

MX240, MX480 and MX960 3D Universal Edge Routers



Product Overview

Network operators of all types are challenged to provide uninterrupted, responsive and customized digital experiences to their customers, all while addressing the relentless bandwidth demands on their network. This requires a dynamic service-oriented network edge that cost-effectively meets capacity demands and easily adapts to meet long-term forecasts.

The SDN-ready MX960, MX480 and MX240 3D Universal Edge Routers deliver the industry-leading performance, reliability and scale that service providers and enterprises need to meet these challenges and increase revenues, reduce TCO, and improve customer experiences.

Product Description

Consumers and enterprises expect highly responsive and customizable cloud-like online services, and current trends show that they are relying on their service providers more than ever before. For example, global e-commerce sales are growing at 20 percent annually¹; enterprises are moving infrastructure to the cloud²; and every minute of every day, more than 300 hours of video are uploaded to YouTube³. Looking to the near future, analysts expect that by 2020, 26 billion Internet of Things (IoT) devices will be in use and generating data—more than a tenfold increase from 2015⁴. These trends place significant demands on the network, especially at the network edge.

With a comprehensive set of powerful routing, switching, and services capabilities, the modular MX960, MX480 and MX240 3D Universal Edge Routers—part of the MX Series portfolio of high-performance, software-centric physical and virtual routers—help service providers and enterprises succeed in a hyper-connected world. Powered by the Junos[®] operating system and the programmable Junos Trio chipset, these powerful edge routers provide the performance, reliability and scale needed to cost-effectively ensure a positive customer experience under all network conditions.

Architecture and Key Components

The MX960, MX480 and MX240 share a common architecture and feature set. The three different chassis sizes help service providers and enterprises “right-size” without compromising quality.

- The MX960 offers up to 12 connectivity slots and is ideal for service provider and cloud networks, cable applications, and mobile service cores
- The MX480 has six connectivity slots and is ideal for mid-size service provider, cloud/data center and cable applications, as well as enterprise cores and data centers
- The MX240 offers up to three connectivity slots and is ideal for smaller service provider and cable sites, data-center interconnects, enterprise WANs, data centers, and campuses

The MX960, MX480 and MX240 also share common components, including field-replaceable switch fabrics, Routing Engines and Modular Port Concentrators (MPCs) which are installed from the front, and power supplies and fan trays which are installed from the back; cooling is provided by fully redundant fan trays that take air in from the front and exhaust air to the rear.

¹ Source: B2C eCommerce Sales Worldwide, Statista, www.statista.com/statistics/261245/b2c-e-commerce-sales-worldwide/

² Source: Digital Business, Rethinking Fundamentals, Bill McNee, Founder and CEO, Saugatuck Technology

³ Source: YouTube Statistics, www.youtube.com/yt/press/statistics.html

⁴ Source: Gartner Says the Internet of Things Installed Base Will Grow to 26 Billion Units By 2020; <http://www.gartner.com/newsroom/id/2636073>

Switch Control Board

The Switch Control Board (SCB) controls power to connectivity and service cards, as well as manages clocking, resets, and boots. The SCB also monitors and controls system functions, including fan speed, board power, the inline power distribution module (PDM), and the system front panel. The switch fabric is integrated into the SCB, providing a non-blocking architecture that connects to all slots within the chassis, and houses the Routing Engine. Three SCBs are available—the SCB, SCBE, and SCBE2.

Table 1: MX Series Switch Fabric Options

Model Number	Description	Switch Fabric Capacity (Tbps)		
		MX960	MX480	MX240
SCBE2-MX-BB	Enhanced MX Switch Control Board (SCBE2)	10.56	5.76	1.92
SCBE-MX-BB	Enhanced Switch Control Board (SCBE)	5.28	2.88	.96
SCB-MX960-BB	Switch Control Board (SCB)	2.64	1.44	.48

Switch fabric capacity measurements are half-duplex

Routing Engine

The Routing Engine (RE) provides control plane functions, runs Junos OS, and handles all routing protocol processes, the software processes that control the router's interfaces, the chassis components, system management, and user access to the router. Software processes that run on the Routing Engine maintain the routing tables, manage routing protocols, control the router interfaces and some chassis components, and provide the interface for system management and user access to the router. Routing Engines communicate with DPCs and MPCs via dedicated out-of-band management channels.

Modular Port Concentrators

Modular Port Concentrators (MPCs) provide comprehensive Layer 3 routing, MPLS, Layer 2 switching, inline services, subscriber management, and advanced hierarchical quality of service (HQoS) among many other features. Some MPCs provide network connectivity directly; others host Modular Interface Cards (MICs) that allow users to "mix and match" interface types. Powered by the programmable Junos Trio chipset, MPCs also collect statistics at the hardware and software component levels that identify resource utilization, loss and delay measurements, and queue depth.

For more details on connectivity MPCs, see www.juniper.net/assets/us/en/local/pdf/datasheets/1000294-en.pdf

MS-MPCs provide dedicated processing for Network Edge Services (CGN, IPsec, stateful firewall, deep packet inspection [DPI], monitoring, and other compute-intensive services) and efficiently integrate these services directly on the MX960, MX480 and MX240 at scale and without impacting forwarding performance. MS-MPCs also reduce dependence on appliances and the layers of complexity they add to the operations environment.

For more details on the Multiservices MPCs, see www.juniper.net/assets/us/en/local/pdf/datasheets/1000454-en.pdf

For more details on network edge services, see www.juniper.net/us/en/products-services/network-edge-services/

Junos OS

Junos is a reliable, high-performance, modular network operating system that is supported across all of Juniper Networks physical and virtual routing, switching, and security platforms. Junos OS improves network operations and increases the availability, performance, and security of all types of MX Series services with features like low-latency multicast, and comprehensive QoS Unified ISSU and Junos Continuity, which enhance continuous delivery and eliminate the risk and complexity of OS upgrades.

With secure programming interfaces, the Juniper Extension Toolkit and versatile scripting support, as well as integration with popular orchestration frameworks, Junos OS offers flexible options for continuous delivery and DevOps style management that can unlock more value from the network.

For more details on Junos OS, please visit www.juniper.net/us/en/products-services/nos/junos

MX Series Features and Benefits

Unmatched Network Availability

The MX Series 3D Universal Edge Routers are true carrier-grade edge routing platforms that ensure network and service availability with a broad set of multi-layered physical, logical, and protocol-level resiliency features. In addition, Juniper's Virtual Chassis technology supports chassis-level redundancy while enabling users to manage two routers as a single element. Additionally, a link aggregation group (LAG) implementation supports stateful chassis, card, and port redundancy, as well as subscriber and session persistence.

Junos OS has a modular architecture that runs each program independently in its own protected memory space to ensure individual processes do not interfere with one another. Junos strives to achieve uninterrupted routing and forwarding using innovative features such as Unified ISSU, which permits OS without disruption, and Junos Continuity, which eliminates the need for OS upgrades when adding new hardware to deployed MX Series routers. Simply add the driver package for the new hardware—no reboot is required. Other continuous systems availability features include graceful restart, Junos XML management protocol commit script capabilities, and service-level resiliency features such as VPLS multihoming and MPLS Fast ReRoute. Junos Automation provides a powerful set of scripts for problem detection and resolution, and Advanced Insight Solutions (AIS) embeds Juniper engineering expertise directly into the MX Series router.

Embedded Element-Layer Analytics

The programmable Junos Trio chipsets provide the power to monitor and collect data at the component level, and use the Junos Telemetry Interface to stream this data into monitoring, analytics, performance management, and similar visualization tools (see Figure 1), as well as Path Computation Elements such as Juniper Networks NorthStar Controller.

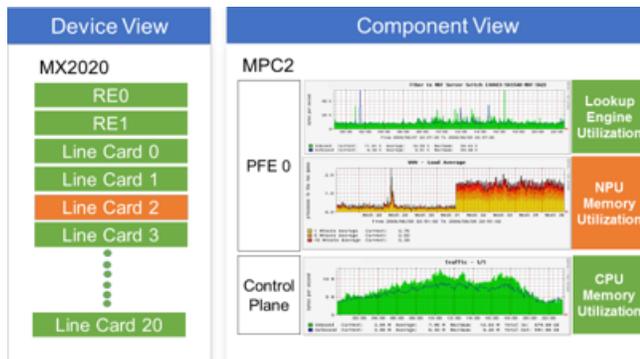


Figure 1. Visualized Analytics derived from MX Series router and MPCs

This information helps identify current and trending congestion, resource utilization, traffic volume, latency, and delay, which can be used to identify issues, make informed decisions on network design and investments, and enable network optimization.

Integrated Network Edge Services

Hosting Network Edge Services directly on MX Series routers—without impacting routing or forwarding performance—helps consolidate and eliminate service-specific appliances as well as their operating systems and management systems, which streamlines operations and lowers TCO.

Juniper's Network Edge Services portfolio includes:

- Junos Address Aware, which conserves the IPv4 address pool, ensures IPv4/IPv6 coexistence, and aids in the transition to IPv6
- Junos Network Secure, which provides stateful firewall services for network protection and managed security
- Junos VPN Site Secure, which uses standard encryption modes to secure communications over access networks, and for added security over L3 VPNs
- Junos Traffic Vision, which provides the granular traffic visibility needed to improve network efficiency, increase security, and support operational tasks
- Junos Video Focus, which provides standards-based video monitoring and automatic issue mitigation to ensure high-quality customer experiences
- Junos Web Aware, a powerful application that tracks HTTP requests and responses, and enables tag insertion and header enrichment
- Junos L4 Load Balancer, a hybrid traffic load balancer based on advanced Junos OS capabilities that increases network efficiency

Network Edge Services are optionally licensed individually; the MX Series can host multiple services concurrently. Network Edge Services can also be deployed on a Juniper Networks Service Control Gateway—an MX Series router running Junos Subscriber Aware and/or Junos Application Aware.

For more details on network edge services, see www.juniper.net/us/en/products-services/network-edge-services

Addresses Broadest Set of Service Provider Applications

Broadband Edge

The MX960, MX480 and MX240 routers offer powerful Broadband Network Gateway (BNG) features that allow broadband services to be provisioned for today and tomorrow, with support for Point-to-Point Protocol (PPP) subscriber termination, Dynamic Host Configuration Protocol (DHCP), IPv4/IPv6 local server, and relay proxy for subscriber migration to DHCP access models. Juniper's BNG also supports hierarchical queuing, granular QoS, and dynamic multilayer service activation, RADIUS, and Diameter support for backend server integration to facilitate authentication, policy control, and accounting, as well as support for flexible L2/L3 wholesale models.

Business Edge

MX960, MX480 and MX240 routers include a comprehensive VPN toolkit to support feature-rich, standards-based, secure internetworking for innovative business services. In addition to basic Layer 3 VPN, Layer 2 VPN, and VPLS support, the MX Series routers offer enhanced VPN services such as QoS prioritized VPN traffic for voice and video, VPN-aware multicast and firewall services that leverage technologies such as LDP-BGP VPLS internetworking, point-to-multipoint label-switched paths (P2MP LSPs), BGP-based multicast L3VPN, L2 VPN internetworking to connect dissimilar L2 access networks, MPLS plug-and-play, and IPsec/generic routing encapsulation (GRE) VPNs.

Metro Ethernet

MX960, MX480 and MX240 routers provide outstanding support for metro and aggregation networks by offering a full suite of routing and switching features, allowing network operators to choose a deployment model that best fits their business and technical needs. The MX960, MX480 and MX240 routers can be deployed as IP/IP VPN edge routers, Ethernet VPN (E-VPN) and VPLS provider edge routers (VPLS-PE), MPLS label-switching routers (LSR), and as Layer 2 Ethernet switches or Layer 3 IP routers.

Universal SDN Gateway

MX960, MX480 and MX240 routers are ideal universal SDN gateways, interconnecting virtual and physical networks and virtual networks operating with different technologies. Key enabling features include support for Multiprotocol BGP (MBGP), dynamic tunnels using MPLS-over-GRE or VXLAN encapsulation, virtual routing and forwarding (VRF) tables or E-VPNs, and Netconf, as well as mechanisms to send traffic between VRF and global routing tables based on configuration and policy.

Service Control Gateway

The MX960, MX480 and MX240 routers provide an excellent foundation for the Service Control Gateway, an advanced solution that considers network state, application type, subscriber privilege, and operator policy to deliver networked services. Leveraging Junos Application Aware, which uses deep-packet inspection techniques to identify and classify traffic on a per application basis, and Junos Subscriber Aware, which

associates traffic flows with the subscriber that generated them, the Service Control Gateway supports differentiated service creation and delivery, and when used with Contrail Cloud Platform, can create and dynamically direct traffic into complex service chains.

For more information on the Service Control Gateway, see www.juniper.net/assets/us/en/local/pdf/datasheets/1000540-en.pdf



Specifications and Approvals

This section lists basic specifications by platform. For further details, please refer to the hardware installation manuals at www.juniper.net/techpubs/hardware.

Specification	MX240	MX480	MX960
Dimensions and Power			
Physical dimensions (W x H x D)	17.5 x 8.7 x 23.8 in (44.5 x 22.1 x 60.5 cm)	17.5 x 14 x 23.8 in (44.5 x 35.6 x 60.5 cm)	17.5 x 27.8 x 23.5 in (44.5 x 70.5 x 59.7 cm)
Weight (lb/kg) fully configured	130 lb/59 kg	180 lb/81.7 kg	334 lb/151.6 kg
Mounting	Front or center	Front or center	Front or center
Power (DC/AC)	-40 to -72 V DC 100 to 240 V AC	-40 to -72 V DC 100 to 240 V AC	-40 to -72 V DC 200 to 240 V AC

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.

Ordering Information

Model Number	Description		
Base Unit	MX240	MX480	MX960
DC Chassis	MX240BASE-DC, MX240BASE3-DC	MX480BASE-DC, MX480BASE3-DC	MX960BASE3-DC; MX960BASE-DC
AC Chassis	MX240BASE-AC, MX240BASE3-ACH, MX240BASE3-ACL	MX480BASE-AC, MX480BASE3-AC	MX960BASE3-AC; MX960BASE-AC
Modular Port Concentrators (MPCs)			
MPC7-10G	Fixed 40x 10GbE line card bundle with full scale L2/L2.5 and reduced scale L3 features, optional license permits up to 32,000 queues with HQoS		
MPC7-10G-RB	Fixed 40x 10GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions; includes full scale L2/L2.5, L3 and L3VPN features		
MPC7-10G-I-RB	Fixed 40x 10GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions, includes full scale L2/L2.5, L3 features and up to 16 L3VPN instances		
MPC7-MRATE	Fixed 12x QSFP line card bundle for the MPC7-MRATE only, all ports support 4x 10GbE, 40GbE and 4 ports support 100GbE (QSFP 28), with full scale L2/L2.5 and reduced scale L3 features, optional license permits up to 32,000 queues with HQoS		
MPC7-MRATE-RB	Fixed 12x QSFP line card bundle for the MPC7-MRATE only, all ports support 4x 10GbE, 40GbE and 4 ports support 100GbE (QSFP 28), includes full scale L2/L2.5, L3 and L3VPN features.		
MPC7-MRATE-I-RB	Fixed 12x QSFP line card bundle for the MPC7-MRATE only, all ports support 4x 10GbE, 40GbE and 4 ports support 100GbE (QSFP 28), includes full scale L2/L2.5, L3 features and up to 16 L3VPN instances		
MPC7-MRATE-Q	Fixed 12x QSFP line card for the MPC7-MRATE only, all ports support 4x 10GbE, 40GbE and 4 ports support 100GbE (QSFP 28), with HQoS; supports 1 million queues and 128,000 sessions; with full scale L2/L2.5 and reduced scale L3 features,		
MPC7-MRATE-Q-RB	Fixed 12x QSFP line card bundle, all ports support 4x 10GbE, 40GbE and 4 ports support 100GbE (QSFP 28), with HQoS; supports 1 million queues and 128,000 sessions; includes full scale L2/L2.5, L3 and L3VPN features.		
MPC7-MRATE-Q-I-RB	Fixed 12x QSFP line card bundle for the MPC7-MRATE only, all ports support 4x 10GbE, 40GbE and 4 ports support 100GbE (QSFP 28), with HQoS; supports 1 million queues and 128,000 sessions, includes full scale L2/L2.5, L3 features and up to 16 L3VPN instances.		
MPC5E-100G10G	Fixed 2x 100GbE and 4x 10GbE line card bundle with full scale L2/L2.5 and reduced scale L3 features, optional license permits up to 32,000 queues with HQoS.		
MPC5E-100G10G-IRB	Fixed 2x 100GbE and 4x 10GbE line card bundle with full scale L2/L2.5, L3 features and up to 16 L3VPN instances, optional license permits up to 32,000 queues with HQoS.		
MPC5E-100G10G-RB	Fixed 2x 100GbE and 4x 10GbE line card bundle with full scale L2/L2.5, L3 and L3VPN features, optional license permits up to 32,000 queues with HQoS.		
MPC5E-40G10G	Fixed 6x 40GbE or 24x 10GbE line card bundle with full scale L2/L2.5 and reduced scale L3 features, optional license permits up to 32,000 queues with HQoS.		
MPC5E-40G10G-IRB	Fixed 6x 40GbE or 24x 10GbE line card bundle with full scale L2/L2.5, L3 features and up to 16 L3VPN instances, optional license permits up to 32,000 queues with HQoS.		
MPC5E-40G10G-RB	Fixed 6x 40GbE or 24x 10GbE line card bundle with full scale L2/L2.5, L3 and L3VPN features, optional license permits up to 32,000 queues with HQoS.		
MPC5EQ-100G10G	Fixed 2x 100GbE and 4x 10GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions; includes full scale L2/L2.5 and reduced scale L3 features.		
MPC5EQ-100G10G-IRB	Fixed 2x 100GbE and 4x 10GbE GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions; includes full scale L2/L2.5, L3 features and up to 16 L3VPN instances.		
MPC5EQ-100G10G-RB	Fixed 2x 100GbE and 4x 10GbE GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions; includes full scale L2/L2.5, L3 and L3VPN features.		
MPC5EQ-40G10G	Fixed 6x 40GbE or 24x 10GbE GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions; includes full scale L2/L2.5 and reduced scale L3 features.		
MPC5EQ-40G10G-IRB	Fixed 6x 40GbE or 24x 10GbE GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions, includes full scale L2/L2.5, L3 features and up to 16 L3VPN instances.		
MPC5EQ-40G10G-RB	Fixed 6x 40GbE or 24x 10GbE GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions, includes full scale L2/L2.5, L3 and L3VPN features.		
MPC4E-3D-2GE	Fixed 2x 100GbE and 8x 10GbE line card bundle with full scale L2/L2.5 and reduced scale L3 features		
MPC4E-3D-32XGE-SFPP	Fixed 32x 10GbE line card bundle with full scale L2/L2.5 and reduced scale L3 features		

Model Number	Description
MPC4E-3D-2CGE-8XGE-IRB	Fixed 2x 100GbE and 8x 10GbE line card bundle with full scale L2/L2.5, L3 features, up to 16 L3VPNs per MPC
MPC4E-3D-32XGE-IRB	Fixed 32x 10GbE SFPP line card bundle with full scale L2/L2.5, L3 features, up to 16 L3VPNs per MPC
MPC4E-3D-2CGE8XGE-RB	Fixed 2x 100GbE and 8x 10GbE line card bundle with full scale L2/L2.5, L3 and L3VPN features
MPC4E-3D-32XGE-RB	Fixed 32x GbE SFPP line card bundle with full scale L2/L2.5, L3 and L3VPN features
MX-MPC3E-3D	MPC3 with support for 100GbE, 40GbE, and 10GbE interfaces, L2.5 features, optics sold separately
MX-MPC3E-3D-R-B	MPC3E with support for 100GbE, 40GbE, and 10GbE interfaces, includes full scale L2, L3, L3VPN features, optics sold separately
MPC3E-3D-NG	Next-generation MPC3E with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5 and reduced scale L3 features. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by MPC1E, MPC2E, and MPC3E.
MPC3E-3D-NG-IR-B	Next-generation MPC3E line card bundle with upgraded CPU and memory. Offers full feature parity with the MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5 and L3 features and up to 16 L3VPNs per MPC. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by the MPC1E, MPC2E, and MPC3E.
MX-MPC3E-3D-R-B	MPC3E with support for 100GbE, 40GbE, and 10GbE interfaces, includes full scale L2, L3, L3VPN features, optics sold separately
MPC3E-3D-NG	Next-generation MPC3E with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5 and reduced scale L3 features. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by MPC1E, MPC2E, and MPC3E.
MPC3E-3D-NG-IR-B	Next-generation MPC3E line card bundle with upgraded CPU and memory. Offers full feature parity with the MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5 and L3 features and up to 16 L3VPNs per MPC. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by the MPC1E, MPC2E, and MPC3E.
MPC3E-3D-NG-R-B	Next-generation MPC3E line card bundle with upgraded CPU and memory. Offers full feature parity with the MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 and L3VPN features. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by the MPC1E, MPC2E, and MPC3E.
MPC3E-3D-NG-Q	Next-generation MPC3E with upgraded CPU and memory. Offers full feature parity with the MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5 features, reduced scale L3 features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by the MPC1E, MPC2E, and MPC3E.
MPC3E-3D-NG-Q-IR-B	Next-generation MPC3E line card bundle with upgraded CPU and memory. Offers full feature parity with the MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 and up to 16 L3VPN features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by the MPC1E, MPC2E, and MPC3E.
MPC3E-3D-NG-Q-R-B	Next-generation MPC3E line card bundle with upgraded CPU and memory. Offers full feature parity with the MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5 features, L3 features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by the MPC1E, MPC2E, and MPC3E.
MPC-3D-16XGE-SFPP	Fixed 16x 10GbE line card bundle with L2.5 features
MPC-3D-16XGE-SFPP-R-B	Fixed 16x 10GbE GbE line card bundle with full scale L2/L2.5 and L3 features
MPC2E-3D-NG	Next-generation MPC2E with upgraded CPU and memory. Offers full feature parity with the MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5 and reduced scale L3 features. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by MPC1E and MPC2E.
MPC2E-3D-NG-IR-B	Next-generation MPC2E line card bundle with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 features and up to 16 L3VPNs per MPC. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by MPC1E and MPC2E.
MPC2E-3D-NG-R-B	Next-generation MPC2E line card bundle with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 and L3VPN features. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by MPC1E and MPC2E.
MPC2E-3D-NG-Q	Next-generation MPC2E with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, and reduced scale L3 features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by MPC1E and MPC2E.
MPC2E-3D-NG-Q-IR-B	Next-generation MPC2E line card bundle with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 and up to 16 L3VPN features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by MPC1E and MPC2E.
MPC2E-3D-NG-R-B	Next-generation MPC2E line card bundle with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 and L3VPN features. Flexible queuing option enables hierarchical QoS support with up to 32,000 total queues. Supports all MICs supported by MPC1E and MPC2E.

Model Number	Description
MPC2E-3D-NG-Q	Next-generation MPC2E with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, and reduced scale L3 features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by MPC1E and MPC2E.
MPC2E-3D-NG-Q-IR-B	Next-generation MPC2E line card bundle with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 and up to 16 L3VPN features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by MPC1E and MPC2E.
MPC2E-3D-NG-Q-R-B	Next-generation MPC2E line card bundle with upgraded CPU and memory. Offers full feature parity with MPC1E, MPC2E, and MPC3E. Includes full scale L2/L2.5, L3 features, and hierarchical QoS with up to 512,000 queues per slot. Supports all MICs supported by MPC1E and MPC2E.
MX-MPC2-3D	MPC2 with port queuing; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2-3D-EQ	MPC2 line card bundle with per-IFL HQoS, 512,000 queues; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2-3D-EQ-R-B	MPC2 line card bundle with per-IFL HQoS, 512,000 queues; includes full scale L3, L2 and L2.5 features
MX-MPC2-3D-Q	MPC2 line card bundle with per-IFL HQoS, 256,000 queues (max 128,000 egress); includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2-3D-Q-R-B	MPC2 line card bundle; includes full scale L3, L2, and L2.5 features
MX-MPC2-3D-R-B	MPC2 line card bundle; includes full scale L3, L2, and L2.5 features
MX-MPC2E-3D	Enhanced MPC2 with port queuing; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2E-3D-EQ	Enhanced MPC2 with per-IFL HQoS, 512,000 queues; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2E-3D-EQ-R-B	Enhanced MPC2 line card bundle; includes full scale L3, L2, and L2.5 features
MX-MPC2E-3D-P	Enhanced MPC2 with 1588v2, port queuing; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2E-3D-P-Q-B	Enhanced MPC2 line card bundle; includes 1588v2, per-IFL HQoS, 256,000 queues (maximum 128,000 egress), full scale L2/L2.5 and reduced scale L3 features
MX-MPC2E-3D-P	Enhanced MPC2 with 1588v2, port queuing; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2E-3D-P-Q-B	Enhanced MPC2 line card bundle; includes 1588v2, per-IFL HQoS, 256,000 queues (maximum 128,000 egress), full scale L2/L2.5 and reduced scale L3 features
MX-MPC2E-3D-Q	Enhanced MPC2 line card bundle, includes per-IFL HQoS, 256,000 queues (maximum 128,000 egress); includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC2E-3D-Q-R-B	Enhanced MPC2E line card bundle; includes per-IFL HQoS, 256,000 queues (maximum 128,000 egress), full scale L3, L2, and L2.5 features
MX-MPC1-3D	MPC1 with port queuing; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC1-3D-Q	MPC1 with per-IFL HQoS, 128,000 queues (maximum 64,000 egress); includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC1-3D-Q-R-B	MPC1 line card bundle; includes full scale L3, L2, and L2.5 features
MX-MPC1-3D-R-B	MPC1 line card bundle; includes full scale L3, L2, and L2.5 features
MX-MPC1E-3D	Enhanced MPC1 with port queuing; includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC1E-3D-Q	Enhanced MPC1 with per-IFL HQoS, 128,000 queues (max 64,000 egress); includes full scale L2/L2.5 and reduced scale L3 features
MX-MPC1E-3D-Q-R-B	Enhanced MPC1 with per-IFL HQoS, 128,000 queues (max 64,000 egress) line card bundle; includes full scale L3, L2, and L2.5 features
MX-MPC1E-3D-R-B	Enhanced MPC1 line card bundle; includes full scale L3, L2, and L2.5 features
MS-MPC-128	Multiservices MPC supports a variety of optionally licensed applications including Stateful firewall, Carrier-Grade NAT (CGN), and deep packet inspection (DPI); each purchased separately.

Modular Interface Cards (MICs)

MIC3-3D-10XGE-SFPP	MIC with 10x10GbE small form-factor pluggable plus transceiver (SFPP+) interface, optics sold separately
MIC3-3D-1X100GE-CFP	MIC with 1x100GbE C form-factor pluggable transceiver (CFP) interface, optics sold separately
MIC3-3D-1X100GE-CXP	MIC with 1x100GbE 100-gigabit small form-factor pluggable transceiver (CXP) interface, optics sold separately
MIC3-100G-DWDM	MIC with 1x100GbE OTU4 DWDM PIC, DP-QPSK, full C-band tunable, GFEC, HGFE, SDFEC. Requires MPC3E or MPC3E-NG. Optics sold separately.
MIC3-3D-2X40GE-QSFP	MIC with 2x40GbE quad small form-factor pluggable plus transceiver (QSFP+) interface, optics sold separately

Model Number	Description
MIC-3D-1CHOC48	1 port channelized OC48/channelized STM16 (down to DS0) MIC
MIC-3D-1OC192-XFP	1 port OC192/STM64 MIC
MIC-3D-20GE-SFP	20x10/100/1000 MIC for MX Series; requires optics sold separately
MIC-3D-2XGE-XFP	2x10GbE MIC for MX Series; requires optics sold separately
MIC-3D-40GE-TX	40x10/100/1000 RJ-45 full height MIC (fixed optics)
MIC-3D-4CHOC3-2CHOC12	4 port channelized OC3/2 port channelized OC12 (down to DS0) MIC
MIC-3D-4COC3-1COC12-CE	Multirate circuit emulation MIC, 4 port channelized OC3/STM1 (to DS0) or 1 port channelized OC12/STM4 (to DS0)

Dense Port Concentrators (DPCs)

DPCE-R-20GE-2XGE	20-port GbE + 2-port 10GbE DPC with L2+L3 features
DPCE-R-Q-20GE-2XGE	20-port GbE + 2-port 10GbE enhanced queuing DPC with L2+L3 features
DPCE-R-Q-20GE-SFP	20x10GbE L2/L3 capable with enhanced queuing
DPCE-R-2XGE-XFP	2x10GbE Enhanced DPC for MX Series
DPCE-R-40GE-SFP	40x10GbE L2/L3 capable
DPCE-R-Q-40GE-SFP	40x10GbE enhanced queuing DPC for MX Series with L2/L3 features and VLAN-HQoS
DPCE-R-40GE-TX	40-port 10/100/1000 RJ-45 DPC with L2+L3 features
DPCE-X-40GE-SFP	40x10GbE L2+ capable
DPCE-X-Q-40GE-SFP	40x10/100/1000 Ethernet L2/L3 capable with RJ45
DPCE-X-4XGE-XFP	4x10GbE L2+ capable
DPCE-R-4XGE-XFP	4x10GbE Enhanced DPC with L2+L3 features
DPCE-R-Q-4XGE-XFP	4x10GbE queuing DPC with L2/L3 features and VLAN-HQoS
DPCE-X-Q-4XGE-XFP	4x10GbE L2+ capable board with enhanced queuing
MX-FPC2	DPC with 2 slots for type 2 PICs
MS-DPC	Multiservices DPC provides 20 Gbps of service throughput

Routing Engines

RE-S-X6-64G-BB	6 Core 2.0 GHz CPU and 64 GB memory, base bundle
RE-S-X6-64G-S	6 Core 2.0 GHz CPU and 64 GB memory, spare
RE-S-X6-64G-R	6 Core 2.0 GHz CPU and 64 GB memory, redundant RE
RE-S-X6-64G-LT-S	6 Core 2.0 GHz CPU with 64 GB memory, limited encryption version, spare
RE-S-1300-2048-BB	1.3 GHz CPU and 2 GB memory, base bundle
RE-S-2000-4096-UPG-BB	2 GHz CPU and 4 GB memory, base bundle
RE-S-1300-2048-R	1.3 GHz CPU and 2 GB memory, redundant
RE-S-2000-4096-R	2 GHz CPU and 4 GB memory, redundant
RE-S-1800X2-8G-R	Dual-core 1.8 GHz CPU and 8 GB memory, redundant
RE-S-1800X2-16G-R	Dual-core 1.8 GHz CPU and 16 GB memory, redundant
RE-S-1800X4-8G-R	Quad-core 1.8 GHz CPU and 8 GB memory, redundant
RE-S-1800X4-16G-R	Quad-core 1.8 GHz CPU and 16 GB memory, redundant
RE-S-1800X2-8G-UPG-BB	Dual-core 1.8 GHz CPU and 8 GB memory, upgrade for base bundle
RE-S-1800X2-16G-UPG-BB	Dual-core 1.8 GHz CPU and 16 GB memory, upgrade for base bundle
RE-S-1800X4-8G-UPG-BB	Quad-core 1.8 GHz CPU and 8 GB memory, upgrade for base bundle

Model Number	Description
RE-S-1800X4-16G-UPG-BB	Quad-core 1.8 GHz CPU and 16 GB memory, upgrade for base bundle
RE-S-1800X4-32G-BB	Quad Core 1.8GHz CPU with 32 GB memory, base bundle
RE-S-1800X4-32G-R	Quad Core 1.8GHz CPU with 32 GB memory, redundant
RE-S-1800X4-32G-S	Quad Core 1.8GHz CPU with 32 GB memory, spare
RE-S-1800X4-32G-UB	Quad Core 1.8GHz CPU with 32 GB memory, upgrade for base bundle
RE-S-1800X4-32G-WS	Quad Core 1.8GHz CPU with 32 GB memory, worldwide version

Switch Board Control

SCB-MX960-BB	SCB for MX240, MX480, and MX960
SCBE-MX-BB	Enhanced Switch Control Board for MX240, MX480, and MX960
SCBE2-MX-BB	Enhanced MX Switch Control Board for MX240, MX480, and MX960

Junos OS

USA	Junos OS
Worldwide	Junos-WW

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](https://twitter.com/juniper) and [Facebook](https://facebook.com/juniper).

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