# Juniper
## NETWORKS

The M20 router's compact design offers tremendous performance and port density. The M20 router has a rich feature set that includes numerous advantages.

- *Route lookup rates in excess of 40 Mpps for wire-rate forwarding performance*

- *Aggregate throughput capacity exceeding 20 Gbps*

- *Performance-based packet filtering, rate limiting, and sampling with the Internet Processor II™ ASIC*

- *Redundant System and Switch Board and redundant Routing Engine*

- *Market-leading port density and flexibility*

- *Production-proven routing software with Internet-scale implementations of BGP4, IS-IS, OSPF, MPLS traffic engineering, class of service, and multicasting applications*

## DATASHEET

# M20 Internet Backbone Router

The M20™ Internet backbone router is a high-performance routing platform that is built for a variety of Internet applications, including high-speed access, public and private peering, hosting sites, and backbone core networks.

The M20 router leverages proven M-series ASIC technology to deliver wire-rate performance and rich packet processing,

such as filtering, sampling, and rate limiting. It runs the same JUNOS™ Internet software and shares the same interfaces that are supported by the M40™ Internet backbone router, providing a seamless upgrade path that protects your investment. Moreover, its compact design (14 in / 35.56 cm high) delivers market-leading performance and port density, while consuming minimal rack space.



The M20 router offers wire-rate performance, advanced features, internal redundancy, and scaleability in a space-efficient package.

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## Advantages

| Features | Benefits |
|---|---|

### Architecture

| Features | Benefits |
|---|---|
| Highly integrated ASIC forwarding | ■ Oversized ASICs designed to perform lookups at a rate of 40 Mpps.<br>■ Half-duplex throughput rate of 20+ Gbps<br>■ Scales well with large, complex forwarding tables.<br>■ Full utilization of expensive circuits.<br>■ Packet size does not affect forwarding performance.<br>■ Rock solid system stability.<br>■ Lower part count for high reliability. |
| Routing and forwarding performance cleanly separated | ■ Routing fluctuations and network instability do not impede packet forwarding.<br>■ Rapid convergence.<br>■ Reliable and predictable performance for latency sensitive traffic, such as voice over IP and streaming video multicasting. |
| Single-stage buffering | ■ Eliminates head-of-line blocking.<br>■ Efficiently uses available interface bandwidth.<br>■ Optimal support for multicast traffic.<br>■ Reduces latency by requiring only one write to and one read from shared memory. |
| Features are implemented in ASICs | ■ Industry-leading performance with value-added services enabled. |
| Redundant System and Switch Board (SSB) | ■ Increases system availability.<br>■ Ensures automatic failover to redundant SSB in case of failure. |
| Redundant Routing Engine | ■ Increases system availability.<br>■ Decreases mean time to repair (MTTR). |
| Field Replaceable Flexible PIC Concentrators, SSBs, Routing Engines, and power supplies | ■ Increases system serviceability and availability.<br>■ Decreases MTTR. |
| JUNOS Internet software already deployed in the largest and fastest growing networks | ■ Proven performance and reliability. |

### Interfaces

| Features | Benefits |
|---|---|
| Market-leading port density | ■ Efficient use of POP rack space.<br>■ Future growth not limited by space. |
| Fine granularity of interchangeable interfaces | ■ Flexibly deployed in multiple environments, including core, peering, high-speed access, and hosting.<br>■ Lowers the cost of entry configurations. |

### Environment

| Features | Benefits |
|---|---|
| Maximum chassis power of 24 A at -48 VDC, or 12 A at 100 VAC, 6 A at 240 VAC | ■ Efficient use of POP power (<1.7 Amp/rack inch).<br>■ Lowers POP cooling requirements. |
| Maximum heat dissipation of 4,000 BTU | ■ Protects against overheating. |

### Services

| Features | Benefits |
|---|---|
| Flexible and comprehensive support packages | ■ Increases network availability.<br>■ Eases network configuration and deployment.<br>■ Flexibility to fit your business model.<br>■ Worldwide 24x7x365 access. |
| Professional consulting | ■ Eases network planning and configuration.<br>■ Adds expertise to on-site engineering team. |
| Product and technology training | ■ Provides hands-on configuration experience.<br>■ Increases product and network design knowledge. |

*" It [JUNOS software] dramatically increases our confidence that we will have access to technology to keep scaling along with what the demands on the network are. We can keep running. "*

—Michael O'Dell,
Chief Scientist,
UUNET
Technologies, Inc.

## Architecture

The two key components of the M20 architecture are the Packet Forwarding Engine (PFE) and the Routing Engine, which are connected via a 100-Mbps link. Control traffic passing through the 100-Mbps link is prioritized and rate limited to help protect against denial-of-service attacks.

- The PFE is responsible for packet forwarding performance. It consists of the Flexible PIC Concentrators (FPCs), physical interface cards (PICs), System and Switch Board (SSB), and state-of-the-art ASICs.

- The Routing Engine maintains the routing tables and controls the routing protocols. It consists of an Intel-based PCI platform running JUNOS software.

The architecture ensures industry-leading service delivery by cleanly separating the forwarding performance from the routing performance. This separation ensures that stress experienced by one component does not adversely affect the performance of the other since there is no overlap of required resources.

### Logical View of M20 Architecture
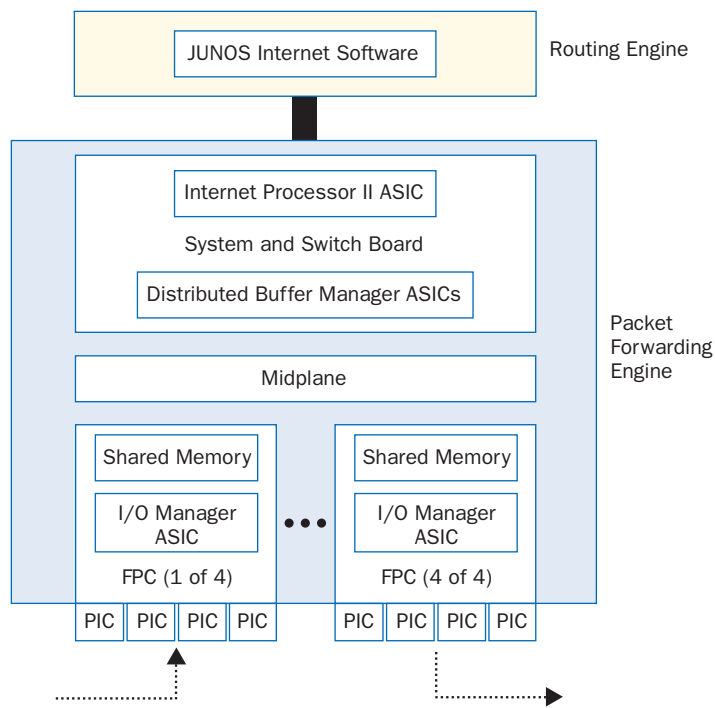


### Leading-edge ASICs

The feature-rich M20 ASICs deliver a comprehensive hardware-based system for packet processing, including route lookups, filtering, sampling, rate limiting, load balancing, buffer management, switching, encapsulation, and de-encapsulation functions. To ensure a non-blocking forwarding path, all channels between the ASICs are oversized, dedicated paths.

#### Internet Processor and Internet Processor II ASICs

The Internet Processor™ ASIC, which was originally deployed with M20 routers, supports an aggregated lookup rate of over 40 Mpps.

An enhanced version, the Internet Processor II ASIC, supports the same 40 Mpps lookup rate. With over one million gates, this ASIC delivers predictable, high-speed forwarding performance with service flexibility, including filtering and sampling. The Internet Processor II ASIC is the largest, fastest, and most advanced ASIC ever implemented on a router platform and deployed in the Internet.

#### Distributed Buffer Manager ASICs

The Distributed Buffer Manager ASICs allocate incoming data packets throughout shared memory on the FPCs. This single-stage buffering improves performance by requiring only one write to and one read from shared memory. There are no extraneous steps of copying packets from input buffers to output buffers. The shared memory is completely nonblocking, which in turn, prevents head-of-line blocking.

#### I/O Manager ASICs

Each FPC is equipped with an I/O Manager ASIC that supports wire-rate packet parsing, packet prioritizing, and queuing. Each I/O Manager ASIC divides the packets, stores them in shared memory (managed by the Distributed Buffer Manager ASICs), and re-assembles the packets for transmission.

#### Media-specific ASICs

The media-specific ASICs perform physical layer functions, such as framing. Each PIC is equipped with an ASIC or FPGA that performs control functions tailored to the PIC's media type.

### Packet Forwarding Engine

The PFE provides Layer 2 and Layer 3 packet switching, route lookups, and packet forwarding. The Internet Processor II ASIC forwards an aggregate of up to 40 Mpps for all packet sizes. The aggregate throughput is 20.6 Gbps half-duplex.

The PFE supports the same ASIC-based features supported by all other M-series routers. For example, class-of-service features include rate limiting, classification, priority queuing, Random Early Detection and Weighted Round Robin to increase bandwidth efficiency. Filtering and sampling are

also available for restricting access, increasing security, and analyzing network traffic.

Finally, the PFE delivers maximum stability during exceptional conditions, while also providing a significantly lower part count. This stability reduces power consumption and increases mean time between failure.

### Flexible PIC Concentrators

The FPCs house PICs and connect them to the rest of the PFE. There is a dedicated, full-duplex, 3.2-Gbps channel between each FPC and the core of the PFE.

You can insert up to four FPCs in an M20 chassis. Each FPC slot supports one FPC or one OC-48c/STM-16 PIC. Each FPC supports up to four of the other PICs in any combination, providing unparalleled interface density and configuration flexibility.

Each FPC contains shared memory for storing data packets received; the Distributed Buffer Manager ASICs on the SSB manage this memory. In addition, the FPC houses the I/O Manager ASIC, which performs a variety of queue management and class-of-service functions.

### Physical Interface Cards

PICs provide a complete range of fiber optic and electrical transmission interfaces to the network. The M20 router offers flexibility and conserves rack space by supporting a wide variety of PICs and port densities. All PICs occupy one of four PIC spaces per FPC except for the OC-48c/STM-16 PIC, which occupies an entire FPC slot.

An additional Tunnel Services PIC enables the M20 router to function as the ingress or egress point of an IP-IP unicast tunnel, a Cisco generic routing encapsulation (GRE) tunnel, or a Protocol Independent Multicast - Sparse Mode (PIM-SM) tunnel.

For a list of available PICs, see the *M-series Internet Backbone Routers Physical Interface Cards* datasheet.

### System and Switch Board

The SSB performs route lookup, filtering, and sampling, as well as provides switching to the destination FPC. Hosting both the Internet Processor II ASIC and the Distributed Buffer Manager ASICs, the SSB makes forwarding decisions, distributes data cells throughout memory, processes exception and control packets, monitors system components, and controls FPC resets. You can have one or two SSBs, ensuring automatic failover to a redundant SSB in case of failure.

### Routing Engine

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. These routing and software processes run on top of a kernel that interacts with the PFE.
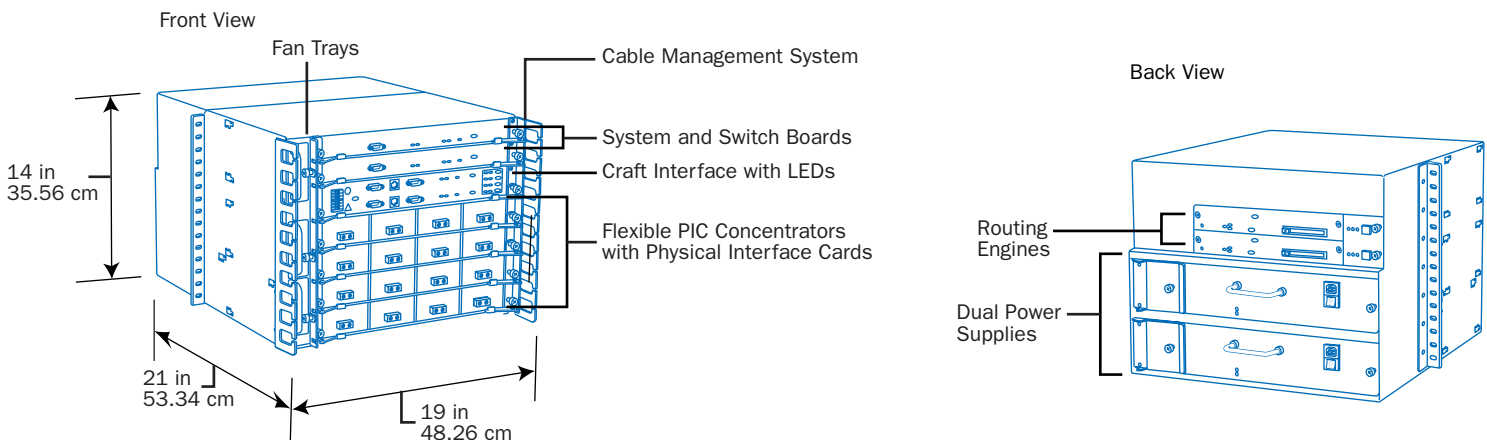
- The Routing Engine processes all routing protocol updates from the network, so PFE performance is not affected.

- 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.

You can install a redundant Routing Engine to ensure maximum system availability and to minimize MTTR in case of failure.

### JUNOS Internet Software

JUNOS software is optimized to scale to large numbers of network interfaces and routes. The software consists of a series of system processes running in protected memory on top of an independent operating system. The modular design improves reliability by protecting against system-wide failure since the failure of one software process does not affect other processes.

### M20 Router Front and Back Views



Front View

Fan Trays

Cable Management System

System and Switch Boards

Craft Interface with LEDs

Flexible PIC Concentrators with Physical Interface Cards

14 in
35.56 cm

21 in
53.34 cm

19 in
48.26 cm

Back View

Routing Engines

Dual Power Supplies

# Specifications

| Specification | Description | | |
|---|---|---|---|
| Physical | Height | 14 in / 35.56 cm | |
| | Width | 19 in / 48.26 cm | |
| | Depth | 21 in / 53.34 cm | |
| | Weight | Maximum configuration 150 lbs / 60.04 kg | |
| | Mounting | Front or center rack mount | |
| FPC | ■ 3.2-Gbps throughput (full duplex)<br>■ I/O Manager ASIC for wire-rate parsing, prioritizing, and queuing of packets | | |
| SSB | ■ One Internet Processor or Internet Processor II ASIC for 40-Mpps packet lookup<br>■ Two Distributed Buffer Manager ASICs for coordinating pooled, single-stage buffering<br>■ PowerPC 603e processor running at 200 MHz for handling exception packets<br>■ 33-MHz PCI bus, which connects the PowerPC 603e processor and the Internet Processor or Internet Processor II ASIC<br>■ Four slots of 1-MB SSRAM<br>■ 64-MB DRAM<br>■ 512-KB boot flash EPROM (programmable on the board) | | |
| Routing Engine | ■ Compact PCI industrial form factor<br>■ 333-MHz Intel Pentium II<br>■ 80-MB flash drive for primary storage<br>■ 6.4-GB hard drive for secondary storage<br>■ 110-MB flash PC card for tertiary storage<br>■ 10/100 Base-T auto-sensing RJ-45 Ethernet port for out-of-band management<br>■ Two RS-232 (DB9 connector) asynchronous serial ports for console and remote management | | |
| Power Requirements | DC | Maximum power | 1,200 watts |
| | | Maximum current | 24 A at -48 VDC |
| | | Input voltage | -40.5 to -72 VDC operating range |
| | AC | Maximum power | 1,200 watts |
| | | Maximum current | 12 A at 100 VAC, 6 A at 240 VAC |
| | | Input voltage | 100 V to 240 VAC rms |
| Environmental | Temperature | 32 to 104 degrees F / 0 to 40 degrees C | |
| | Maximum Altitude | No performance degradation to 10,000 ft / 3,048 m | |
| | Relative Humidity | 5 to 90 percent noncondensing | |
| | Seismic / Earthquake | Designed to meet Bellcore Zone 4 earthquake requirements | |
| | Thermal Output | 3,850 BTU/hour | |
| Agency Approvals | Safety | ■ CSA C22.2 No. 950<br>■ * UL 1950<br>■ EN 60950, Safety of Information Technology Equipment<br>■ EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide<br>■ EN 60825-2 Safety of Laser Products - Part 2: Safety of Optical Fibre Communication Systems | |
| | EMC | ■ AS 3548 Class A (Australia)<br>■ EN 55022 Class A emissions (Europe)<br>■ FCC Class A (USA)<br>■ VCCI Class A (Japan) | |
| | Immunity | ■ EN 61000-3-2 Power Line Harmonics<br>■ EN 61000-4-2 ESD<br>■ EN 61000-4-3 Radiated Immunity<br>■ EN 61000-4-4 EFT<br>■ EN 61000-4-5 Surge<br>■ EN 61000-4-6 Low Frequency Common Immunity<br>■ EN 61000-4-11 Voltage Dips and Sags | |
| | NEBS | Designed to meet these standards<br>■ GR-63-Core: NEBS, Physical Protection<br>■ GR-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment<br>■ SR-3580 NEBS Criteria Levels (Level 3 Compliance) | |
| | ETSI | ■ ETS-300386-2 Switching Equipment | |

# Ordering Information

| Model Number | Description |
|---|---|
| **Router** | |
| M20BASE-DC | M20 base unit: 4-slot chassis with cooling system, midplane, Routing Engine (768-MB DRAM, 80-MB flash drive, 6.4-GB hard drive, 110-MB flash PC card), two DC power supplies, complete documentation (CD ROM) |
| M20BASE-AC | M20 base unit: 4-slot chassis with cooling system, midplane, Routing Engine (768-MB DRAM, 80-MB flash drive, 6.4-GB hard drive, 110-MB flash PC card), two AC power supplies (AC power cables are country specific and sold separately), complete documentation (CD ROM) |
| **Components** | |
| SSB-M20 | System and Switch Board with Internet Processor ASIC |
| SSB-E-M20 | Enhanced System and Switch Board with Internet Processor II ASIC |
| **FPC** | |
| FPC | Flexible PIC Concentrator |
| **Power Cables** | |
| CBL-PWR-10AC-AU | M20 AC power cable, Australia (10A, 8.2 ft / 2.5 m) |
| CBL-PWR-10AC-EU | M20 AC power cable, Europe (10A, 8.2 ft / 2.5 m) |
| CBL-PWR-10AC-IT | M20 AC power cable, Italy (10A, 8.2 ft / 2.5 m) |
| CBL-PWR-10AC-JP | M20 AC power cable, Japan (10A, 8.2 ft / 2.5 m) |
| CBL-PWR-10AC-UK | M20 AC power cable, UK (10A, 8.2 ft / 2.5 m) |
| CBL-PWR-10AC-US | M20 AC power cable, US (10A, 8.2 ft / 2.5 m) |
| **Software** | |
| JUNOS | JUNOS Internet software (flash PC card) for USA and Canada (not for export) |
| JUNOS-WW | JUNOS Internet software (flash PC card) for all countries except the USA and Canada (satisfies USA government requirements for the export of encryption technology) |

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