to 1 million subscriber sessions
VBNG-PREF-1K	Perpetual Preferred vBNG license for up to 1,000 subscriber sessions
VBNG-PREF-10K	Perpetual Preferred vBNG license for up to 10,000 subscriber sessions
VBNG-PREF-100K	Perpetual Preferred vBNG license for up to 100,000 subscriber sessions level
VBNG-PREF-1M	Perpetual Preferred vBNG license for up to 1 million subscriber sessions
VBNG-PREF-1K-1YR	Annual Preferred vBNG license for up to 1,000 subscriber sessions
VBNG-PREF-10K-1YR	Annual Preferred vBNG license for up to 10,000 subscriber sessions
VBNG-PREF-100K-1YR	Annual Preferred vBNG license for up to 100,000 subscribers
VBNG-PREF-1M-1YR	Annual Preferred vBNG license for up to 1 million subscribers
VBNG-ELIT-1K	Perpetual Elite vBNG license for up to 1,000 subscriber sessions
VBNG-ELIT-10K	Perpetual Elite vBNG license for up to 10,000 subscriber sessions
VBNG-ELIT-100K	Perpetual Elite vBNG license for up to 100,000 subscriber sessions
VBNG-ELIT-1M	Perpetual Elite vBNG license for up to 1 million subscriber sessions
VBNG-ELIT-1K-1YR	Annual Elite vBNG license for up to 1,000 subscriber sessions
VBNG-ELITE-10K-1YR	Annual Elite vBNG license for up to 10,000 subscriber sessions
VBNG-ELIT-100K-1YR	Annual Elite vBNG license for up to 100,000 subscriber sessions
VBNG-ELIT-1M-1YR	Annual Elite vBNG license for up to 1 million subscriber sessions

About Juniper Networks

Juniper Networks challenges the status quo with products, solutions and services that transform the economics of networking. Our team co-innovates with customers and partners to deliver automated, scalable and secure networks with agility, performance and value. Additional information can be found at Juniper Networks or connect with Juniper on Twitter and Facebook.

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