MX301 UNIVERSAL ROUTING PLATFORM DATASHEET

Product Overview

The MX301, an integral part of the MX family of routers, offers massive scale and efficiency for space- and power-constrained environments. The MX301 helps customers do more with less by redefining per rack-unit economics. It simplifies network design, reduces OpEx, and enables profitable delivery of many services —all while seamlessly supporting traditional and emerging network architectures.

Product Description

The Juniper Networks® MX301 Universal Routing Platform is a compact, high-performance edge router purpose-built to meet the evolving demands of next-generation networks. Powered by Juniper's Trio 6 silicon and featuring a highly efficient 1RU form factor, the MX301 delivers up to 1.6 Tbps of system throughput with unmatched density and agility. Its design makes it ideal for service providers, cloud providers, MSOs, and enterprises deploying at scale. Its space- and power-optimized design consumes as little as 0.3W per Gb, delivering exceptional performance and sustainability at the network edge.

As an AI-native platform, the MX301 is optimized for emerging edge use cases, including distributed AI inference, low-latency service delivery, and real-time analytics. It supports ultra-high-density port configurations up to 400GbE—enabling flexible deployment in metro aggregation, enterprise WAN edge, and AI edge clustering scenarios. Its rich feature set, powered by Junos® OS, ensures seamless integration with existing MX Series deployments and full lifecycle automation.

Built-in hardware acceleration enables robust security without compromise. The MX301 delivers line-rate MACsec on 400GbE interfaces and IPsec encryption in ESP tunnel mode directly within the forwarding plane—offering AES-GCM-128/256 encryption while preserving packet integrity and performance.

With advanced telemetry, deep programmability, and service-aware scale, the MX301 lets operators modernize their WAN and edge architectures confidently, delivering secure, automated, and high-performance connectivity for the most demanding cloud era and AI-driven environments.

Architecture and Key Components

Built on Juniper's Trio 6 silicon, the MX301 brings powerful programmability, deep service scale, and AI-ready interfaces in a space- and energy-efficient chassis.

Integrated Routing Engine

A single routing engine (RE) on the MX301 runs Junos OS, where it manages all routing protocol processes, router interface control, and control plane functions such as chassis operations, system management, and user access to the router. These processes run on top of a kernel that interacts with the packet forwarding engine (PFE) on modular interface cards (MICs) via dedicated high-bandwidth management channels, providing a clean separation between the control and forwarding planes.

Fixed Interface Design

Powered by Juniper's sixth-generation programmable Trio silicon, the MX301 delivers unprecedented bandwidth in a compact, power-optimized 1RU form factor. Unlike modular systems such as the MX304, the MX301 uses high-density fixed ports rather than MICs, simplifying deployment while providing broad routing, switching, inline services, subscriber management, and hierarchical quality of service (HQoS). With configurations supporting 1 to 400GbE interfaces, the MX301 enables service providers, cloud operators, and enterprises to flexibly and efficiently meet their connectivity requirements without the complexity of modular cards.

Power

The MX301 power and thermal subsystems use advanced technology to optimize power efficiency without sacrificing scale or features. The power subsystem is highly resilient, allowing full power supply and power cable feed redundancy, resulting in industry-leading power consumption efficiency.

Junos Operating System

Junos OS is a reliable, high-performance, modular network operating system supported across all of Juniper's physical and virtual routing, switching, and security platforms. It reduces the cost, complexity, and resources required to implement and maintain a Juniper-based network. With secure programming interfaces, the Juniper® Extension Toolkit (JET), versatile scripting support, and integration with popular orchestration frameworks, Junos OS offers flexible options for continuous delivery and DevOps-style management, helping service providers unlock more value from the network.

Features and Benefits

Table 1: MX301: Maximum line-rate port density

Interface	MX301 port density
1GbE/10GbE/25GbE	32
40GbE	8
50GbE	32
100GbE	16
400GbE	4

High Efficiency And Compact Design

The MX301 delivers up to 1.6 Tbps of throughput in a remarkably compact 1RU form factor with flexible 100G/4000G port flexibility, redefining edge efficiency for dense deployments. Its advanced Trio 6 chipset, combined with modular interface flexibility, allows operators to scale out high-bandwidth edge services while reducing space and power needs—achieving industry-leading power usage as low as 0.3W per Gb. This decreases total cost of ownership and enables sustainable growth for next-generation, bandwidth-intensive workloads.

Secure Networking

The MX301 incorporates line-rate MACsec and IPsec encryption, as well as Trusted Platform Module (TPM) support, securing traffic at Layers 2 and 3 without compromising performance. Operators benefit from built-in hardware-based encryption for 400GbE and 100GbE ports, safeguarding critical data flows and supporting compliance with regulatory and enterprise security standards. The TPM enables secure device identity and hardware root of trust, further ensuring platform integrity for trusted transport in sensitive or regulated environments.

AI-optimized

Purpose-built for the AI era, the MX301's deterministic latency and high-throughput architecture are ideal for aggregating and forwarding real-time AI and inference traffic. Its programmable Trio 6 silicon, multi-rate port density up to 400GbE, and support for precision time protocol (PTP) deliver predictable, low-latency connectivity—critical for AI edge aggregation, distributed analytics, and latency-sensitive automation. Open APIs and deep telemetry enable integration with AIOps platforms, maximizing both network agility and AI application performance.

Junos Telemetry Interface

The programmable Junos Trio 6 chipset provides the power to monitor and collect data at the component level. The chipset uses the Junos Telemetry Interface to stream this data in a scalable manner to monitoring, analytics, and performance management applications, as well as to path computation elements (PCEs) such as Juniper Networks Paragon Pathfinder. The derived telemetry information identifies current and trending congestion, resource utilization, traffic volume, latency, and delay, helping service providers detect issues and make informed decisions about network design, optimization, and investments.

Integrated Timing

MX Series routers support highly scalable and reliable hardware-based timing that meets the strictest LTE requirements, including synchronous Ethernet for frequency and the 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 accuracy (< 1.5 uS) required for LTE-Advanced, eliminating the need for external clocks. The MX301 also supports advanced timing standards such as G.8275.1.

Junos Automation Toolkit

The Junos Automation Toolkit, included in the Junos OS software, offers a suite of tools supported on all Juniper Networks switches, routers, and security devices. These tools leverage the native XML capabilities of Junos OS, including commit scripts, operations scripts, event policies and scripts, and macros that automate operational and configuration tasks. Automation saves time by performing repetitive operational and configuration tasks, speeding up troubleshooting, and maximizing network uptime by warning operators of potential problems and automatically responding to system events.

Applications and Use Cases

The MX301 Universal Routing Platform delivers a powerful solution for the following use cases.

Business Edge and Secure SD-WAN

The MX301 offers the 1GbE, 10GbE, 25GbE, 40GbE, 50GbE, 100GbE, and 400GbE interfaces that large enterprises and service providers need. It also includes a comprehensive VPN toolkit to support feature-rich, standards-based, and secure internetworking for innovative business services. The MX301 delivers deterministic performance with inline MACsec and IPsec encryption, as well as TPM support for trusted transport.

In addition to basic L2/L3 VPN and virtual private LAN service (VPLS) support, the MX301 offers enhanced VPN services such as quality-of-service (QoS)-prioritized VPN traffic for voice and video, L2 VPN internetworking to connect dissimilar L2 access networks, and rich IP/MPLS features to customize services and meet service-level agreements (SLAs).

Metro Aggregation

The MX301 provides 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 suits their business and technical needs and goals. The MX301 can be deployed as an IP/MPLS VPN edge router, VPLS router, MPLS label-switching router (LSR), or as a Layer 2 Ethernet switch or Layer 3 IP router. The MX301 also supports an extensive set of Ethernet operation, administration, and maintenance (OAM) features and is Metro Ethernet Forum (MEF) certified 3.0.

Enterprise Core/Branch

The compact 1RU form factor and high-bandwidth capabilities of the MX301 make it ideal for large branch offices and enterprise core deployments. With support for up to 1.6 Tbps throughput and a versatile range of interfaces from 1GbE to 400GbE, the MX301 delivers the scale and agility enterprises need to consolidate infrastructure and future-proof their WAN. Integrated inline encryption (MACsec and IPsec) ensures sensitive applications and data remain secure, while Junos OS provides seamless operational consistency across campus and branch networks.

Distributed Broadband Deployments

The MX301 is engineered to address the scale and resiliency demands of modern broadband networks, supporting up to 16,000 subscriber sessions in a compact chassis. Its programmability and integrated service functions—including subscriber management, DHCP, PPPoE, and advanced HQoS—allow broadband providers to deliver differentiated services while maintaining high performance at peak load. The system's low power draw and small footprint make it particularly attractive for distributed locations such as remote central offices and rural broadband rollouts.

AI Edge Aggregation

Purpose-built for AI-native environments, the MX301 aggregates high-volume, low-latency traffic from distributed edge inference nodes. Its line-rate 400GbE ports and Trio 6 chipset enable deterministic performance for real-time AI applications, including industrial automation, smart cities, and intelligent transportation. Autonomous AI workloads are supported with secure and efficient transport backed by inline MACsec/IPsec and PTP capabilities. Additionally, open APIs and integration with Marvis® AI allow operators to automate AI edge networking with full telemetry and lifecycle awareness.

5G User Plane Routing

Optimized for distributed 5G architectures, the MX301 serves as a high-performance user plane function (UPF), delivering up to 1.6 Tbps throughput with line-rate MACsec and IPsec encryption. It supports 3GPP CUPS with key interfaces (N3/N4/N6/N9) and PFCP-based control for dynamic session management. Compact and power efficient, the MX301 is ideal for edge-located UPFs, enabling ultra-low-latency service delivery for eMBB, IoT, and MEC use cases. Advanced QoS, 5QI/QFI policy enforcement and dual stack 4G/5G support ensure seamless mobile service evolution and full lifecycle automation with Junos OS.

Figure 1 : MX301 Universal Routing Platform

Specifications

Physical Specifications

- Physical dimensions: (HxWxD): 1.75 x 17.3 x 17.7 inches (4.45 x 44 x 45 cm)
- 2 PSU FRUs (1+1 Redundancy)
- Power consumption: <500W Typical
- Airflow: Front to back
- 6 Fan FRUs (N+1 Redundancy)
- Maximum weight (approximate): 26 lbs (12 kg)
- System mounting: 2/4-post rack mounting
- Rack units: 1
- NEBS Compliance
- Operating temperatures: 32° to 115° F (0° to 46° C) at sea level

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 https://www.juniper.net/us/en/products.html.

Ordering Information

SKU	Description
MX301-HW-BASE	MX301 Bundle – price includes power supplies and trays
S-MX-16C-A1-C1-P	SW, MX, 16x100GE ports, Adv1, Class 1, w-out SW Support, Perpetual
S-MX-16C-P1-C1-P	SW, MX, 16x100GE ports, Pre1, Class 1, w-out SW Support, Perpetual
S-MX-1C-A1-C1-P	SW, MX, 1x100GE ports, Adv1, Class 1, Class 1, w-out SW Support, Perpetual. Subject to Min PAYG
S-MX-1C-P1-C1-P	SW, MX, 1x100GE ports, Pre1, Class 1, w-out SW Support, Perpetual. Subject to Min PAYG
S-MX-1C-A1-C1-1	SW, MX, 1x100GE ports, Adv1, Class 1, with SW Support, 1 YEAR - Renewal Only
S-MX-1C-A1-C1-3	SW, MX, 1x100GE ports, Adv1, Class 1, with SW Support, 3 YEAR
S-MX-1C-A1-C1-5	SW, MX, 1x100GE ports, Adv1, Class 1, with SW Support, 5 YEAR
S-MX-1C-A1-C1-7	SW, MX, 1x100GE ports, Advanced1, Class 1, Scale on Demand, with SVC Customer Support, 7 YR
S-MX-1C-P1-C1-1	SW, MX, 1x100GE ports, Pre1, Class 1, with SW Support, 1 YEAR - Renewal Only
S-MX-1C-P1-C1-3	SW, MX, 1x100GE ports, Pre1, Class 1, with SW Support, 3 YEAR
S-MX-1C-P1-C1-5	SW, MX, 1x100GE ports, Pre1, Class 1, with SW Support, 5 YEAR
S-MX-1C-P1-C1-7	SW, MX, 1x100GE ports, Premium1, Class 1, Scale on Demand, with SVC Customer Support, 7 YR

About Juniper Networks

Juniper Networks is leading the convergence of AI and networking. Mist™ , Juniper's AI-native networking platform, is purpose-built to run AI workloads and simplify IT operations, assuring exceptional and secure user and application experiences—from the edge to the data center to the cloud. Additional information can be found at juniper.net, X (formerly Twitter), LinkedIn, and Facebook.

Corporate and Sales Headquarters

Juniper Networks, Inc.

1133 Innovation Way

Sunnyvale, CA 94089 USA

Phone: 888.JUNIPER (888.586.4737)

or +1.408.745.2000

www.juniper.net

APAC and EMEA Headquarters

Juniper Networks International B.V.

Boeing Avenue 240 1119 PZ Schiphol-Rijk

Amsterdam, The Netherlands

Phone: +31.207.125.700

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