M SERIES MULTISERVICE EDGE ROUTERS

Product Overview

Juniper Networks M Series Multiservice Edge Routers combine best-in-class IP/MPLS capabilities with unmatched reliability, stability, security, and service richness. They are ideal for enterprises and service providers and can be deployed in small and medium core, multiservice edge, collapsed POP routing, peering, route reflector, campus or WAN gateway applications. They support high density aggregation of a large range of access types including ATM, Frame Relay, Ethernet, SONET/SDH and TDM. M Series routers leverage the highly programmable Internet Processor II ASIC, Juniper Networks I-chip, and IP/MPLS-rich JUNOS Software.

Product Description

The Juniper Networks® M Series Multiservice Edge Routers span from over 7 Gbps up to 320 Gbps of throughput and include the Juniper Networks M7i, M10i, M40e, M120, and M320 Multiservice Edge Routers. Because the same scalable and production-hardened Juniper Networks JUNOS® Software runs on all M Series routers, a consistent set of capabilities is available at all network locations – regardless of customer connection or serving area density.

The M Series Multiservice Edge Routers are deployed in the world's largest networks. Why? Because they deliver advanced IP/MPLS services at scale, enabling enterprises and service providers to reduce costs through network consolidation while simultaneously generating new revenues. Constructed with a clean separation between control plane, forwarding plane, and services plane, M Series routers support multiple services over any type of access connection without compromise. They support these services on a single platform – maximizing revenue and minimizing operational and capital costs. The services include a broad array of VPNs, network-based security, real-time voice and video, bandwidth on demand, rich multicast of premium content, IPv6 services, granular accounting, and much more. The service portfolio continues to grow with every release of JUNOS Software, leveraging the tremendous flexibility and performance headroom of the service-built architecture.

Applications

Enhanced for the Edge

The versatile IP/MPLS capable M Series Multiservice Edge Routers can be deployed at the edge of provider networks, in small and medium cores, and in peering, route reflector and data center applications. Recent M Series innovations have dramatically expanded edge capabilities by leveraging the highly programmable Internet Processor II and I-chip ASICs and IP/MPLS-rich JUNOS Software. M Series routers are now deployed and scaling services at the edge of some of the world's largest production networks.

Consistent Services to All Customers

The M Series Multiservice Edge Routers span from over 7 Gbps up to 320 Gbps of throughput, including the M7i, M10i, M40e, M120 and M320 routers. The same scalable and production-hardened JUNOS Software runs on all IP/MPLS M Series routers, making a consistent set of capabilities available at all network locations–regardless of customer connection or serving-area density.

Access-agnostic, and with Leading Density

The versatile M Series can be deployed in both the service provider environment and in high-end enterprise environments.

In service provider environments, the M Series is deployed predominantly as a multiservice edge router but can also be deployed in small and medium cores, peering, route reflector, multicast, mobile and data center applications.

Large enterprises typically deploy M7i, M10i or M120 in a number of different locations, including Internet gateway router, WAN router, campus core router, regional backbone and data center.

Features and Benefits

With its broad interface portfolio, a single M Series router can provide a single point of edge aggregation for thousands of customers over any access type, including ATM, Frame Relay, Ethernet, and TDM, as well as at any speed from DS0 up to OC-192/STM-64 and 10-Gigabit Ethernet. Leveraging dense Ethernet and highly channelized interfaces, the M Series routers boast leading densities for virtually all port types.

Comprehensive VPN Portfolio

The M Series also supports the industry's most comprehensive VPN portfolio. They can simultaneously run and scale Layer 2 virtual circuits, Layer 2 VPNs, Layer 2.5 Interworking VPNs, Layer 3 2547 VPNs, VPLS, IPsec, GRE, IP-IP and other tunneling mechanisms with no performance compromise. This broad set of VPNs meets the needs of the widest possible set of customers, maximizing the enterprises and service provider's revenue while minimizing required infrastructure. For example, a provider can use Layer 3 VPNs to deliver an outsourced routing service and can also use Layer 2 VPNs to provide a point-to-point ATM service over a common IP/MPLS infrastructure.

Granular QoS and Statistics

Rich packet processing enables the M Series to support multiple levels of granular quality of service (QoS) per-port, per-logical circuit (DLCI, VC/VP, VLAN), and per-channel (to DS0) for traffic prioritization. These comprehensive QoS functions include classification, rate limiting, shaping, weighted round-robin scheduling, strict priority queuing, weighted random early detection, random early detection, and packet marking. For network convergence applications, Layer 2 class of service (CoS) can be mapped to Layer 3 CoS on a per-DLCI, per-VP/VC, or per-VLAN basis. Simultaneously, extensive statistics can be collected and diagnostics performed at this same level of granularity to enable flexible billing, traffic planning, and rapid troubleshooting.

Rich Packet Processing and Advanced Services

What's more, a broad portfolio of services can be layered on top of VPNs for additional revenue generation. A comprehensive suite of multicast capabilities, including multicast over MPLS VPNs, enables efficient distribution of premium content. Hardware-based IPv6 and a number of IPv6 migration tools such as IPv6 over MPLS, ease access to the benefits of this next-generation IP protocol without performance compromise. Network Address Translation (NAT) and stateful firewall can be configured per VRF to enable network-based security for additional revenues, and IPsec can be used to support a premium security service for end users with high security requirements. The M Series service-built edge is continuously enhanced with new packet processing capabilities to ensure maximum revenue generation opportunities.

The latest additions in terms of advanced services capabilities on the M120 and M320 are the Session Border Controller (SBC) and Dynamic Application Awareness (DAA) applications supported on the Multiservices PIC. The SBC application enables the efficient deployment of scalable multimedia services resulting in both CapEx and OpEx benefits. DAA allows better visibility on the traffic flows thanks to Deep Packet Inspection (DPI) analysis and supports applications like application-aware traffic prioritization, Peer-to-Peer traffic mitigation or Intrusion Detection and Prevention (IDP) business-class 'clean-pipe' services.

Highly Reliable

The M Series service-built architecture has been designed from the ground up with scale and stability in mind, including the modular and fault-protected design of JUNOS Software along with a rigorous system-testing process. Furthermore, all M Series routers offer redundant power and cooling and the M10i, M40e, M120, and M320 offer fully redundant hardware, including redundant Routing Engines and Switching/Forwarding Engine Boards. JUNOS Software features enhance this redundant architecture by enabling non-stop forwarding in the event of a routing engine failure via a hitless switchover and when a minor software upgrade is required by supporting in-service software upgrades. This functionality augments other high-availability capabilities that include graceful protocol routing restart, MPLS fast reroute, VRRP, SONET APS, SDH MSP, BFD, and LACP.

Robust Security

All M Series routers support highly scalable J-Protect filtering capabilities, unicast reverse-path forwarding, and high-performance rate limiting for industry-leading DOS attack protection. The J-Protect security capabilities of the M Series routers can be further enhanced with the Multiservices Physical Interface Card (PIC) that accelerates, in hardware, additional network-based security services such as high-speed NAT, stateful firewall with attack detection, DPI/IDP capabilities and J-Flow accounting. With the rich feature set of JUNOS Software combined with industry-leading ASIC technology, the M Series service-built edge provides a new level of reliable and secure service delivery at the edge of the network.

M Series Features and Benefits

FEATURES	BENEFITS

New service models	• Industry's most comprehensive VPN portfolio meets the largest number of customer needs and maximizes revenues
	  – Simultaneously run Layer 2 Virtual Circuit, Layer 2 VPN, Layer 2.5 Interworking VPNs, Layer 3 2547 VPN, VPLS, IPsec, IP over IP, and GRE
	  – Highly scalable, supporting thousands of VPNs
	• Granular QoS with low latency and jitter performance to support voice, video, and other real-time applications
	  – Per DLCI, per VP, per VC, per VLAN, per channel (DS0), and per port QoS
	  – Classification, rate limiting, shaping, weighted round-robin scheduling, strict priority scheduling, weighted random early detection, random early detection, and packet marking
	  – Mapping Layer 2 (802.1p, CLP, DE) to Layer 3 QoS (IP DSCP, MPLS EXP)
	• Hardware-based IPv6 performance, IPv6 over MPLS, IPv6 over IPv4 GRE tunnels, and IPv6/IPv4 dual stack functionality
	• Robust multicast support, including IGMP v1/v2/v3, PIM-SM, PIM-DM, MLD, SSM, RP, MSDP, BSR, multicast in MPLS/BGP VPNs to support resource-efficient delivery of high-value content
	• Network-based security services including NAT and stateful firewall, and NAT and stateful firewall per VRF
	• MLPPP, MLFR .15 and MLFR .16, and 802.3ad (including LACP) for aggregated links
	• J-Flow accounting, source class usage, and destination class usage for flexible billing on a per-application or per-CoS resource usage basis and for distance-based billing
	  – Multivendor network management solution through partnerships
	• Industry-leading, XML-based JUNOScript API facilitates third-party and in-house OSS development
	• Session Border Controller services, for efficient deployment of scalable multimedia services resulting in both CapEx and OpEx benefits
	• Dynamic Application Awareness, enables more visibility to better derive value from traffic

Services everywhere	• One feature-rich JUNOS Software image runs across all M Series routers, ensuring consistent services and enabling providers to market all services to all users regardless of connection or serving area density
	  – From the smallest PoPs to the largest PoPs, from the enterprise core to branch aggregation
	  – Over virtually any access technology including ATM, FR, Ethernet, and TDM connections
	  – At any speed, from DS0 to OC-192/STM-64
	  – Lowers operational costs
	• Seamless migration to larger platforms to meet network growth

Proven dependability	• Production-proven services scaled in the world's largest networks • Hitless switchover for RE switchover with non-stop forwarding • In-service software upgrades for disruption-free minor upgrades • MPLS FRR to ensure traffic can quickly reroute around failures • MPLS TE path control for path optimization combined with predictable performance for latency-sensitive traffic such as voice and video • Advanced OA&M features such as LSP ping for troubleshooting MPLS • IETF Graceful Protocol Restart mechanism for hitless restarts of IS-IS, BGP, OSPF, OSPFv3, LDP, RSVP, Layer 2 VPN, and Layer 3 VPN • Modular JUNOS Software ensures that a failure of one module does not impact the entire operating system • User-friendly commands for safely deploying new configurations to live networks and for rolling back to previous working configurations

More from less infrastructure	• Service-built architecture provides clean separation between control plane, forwarding plane, and services plane to support multiple services on a single platform
	  – Maximum revenue with the lowest possible CapEx and OpEx
	  – Consolidate functions previously performed by discrete devices such as NAT, stateful firewall, IPsec, and QoS into a single M Series router
	  – Multiple services on a single platform allows customers to trial many different services without capital investment, and then to scale successful services to large user populations
	• Robust Layer 2 VPNs, Layer 2.5 Interworking VPNs, and Layer 2 to Layer 3 QoS mapping for transparently, consolidating multiple networks to a common IP/MPLS infrastructure
	• Logical routers enable enterprises and providers to segment a router into multiple administrative and routing domains, so that two completely different organizations can share infrastructure

Secure networks	• High-performance J-Protect NAT, stateful firewall, attack detection, DPI/IDP capabilities and IPsec via the Multiservices PIC* • Separate routing plane and control plane enables stateful firewall protection of the control plane • J-Flow stateful monitoring of packet flows with standard flowed v5 and v8 records for comprehensive monitoring of the network • Highly scalable filtering, unicast RPF, and rate limiting protects against IP spoofing and DOS attacks • High-performance IPsec and IPsec over MPLS with digital certificate support for an additional layer of security • Additional ubiquitous security features such as port mirroring, encrypted management session traffic, secure tunneling capabilities, secure remote logins, and configurable privilege levels and user accounts

*Physical Interface Card

M7i Multiservice Edge Router

The M7i Multiservice Edge Router is Juniper Networks' most compact routing platform. It's 3.5 inches (8.9 cm) in height and supports 7+ Gbps throughput. The M7i is ideal as an IP/MPLS provider edge router in small PoPs or as an enterprise routing solution for Internet gateway or branch aggregation. With its integrated Adaptive Services or Multiservices Module supporting hardware-accelerated NAT, stateful firewall, IPsec, and J-Flow accounting, it can be used as a campus border router or as head office customer premise equipment. It supports either 2 fixed Fast Ethernet ports, 2 fixed Gigabit Ethernet ports, or 1 fixed Gigabit Ethernet port via a Fixed Interface Card (FIC), as well as supporting 4 ejector-enabled PICs. The M7i router supports interface speeds of up to OC-12c/STM-4 and Gigabit Ethernet. PICs are interchangeable between the M7i and M10i routers.

M10i Multiservice Edge Router

The M10i Multiservice Edge Router is Juniper's most compact and cost-effective fully redundant M Series edge router. The M10i boasts fully redundant common hardware components including redundant Routing Engines, Compact Forwarding Engine Boards, fan trays, and power supplies. Combined with JUNOS Software reliability features, the M10i router is the product of choice for enabling reliable and secure services in small and medium PoPs. The M10i supports 8 ejector-enabled PICs via 2 built-in Flexible PIC concentrators, and interface speeds up to OC-12/STM-4 and Gigabit Ethernet. PICs are interchangeable between the M7i and M10i routers.

M40e Multiservice Edge Router

The M40e Multiservice Edge Router provides a dense, highly redundant platform primarily targeted for dense dedicated access aggregation and provider edge services in medium and large PoPs. This 40+ Gbps platform supports 32 ejector-enabled PICs via 8 FPCs and up to OC-48/STM-16 uplink speeds in a half-rack package. The M40e offers common hardware redundancy including the switch fabrics, Routing Engines, fan trays, and power supplies. PICs are compatible with the M120 and Juniper Networks T320 and T640 Core Routers.

M120 Multiservice Edge Router

The M120 Multiservice Edge Router is the newest addition to the industry-leading M Series. The M120 delivers support for 128 Gigabit Ethernet subscriber ports, with 10-Gigabit Ethernet or OC 192 uplink capabilities in an affordable, compact form factor. Ideal for supporting high-bandwidth converged edge routing applications, the M120 is designed to facilitate service aggregation for the multiplay needs of both service providers and enterprise users. The M120 extends a cost-effective, Ethernet-optimized infrastructure with 10-gigabit networking capabilities to the network edge. Capable of supporting MPLS services at Layers 2 and 3, including Layer 3 VPNs, the M120 is designed to deliver superior redundancy and facilitate the transport of legacy Frame Relay and ATM traffic over high-bandwidth Ethernet links. PICs are compatible with M40e, T320, and T640 routers.

M320 Multiservice Edge Router

The M320 Multiservice Edge Router is a high performance, 10 Gbps-capable, distributed architecture edge router. It offers up to 16 OC-192c/STM-64 PICs per chassis (32 per rack) or up to 64 OC-48c/STM-16 ports per chassis (128 per rack), with up to 320 Gbps throughput. The M320 router is ideal for medium-size backbone cores requiring predictable performance for feature-rich infrastructures. It also supports provider edge services in 10-gigabit PoPs with the ability to support up to 32 type 1 and type 2 PICs and up to 16 type 3 PICs for 10 Gbps uplinks. In addition, this platform is ideal where switching fabric and Routing Engine redundancy are required. All major components are field replaceable, increasing system serviceability and reliability, and decreasing mean time to repair. PICs are compatible with M40e, M120, T320, and T640 routers.

Key Components

Key components of each M Series router are the Packet Forwarding Engine (PFE) and the Routing Engine.

- The PFE is a logical entity responsible for packet forwarding. It physically consists of the PICs, FPCs, FIC, control/system/forwarding board, and state-of-the-art ASICs.

- PICs provide a complete range of fiber optic and electrical transmission interfaces to the network. For a listing of available PICs, see the M Series PICs and FPCs datasheet.

- Flexible PIC Concentrators house PICs and connect them to the rest of the PFE. On the M320, FPCs parse, prioritize, and queue the packets before forwarding them across the midplane to the appropriate destination interface. On egress, FPCs prioritize, queue, re-assemble, and forward packets out through the appropriate port. Up to four PICs can be mixed and matched within a single FPC slot, increasing configuration flexibility and network scalability, while maximizing PoP efficiency. The FPC required depends on the platform and on the PICs that are needed.

- The FIC is available only on the M7i and contains either two fixed Fast Ethernet interfaces or one fixed Gigabit Ethernet interface. The Gigabit Ethernet interface requires small form factor pluggable transceiver optics (ordered separately).

- On M7i, M10i, and M40e, the control/system/forwarding-engine board performs route lookup and switching to the destination FPC. It makes forwarding decisions, distributes data cells throughout memory, processes exception and control packets, monitors system components, and controls FPC resets. There are different names for this component on various platforms:
  - M7i/M10i Compact Forwarding Engine Board or recent Enhanced Compact Forwarding Engine board
  - M40e Switching and Forwarding Module

- The M120 uses a distributed forwarding architecture which separates the PFE in two components which are connected through the midplane: the FPC (or compact FPC) and the Forwarding Engine Board (FEB). FEBs provide route lookup

and forwarding functions from FPCs and cFPCs. FPCs and cFPCs are located on the front of the chassis, and provide power and management to the PICs. This design allows greater level of forwarding engine resiliency and system availability by supporting 1+1 fast failover and N:1 standby failover options.

- The M320 also uses a distributed architecture, where the PFE is contained entirely within the FPC. The latest additions to the M320 FPC family is the set of three Enhanced III FPCs. The new E3 FPCs provide additional QoS support, increased next-hop scaling and system performance gains. Route lookup and packet processing occurs on the ingress PFE, and is then switched across the Switch Interface Board (switching fabric) to the egress PFE for final route lookup and packet processing. The feature-rich programmable ASICs deliver a comprehensive, hardware-based system for packet processing and support for uncompromising 40 Gbps performance per PFE. To ensure a non-blocking forwarding path, all channels between the ASICs and between ingress and egress PFEs are oversized, dedicated paths.

- The programmable ASICs deliver a comprehensive, hardware-based system for packet processing. To ensure a non-blocking forwarding path, all channels between the ASICs are oversized, dedicated paths.

- The Routing Engine maintains the routing tables and controls the routing protocols, as well as the JUNOS Software processes that control the router's interfaces, the chassis components, system management, and user access to the router.

- The Routing Engine processes all routing protocol updates from the network, so forwarding performance is not affected.

- The Routing Engine implements each routing protocol with a complete set of Internet features and provides full flexibility for advertising, filtering, and modifying routes. Routing policies are set according to route parameters, such as prefixes, prefix lengths, and BGP attributes.

M7i

M10i

M40e

M120
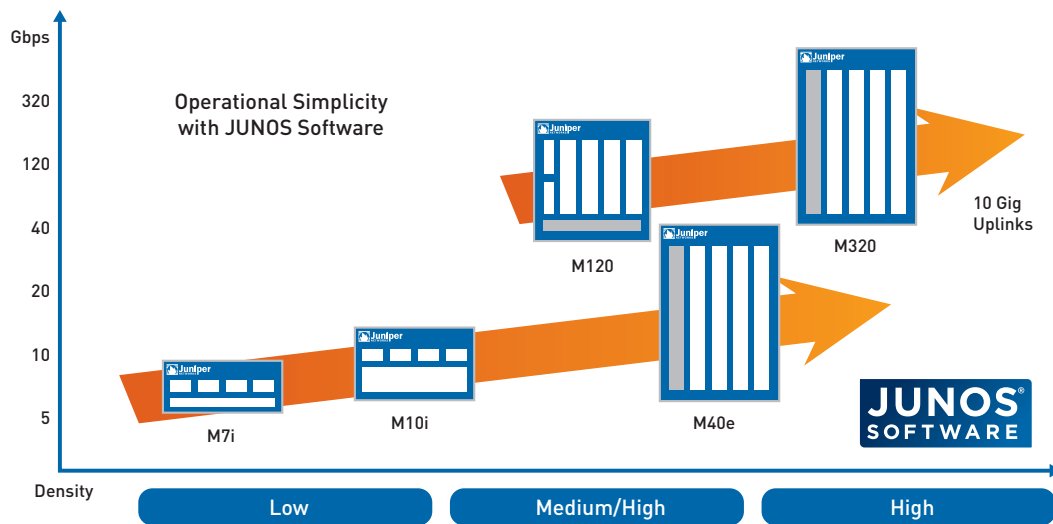
M320

Product Options

M Series Reference Table

ROUTER	M7i	M10i	M40e	M120	M320
Aggregate half-duplex throughput	10 Gbps/16 Mpps	16 Gbps/16 Mpps	51.2 Gbps/40 Mpps	120 Gbps/90 Mpps (15 Mpps per FEB)	320 Gbps/385 Mpps
FPC* slots and full duplex throughput per slot	1 built-in, 4 Gbps additional 1 Gbps for FIC	2 built-in, 4 Gbps	8 FPC slots, 3.2 Gbps	4 FPC slots, 10 Gbps	8 FPC slots, 20 Gbps
PICs** per chassis	4, plus 2 additional fixed FE, or 1 fixed GE ports	8	32	16	32
Chassis per rack	24	9	2	4	2
Redundancy	No	Yes	Yes	Yes	Yes

M Series Specifications

ROUTER	M7i	M10i	M40e	M120	M320
Physical					
Dimensions (W x H x D)	17.5 x 3.5 x 18 in (44.5 x 8.9 x 45.7 cm)	17.5 x 8.5 x 18 in (44.5 x 22.2 x 45.7 cm)	17.4 x 35 x 26 in (44.2 x 88.9 x 66 cm)	17.5 x 20.7 x 25.7 in (44.5 x 52.6 x 65.3 cm)	17.4 x 34.8 x 25.7 in (44.2 x 88.4 x 65.3 cm)
Maximum weight	38.2 lb / 17.3 kg	79 lb / 36 kg	370.5 lb / 168 kg	230 lb / 105 kg	439 lb / 199.6 kg
Mounting	Front or center	Front or center	Front or center	Front or center	Front or center
Power					
DC input power (Fully loaded)	10 A at -48 VDC 378 watts	12 A at -48 VDC 576 watts	54 A at -48 VDC 2,600 watts	45 A at 48 VDC 2,150 watts	65 A at 48 VDC 3,135 watts
No. of power supplies required (non-redundant/redundant)	1/2	2/4	1/2	1/2	2/4
AC input power (Fully loaded)	4 to 2 A 100 to 240 VAC 47 to 63 Hz 400 watts	8 to 4 A 100 to 240 VAC 47 to 63 Hz 800 watts	15 to 13 A 200 to 240 VAC 47 to 63 Hz 3,000 watts	28 to 14 A 100 to 240 VAC 47 to 63 Hz 2,200 watts	17 to 14 A 200 to 240 VAC 47 to 63 Hz 3,500 watts
No. of power supplies required (non-redundant/redundant)	1/2	2/3	1/2	1/2	3/4
Environment					
Temperature	32° to 104° F 0° to 40° C	32° to 104° F 0° to 40° C	32° to 104° F 0° to 40° C	32° to 104° F 0° to 40° C	32° to 104° F 0° to 40° C
Relative humidity	5% to 90% noncondensing humidity	5% to 90% noncondensing humidity	5% to 90% noncondensing humidity	5% to 90% noncondensing humidity	5% to 90% noncondensing humidity
Maximum altitude	No performance degradation to 10,000 ft / 3,048 m	No performance degradation to 10,000 ft / 3,048 m	No performance degradation to 10,000 ft / 3,048 m	No performance degradation to 10,000 ft / 3,048 m	No performance degradation to 10,000 ft / 3,048 m

*Flexible PIC Concentrator
**Physical Interface Card

Operational Simplicity with JUNOS Software

Gbps

320

120

40

20

10

5

M7i   M10i   M40e   M120   M320

10 Gig Uplinks

JUNOS® SOFTWARE

Density

| Low | Medium/High | High |

M Series Specifications

Forwarding and Switch Interface Boards

M7i, M10i CFEB

Enhanced Compact Forwarding Engine Board
- I-chip ASIC for 15 Mpps packet lookup, parsing, prioritizing, and queuing of packets
- 1 GHz CPU and supporting logic
- 1280 MB DDR SDRAM for packets storage
- 32 MB RLDRAM for forwarding tables associated with ASICs
- 100 ms of delay-bandwidth buffering
- 512 KB boot flash EPROM (programmable on the board)

M7i
- 10 Gbps throughput rate (5 Gbps full duplex)
- Optional Adaptive Services Module or Multiservice Module

M10i
- 16 Gbps throughput rate (8 Gbps full duplex)

Compact Forwarding Engine Board
- Internet Processor II-based ASIC for 16 Mpps packet lookup
- 266 MHz CPU and supporting logic
- Two enhanced I/O Manager ASICs for parsing, prioritizing, and queuing of packets
- 4 MB parity-protected SSRAM per I/O Manager ASIC
- 128 MB or 256 MB of packets storage
- 8 MB SSRAM for forwarding tables associated with ASICs
- 200 ms of delay-bandwidth buffering
- Two 512 KB boot flash EPROM (programmable on the board)

M7i
- 8.4 Gbps throughput rate (4.2 Gbps full duplex)
- Optional Adaptive Services Module

M10i
- 12.8 Gbps throughput rate (6.4 Gbps full duplex)

M7i, M10i CFEB (continued)

M40e SFM
Switching and Forwarding Module
- 51.2 Gbps throughput (25.6 Gbps full duplex)
- One Internet Processor II ASIC for 40 Mpps aggregate packet lookup
- Two Distributed Buffer Manager ASICs for coordinating pooled, single-stage buffering
- 256 KB parity-protected Level 2 cache
- Optional redundancy

Switching and Forwarding Module
- 16 MB version
- PowerPC 603e processor running at 266 MHz
- 16 MB parity-protected SSRAM
- 256 MB parity-protected DRAM

M320 SIB

Switch Interface Board for Interconnecting FPCs
- Four required per M320 chassis; all four active
- 80 Gbps throughput per SIB, 320 Gbps throughput per system
- Processor subsystem 300 MHz CPU
- System controller
- 256 MB DRAM

FPC

M40e

- 3.2 Gbps full-duplex throughput per M40e-FPC, M40e-FPC1, and M40e-FPC2
- Two Packet Director ASICs for dispersing and balancing packets across the enhanced I/O Manager ASICs
- Two enhanced I/O Manager ASICs
- Parsing, prioritizing, and queuing of packets
- 2 MB parity-protected SSRAM per I/O Manager ASIC
- 200 ms of delay-bandwidth buffering per FPC

M Series Specifications (continued)

M120

- 4 Gbps full-duplex throughput per M120-FPC1
- 10 Gbps full-duplex throughput per M120-FPC2
- 10 Gbps full-duplex throughput per M120-FPC3
- 10 Gbps full-duplex throughput per M120-cFPC
- Layer 2 / Layer 3 Packet Processing ASICs
- Switch Interface ASICs
- I-chip on the Packet Forwarding Engine
- Memory subsystem, including queuing and memory interface ASICs
- Processor subsystem

M320

- 4 Gbps full-duplex throughput per M320-FPC1
- 16 Gbps full-duplex throughput per M320-FPC2
- 20 Gbps full-duplex throughput per M320-FPC3
- Layer 2 / Layer 3 Packet Processing ASICs
- Switch Interface ASICs
- Internet Processor ASICs
- Memory subsystem, including queuing and memory interface ASICs
- Processor subsystem

Routing Engine

400 MHz (M7i, M10i)

- 400 MHz Intel Celeron processor with default 256 KB Level 2 cache
- 768 MB SDRAM
- 1 GB compact flash drive for primary storage
- 20 GB IDE hard drive for secondary storage
- Fast Ethernet RJ-45 port for out-of-band management
- Two RS-232 (DB-9 connector) asynchronous serial ports for console and remote management
- Optional PCMCIA card adapter and 1 GB compact flash card for media upgrades

850 MHz (M7i, M10i)

- 850 MHz Intel Pentium III
- 1.5 GB DRAM
- 1 GB compact flash drive for primary storage
- 40 GB IDE hard drive for secondary storage
- Fast Ethernet RJ-45 port for out-of-band management
- Two RS-232 (DB-9 connector) asynchronous serial ports for console and remote management
- Optional PCMCIA card adapter and 1 GB compact flash card for media upgrades

1000 MHz (M40e, M120)

- 1 GHz Intel Celeron M processor
- 2 GB DRAM
- 1 GB compact flash drive for primary storage
- 40 GB IDE hard drive for secondary storage
- Fast Ethernet RJ-45 port for out-of-band management
- Two RS-232 (DB-9 connector) asynchronous serial ports for console and remote management
- 1 GB USB drive for media upgrades

2 GHz (M120, M320)

- 2 GHz Intel Celeron M processor
- 4 GB DRAM
- 1 GB compact flash drive for primary storage
- 40 GB IDE hard drive for secondary storage
- Fast Ethernet RJ-45 port for out-of-band management
- Two RS-232 (DB-9 connector) asynchronous serial ports for console and remote management
- 1 GB USB drive for media upgrades

Control Systems

M40e

Miscellaneous Control Subsystem
- 19.44 MHz Stratum 3 reference clock for PICs
- Controller to monitor the status of router components

M120

Control Board
- Switch fabric—Provides transit traffic through the Control Board
- Control FPGA—Provides the PCI interface to the Routing Engine
- 1000BASE-T Ethernet controller—Provides a 1-Gbps Ethernet link between the Routing Engines
- Ethernet switch—Provides Ethernet connectivity between the Routing Engine and the FPCs and FEBs
- SONET clocking module—Provides a Stratum 3 timing reference for all SONET interfaces installed in the system
- Optional redundancy

M320

Control Board
- Provides buses and control processors used for chassis management
- 10/100BASE-T/TX Ethernet switch for intermodule communication
- Processor subsystem
- Two external clock inputs for 19.44 MHz Stratum 3 reference clock
- Optional redundancy

M Series Specifications (continued)

Approvals

Safety Approvals

- CAN/CSA-C22.2 No.60950-00/UL 60950 Third Edition, Safety of Information Technology Equipment
- EN 60950 Safety of Information Technology Equipment
- EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide

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-61000-4-11 Voltage Dips and Sags

EMC

- AS/NZS 3548 Class A (Australia/New Zealand)
- EN55022 Class A (Europe)
- FCC Part 15 Class A (USA)
- VCCI Class A (Japan)
- BSMI Class A (Taiwan)

NEBS

- SR-3580 NEBS Criteria Levels (Level 3 Compliance)
- GR-63-CORE: NEBS, Physical Protection
- GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment

ETSI

- ETSI EN-300386-2 Telecommunication Network Equipment. Electromagnetic Compatibility Requirements

Management

Element Management
- J-Web graphical user interface

Policy Management
- Juniper Networks SDX300 Service Deployment System
- Juniper Networks JUNOScope IP Service Manager

Third-Party Management Applications
- Dorado, InfoVista, Micromuse, and WANDL

SNMP
- SNMP v2/v3 Bilingual Agent support

Performance-Enabling Services and Support

Juniper Networks is the leader in performance-enabling services and support, which are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to bring revenue-generating capabilities online faster so you can realize bigger productivity gains, faster rollouts of new business models and ventures, and greater market reach, while generating higher levels of customer satisfaction. At the same time, Juniper Networks ensures operational excellence by optimizing your network to maintain required levels of performance, reliability, and availability. For more details, please visit **www.juniper.net/products-services.**

Ordering Information

This section lists only the base units and basic options.

Note: PICs are not included as part of the base units and must be ordered separately. For PIC ordering information, see the PICs datasheets at **www.juniper.net**. For further details on bundles, options, and spares, contact a Juniper Networks sales representative.

COMPONENT	DESCRIPTION	MODEL NUMBER				
		M7i	**M10i**	**M40e**	**M120**	**M320**
Base Unit	DC Chassis	M7iBASE-DC-2FETX M7iBASE-DC-1GE	M10iBASE-DC	M40eBASE-DC	M120BASE-DC	M320BASE-DC
	AC Chassis	M7iBASE-AC-2FETX M7iBASE-AC-1GE M7i-AC-2GE-P	M10iBASE-AC	M40eBASE-AC	M120BASE-AC	M320BASE-AC
Flexible PIC Concentrator	FPC	Built into chassis	Built into chassis	M40e-FPC-S	–	–
	FPC1	–	–	M40e-FPC1-EP	M120-FPC1	M320-FPC1-E2 M320-FPC1-E3
	FPC2	–	–	M40e-FPC2-EP	M120-FPC2	M320-FPC2-E2 M320-FPC2-E3
	FPC3	–	–	–	M120-FPC3 M120-cFPC-1OC192-XFP M120-cFPC-1XGE-XFP	M320-FPC3-E2 M320-FPC3-E2-20GE-SFP M320-FPC3-E2-2XGE-XENPAK M320-FPC3-E3 M320-FPC3-E3-20GE-SFP M320-FPC3-E3-2XGE-XENPAK
System Switching and Forwarding Boards		Base bundle options: FEB-M7i-BB FEB-M7i-E-BB Integrated services options: FEB-M7i-SVCS-BB FEB-M7i-SVCS-ASM-E-BB FEB-M7i-SVCS-MS-E-BB	Base bundle options: FEB-M10i-M7i-BB FEB-M10i-M7i-E-BB Redundancy options: FEB-M10i-M7i-R FEB-M10i-M7i-E-R	In-base bundle Redundancy: SFM-R	In-base bundle Redundancy: FEB-M120	In-base bundle Redundancy: SIB-M-R
Routing Engine		In-base bundle	In-base bundle Redundancy: RE-400-768-R RE-850-1536-R	In-base bundle Redundancy: RE-A-1000-2048-R	In-base bundle Redundancy: RE-A-1000-2048-R RE-A-2000-4096-R	In-base bundle Redundancy: RE-A-2000-4096-R

Note: Services supported by the Multiservices or Adaptive Services PICs are subject to license.

About Juniper Networks

Juniper Networks, Inc. is the leader in high-performance networking. Juniper offers a high-performance network infrastructure that creates a responsive and trusted environment for accelerating the deployment of services and applications over a single network. This fuels high-performance businesses. Additional information can be found at **www.juniper.net**.

To purchase Juniper Networks solutions, please contact your Juniper Networks representative at **1-866-298-6428** or authorized reseller.

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