

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.

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, M20, 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 platforms 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 platforms can be further enhanced with the Adaptive Services PIC that accelerates, in hardware, additional network-based security services such as high-speed NAT, stateful firewall with attack detection, 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 service provider networks.

Advantage

Features	Benefits
New Service Models	<ul style="list-style-type: none"> • Industry's most comprehensive VPN portfolio meets the largest number of customer needs and maximizes provider 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 (DSO), 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
Services Everywhere	<ul style="list-style-type: none"> • One feature-rich JUNOS image runs across all M-series platforms, 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 • Over virtually any access technology including ATM, FR, Ethernet, and TDM connections • At any speed, from DSO to OC-192/STM-64 • Lowers operational costs • Seamless migration to larger platforms to meet network growth

Features	Benefits
Proven Dependability	<ul style="list-style-type: none"> • 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 • ETF 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	<ul style="list-style-type: none"> • 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 platform • 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 providers to segment a router into multiple administrative and routing domains, so that two completely different organizations can share infrastructure
Secure Networks	<ul style="list-style-type: none"> • High-performance J-Protect NAT, stateful firewall, attack detection, and IPSec via the Adaptive Services 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

M7i Router

The M7i 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. With its integrated Adaptive Services 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 Router

The Juniper Networks M10i router is the company'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 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.

M20 Router

Only 14 inches (35.5 cm) in height, the M20 design delivers increased port density, performance of 20+ Gbps throughput, and high scalability and reliability all in a space-efficient package. The M20 offers fully redundant hardware, including redundant switching fabrics and Routing Engines to increase system availability. The M20 supports 16 PICs and up to OC-48/STM-16 uplink speeds in a compact package ideal for the provider edge in medium and large PoPs.

M40e Router

The M40e 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.

M120 Router

The M120 Multiservice Edge Router is the newest addition to the industry-leading Juniper Networks M-series product family. 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 platform

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.

M320 Router

The M320 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 platform 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.

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. 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 2 fixed Fast Ethernet interfaces or 1 fixed Gigabit Ethernet Interface. The Gigabit Ethernet interface requires small form factor pluggable transceiver optics (ordered separately).
- On M7i, M10i, M20, and M40e, the control/system/forwarding 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
 - M20 System and Switch Board
 - M40e Switching and Forwarding Module
- M320 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 M320-FPC-E3 cards. 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.

M-series Specifications

Forwarding and Switch Interface Boards

M7i, M10i CFEB

Compact Forwarding Engine Board

M7i router

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

M10i router

- 12.8 Gbps throughput rate (6.4 Gbps full duplex)
- Does not support Adaptive Services Module
- 266 MHz CPU and supporting logic
- Internet Processor II-based ASIC for 16 Mpps packet lookup
- Two enhanced I/O Manager ASICs
- Parsing, prioritizing, and queuing of packets
- 4 MB parity-protected SSRAM per I/O Manager ASIC
- 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)

M20 SSB SA2000

System and Switch Board

- 25.6 Gbps throughput (12.8 Gbps full duplex)
- One Internet Processor II ASIC for 40 Mpps packet lookup
- Two Distributed Buffer Manager ASICs for coordinating pooled, single-stage buffering
- 33 MHz PCI bus, which connects the PowerPC 603e processor and the Internet Processor II ASIC
- 512 KB boot flash EPROM (programmable on the board)
- Optional redundancy
- 16 MB version
- PowerPC 603e processor running at 266 MHz for handling exception packets
- 16 MB SSRAM
- 256 MB DRAM

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
- 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
- Two Fast Ethernet interfaces

FPC

M20

- 3.2 Gbps full-duplex throughput per FPC
- Enhanced I/O Manager ASIC
- Parsing, prioritizing, and queuing of packets
- 2 MB parity-protected SSRAM per I/O Manager ASIC
- 200 ms of delay-bandwidth buffering per 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

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
- 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
- 256 MB SDRAM DIMMs, upgradeable to 512 MB or 768 MB SDRAM in 256 MB increments
- 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
- Backup boot media
- Optional PCMCIA card adapter and 256 MB compact flash card

600 MHz (M20, M40e)

- 600 MHz Intel Pentium III
- Memory
- M20, M40e: 2 GB ECC DRAM
- 256 MB flash drive for primary storage
- 30 GB IDE hard drive for secondary storage
- Tertiary storage
- M20, M40e: 128 MB flash PC card

M120

- 1 GHz Intel Celeron M processor
- 2 GB DRAM
- 1 GB DMA Compact flash drive for primary storage
- 40 GB IDE hard drive for secondary storage

M320

- 1.6 GHz Pentium IV processor with integrated 256 KB Level 2 cache
- 2 GB DRAM
- 256 MB Compact flash drive for primary storage
- 30 GB IDE hard drive for secondary storage
- 10/100 Base-T auto-sensing RJ-45 Ethernet port for out-of-band management
- Two RS-232 (DB9 connector) asynchronous serial ports for console and remote management
- Optional redundancy

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	M20	M40e	M120	M320
Base Unit	DC Chassis	M7iBASE-DC-2FXTX M7iBASE-DC-1GE	M10iBASE-DC	M20BASE-DC	M40eBASE-DC	M120BASE-DC	M320BASE-DC
	AC Chassis	M7iBASE-AC-2FXTX M7iBASE-AC-1GE M7iBASE-AC-2GE-P	M10iBASE-AC	M20BASE-AC	M40eBASE-AC	M120BASE-AC	M320BASE-AC
Flexible PIC Concentrator	FPC	Built into chassis	Built into chassis	FPC-E	M40e-FPC-S	-	-
	FPC1	-	-	M20-FPC1-EP	M40e-FPC1-EP	M120-FPC-1	M320-FPC1 M320-FPC1-E2 M320-FPC-E3
	FPC2	-	-	-	M40e-FPC2-EP	M120-FPC-2	M320-FPC2 M320-FPC2-E2 M320-FPC2-E3
	FPC3	-	-	-	-	M120-FPC-3	M320-FPC3 M320-FPC3-20GE-SFP M320-FPC32XGE-XENPAK 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	In-base bundle Adaptive Service module option: FEB-M7i-SVCS-BB	In-base bundle Redundancy: FEB-M10i-M7i-R	In-base bundle Redundancy: SSB-E-M20	In-base bundle Redundancy: SFM-R	In-base bundle Redundancy: FEB-M120	In-base bundle Redundancy: SIB-M-R	
Routing Engine	In-base bundle Redundancy: RE-400-256-R	In-base bundle Redundancy: RE-400-256-R	In-base bundle Redundancy: RE-600-2048-R	In-base bundle Redundancy: RE-600-2048-R	In-base bundle Redundancy: RE-A-1000-2048-R RE-A-2000-4096-R	In-base bundle Redundancy: RE-1600-2048-R	

Control Systems

M40e

Miscellaneous Control Subsystem

- 19.44 MHz stratum 3 reference clock for PICs
- Controller to monitor the status of router components

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

