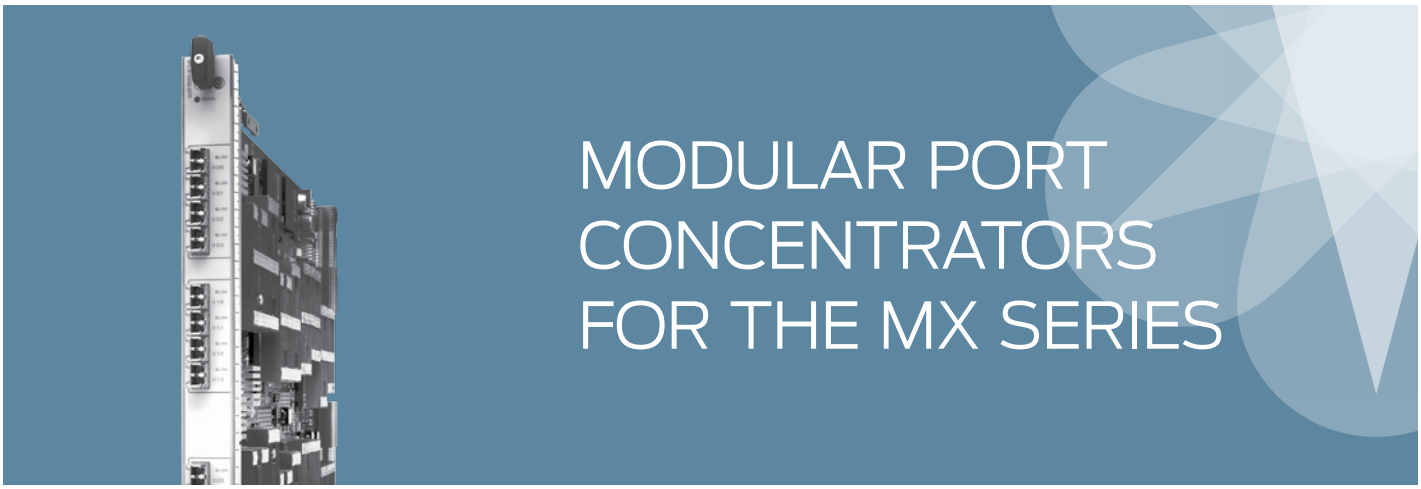

MODULAR PORT CONCENTRATORS FOR THE MX SERIES

Product Overview

For Ethernet networks that require scalability and a service rich feature set, the Modular Port Concentrators (MPCs) provide subscriber management services and advanced scale to cost optimize the most demanding networks. Designed for flexibility, customers are able to mix and match interfaces to create customized chassis configurations.

Product Description

Modular Port Concentrators (MPCs) are a set of next-generation advanced line modules for Juniper Networks® MX Series 3D Universal Edge Routers that deliver the performance, services, and scalability that are critical to today's advanced Ethernet services edge and broadband edge networks. Designed for flexibility, MPCs introduce both the industry's highest capacity and modular 1GbE, 10GbE, 40GbE, and 100GbE, along with Multiservice MICs (Sonet/SDH and ATM) hardware to the MX Series portfolio, allowing customers to flexibly mix and match interfaces to create service-specific and "pay as you grow" configurations. The MPC houses the packet forwarding engines that deliver comprehensive Layer 3 routing (IPv4 and IPv6), MPLS, Layer 2 switching, inline services, and advanced hierarchical quality of service (H-QoS) per MX Series slot.

Table 1: Modular Port Concentrator Options

Model Number	Description
MX-MPC1-3D	1 Trio PFE, per port queueing, 64 K IFLs (logical interfaces)
MX-MPC2-3D	2 Trio PFEs, per port queuing, 64 K IFLs
MX-MPC1-3D-Q	1 Trio PFE, enhanced queuing, 128 KB queues (max 64 KB egress), 32 K IFLs
MX-MPC2-3D-Q	2 Trio PFEs, enhanced queuing, 256 KB queues (max 128 KB egress), 64 K IFLs
MX-MPC2-3D-EQ	2 Trio PFEs, enhanced queuing, 512 KB egress (or 256 KB ingress/egress), 64 K IFLs
MPC-3D-16XGE-SFPP	16 port 10GbE MPC requires small form-factor pluggable transceiver (SFP+) interfaces
MX-MPC1E-3D	Enhanced MPC, 1 Trio PFE, per port queueing, Synchronous Ethernet, 64 K IFLs (logical interfaces)
MX-MPC2E-3D	Enhanced MPC, 2 Trio PFEs, per port queuing, Synchronous Ethernet, 64 K IFLs
MX-MPC1E-3D-Q	Enhanced MPC, 1 Trio PFE, enhanced queuing, Synchronous Ethernet, 128 KB queues (max 64 KB egress), 32 K IFLs
MX-MPC2E-3D-Q	Enhanced MPC, 2 Trio PFEs, enhanced queuing, Synchronous Ethernet, 256 KB queues (max 128 KB egress), 64 K IFLs
MX-MPC2E-3D-EQ	Enhanced MPC, 2 Trio PFEs, enhanced queuing, Synchronous Ethernet, 512 KB egress (or 256 KB ingress/egress), 64 K IFLs
MX-MPC3E-3D	MPC3 with support for 100GbE, 40GbE, and 10GbE interfaces, L2.5 features
MX-MPC3E-3D-R-B	MPC3E with support for 100GbE, 40GbE, and 10GbE interfaces; includes full scale L2, L3, L3VPN features

Modular Interface Cards

The Modular Interface Card, or MIC, plugs into the MPC to provide the physical interface for the MPC line module. Up to two MICs are supported per MPC with a variety of 1GbE and 10GbE MICs available.

Table 2: Modular Interface Card Options

Model Number	Description
Gigabit Ethernet MICs	
MIC-3D-20GE-SFP	20 port 10/100 1GbE MIC
MIC-3D-2XGE-XFP	2 port 10GbE MIC
MIC-3D-4XGE-XFP	4 port 10GbE MIC
MIC-3D-40GE-TX	40 port 1GbE Tx MIC
MIC3-3D-2X40GE-QSFPP	MIC with 2x40GbE QSFP+ interface
MIC3-3D-1X100GE-CFP	MIC with 1x100GbE CFP interface
MIC3-3D-1X100GE-CXP	MIC with 1x100GbE CXP interface
Multiservice Interface MICs (Sonet/SDH and ATM MICs)	
MIC-3D-8OC3OC12-4OC48	High-density multi-rate MIC, 8 port non-channelized OC3-OC12 / 4 port non-channelized OC48 MIC
MIC-3D-4OC3OC12-1OC48	Low-density multi-rate MIC, 4 port non-channelized OC3-OC12 / 1 port non-channelized OC48 MIC
MIC-3D-4CHOC3-2CHOC12	Low density multi-rate MIC, channelized, 4 port channelized OC3 / 2 port channelized OC12 (down to DS0) MIC
MIC-3D-4OC3OC12-1OC48	Low density multi-rate MIC, 4 port non-channelized OC3-OC12 / 1 port non-channelized OC48 MIC
MIC-3D-8CHOC3-4CHOC12	High density multi-rate MIC, channelized, 8 port channelized OC3 / 4 port channelized OC12 (down to DS0) MIC
MIC-3D-8DS3-E3	8 port non-channelized DS3 / non-channelized E3 MIC
MIC-3D-8CHDS3-E3-B	8 port channelized DS3 (down to DS0) / non-channelized E3 MIC
MIC-3D-8OC3-2OC12-ATM	Multi-rate ATM MIC, 8 port non-channelized OC3/STM1 or 2 port non-channelized OC12/STM4

16 Port 10GbE MPC

The 16 port 10GbE fixed configuration MPC for the MX Series 3D routers provide unprecedented port density and performance for the metro core and for large enterprises. The 16 port 10GbE MPC provides full wire-rate performance for the ports. This card is designed to be deployed in the Juniper Networks MX240, MX480, and MX960 3D Universal Edge Router, and it supports all of the Layer 2, Layer 3, and MPLS features currently available on the existing set of Dense Port Concentrator (DPC) line cards. The 16 port 10GbE MPCs provide port-based queuing with eight queues per port.

The high throughput performance of the 16 port 10GbE is delivered with the industry leading Juniper Networks Junos® Trio chipset. The Junos Trio chipset is also found on Juniper's other MPCs and on the Juniper Networks MX80 3D Universal Edge Router.

Junos Trio Chipset

Building on Juniper's foundation of advanced silicon, each MPC leverages the Junos Trio chipset, Juniper's next-generation silicon technology. Junos Trio is a complex of service-specific Network Instruction Set Processors that together deliver advanced forwarding, queuing, scheduling, and services with the capacity to scale beyond 100 Gbps per MX Series slot. Junos Trio also enhances the MX Series with support for inline "services without compromise," allowing customers to cost effectively add services simply by "turning on" the service via Junos. Inline services include J-Flow, lawful intercept, tunnel services (generic routing encapsulation (GRE),

IP over IP (IP-IP)), IP reassembly, Multilink Point-to-Point Protocol (MLPPP) F&R, Layer 2 Tunneling Protocol (L2TP), L2TP access concentrator (LAC), and L2TP network server (LNS).

Junos Operating System

With Junos Trio silicon at its core, each MPC is optimized for the demanding scale and feature rich services that are required of our next-generation broadband edge networks. With subscriber management services and scale for up to 64,000 sessions per module, MPCs deliver the advanced scale necessary to cost optimize the most demanding networks. Session scale is matched with highly scalable and advanced quality of service (QoS) so that service quality is delivered without compromise. The MPCs offer the following QoS features:

- Up to 512 KB queues per MPC
- Up to 8 queues per session
- Per queue shaping
- 5 levels of scheduler hierarchy
- Strict priority queuing
- Weighted round-robin (WRR)
- Weighted random early detection (WRED)
- Intelligent oversubscription
- 16 K IFL set shapers
- Shared shaping

MPCs are supported in the large capacity MX960, mid-sized MX480, and the smaller MX240. They offer a seamless, cost-effective way to deploy advanced Ethernet edge services that range in speed from 10 Mbps to 10 Gbps. MPCs will also coexist and interoperate with existing MX Series DPC hardware, allowing customers to take advantage of the advanced QoS and scaling features while protecting their current investment.

Service Rich Junos Support

Juniper Networks has extended its award-winning Junos operating system to include support for the MPCs and MX Series 3D Universal Edge Routers. Using a single, common OS release across Juniper Networks M Series Multiservice Edge Routers, T Series Core Routers, and MX Series routers provides consistent support for both legacy and Ethernet-based services across a broad range of chassis types and sizes to ensure ease of use and operation. The proven stability of Junos OS coupled with proven routing protocols, flexible policy language, and industry leading MPLS implementation can be a tremendous asset when building an Ethernet-centric infrastructure.

Intelligent Oversubscription

Unique to the MX Series family of MPCs is a functionality known as intelligent oversubscription. Intelligent oversubscription is a mechanism designed to efficiently protect high priority traffic such as control, voice and video. The MPC ensures that that low priority traffic is dropped as early as possible to free up resources for high priority traffic processing.

Dynamic Policy Engine for QoS

The Junos Trio chipset not only delivers a wide range of quality-of-service (QoS) features and functionality, it is also a policy engine that enables a variety of intelligent applications. It is dynamic in the way it supports various policies and in the fact that it can support several applications simultaneously.

The following are dynamic policy engine highlights:

- **Stateless application detection:** Junos Trio has the ability to look deeply into packets to detect applications and class of packets.
- **Intelligent class aware hierarchical rate limiters:** The ability to both honor user configured rate-limit policies for multiple classes of traffic at the same time, and protect conforming high priority traffic from low priority traffic bursts. These rate limiters can be applied to a variety of attachment points—ports, logical interfaces, arbitrary collection of interfaces, and a variety of user configured policies.
- **Dynamic bandwidth profiles:** Ability to group a set of interfaces and provide an aggregate shaping bandwidth control for them.
- **Class aggregate bandwidth profiles:** Ability to apply a policy to individual subscribers, as well as shape individual classes of traffic as an aggregate of all subscribers.
- **Dynamic priority protection:** Ability to protect bandwidth of high priority traffic, even in the presence of bursty low priority traffic that has depleted a subscriber's bandwidth.

MX-MPC1-3D

MPC-3D-16XGE-SFPP

Features and Benefits

Via Junos OS, the MPCs support a wide range of L2 and L3 Ethernet functionality, including 802.1Q virtual LAN (VLAN), link aggregation, circuit cross-connect (CCC), Virtual Router Redundancy Protocol (VRRP), L2 to L3 mapping, and port monitoring. Additionally, the MPCs support filtering, sampling, load balancing, rate limiting, class of service (CoS), and other key features necessary for deployment of dependable, high-performance Ethernet services.

Specifications

- Accepts traffic destined for generic routing encapsulation (GRE) tunnels or Distance Vector Multicast Routing Protocol (DVMRP) (IP-in-IP) tunnels
- Bidirectional Forwarding Detection (BFD) protocol
- BGP
- BGP and MPLS virtual private networks (VPNs)
- DVMRP and GRE support for access side and server side
- Firewall filters
- Flexible Ethernet encapsulation
- IEEE 802.3ad link aggregation
- IPv4
- IP multicast
- IPv6
- IPv6 multicast
- IPv6 neighbor discovery
- IS-IS
- G.781 "Synchronization layer functions"
- G.8261 "Timing and synchronization aspects in packet networks"
- G.8262 "Timing characteristics of a synchronous Ethernet equipment slave clock"
- G.8264 "Distribution of timing information through packet networks"
- Local loopback
- Media access control (MAC) learning, policing, accounting, and filtering
- Maintenance data link (MDL)
- Multiple Tag Protocol Identifiers (TPIDs)
- MPLS
- OSPF
- Packet mirroring
- Quality of service (QoS) per channel: weighted round-robin (WRR), random early detection (RED), and weighted random early detection (WRED)
- Remote loopback
- RIP
- Spanning Tree Protocol (STP)
- Transparent bridging
- IEEE 802.1Q VLANs
  - VLAN stacking and rewriting
  - Channels defined by two stacked VLAN tags
  - IP service for nonstandard TPID and stacked VLAN tags
- Virtual private LAN service (VPLS)
- VPN
- VRRP

Agency Approvals

Safety

- CAN/CSA-22.2 No.60950-1-03-UL60950-1, 2nd Ed. Safety of Information Technology Equipment
- EN 60950-1 Safety of Information Technology Equipment

EMC

- AS/NZS CISPR22 Class A (Australia/New Zealand)
- EN 55022 Class A Emissions (Europe)
- FCC Part 15 Class A (USA)
- VCCI Class A (Japan)

Immunity

- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Common Immunity
- EN 1000-4-11 Voltage Dips and Sags

ETSI

- ETS-300386-2 Telecommunication Network Equipment Electromagnetic Compatibility Requirements

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
MX-MPC1-3D	1 Trio PFE, port queue, 64 K IFLs
MX-MPC2-3D	2 Trio PFEs, port queue, 64 K IFLs
MX-MPC1-3D-Q	1 Trio PFE, rich queue, 128 KB queues (max 64 Kb egress), 32 K IFLs
MX-MPC2-3D-Q	2 Trio PFEs, rich queue, 256 KB queues (max 128 KB egress), 64K IFLs
MX-MPC2-3D-EQ	2 Trio PFEs, enhanced queue, 512 KB egress (or 256 KB ingress/egress), 64 K IFLs
MPC-3D-16XGE-SFPP	16 port 10GbE MPC requires small form-factor pluggable transceiver (SFP+) interfaces
MX-MPC1E-3D	Enhanced MPC, 1 Trio PFE, port queue, Synchronous Ethernet, 64 K IFLs
MX-MPC2E-3D	Enhanced MPC, 2 Trio PFEs, port queue, Synchronous Ethernet, 64 K IFLs
MX-MPC1E-3D-Q	Enhanced MPC, 1 Trio PFE, rich queue, 128 KB queues (max 64 Kb egress), Synchronous Ethernet, 32 K IFLs
MX-MPC2E-3D-Q	Enhanced MPC, 2 Trio PFEs, rich queue, 256 KB queues (max 128 KB egress), Synchronous Ethernet, 64K IFLs
MX-MPC2E-3D-EQ	Enhanced MPC, 2 Trio PFEs, enhanced queue, 512 KB egress (or 256 KB ingress/egress), Synchronous Ethernet, 64 K IFLs
MIC-3D-20GE-SFP	20 ports of 10/100/1000 Ethernet with SFP interfaces
MIC-3D-2XGE-XFP	2 10GbE MICs with 10-gigabit small form-factor pluggable transceiver (XFP) interfaces
MIC-3D-4XGE-XFP	4 10GbE MICs with XFP interfaces
MIC-3D-40GE-TX	40 ports of 10/100/1000 Ethernet with Tx interfaces
MIC3-3D-2X40GE-QSFPP	MIC with 2x40GE QSFP+ interface
MIC3-3D-1X100GE-CFP	MIC with 1x100GE CFP interface
MIC3-3D-1X100GE-CXP	MIC with 1x100GE CXP interface
MIC-3D-8OC3OC12-4OC48	High-density multi-rate MIC, 8 port non-channelized OC3-OC12 / 4 port non-channelized OC48 MIC
MIC-3D-4OC3OC12-1OC48	Low-density multi-rate MIC, 4 port non-channelized OC3-OC12 / 1 port non-channelized OC48 MIC
MIC-3D-4CHOC3-2CHOC12	Low density multi-rate MIC, channelized, 4 port channelized OC3 / 2 port channelized OC12 (down to DS0) MIC
MIC-3D-4OC3OC12-1OC48	Low density multi-rate MIC, 4 port non-channelized OC3-OC12 / 1 port non-channelized OC48 MIC
MIC-3D-8CHOC3-4CHOC12	High density multi-rate MIC, channelized, 8 port channelized OC3 / 4 port channelized OC12 (down to DS0) MIC
MIC-3D-8DS3-E3	8 port non-channelized DS3 / non-channelized E3 MIC
MIC-3D-8CHDS3-E3-B	8 port channelized DS3 (down to DS0) / non-channelized E3 MIC
MIC-3D-8OC3-2OC12-ATM	Multi-rate ATM MIC, 8 port non-channelized OC3 / STM1 or 2 port non-channelized OC12/ STM4

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1000294-007-EN May 2012 Printed on recycled paper