MX Series 5G Universal Routing Platforms

Product Overview

Unrelenting traffic growth—driven by higher speeds, more subscribers, mobile penetration, cloud adoption, and ubiquitous video consumption—is straining traditional service provider and enterprise networks.

To accommodate this reality, Juniper's Secure Automated Distributed Cloud solution helps service providers react to changing market conditions and accelerate service delivery with world-class products and innovative architectural components. The MX Series is an integral part of this solution.

Powered by the Junos OS and programmable Trio/Si5 silicon chipset, MX Series platforms deliver powerful routing, switching, security, and services features that help operators successfully transform their networks—and their businesses—in today's hyper-connected world.

Product Description

The continuous expansion of mobile, video, and cloud-based services is disrupting traditional networks and impacting the businesses that rely on them. While annual double-digit traffic growth requires massive resource investments to prevent congestion and accommodate unpredictable traffic spikes, capturing return on that investment can be elusive. Emerging trends such as 5G mobility, Internet of Things (IoT) communications, and the continued growth of cloud networking promise even greater network challenges in the near future. The Juniper Networks® MX Series 5G Universal Routing Platform delivers the industry's first end-to-end infrastructure security solution for enterprises as they look to move business-critical applications to public clouds. Delivering features, functionality, and secure services at scale in the 5G era with no compromises, the MX Series is a critical part of the network evolution happening now.

At the same time, traditional operations environments are increasingly challenged to meet consumer and business requirements for rapid service delivery and cloud-like network experiences. Issues related to monitoring and management are placing additional stress on already strained budgets and personnel, and promising technologies like Network Functions Virtualization (NFV) and SDN introduce an entirely new set of operational challenges.

Our hyper-connected world demands more agile, automated, and scalable networks. Now more than ever, network operators need to transform their networks—and their operations environments—to accommodate this reality.

Utilizing state-of-the-art software and hardware innovations, MX Series 5G Universal Routing Platforms are helping network operators worldwide successfully transform their networks and services. Powered by the Juniper Networks Junos® operating system and the programmable Trio chipset, MX Series platforms support a broad set of automation tools and telemetry capabilities that enable a rich set of business- and consumer-oriented services with predictable low latency and wire-rate forwarding at scale, while providing the reliability needed to meet strict service-level agreements (SLAs).

An Agile Family of Cloud-Era Universal Routing Platforms

The MX Series portfolio was designed for agility and built from the ground up to support a universal set of edge applications, helping Juniper customers rapidly respond to evolving business and technical requirements while simplifying operations without sacrificing their current infrastructure investments.

With its massive scale and efficiency, the MX Series is ideal for space- and power-constrained environments. It redefines per-slot economics, enabling customers to do more with less while simplifying network design, reducing OpEx. It also enables the profitable delivery of a broad range of business, residential, mobile, cable, data center, and cloud services while seamlessly supporting traditional and emerging network architectures with adaptive software and pervasive security. The flexibility of the MX Series is enabled by the programmable Trio chipset, which allows MX Series platforms to add support for new features, such as telemetry, without costly hardware upgrades. Additionally, support for the Junos Automation Toolkit and the Juniper Extension Toolkit provide modern programming languages that reduce costs and increase profitability by improving productivity and customization.

This agility is evident in the wide variety of MX Series use cases that have been proven in the world's largest and most demanding networks, including:

- **Business Edge**: MX Series platforms support the broadest range of L2/L2.5/L3 VPN services which, in combination with multilayer, multiprotocol resiliency, ensure that customer SLAs are met under all network conditions.

- **Internet/Peering Gateway**: MX Series platforms support the high performance, reliability, scale, and density needed to efficiently peer with Internet and other service provider networks.

- **Broadband Network Gateway (BNG)**: MX Series platforms offer the highest subscriber density and most sophisticated broadband edge features available in the industry.

- **Universal SDN Gateway**: The MX Series offers a comprehensive solution for interconnecting virtual and physical networks—as well as between virtual networks operating with different technologies—via support for Multiprotocol BGP (MBGP), dynamic tunnels using MPLSoGRE or Virtual Extensible LAN (VXLAN) encapsulation, virtual routing and forwarding (VRF) tables, E-VPNs, and Network Configuration Protocol (NETCONF), along with the ability to send traffic between VRF and global routing tables based on configuration and policy.

- **Data Center and Cloud Edge**: The MX Series is ideal for data center/cloud edge applications, with support for multiple overlay encapsulation methods, including VXLAN, Network Virtualization using Generic Routing Encapsulation (NVGRE),

MPLSoUDP, MPLSoGRE, 802.1BR, SR-MPLS, and SR-V6. The MX Series also incorporates data plane security with inline IPsec/MACsec in the MPC-10E line cards, making it a perfect fit for data center and cloud deployments.

- **Enterprise WAN**: Enterprises and government agencies worldwide use MX Series platforms to build their own overlay network on top of a service provider's Layer 2 or MPLS network, using encapsulation technologies such as MPLSoGRE, VXLAN, and IPsec for secure transport.

- **Universal Metro/Aggregation**: MX Series platforms offer a full suite of routing and switching features, allowing you to choose a deployment model that best fits your business and technical needs. The MX Series can be deployed as IP/IP VPN edge routers, Ethernet VPN (EVPN) and virtual private LAN service (VPLS) provider edge (VPLS-PE) routers, MPLS label-switching (LSR) routers, and as Layer 2 Ethernet switches or Layer 3 IP routers.

- **Mobile Backhaul**: In addition to switching, routing, and security features, MX Series platforms support highly scalable and reliable hardware-based timing that meets the strictest LTE requirements, including Synchronous Ethernet for frequency and the Precision Time Protocol (PTP) for frequency and phase synchronization. In addition, the MX104 is ETSI 300-compliant, enabling deployment in next-generation mobile applications such as 5G.

At-a-Glance: MX Series 5G Universal Routing Platforms Comparison

The MX Series portfolio includes a wide range of physical and virtual platforms that share a common architecture and feature set. This enables Juniper customers to select the platform that best addresses their unique business goals and satisfies their scale, density, resiliency, space, power, and value-added service requirements without compromising on quality or features.

Modular MX Series Platforms

MX960, MX480, and MX240 5G Universal Routing Platforms are modular, chassis-based platforms.

- The MX960 has been proven in the world's largest service provider, cable, mobile, and data center networks, offering 10 Tbps of system capacity in support of business and residential broadband services as well as peering and provider edge applications.

- The MX480 is a modular, 5 Tbps-capable router that supports a wide range of cloud, campus, enterprise, data center, service provider, cable, and mobile service core applications.

- The MX240 is a compact router ideal for space-constrained cloud, enterprise, data center, service provider, cable, and mobile service core deployments.

The latest generation of line card hardware for the MX960, MX480, and MX240 platforms delivers multi-terabit crypto capabilities with 256-bit encryption complying with AES-GCM encapsulation per RFC4303; AES-GCM encapsulation per RFC4106; AES-GMAC encapsulation per RFC4543; and AES-GMAC (IPv4/v6) encapsulation per RFCs 4302 and 4543. Along with multi-terabit routing, the latest MPC also delivers integrated Layer 2 MACsec features at flexible interface rates of 10GbE, 40GbE, and 100GbE.

Fixed-Configuration MX Series Platforms

MX204, MX150, MX104, MX80, MX40, MX10, and MX5 Universal Routing Platforms are fixed-configuration platforms that support modular interfaces.

- The MX204 is a space- and power-optimized router delivering ultra-high port density and throughput while consuming just 0.9 W/Gb. It addresses the emerging edge and metro Ethernet networking needs of service providers, mobile, web-scale operators, and MSOs by delivering 800 Gbps of throughput in support of high-density 100GbE, 40GbE, and discrete and breakout 10GbE and 1GbE interfaces—all in a single rack unit.

- The MX150 is a compact, full-featured router that supports 1GbE and 10GbE interfaces. It provides a cost-effective solution for a wide range of low-bandwidth provider edge, business edge, broadband network gateway (BNG), and enterprise WAN applications.

- The MX104 is a mobile backhaul-optimized, ETSI 300 mm-compliant chassis with high redundancy and 160 Gbps of throughput. The MX104 offers four MIC slots and redundant fixed 10GbE interfaces for flexible network connectivity.

- The MX80, MX40, MX10, and MX5 are software upgradeable from 40 Gbps to 160 Gbps, enabling cost-effective "pay as you grow" scale. These platforms have up to four Modular Interface Card (MIC) slots and two fixed 10GbE interfaces for connecting to the network.

The following table provides a comparison between the various MX Series modular and fixed-configuration platforms.

Table 1: MX Series 5G Universal Routing Platforms at a Glance

	MX960	MX480	MX240	MX204	MX150	MX104	MX80	MX40	MX10	MX5
Rack units	16	8	5	1	1	3.5	2	2	2	2
Systems per rack	3	6	9	48	48	13	24	24	24	24
Slots	11 MPCs	6 MPCs	2 MPCs	8 10GbE, 4 100GbE	NA	4 10GbE, 4 MIC slots	4 10GbE, 3[1] MIC slots	2 10GbE, 3[2] MIC slots	3[3] MIC slots	3[4] MIC slots
Per slot capacity	480 Gbps	480 Gbps	480 Gbps	NA	NA	20 Gbps	20 Gbps	20 Gbps	20 Gbps	20 Gbps
Maximum system throughput[5]	10.56 Tbps	5.76 Tbps	1.92 Tbps	800 Gbps	40 Gbps	160 Gbps	160 Gbps	120 Gbps	80 Gbps	40 Gbps
PDH	Yes	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	NA
Sonet/SDH	Yes	Yes	Yes	NA	NA	Yes	Yes	Yes	Yes	NA
Maximum 1GbE	440	240	80	24	12	80	80	60	40	20
Maximum 10GbE	440	240	80	24	2	8	8	4	1	NA
Maximum 40GbE	132	72	24	4	NA	NA	NA	NA	NA	NA
Maximum 100GbE	44	24	8	4	NA	NA	NA	NA	NA	NA
10GbE DWDM	88	48	16	NA	NA	NA	NA	NA	NA	NA
100GbE DWDM	22	12	4	NA	NA	NA	NA	NA	NA	NA

[1] The MX80 has two front MIC slots and one rear MIC slot. The rear MIC slot only supports the MS-MIC.
[2] The MX40 has two front MIC slots and one rear MIC slot. The rear MIC slot only supports the MS-MIC.
[3] The MX10 has two front MIC slots and one rear MIC slot. The rear MIC slot only supports the MS-MIC.
[4] The MX5 has one front MIC slot and one rear MIC slot. The rear MIC slot only supports the MS-MIC.
[5] Note, system throughput is calculated as (per slot capacity) x (number of slots) x (2).

Architecture and Key Components

Modular Components for Chassis-Based MX Series Platforms

The modular, chassis-based MX960, MX480, and MX240 share the following components:

- Modular Port Concentrators (MPCs) provide routing, MPLS, switching, inline services, subscriber management, and hierarchical quality of service (HQoS) among many other features. MPCs may also host interfaces directly or via Modular Interface Cards (MICs) that allow users to "mix and match" interface types. Powered by the programmable Trio chipset, MPCs collect and stream telemetry that identifies resource utilization, loss and delay, and other metrics.

- Switch Control Boards (SCBs) feature an integrated switch fabric that connects to all slots in the chassis in a nonblocking architecture. The SCBs house the Routing Engine, control power to MPCs, monitor and control system functions such as fan speed and the system front panel, and manage clocking, resets, and boots.

- The Routing Engine (RE) provides the control plane, runs Juniper Networks Junos® operating system, and handles all routing protocol processes as well as the software processes that control MPCs, chassis components, system management, and user access to the router. REs communicate with MPCs via dedicated out-of-band management channels.

MPC-10E Line Card

The MPC-10E line card is a key contributor to the service provider transformation in the cloud era when deployed with MX960, MX480, and MX240 platforms in a Juniper Secure Automated Distributed Cloud environment. By providing the underlying network infrastructure with scale, agility, routing innovation, and pervasive security while incorporating universal (10/40/100/400GbE) ports, the MPC-10E protects existing investments with disaggregated software innovation and infinite programmability. Built-in automation enables rapid deployment without disrupting the existing MX960/MX480/MX240 footprint. The MPC-10E line card is powered by the new Juniper Si5 silicon, which enables the benefits highlighted in Table 2.

Table 2: MPC-10E Line Card Benefits at a Glance

Attribute	Benefit
Performance	Triples MX960/MX480/MX240 chassis performance to 1/1.5 Tbps per slot with new SCBE3 fabric, enabling up to 10 Tbps throughput
Universal Interfaces	Reduces interface sparing with multi-rate 10/40/100GbE interfaces
Power Efficiency	Consumes ~0.5 W per gigabit per system level
Inline Data Plane Security	Features AES-256 MACsec line-side encryption and native IPsec tunnel support
Investment Protection	Backward compatible with existing MPCs and REs: PC3E/MPC4E/MPC5E/MPC7E/NG-MPC, MS-MPC, NG-MSMPC, MPC2E/3E-NG, and 16x10G MPCs; RE-S-1800 and RE-S-X6 Routing Engine modules
Seamless Deployment	Reuse deployed MX960/MX480/MX240 chassis, power modules, and fan trays

Junos OS

Junos OS is a reliable, high-performance, modular network operating system that is supported across all of Juniper's physical and virtual routing, switching, and security platforms. Junos OS improves network operations and increases service availability, performance, and security with features like low-latency multicast, comprehensive quality of service (QoS), unified in-service software upgrade (unified ISSU), and Junos Continuity, which eliminates the risk and complexity of OS upgrades. With secure programming interfaces, versatile scripting support, and integration with popular orchestration frameworks, Junos OS offers flexible options for DevOps style management that can unlock more value from the network.

The Programmable Trio Chipset

The programmable Trio chipset is Juniper-developed breakthrough silicon technology that is implemented across the MX Series portfolio. Its innovative design improves business economics by enabling a truly converged platform with maximum performance, service agility, and exceptional power and thermal efficiency.

Trio has a programmable forwarding data structure that allows fast microcode changes in the hardware itself, as well as a programmable lookup engine that allows inline service processing. Furthermore, Trio's programmable QoS engine supports coarse and fine-grained queuing to efficiently address the diverse requirements of core, edge, and aggregation use cases.

With its proven extensibility and agility, the programmable Trio chipset helps network operators worldwide successfully address their most complex technical and market challenges, and promises to meet the requirements of emerging applications for many years to come.

Network Edge Services

MX Series platforms can host optionally licensed Junos OS-based network edge services at scale, both inline on MPCs as well as on dedicated service cards. Hosting network edge services on MX Series platforms reduces network cost and complexity by eliminating numerous elements, operating systems, and interconnections.

- MPCs support inline services using the programmable Trio chipset; supported services include flow monitoring, 1:1 Network Address Translation (NAT), port mirroring, generic routing encapsulation (GRE), IP tunneling, logical tunnels, lawful intercept, and video monitoring.

- The MS-MPC and the MS-MIC provide dedicated processing for compute-intensive services such as carrier-grade NAT (CGNAT), IPsec, stateful firewall, deep packet inspection, flow monitoring, and load balancing.

MX Series Platform/Feature Matrix

		MX960	MX480	MX240	MX204	MX150	MX104	MX80	MX40	MX10	MX5
Security	Firewall filters/ACLs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	DDoS—control plane	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	DDoS—FlowSpec	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Stateless filters L2-L4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Stateful services[6]	✓	✓	✓	✓	No	✓	✓	✓	✓	✓
Inline Services	GRE reassembly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	1:1 NAT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Flow monitoring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Video monitoring	✓	✓	✓	✓	No	✓	✓	✓	✓	✓
	Lawful intercept	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Mirroring	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Service Card Supported Services[6]	Deep packet inspection	✓	✓	✓	No	No	No	No	No	No	No
	CGNAT	✓	✓	✓	No	No	✓	✓	✓	✓	✓
	Flow monitoring	✓	✓	✓	✓	No	✓	✓	✓	✓	✓
	Traffic load balancing	✓	✓	✓	No	No	No	No	No	No	No
	IPsec	✓	✓	✓	No	✓	✓	✓	✓	✓	✓
	Stateful firewall	✓	✓	✓	No	No	✓	✓	✓	✓	✓
	HTTP header manipulation	✓	✓	✓	No	No	No	No	No	No	No
Resiliency	Redundant RE	✓	✓	✓	No	No	✓	No	No	No	No
	Unified ISSU	✓	✓	✓	No	No	✓	No	No	No	No
	Nonstop active routing (NSR)	✓	✓	✓	No	No	✓	No	No	No	No
	Fast restoration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Operation, Administration, and Maintenance (OAM)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
System Virtualization	Enhanced SLA and queuing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Junos Fusion Edge (AD)	✓	✓	✓	✓	No	✓	✓	✓	✓	✓
	Logical systems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Virtual router/switch	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Path Computation Element Protocol (PCEP)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	OpenConfig	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	YANG data modeling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Juniper Extension Toolkit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[6] Service Card supported services are available via optional software license and require an MS-MPC or MS-MIC.

Key Features and Benefits

Unmatched Network Availability

MX Series platforms ensure network and service availability with a broad set of multilayered physical, logical, and protocol-level resiliency features, including Juniper's Virtual Chassis technology, which supports chassis-level redundancy while enabling users to manage two routers as a single element. Additionally, a multichassis link aggregation group (MC-LAG) implementation supports stateful chassis, card, and port redundancy, as well as subscriber and session persistence.

Application Aware Networking

MX Series platforms use deep packet inspection to detect applications, and they consult with user-defined policies to determine traffic treatment on a per-application basis, enabling highly customized and differentiated services at scale. Working in conjunction with Juniper Networks Contrail® Cloud Platform™, MX Series routers can also steer into complex service chains and stream granular data to analytics engines and back-office systems to permit real-time charging and end-user engagement at the application and content level.

Junos Continuity and Unified In-Service Software Upgrade (Unified ISSU)

Junos Continuity and unified ISSU features remove the downtime risks associated with implementing new hardware or upgrading operating systems.

- Junos Continuity eliminates OS upgrades and system reboots when adding new hardware to MX Series platforms; a plug-in package provides the drivers and support files needed to bring the hardware online.

- Unified ISSU reduces the risks associated with OS upgrades by enabling upgrades between two different Junos OS releases (major or minor) with no control plane disruption and minimal traffic disruption on the forwarding plane.

Junos Telemetry Interface

The Junos Telemetry Interface feature streams component-level data to monitoring, analytics, performance management, and visualization tools as well as to Path Computation Elements such as Juniper Networks NorthStar Controller. Analytics derived from this streaming telemetry can identify current and trending congestion, resource utilization, traffic volume, and buffer occupancy, which can be used to make informed decisions on network design and investments.

Integrated Timing

MX Series platforms support highly scalable and reliable hardware-based timing that meets the strictest LTE requirements, including Synchronous Ethernet for frequency, and the Precision Time Protocol (PTP) for frequency and phase synchronization. Synchronous Ethernet and PTP can be combined in a "hybrid" mode to achieve the highest level of frequency (10 ppb) and phase (<1.5 uS) accuracy required for LTE-Advanced, eliminating the need for external clocks.

Junos Fusion Provider Edge

Junos Fusion Provider Edge enables MX Series platforms to act as aggregation devices for the Juniper Networks EX4300 Ethernet Switch and QFX5100 line of data center switching platforms acting as satellite devices while appearing to management as a single, port-dense device managed by a single IP address. Junos Fusion Provider Edge significantly expands the number of network interfaces on the MX Series router while keeping operations simple.

Automated Support and Prevention

Juniper's Automated Support and Prevention consists of an ecosystem of tools, applications, and systems that simplify and streamline operations, delivering operational efficiency, reducing downtime, and increasing your network's ROI running Junos OS. Automated Support and Prevention brings operational efficiency by automating several time-consuming tasks such as incident management, inventory management, proactive bug notification, and on-demand End-of-Life/End-of-Support/End-of-Engineering (EOL/EOS/EOE) reports. The Junos Space® Service Now and Service Insight service automation tools are standard entitlements of all Juniper Care contracts.

Junos Automation Toolkit and Juniper Extension Toolkit

Included in Junos OS software, the Junos Automation Toolkit is a suite of tools supported on all Juniper Networks switches, routers, and security devices. These tools, which leverage the native XML capabilities of Junos OS, include commit scripts, op scripts, event policies and event scripts, and macros that help automate operational and configuration tasks. Additionally, the platform-independent Juniper Extension Toolkit provides a modern programming tool kit that includes support for:

- OpenConfig/YANG
- gRPC, Thrift, NETCONF
- JSON/XML
- API support for all modern programming languages
- Rich on-box scripting support using Python
- REST APIs

Together, Junos OS automation and programmability features simplify complex configurations and reduce the potential for configuration errors. They also save time by automating operational and configuration tasks, speed troubleshooting, and maximize network uptime by warning operators of potential problems and automatically responding to system events.

MX960

MX240

MX480

MX204

MX150

MX80/40/10/5

MX104

Specifications

		MX960	MX480	MX240	MX204	MX150	MX104	MX80-MX5
Layout	System capacity	10.56 Tbps	5.76 Tbps	1.92 Tbps	800 Gbps	40 Gbps	160 Gbps	160 Gbps to 40 Gbps
	Slot orientation	Vertical	Horizontal	NA	Horizontal	NA	Horizontal	Horizontal
	Mounting	Front or center	Front or center	Front or center	Front or center	Front or center	Front or center	Front or center
Physical Specification	Dimensions (W x H x D)	17.37 x 27.75 x 23 in (44.11 x 70.49 x 58.42 cm)	17.45 x 14 x 24.5 in (44.3 x 35.6 x 62.2 cm)	17.45 x 8.71 x 24.5 in (44.3 x 22.1 x 62.2 cm)	17.6 x 1.75 x 18.7 in (44.7 x 4.45 x 47.5 cm)	17.36 x 1.72 x 12 in (44.09 x 4.37 x 30.48 cm)	17.22 x 9.46 x 6.09 in (43.7 x 24 x 15.47 cm)	17.5 x 3.5 x 23.46 in (44.5 x 8.9 x 59.6 cm)
	Weight fully loaded	334 lb/ 151.6 kg	180 lbs/ 81.6 kg	130 lb/ 59 kg	23.15 lb/ 10.5 kg	9.48 lb / 4.3 kg	32 lb/14.5 kg	30 lb/13.7 kg
	Weight unloaded	150 lbs/ 68.1 kg	65.5 lbs/ 29.7 kg	52 lbs/ 23.6 kg	17 lb/ 7.71 kg	NA	NA	NA
Routing Engine	Default memory	2x16 MB NOR flash storage; 64 GB of DDR4 RAM; 2x50 GB SSD	2x16 MB NOR flash storage; 64 GB of DDR4 RAM; 2x50 GB SSD	2x16 MB NOR flash storage; 64 GB of DDR4 RAM; 2x50 GB SSD	32GB DDR4; 2x100 GB SSD	Xeon D processor running Wind River Linux 7; 32 GB DDR4 RAM; 400 GB SSD	4 MB boot flash; 8 GB of NAND Flash; 4 GB of DDR3 RAM	8 MB boot flash; 4 GB on NAND flash storage; 2 GB of DDR2 RAM
	Number of cores	6 cores	6 cores	6 cores	8 cores	6 cores	1 core	1 core
Redundancy	Components	Power supplies, REs, fans	Power supplies, REs, fans	Power supplies, REs, fans	Power supplies and fans	Fans	Power supplies, REs, fans	Power supplies and fans
Power	Power input [AC]	200 to 240 V AC	100 to 240 V AC	100 to 240 V AC	100 to 240 V AC	100 to 240 V AC	100 to 240 V AC	100 to 240 V AC
	Power input [DC]	–40 to –72 V DC	–40 to –72 V DC	–40 to –72 V DC	–40 to –72 V DC	NA	–40 to –72 V DC	–40 to –72 V DC
	Typical power draw (AC)	6520 W	3470 W	1860 W	260 W	140 W	325 W	365 W
	Typical power draw (DC)	6670 W	3150 W	1690 W	260 W	NA	350 W	310 W

		MX960	MX480	MX240	MX204	MX150	MX104	MX80-MX5
Environmental	Air flow	Front to back	Side to side	Side to side	Front to back	Front to back	Side to side [forced air]	Side to side [forced air]
	Operating temperature	32º to 115º F (0º to 46º C) at sea level	32º to 115º F (0º to 46º C) at sea level	32º to 115º F (0º to 46º C) at sea level	32º to 115º F (0º to 46º C)	32º to 122º F (0º to 50º C)	–40º to 149º F (–40º to 65º C)	32º to 115º F (0º to 46º C) at sea level
	Operating humidity	5% to 90%	5% to 90%	5% to 90%	5% to 90%	5% to 90%	5% to 90%	5% to 90%
	Operating altitude	10,000 ft (3048 m)	10,000 ft (3048 m)	10,000 ft (3048 m)	6,000 ft (1900 m)			10,000 ft (3048 m)
Certifications	NEBS	- GR-1089-Core EMC and Electrical Safety - Common Bonding Network (CBN) - National Electrical Code (NEC) - GR-63-Core Physical Protection	- GR-1089-Core EMC and Electrical Safety - Common Bonding Network (CBN) - National Electrical Code (NEC) - GR-63-Core Physical Protection	- GR-1089-Core EMC and Electrical Safety - Common Bonding Network (CBN) - National Electrical Code (NEC) - GR-63-Core Physical Protection	- GR-1089-Core EMC and Electrical Safety - Common Bonding Network (CBN) - National Electrical Code (NEC) - GR-63-Core Physical Protection	NA	- SR-3580 (2007) NEBS Criteria Levels (Level 3 Compliance) - GR-63-Core (2006) NEBS Physical Protection - GR-1089-Core (2006) EMC and Electrical Safety - GR-3108-CORE Issue 2, December 2008 - IEEE 1613: 2009 - IEC 61850-3: 2013	- GR-63-Core Physical Protection - GR-1089-Core:EMC and Electrical Safety

Ordering Information

MX5, MX10, MX40, and MX80 Base Product Bundles

Product	Product Number	Description
MX5-MX80	MX5BASE-T	MX5 chassis with timing support—includes dual power supplies, MIC-3D-20GE-SFP, S-MX80-ADV-R, S-MX80-Q, and S-ACCT-JFLOW-IN-5G licenses. Power supply cable needs to be ordered separately.
	MX10BASE-T	MX10 chassis with timing support—includes dual power supplies, MIC-3D-20GE-SFP, 1 empty MIC slot, S-MX80-ADV-R, S-MX80-Q, and S-ACCT-JFLOW-IN-5G licenses. Power supply cable needs to be ordered separately.
	MX40BASE-T	MX40 chassis with timing support—includes dual power supplies, 2 empty MIC slots, 2x10GbE fixed ports, S-MX80-ADV-R, S-MX80-Q, and S-ACCT-JFLOW-IN-5G licenses. Power supply cable needs to be ordered separately.
	MX80BASE-P	MX80 chassis with PTP and Synchronous Ethernet support—includes one power supply, 2 empty MIC slots, 4x10GbE 10-gigabit small form-factor pluggable transceiver (XFP) built-in ports, fan tray with filter. Power supply cable needs to be ordered separately.
	MX80BASE-T	MX80 chassis with timing support—includes one power supply, 2 empty MIC slots, 4x10GbE XFP built-in ports, fan tray with filter. Power supply cable needs to be ordered separately.

Product	Product Number	Description
MX104	MX104-AC	MX104 chassis with 4 MIC slots, 4X10GbE SFPP built-in ports (license required for activation), AC power supply, fan tray with filter, Packet Forwarding Engine and Routing Engine, Altius-MX104.
	MX104-DC	MX104 chassis with 4 MIC slots, 4X10GbE SFPP built-in ports (license required for activation), DC power supply, fan tray with filter, Packet Forwarding Engine and Routing Engine, Altius-MX104.

MX5, MX10, MX40, and MX80 A La Carte Chassis

Product	Product Number	Description
MX5	MX5-T-AC	AC chassis
	MX5-T-DC	DC chassis
MX10	MX10-T-AC	AC chassis
	MX10-T-DC	DC chassis
MX40	MX40-T-AC	AC chassis
	MX40-T-DC	DC chassis
MX80	MX80-T-AC	AC chassis
	MX80-T-DC	DC chassis
	MX80-AC	AC chassis
	MX80-DC	DC chassis
	MX80-48T-AC	AC chassis
	MX80-48T-DC	DC chassis

MX5, MX10, and MX40 Upgrade Licenses

Product	Product Number	Description
MX5	MX-5-10-UPG-B	Software upgrade for MX5 to MX10
	MX-5-40-UPG-B	Software upgrade for MX5 to MX40
	MX-5-80-UPG-B	Software upgrade for MX5 to MX80
MX10	MX-10-40-UPG-B	Software upgrade for MX10 to MX40
	MX-10-80-UPG-B	Software upgrade for MX10 to MX80
MX40	MX-40-80-UPG-B	Software upgrade for MX40 to MX80

MX80 Software Licenses

Product	Product Number	Description
MX80	S-MX80-ADV-R	License to support full scale L3 route and L3 VPN on MX80
	S-MX80-Q	License to support per VLAN queuing on MX80
	S-MX80-SA-FP	Subscriber Management Feature Pack License
	S-MX80-SSM-FP	Subscriber Service Management Feature Packet License (RADIUS/SRC Series-based service activation and deactivation) per service accounting features for subscribers, MX80

MX104 A La Carte Chassis

Product	Product Number	Description
MX104	MX104-AC-Base	MX104 base chassis with 1 AC power supply, fan tray, filter, 1 RE, 4 MIC slots (optics for fixed ports not included, MICs not included)
	MX104-DC-Base	MX104 base chassis with 1 DC power supply, fan tray, filter, 1 RE, 4 MIC slots (optics for fixed ports not included, MICs not included)

MX104 Upgrade Licenses

Product	Product Number	Description
MX104	S-MX104-UPG-2x10GE	Upgrade license to activate 2 x 10GbE fixed ports
	S-MX104-UPG-4x10GE	Upgrade license to activate 4 x 10GbE fixed ports

MX104 Software Licenses

Product	Product Number	Description
MX104	S-MX104-SSM-FP	L3 Subscriber Service Management Feature Packet License, MX104
	S-MX104-Q	License to support per VLAN queuing on MX104
	S-MX104-ADV-R	License to support full-scale L3 route and L3 VPN on MX104

MX150 Base Bundle

Product	Product Number	Description
MX150	MX150-R	MX150 with 10 10/100/1000BASE-T ports, two 100/1000BASE-X SFP ports, and two 10GBASE-X SFP+ ports (optics sold separately), 6-core x86 processor, 400 GB SSD, and 32 GB memory. Supports full L2/L3 feature sets including HQoS and IPsec.

MX150 A La Carte Chassis

Product	Product Number	Description
MX150	MX150	MX150 with 10 10/100/1000BASE-T ports, two 100/1000BASE-X SFP ports, and two 10GBASE-X SFP+ ports (optics sold separately), 6-core x86 processor, 400 GB SSD, and 32 GB memory. Supports basic L2 features.

MX150 Upgrade Licenses*

Product	Product Number	Description
MX150	S-MX150-IR	Software license to support full L2 and limited L3 features and performance
	S-MX150-R	Software license to support full L2/L3 features and scale, including HQoS and IPsec

* Both S-MX150-IR and S-MX150-R are needed to upgrade from MX150 to MX150-R

MX204 Base Product Bundles

Product	Product Number	Description
MX204	MX204	MX204 chassis with 3 fan trays and 2 power supplies
	MX204-R	MX204 chassis with 3 fan trays and 2 power supplies, R mode
	MX204-IR	MX204 chassis with 3 fan trays and 2 power supplies, IR mode

MX204 Chassis

Product	Product Number	Description
MX204	JNP204-CHAS	MX204 chassis, spare

MX204 Power Supply

Product	Product Number	Description
MX204	JPSU-650W-AC-AO	MX204 AC power supply, spare
	JPSU-650W-DC-AFO	MX204 DC power supply, spare

MX204 Fan Trays

Product	Product Number	Description
MX204	JNP-FAN-1RU	MX204 fan tray

MX240, MX480, and MX960 Base Bundles

Product	Product Number	Description
MX240	MX240BASE-AC-HIGH	4 slot MX240 base chassis with 1 AC power supply, 1 SCB
	MX240BASE-AC-LOW	4 slot MX240 base chassis with 2 AC power supplies, 1 SCB
	MX240BASE3-DC	4 slot MX240 base 3 chassis, DC power
	MX240BASE-DC	4 slot MX240 base chassis with 1 fan tray, 1 DC power supply, 1 SCB
	MX240BASE3-ACH	4 slot MX240 base 3 chassis, highline AC power
	MX240BASE3-ACL	4 slot MX240 base chassis, lowline AC power
MX480	MX480BASE3-AC	8 slot MX480 base bundle, AC power
	MX480BASE-AC	8 slot MX480 AC base chassis, 1 fan tray, 3 AC power supplies, 1 SCB, 1 RE
	MX480BASE3-DC	8 slot MX480 base 3 chassis, DC power
	MX480BASE-DC	8 slot MX480 base chassis with 1 fan tray, 2 DC power supplies, 1 SCB, 1 RE
MX960	MX960BASE3-AC	14 slot MX960 base 3 chassis, AC power
	MX960BASE-AC	14 slot MX960 base chassis with 2 fan trays, 3 AC power supplies, 2 SCBs, 1 RE
	MX960BASE3-AC-ECM	14 slot MX960 base 3 chassis with AC power and extended cable manager
	MX960BASE-AC-ECM	14 slot MX960 base chassis with AC power and extended cable manager
	MX960BASE3-DC	14 slot MX960 base 3 chassis, DC power
	MX960BASE-DC	14 slot MX960 base chassis with 2 fan trays, 2 DC power supplies, 2 SCBs, 1 RE
	MX960BASE3-DC-ECM	14 slot MX960 base 3 chassis with DC power and extended cable manager
	MX960BASE-DC-ECM	14 slot MX960 base chassis with DC power extended cable manager

MX240, MX480 and MX960 Premium Bundles

Product	Product Number	Description
MX240	MX240-PREMIUM2-AC-HIGH	4 slot MX240 premium 2 chassis with midplane, redundant RE, SCBEs, highline AC power
	MX240-PREMIUM2-AC-LOW	4 slot MX240 premium 2 chassis with midplane, redundant RE, SCBEs, lowline AC power
	MX240-PREMIUM2-DC	4 slot MX240 premium 2 chassis with midplane, redundant RE, SCBEs, DC power
	MX240-PREMIUM3-ACH	4 slot MX240 premium 3 chassis with enhanced midplane, redundant RE, SCBEs, highline AC power
	MX240-PREMIUM3-ACL	4 slot MX240 premium 3 chassis with enhanced midplane, redundant RE, SCBEs, lowline AC power
	MX240-PREMIUM3-DC	4 slot MX240 premium 3 chassis with enhanced midplane, redundant RE, SCBEs, DC power

Product	Product Number	Description
MX480	MX480-PREMIUM2-AC	8 slot MX480 premium 2 chassis with midplane, redundant RE, SCBEs, AC power
	MX480-PREMIUM2-DC	8 slot MX480 premium 2 chassis with midplane, redundant RE, SCBEs, DC power
	MX480-PREMIUM3-AC	8 slot MX480 premium 3 chassis with enhanced midplane, redundant RE, SCBEs, AC power
	MX480-PREMIUM3-DC	8 slot MX480 premium 3 chassis with enhanced midplane, redundant RE, SCBEs, DC power
MX960	MX960-PREMIUM2-AC-ECM	14 slot MX960 premium 2 chassis with midplane, redundant Routing Engine, SCBEs, AC power, and extended cable manager
	MX960-PREMIUM2-DC-ECM	14 slot MX960 premium2 chassis with midplane, redundant Routing Engine, SCBEs, DC power, and extended cable manager
	MX960-PREMIUM3-AC-ECM	14 slot MX960 premium 3 chassis with enhanced midplane, redundant Routing Engine, SCBEs, AC power, and extended cable manager
	MX960-PREMIUM3-DC-ECM	14 slot MX960 premium 3 chassis with enhanced midplane, redundant Routing Engine, SCBEs, DC power, and extended cable manager
	MX960-PREMIUM2-AC	14 slot MX960 premium 2 chassis with midplane, redundant Routing Engine, SCBEs, AC power
	MX960-PREMIUM2-DC	14 slot MX960 premium 2 chassis with midplane, redundant Routing Engine, SCBEs, DC power
	MX960-PREMIUM3-AC	14 slot MX960 premium 3 chassis with midplane, redundant Routing Engine, SCBEs, AC power
	MX960-PREMIUM3-DC	14 slot MX960 premium 3 chassis with midplane, redundant Routing Engine, SCBEs, DC power

MX240, MX480 MX960 Chassis

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

MPCs

Product Number	Description
MPC10E-10C	Modular port concentrator with 8xQSPF28 multirate ports (10/40/100GbE) plus 2xQSFP56-DD multirate ports (10/40/100/400GbE)
MPC10E-15C	Modular port concentrator with 12xQSPF28 multirate ports (10/40/100GbE) plus 3xQSFP56-DD multirate ports (10/40/100/400GbE)

Product Number	Description
MPC7E-10G	Fixed 40x10GbE line card bundle with full-scale L2/L2.5 and reduced scale L3 features; optional license permits up to 32,000 queues with HQoS
MPC7E-10G-RB	Fixed 40x10GbE line card bundle with HQoS; supports 1 million queues and 128,000 sessions; includes full-scale L2/L2.5, L3, and L3VPN features
MPC7E-10G-I-RB	Fixed 40x10GbE 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
MPC7E-MRATE	Fixed 12xQSFP line card bundle for the MPC7-MRATE only; all ports support 4x10GbE and 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
MPC7E-MRATE-RB	Fixed 12xQSFP line card bundle for the MPC7-MRATE only; all ports support 4x10GbE and 40GbE, and 4 ports support 100GbE (QSFP 28); includes full-scale L2/L2.5, L3, and L3VPN features
MPC7E-MRATE-I-RB	Fixed 12xQSFP line card bundle for the MPC7-MRATE only; all ports support 4x10GbE and 40GbE, and 4 ports support 100GbE (QSFP 28); includes full-scale L2/L2.5 and L3 features and up to 16 L3VPN instances
MPC7E-MRATE-Q	Fixed 12xQSFP line card for the MPC7-MRATE only; all ports support 4x10GbE and 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
MPC7E-MRATE-Q-RB	Fixed 12xQSFP line card bundle; all ports support 4x10GbE and 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
MPC7E-MRATE-Q-I-RB	Fixed 12xQSFP line card bundle for the MPC7-MRATE only; all ports support 4x10GbE and 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 2x100GbE and 4x10GbE 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 2x100GbE and 4x10GbE 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 2x100GbE and 4x10GbE 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 6x40GbE or 24x10GbE 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 6x40GbE or 24x10GbE 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 6x40GbE or 24x10GbE line card bundle with full-scale L2/L2.5, L3, and L3VPN features; optional license permits up to 32,000 queues with HQoS

Product Number	Description
MPC5EQ-100G10G	Fixed 2x100GbE and 4x10GbE 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 2x100GbE and 4x10GbE 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 2x100GbE and 4x10GbE 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 6x40GbE or 24x10GbE 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 6x40GbE or 24x10GbE 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 6x40GbE or 24x10GbE 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 2x100GbE and 8x10GbE line card bundle with full-scale L2/L2.5 and reduced scale L3 features
MPC4E-3D-32XGE-SFPP	Fixed 32x10GbE line card bundle with full-scale L2/L2.5 and reduced scale L3 features
MPC4E-3D-2CGE-8XGE-IRB	Fixed 2x100GbE and 8x10GbE line card bundle with full-scale L2/L2.5, L3 features; up to 16 L3VPNs per MPC
MPC4E-3D-32XGE-IRB	Fixed 32x10GbE SFPP line card bundle with full-scale L2/L2.5, L3 features; up to 16 L3VPNs per MPC
MPC4E-3D-2CGE8XGE-RB	Fixed 2x100GbE and 8x10GbE line card bundle with full-scale L2/L2.5, L3, and L3VPN features
MPC4E-3D-32XGE-RB	Fixed 32XGbE small form-factor pluggable transceiver (SFP) 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 HQoS 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 HQoS 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 HQoS support with up to 32,000 total queues; supports all MICs supported by MPC1E, MPC2E, and MPC3E

Product Number	Description
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 HQoS 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 HQoS 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 HQoS 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 HQoS 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 HQoS with up to 512,000 queues per slot; supports all MICs supported by the MPC1E, MPC2E, and MPC3E
MPC-3D-16XGE-SFPP	Fixed 16x10GbE line card bundle with L2.5 features
MPC-3D-16XGE-SFPP-R-B	Fixed 16x10GbE 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 HQoS 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 HQoS 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 HQoS 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, reduced scale L3 features, and HQoS with up to 512,000 queues per slot; supports all MICs supported by MPC1E and MPC2E

Product Number	Description
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 HQoS 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 HQoS 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, reduced scale L3 features, and HQoS 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, up to 16 L3VPN features, and HQoS 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 HQoS 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-R-B	Enhanced 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

Product Number	Description
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); includes 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 (maximum 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 (maximum 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, and deep packet inspection (DPI); each purchased separately

Modular Interface Cards

Product Number	Description
MIC3-3D-10XGE-SFPP	MIC with 10x10GbE small form-factor pluggable plus transceiver (SFP+) 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 dense wavelength-division multiplexing (DWDM) PIC, DP-QPSK, full C-band tunable, GFEC, HGFEC, SDFEC; requires MPC3E or MPC3E-NG; optics sold separately
MIC3-3D-2X40GE-QSFPP	MIC with 2x40GbE quad small form-factor pluggable plus transceiver (QSFP+) interface; optics sold separately
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

Product Number	Description
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	Multi-rate circuit emulation MIC; 4 port channelized OC3/STM1 (to DS0) or 1 port channelized OC12/STM4 (to DS0)

Routing Engines

Product Number	Description
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-X6-64G-LT-BB	6 Core 2.0 GHz CPU with 64 GB memory, limited encryption version, base bundle
RE-S-X6-64G-LT-R	6 Core 2.0 GHz CPU with 64 GB memory, limited encryption version, redundant
RE-S-X6-64G-LT-BB	6 Core 2.0 GHz CPU with 64 GB memory, limited encryption version, base bundle
RE-S-X6-64G-LT-R	6 Core 2.0 GHz CPU with 64 GB memory, limited encryption version, redundant
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
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 Control Board

Product Number	Description
SCB-MX960-BB	SCB for MX240, MX480, and MX960
SCBE-MX-BB	Enhanced Switch Control Board (SCBE) for MX240, MX480, and MX960
SCBE2-MX-BB	SCBE for MX240, MX480, and MX960
SCBE3-MX-BB	1.5 T fabric card for MX240, MX480, and MX960

Broadband Network Gateway (BNG) Licensing

Subscriber Access Feature Pack Licenses

One Subscriber Access (SA) license is required per chassis, and provides:

- Per-subscriber RADIUS accounting (time- and volume-based)
- RADIUS-based authentication and authorization
- Subscriber configuration via client profiles at subscriber login
- RADIUS and/or SDX-based address (pool) management
- Static and dynamic IP management
- Dynamic auto-sensed VLANs

Product Number	Description
S-SA-FP2	Subscriber Access feature pack license for MX240, MX480, MX960, MX2010, and MX2020
S-MX104-SA-FP	Subscriber Management feature pack license for MX104 including S-LNS-IN feature license
S-MX80-SA-FP	Subscriber Management feature pack license for MX80 including S-LNS-IN feature license

Note: Using the MX150 as a BNG requires a vBNG license. Please refer to the vMX data sheet for more information.

Subscriber Services Management Feature Pack Licenses

Subscriber Services Management licenses are optional additions to Subscriber Access licenses that offer:

- Per-service RADIUS accounting (time- and volume-based)
- Service profile activation/deactivation at subscriber login via RADIUS grants/access accepts (services activation/ deactivation VSAs); or change existing sessions via RADIUS COA/RID or Session and Resource Control (SRC)
- Parameterization of service profiles
- ANCP QoS adjustment based on sync rate via Access Node Control Protocol (ANCP)

Product Number	Description
S-SSM-FP	Subscriber Service Management feature pack license (RADIUS/SRC-based service activation/deactivation); per-service accounting features for subscribers, for MX240, MX480, MX960, MX2010, and MX2020
S-MX104-SSM-FP	Subscriber Service Management feature pack license (RADIUS/SRC-based service activation/deactivation); per-service accounting features for subscribers, for MX104
S-MX80-SSM-FP	Subscriber Service Management feature pack license (RADIUS/SRC-based service activation/deactivation); per-service accounting features for subscribers, for MX80
S-SSP-FP	Subscriber Traffic Lawful Intercept feature pack License, for MX80, MX104, MX240, MX480, MX960, MX2010, and MX2020
S-BB-NASREQ	Junos Broadband Policy Enforcement feature license for dynamic subscriber authentication and authorization using NASREQ, for MX80, MX104, MX240, MX480, MX960, MX2010, and MX2020

Additional Subscriber Services Management licenses are available to support Inline L2TP LNS Tunneling, Subscriber-Based Lawful Intercept, Virtual Chassis, and interface with policy management systems, as indicated in the table below.

Product Number	Description
S-BB-GX	Junos Broadband Policy Enforcement feature license for PCRF communications using 3GPP Gx and Gx+, for MX80, MX104, MX240, MX480, MX960, MX2010, and MX2020
S-BB-GY	Junos Broadband Policy Enforcement feature license for online charging using 3GPP Gy interface, for MX80, MX104, MX240, MX480, MX960, MX2010, and MX2020
S-LNS-IN	Software license for Inline L2TP LNS, for MX240, MX480, MX960, MX2010, and MX2020
S-VCR	Software license for single member of an MX Series Virtual Chassis

Subscriber Access Scale Licenses

These tiered licenses support from 4000 to 256,000 sessions and are bound to one chassis.

Product Number	Description
S-SA-4K	Subscriber scale license, up to 4000 subscribers
S-SA-8K	Subscriber scale license, up to 8000 subscribers
S-SA-16K	Subscriber scale license, up to 16,000 subscribers
S-SA-32K	Subscriber scale license, up to 32,000 subscribers
S-SA-64K	Subscriber scale license, up to 64,000 subscribers
S-SA-128K	Subscriber scale license, up to 128,000 subscribers
S-SA-256K	Subscriber scale license, up to 256,000 subscribers

Subscriber Access Scale Upgrade Licenses

These tiered licenses support from 4000 to 256,000 sessions and are bound to one chassis.

Product Number	Description
S-SA-UP-8K	Subscriber scale upgrade, from 4000 to 8000 subscribers
S-SA-UP-16K	Subscriber scale upgrade, from 8000 to 16,000 subscribers
S-SA-UP-32K	Subscriber scale upgrade, from 16,000 to 32,000 subscribers
S-SA-UP-64K	Subscriber scale upgrade, from 32,000 to 64,000 subscribers
S-SA-UP-96K	Subscriber scale upgrade, from 64,000 to 96,000 subscribers
S-SA-UP-128K	Subscriber scale upgrade, from 96,0000 to 128,000 subscribers
S-SA-UP-256K	Subscriber scale upgrade, from 128,000 to 256,000 subscribers

Junos OS

- USA: Junos OS
- Worldwide: Junos-WW

About Juniper Networks

Juniper Networks brings simplicity to networking with products, solutions and services that connect the world. Through engineering innovation, we remove the constraints and complexities of networking in the cloud era to solve the toughest challenges our customers and partners face daily. At Juniper Networks, we believe that the network is a resource for sharing knowledge and human advancement that changes the world. We are committed to imagining groundbreaking ways to deliver automated, scalable and secure networks to move at the speed of business.

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