EX8208 ETHERNET SWITCH

Product Overview

The EX8208 modular Ethernet switch, a member of the Juniper Networks EX Series Ethernet Switches product family, offers a flexible, powerful, and modular platform that delivers the performance, scalability, and high availability required for today's high-density data center, campus aggregation, and core switching environments. With a total capacity of up to 6.2 Tbps, the EX8208 system provides a complete, end-to-end solution for the high-performance networks of today and into the future.

Product Description

The eight-slot Juniper Networks® EX8208 Ethernet Switch, part of the Juniper Networks EX8200 line of Ethernet Switches, is ideal for aggregating access switches such as Juniper Networks EX2200, EX3200, EX3300, EX4200, EX4500 and EX6200 lines of Ethernet switches deployed in campus wiring closets and in data center top-of-rack applications. The EX8208 is also designed to support 1-Gigabit and 10-Gigabit Ethernet server access in data center end-of-row chassis deployments. In core applications, the EX8208 provides approximately 960 Mpps of high-density, wire-speed 10-Gigabit Ethernet performance for the largest campus and data center networks.

Customers can advance the economics of their network by leveraging the consistent performance of the Juniper Networks EX8200 line of Ethernet switches' wire-speed line cards, in conjunction with the EX2200, EX3200, EX3300, EX4200, EX4500 and EX6200 lines of Ethernet switches and Juniper Networks Junos® operating system to reduce capital and operational expenses across the network infrastructure.

EX8208 Ethernet Switch

The EX8208 switch includes an advanced set of hardware features enabled by Juniper-designed EX-PFE2 ASICs and the carrier-class Juniper Networks operating system, Junos OS, delivering the capabilities needed to support the high-performance networks of today and tomorrow.

The EX8208 switch features eight dedicated line-card slots that can accommodate a variety of EX8200 Ethernet line cards. Options include the following:

- **EX8200-48T:** a 48-port 10/100/1000BASE-T RJ-45 unshielded twisted pair (UTP) line card
- **EX8200-48T-ES:** a 48-port 10/100/1000BASE-T RJ-45 UTP extra scale line card
- **EX8200-48F**: a 48-port 100BASE-FX/1000BASE-X SFP fiber line card
- **EX8200-48F-ES**: a 48-port 100BASE-FX/1000BASE-X SFP extra scale fiber line card
- **EX8200-8XS**: an eight-port 10GBASE-X SFP+ fiber line card
- **EX8200-8XS-ES**: an eight-port 10GBASE-X SFP+ fiber extra scale line card
- **EX8200-40XS:** a 40-port 10GBASE-X SFP+ / 1000BASE-X SFP line card
- **EX8200-40XS-ES**: a 40-port 10GBASE-X SFP+ / 1000BASE-X SFP extra scale line card
- **EX8200-48TL**: a 48-port oversubscribed (2.4:1) 10/100/1000BASE-T RJ-45 UTP line card

- **EX8200-48PL**: a 48-port oversubscribed (2.4:1) 10/100/1000BASE-T RJ-45 UTP line card with support for Power over Ethernet (PoE)
- **EX8200-2XS-40T**: a combination line card with 40 oversubscribed (2.5:1) 10/100/1000BASE-T RJ-45 UTP ports, four line-rate 100/1000BASE-SX SFP ports and two line-rate 10GbE SFP+ ports
- **EX8200-2XS-40P**: a combination line card with 40 oversubscribed (2.5:1) 10/100/1000BASE-T RJ-45 UTP PoE+ ports, four line-rate 100/1000BASE-SX SFP ports and two line-rate 10GbE SFP+ ports

Fully configured, a single EX8208 chassis can support up to 384 Gigabit Ethernet or 64 10-Gigabit Ethernet ports at wire speed, or 320 10-Gigabit Ethernet ports in shared bandwidth applications, delivering one of the industry's highest 10-Gigabit Ethernet port densities.

At 14 rack-units (RUs) high, three EX8208 Ethernet Switches can fit in a standard 42 RU rack, enabling up to 1,152 Gigabit Ethernet or 960 10-Gigabit Ethernet ports in a single rack. At just 21 inches deep, the EX8208 is sufficiently compact to fit into typical wiring closets, making it ideal for campus deployments where space is at a premium.

The EX8208 features a switch fabric that is capable of delivering 320 Gbps (full duplex) per slot, enabling scalable wire-rate performance on all ports for any packet size. The passive backplane design supports a future capacity of up to 6.2 Tbps, providing a built-in migration path to next-generation deployments.

The base-configuration EX8208 Ethernet Switch includes a side-mounted hot-swappable fan tray with variable-speed fans, one Switch Fabric and Routing Engine (SRE) module, and one dedicated Switch Fabric module. Base EX8208 switches also ship with either two 2000 watt or two 3000 watt power supplies, although six power supply bays allow users to provision the chassis to provide the power and redundancy required for any application. Redundant EX8208 configurations include a second SRE module for hot-standby resiliency while AC or DC power options provide complete redundancy, reliability, and availability. All components are accessible from the front, simplifying repairs and upgrades.

A front-panel chassis-level LCD panel displays Routing Engine status as well as chassis component alarm information for rapid problem identification and resolution to simplify overall operations. The LCD also provides a flexible, user-friendly interface for performing device initialization and configuration rollbacks, reporting system status and alarm notification, or restoring the switch to its default settings.

Table 1: EX8208 Features at a Glance

| Features	Description
Chassis	14 RU; 21 in (53 cm) deep; 17.25 in (43.8 cm) wide 8 dedicated I/O slots 6.2 Tbps backplane capacity - Dedicated data, control, and management planes - LCD panel for system monitoring
Power	- Energy efficiency: Up to 195,000 packets per second per watt 6 load-sharing power supplies 10,000 W maximum power capacity 220 V AC, 110 V AC and -48 V DC options for N+1 or N+N redundancy
Cooling	- Redundant variable-speed fans and controllers - Side-to-side airflow
Fabric	320 Gbps (full duplex) per slot fabric capacity 2+1 redundancy with dual SREs and SF card - Full line-rate forwarding with two fabrics in system
Routing engine	1+1 redundancy - Master and backup SREs 2 gigabytes DRAM; 2 gigabytes Flash memory - Console + auxiliary serial and Ethernet management ports - USB storage interface
Operating system	Junos OS
High availability	Hardware designed for continuous operation: - Secure, modular architecture isolates faults - Separate control and forwarding planes enhance scalability and resiliency - Transparent failover and network recovery - Graceful Route Engine Switchover (GRES) - Nonstop Routing (NSR) - Nonstop Bridging (NSB) - Non-Stop Software Upgrade (NSSU)
Layer 2 features	- Jumbo frames (9216 Bytes) 4,096 VLANs - VLAN Registration Protocol (GVRP) - Private VLAN (PVLAN) 802.3ad – Link Aggregation Control Protocol (LACP) 802.1D – Spanning Tree Protocol (STP) 802.1w – Rapid Spanning Tree Protocol (RSTP) 802.1s – Multiple Instance Spanning Tree Protocol (MSTP) - VLAN Spanning Tree Protocol (VSTP) - Redundant Trunk Group (RTG)
Layer 3 features	- Static routing - RIP v1/v2 - OSPF v1/v2 - Filter-based forwarding - Virtual Router Redundancy Protocol (VRRP) - BGP (Advanced Feature license) - IS-IS (Advanced Feature license) - IPv6 (Advanced Feature license) - Bidirectional Forwarding Detection (BFD) - Virtual routers
Hardware tunneling	- GRE tunnels* - MPLS capabilities (Advanced feature license)
Multicast	- Internet Group Management Protocol (IGMP) v1/v2/v3 - IGMP snooping v1/v2/v3 - Protocol Independent Multicast PIM-SM, PIM-SSM, PIM-DM, MSDP

* Roadmap
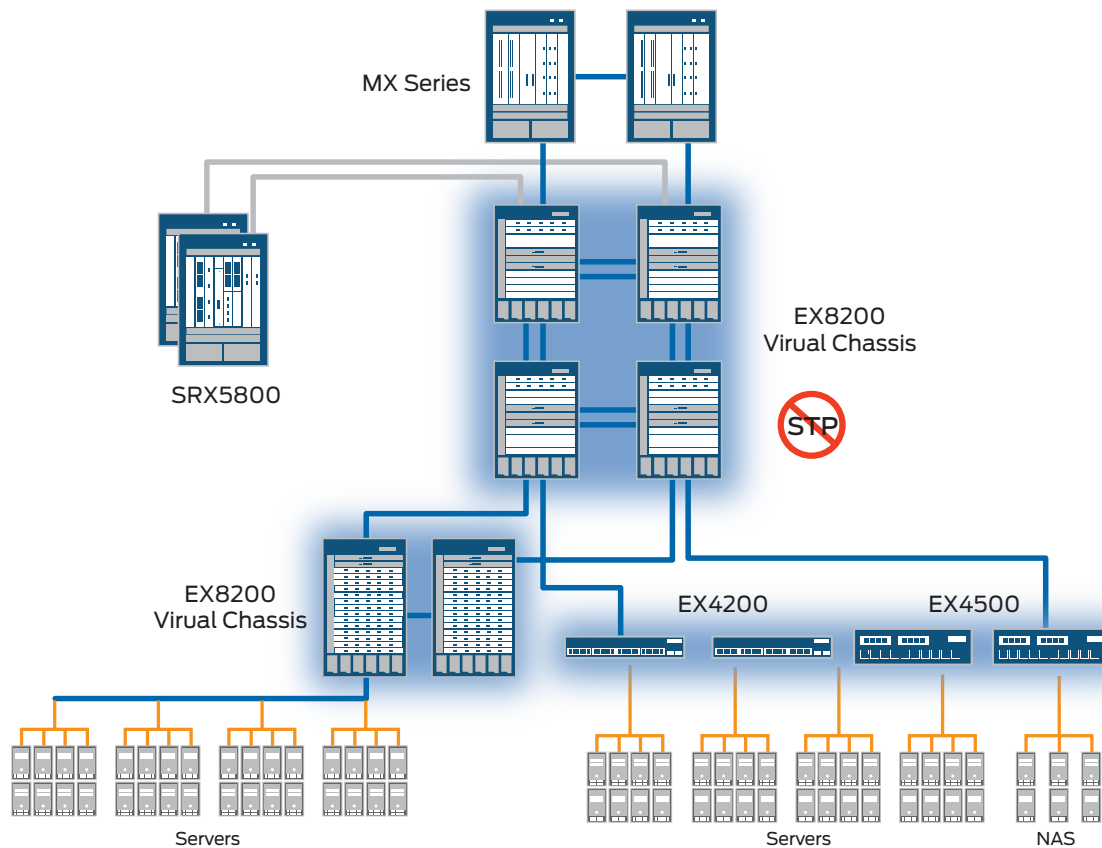
Figure 1: EX8208 Ethernet switches with Virtual Chassis technology offer a high-density, scalable solution for aggregating 10-Gigabit Ethernet uplinks from access-layer devices in the data center.

Table 1: EX8208 Features at a Glance (continued)

Features	Description
Firewall filters	· Ingress and egress L2-L4 access control lists (ACLs): - Port ACLs - VLAN ACLs - Router ACLs · Control plane denial of service (DoS) protection
Quality of service (QoS)	· 2,000 policers per chassis · 8 egress queues per port · Weighted Random Early Drop (WRED) scheduling · Shaped Deficit Weighted Round Robin (SDWRR) queuing · Strict priority queuing · Multi-field classification (L2 – L4) for scheduling and rewrite
Management	· Junos OS command-line interface (CLI) · Junos XML management protocol · Embedded Web-based management – Junos Web · Network and Security Manager (NSM) support · LCD panel · SNMP v1/v2/v3 · RADIUS · TACACS+ · Extensive MIB support · Local and remote analyzer (mirroring) · Link Layer Discovery Protocol (LLDP) · Advanced Insight Solutions (AIS)

Deployment Scenarios

The EX8208 switch is optimized for both data center and campus aggregation and core deployments.

In the data center, the EX8208 switch delivers a high-performance, high-density platform that reduces cost and complexity while improving overall scalability and providing carrier-class reliability. Populated with eight-port EX8200-8XS 10-Gigabit Ethernet line cards, the EX8208 can accommodate large numbers of high-speed, line-rate uplinks at any packet size from access layer devices such as EX4200 switches deployed in Virtual Chassis top-of-rack configurations, offering a scalable solution for supporting more servers with fewer switches. Using the 40-port EX8200-40XS 10-Gigabit Ethernet line card, the EX8208 can support a similar number of servers using traditional standalone top-of-rack or blade-server switches.
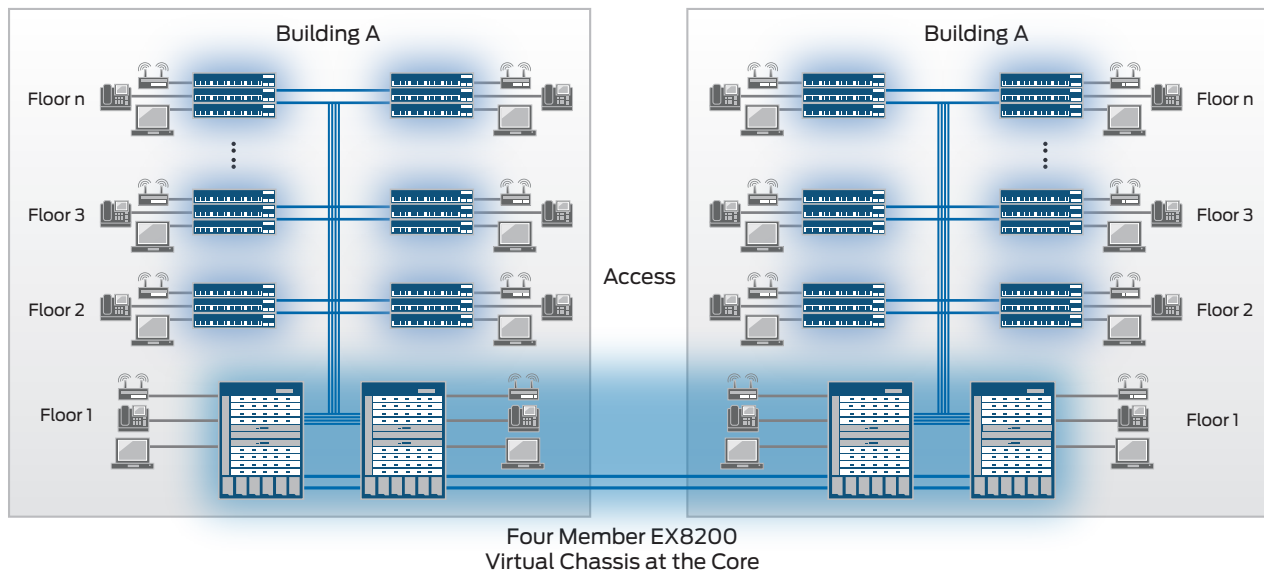
Figure 2: A campus aggregation/core environment can be managed as a single device with an EX8208 Virtual Chassis configuration.

With its high Gigabit Ethernet and 10-Gigabit Ethernet port densities, the EX8208 can also serve as an end-of-row server access switch. High-density Gigabit Ethernet and 10-Gigabit Ethernet ports on the EX8208 enable the consolidation of aggregation and core layers, simplifying the data center architecture while reducing power, space, and cooling requirements, and lowering total cost of ownership (TCO).

The EX8208 switch has a similar impact on campus aggregation and core environments, where high port densities and carrier-class performance enable the switch to support more users with less equipment than traditional solutions. For example, EX4200 switches deployed in Virtual Chassis configurations provide network access for every floor or building throughout a campus with 10-Gigabit Ethernet uplinks; the high-density EX8208 can aggregate Virtual Chassis uplinks within a single platform to provide high-performance, line-rate connectivity to core switches or WAN edge routers.

Virtual Chassis Technology

The EX8208 supports Juniper Networks' unique Virtual Chassis technology, which enables up to four interconnected EX8200 chassis—any combination of EX8208s or EX8216s—to operate as a single, logical device with a single IP address. Deployed as a collapsed aggregation or core layer solution, an EX8200 Virtual Chassis configuration creates a network fabric for interconnecting access switches, routers, and service-layer devices such as firewalls and load balancers using standards-based Ethernet LAGs.

In a Virtual Chassis configuration, EX8200 switches can be interconnected using either single line-rate 10GbE links or a LAG with up to 12 10GbE line-rate links. Since the Virtual Chassis intra-

connections use small form SFP+ interfaces, Virtual Chassis member switches can be separated by distances of up to 40 km (up to 70 km using ZR optics*). In a CWDM/DWDM network, the distance between member chassis can be extended beyond 70 km. If the EX8200 Virtual Chassis switch members are located in the same or adjacent racks, low cost direct attach cables (DACs) can be used as the interconnect mechanism.

Since the network fabric created by an EX8200 Virtual Chassis configuration prevents loops, it eliminates the need for protocols such as Spanning Tree. The fabric also simplifies the network by eliminating the need for Virtual Router Redundancy Protocol (VRRP), increasing the scalability of the network design. In addition, since the Virtual Chassis Control Protocol (VCCP) used to form the EX8200 Virtual Chassis configuration does not affect the function of the control plane, Junos OS control plane protocols such as 802.3ad, OSPF, Internet Group Management Protocol (IGMP), Physical Interface Module (PIM), BGP and others running on an EX8200 Virtual Chassis system behave in exactly the same way as when running on a standalone chassis.

EX8200 Virtual Chassis configurations are highly resilient, with no single point of failure, ensuring that no single element—whether a chassis, a line card, a Routing Engine, or an interconnection—can render the entire fabric inoperable following a failure. Virtual Chassis technology also makes server virtualization at scale feasible by providing simple L2 connectivity over a very large pool of compute resources located anywhere within a data center.

Virtual Chassis technology can also be used to extend EX8200-based VLANs between data centers by placing an equal number of switches in both data centers, or by interconnecting two separate Virtual Chassis configurations using a simple L2 trunk.

* Roadmap

XRE200 External Routing Engine

In an EX8200 Virtual Chassis configuration, the Routing Engine functionality is externalized to a purpose-built, server-class appliance, the XRE200, which supports control plane processing requirements for large-scale systems and provides an extra layer of availability and redundancy.

All control protocols such as OSPF, IGMP, Link Aggregation Control Protocol (LACP), 802.3ah and VCCP, as well as all management plane functions, run or reside on the XRE200. Junos OS high availability (HA) features can be enabled on the two XRE200s required in a redundant EX8200 Virtual Chassis configuration. In the event of an active XRE200 failure, the standby XRE200 takes over and Junos OS HA features ensure that the state of the Virtual Chassis, L2/L3 protocols, and forwarding information are not lost. See the XRE200 data sheet for more information.

Architecture and Key Components

The EX8200 line of Ethernet switches feature a number of distinct architectural elements. The Routing Engine on the SRE module runs Junos OS, which processes all Layer 2 and Layer 3 protocols and manages individual chassis components, while the Switch Fabric module provides the central crossbar matrix through which all data traffic passes. The SRE and Switch Fabric modules work together to fulfill all Routing Engine and Switch Fabric functions.

The EX8200 line cards include ASIC-based packet forwarding engines—the EX-PFE2— that process network traffic at wire rate, as well as a line-card processor that provides scalable local control and status processing. The EX8208 chassis backplane distributes the data, control, and management plane signals over independent paths to the various system components and distributes power throughout the system. The fan tray provides cooling to the line cards and control modules with redundant variable-speed fans, while the power supplies convert building power to the internal voltage required by the system.

All EX8208 components are hot-swappable, and all central functions are available in redundant configurations, providing high operational availability by allowing continuous system operation during maintenance or repairs.

Switch Fabric and Routing Engine (SRE) Module

The EX8208 SRE module performs two functions: it incorporates switch fabric, control plane, and management plane functionality on a single module, and it includes an integrated Routing Engine featuring a 1.2 GHz processor with 2 gigabytes of DRAM and 2 gigabytes of Flash storage. A dedicated front-panel RJ-45 Gigabit Ethernet port on the SRE module supports out-of-band system management and monitoring, while an external USB port allows easy uploading and storage of software images, configuration files, and logs. Direct console access is available through a dedicated serial port; an auxiliary console interface can support remote modem access to the switch.

The Routing Engine on the SRE module is based on the field-proven hardware architecture used by Juniper Networks routers, bringing the same carrier-class performance and reliability to the EX8208 that Juniper's routers provide to the world's largest service provider networks. The Routing Engine's central CPU performs all system control functions and maintains the hardware forwarding table and routing protocol states for the EX8208 switch. Dedicated hardware on the SRE module supports chassis management functions such as environmental monitoring, while communication between SRE modules and individual EX8200 line cards takes place over a dedicated internal Gigabit Ethernet out-of-band control interface.

EX8208 Switch Fabric

The switch fabric for the EX8208 switch, which serves as the central non-blocking matrix through which all network data passes, is distributed across three elements: the dual-redundant SRE modules and the dedicated Switch Fabric module. Working together, the SRE and Switch Fabric modules deliver the necessary switching capacity for the EX8208 switch; when the second SRE module is present, the additional switch fabric serves in hot-standby mode, providing full 2+1 switch fabric redundancy. The Switch Fabric modules are hot-swappable and field-replaceable, enabling failed units to be easily replaced without service interruption.

The two active, load-sharing switch fabrics on the SRE and Switch Fabric modules collectively deliver up to 320 Gbps (full-duplex) of packet-data bandwidth per line-card slot. The EX8208 switch backplane is designed to support a maximum fabric bandwidth of 6.2 Tbps.

Power

The EX8208 chassis contains six power supply bays and supports three types of power supplies, providing complete flexibility for both provisioning and redundancy. Each AC power supply delivers 2000 watts of power at high-line (12 A at 200-240 V) or 1200 W at low-line (15 A at 100-120 V) to the chassis. The EX8208 also supports a 3000 W power supply for high-line operation. A redundant-input 2000 W DC power supply is also available for central office deployments. The EX8200 power supplies are more than 90 percent efficient at a wide range of loads, minimizing building power requirements and reducing overall power consumption. These power supplies are interchangeable across the EX8200 line, simplifying maintenance and sparing.

Although only two power supplies are required for basic configuration and switch power-up, the six power supply bays provide the capacity required to power all possible line-card configurations, and to support N+1 or N+N power redundancy to protect against both component and line input failures. The actual number of power supplies required depends on the combination of line cards installed and the desired level of redundancy (see Table 2). For example, 6000 W is required to support a chassis fully populated with 64 10-Gigabit Ethernet ports, while 3600 W will support various 10-Gigabit Ethernet and Gigabit Ethernet line-card combinations.

Table 2: EX8208 Power Capacity

Maximum System Power Consumption	Typical Power	Reserved Power
Base system (one SRE; one Switch Fabric module; one fan tray)	550 W	1400 W
Redundant system (two SREs; one Switch Fabric module; one fan tray)	665 W	1600 W
Maximum Line Card Power Consumption		
EX8200-8XS (-ES) 8-port 10GbE SFP+ line card	299 W	450 W
EX8200-48T (-ES) 48-port 10/100/1000BASE-T RJ-45 line card	194 W	350 W
EX8200-48F (-ES) 48-port 100FX/1000BASE-X SFP line card	185 W	330 W
EX8200-40XS(-ES)	427 W	550 W
EX8200-40TL/PL	280 W (+900 W for PoE)	320 W (+900 W for PoE)
EX8200-2XS-40T/40P	432 W (+780 W for PoE)	450 W (+780 W for PoE)
Maximum Power Capacity		
220 V 5+1 power supply redundancy	10,000 W	
220 V 3+3 power supply redundancy	6000 W	
110 V 5+1 power supply redundancy	6000 W	
110 V 3+3 power supply redundancy	3600 W	

Features and Benefits

High Availability

The EX8208 switch delivers a number of high availability features to ensure uninterrupted, carrier-class performance.

The EX8208 switch features an extra slot to accommodate a second SRE module, providing N+1 redundancy. When a second SRE module is present, the integrated Routing Engine serves as a backup in hot standby mode, ready to take over in the event of a master RE failure. Should the master fail, an integrated Layer 2 and Layer 3 Graceful Route Engine Switchover (GRES) feature, working in combination with the NSR and NSB features, seamlessly transfers control to the backup, maintaining uninterrupted access to applications, services, and IP communications.

Carrier-Class Operating System

The EX8208 chassis-based switch runs the same Junos OS used by other EX Series switches, as well as the Juniper Networks routers used to power the world's largest and most complex networks.

By utilizing a common operating system, Juniper Networks delivers a consistent implementation and operation of control-plane features across all products. To maintain that consistency, Junos OS adheres to a highly disciplined development process that uses a single source code, follows a single quarterly release train, and employs a highly available modular architecture that prevents isolated failures from bringing an entire system down.

These attributes are fundamental to the core value of the software, enabling all Junos OS-based products to be updated simultaneously with the same software release. All features are fully regression-tested, making each new release a true superset of the previous version; customers can deploy the software with complete confidence that all existing capabilities will be maintained and operate in the same way.

Simplified Management and Operations

A range of system management options are available for the EX8208 switches.

The standard Junos OS CLI provides the same granular management capabilities and scripting parameters found in all Junos OS-based products. The EX8208 switches also include the integrated Junos Web management tool, an embedded device manager that allows users to configure, monitor, troubleshoot, and perform device-level maintenance on individual switches via a browser-based graphical interface. In addition, integrated Junos XML management protocol tools provide early detection and automatic resolution of potential problems related to the operating system.

The Juniper Networks Network and Security Manager (NSM) and Junos Space software tools provide system-level management across all Juniper Networks EX Series Ethernet Switches, as well as other Juniper Networks products deployed throughout the network, all from a single console.

Performance data from EX8208 switches can also be exported to leading third-party management systems such as HP OpenView, IBM Tivoli, and Computer Associates Unicenter, where it is combined with management data from other network components to provide a complete, consolidated view of network operations.

In addition, the EX8200 line of Ethernet switches support the Juniper Networks Service Now solution, a comprehensive set of tools that enable Juniper Networks J-Care Technical Service offerings to automate the delivery of tailored, proactive network intelligence and support services to specific products.

EX8208

EX8208 Modular Switch Specifications

Physical Specifications

Dimensions (W x H x D):
- 17.25 x 24.25 x 21 in (43.82 x 61.6 x 53 cm)

Weight:
- Base configuration: 176 lb (80 kg)
- Redundant configuration: 216 lb (98 kg)
- Chassis with backplane: 115 lb (52.5 kg)
- Fully loaded chassis: 328 lb (149 kg)

Hardware Specifications
- Analyzer Sessions: 7 (local or remote)
- Queues per port: 8
- Policers: 2,000 per chassis
- Media Access Control (MAC) Addresses: 160,000
- VLANs: 4,096
- Private VLAN (PVLAN) support
- Firewall filters (ACLs–Security and QoS): 54,000
- Link aggregation group (LAG) (ports/groups): 12/255
- IPv4 Unicast Routes*: 500,000 maximum/1 million†
- IPv4 Multicast Routes: 100,000/200,000+
- IPv6 Unicast Routes*: 250,000 maximum/500,000†
- IPv6 Multicast Routes: 100,000/200,000+
- Number of Multicast groups: 26,000
- Address Resolution Protocol (ARP) Entries: Up to 100,000**
- L3 Next Hops: 150,000
- Jumbo Frames: 9,216 bytes
- Buffer per 10-Gigabit Ethernet port: 512 MB
- Buffer per 1-Gigabit Ethernet port: 42 MB

EX8208 System Capacity
- Maximum backplane capacity: 6.2 Tbps
- Maximum system throughput: 960 Mpps

IEEE Compliance
- IEEE 802.1AB: Link Layer Discovery Protocol (LLDP)
- IEEE 802.1D-2004: Spanning Tree Protocol (STP)
- IEEE 802.1p: Class-of-service (CoS) prioritization
- IEEE 802.1Q-2006: VLAN tagging
- IEEE 802.1s: Multiple instances of Spanning Tree Protocol (MSTP)
- IEEE 802.1w: Rapid reconfiguration of Spanning Tree Protocol (RSTP)
- IEEE 802.3: 10BASE-T
- IEEE 802.3u: 100BASE-T
- IEEE 802.3ab: 1000BASE-T
- IEEE 802.3z: 1000BASE-X
- IEEE 802.3ae: 10-Gigabit Ethernet
- IEEE 802.3x: Pause Frames/Flow Control
- IEEE 802.3ad: Link Aggregation Control Protocol (LACP)

RFC Compliance
- RFC 768: UDP
- RFC 783: Trivial File Transfer Protocol (TFTP)
- RFC 791: IP
- RFC 792: Internet Control Message Protocol (ICMP)
- RFC 793: TCP
- RFC 826: ARP
- RFC 854: Telnet client and server
- RFC 894: IP over Ethernet
- RFC 903: RARP
- RFC 906: TFTP Bootstrap
- RFC 951, 1542: BootP
- RFC 1492: TACACS+
- RFC 1519: Classless Interdomain Routing (CIDR)
- RFC 1587: OSPF NSSA Option
- RFC 1591: Domain Name System (DNS)
- RFC 1745: BGP4/IDRP for IP-OSPF Interaction
- RFC 1765: OSPF Database Overflow
- RFC 1771: Border Gateway Protocol 4
- RFC 1772: Application of the Border Gateway Protocol in the Internet
- RFC 1812: Requirements for IP Version 4 Routers
- RFC 1965: Autonomous System Confederations for BGP
- RFC 1981: Path MTU Discovery for IPv6
- RFC 1997: BGP Communities Attribute
- RFC 2030: Simple Network Time Protocol (SNTP)
- RFC 2068: HTTP server
- RFC 2080: RIPng for IPv6
- RFC 2081: RIPng Protocol Applicability Statement
- RFC 2131: BOOTP/Dynamic Host Configuration Protocol (DHCP) relay agent and DHCP server
- RFC 2138: RADIUS Authentication
- RFC 2139: RADIUS Accounting
- RFC 2154: OSPF w/Digital Signatures (Password, MD-5)
- RFC 2205: Resource Reservation Protocol (RSVP) - v1 functionality
- RFC 2210: Use of RSVP with IETF Integrated Services
- RFC 2236: IGMP v2
- RFC 2267: Network Ingress Filtering
- RFC 2270: BGP-4 Dedicated AS for Sites/Single Provide
- RFC 2283: Multiprotocol Extensions for BGP-4
- RFC 2328: OSPF v2 (Edge-mode)
- RFC 2338: VRRP
- RFC 2362: PIM-SM (Edge-mode)
- RFC 2370: OSPF Opaque LSA Option
- RFC 2373: IPv6 Addressing Architecture
- RFC 2375: IPv6 Multicast Address Assignments
- RFC 2385: TCP MD5 Authentication for BGPv4
- RFC 2439: BGP Route Flap Damping
- RFC 2453: RIP v2
- RFC 2460: Internet Procol, v6 (IPv6) specification
- RFC 2461: Neighbor Discovery for IP Version 6 (IPv6)
- RFC 2462: IPv6 Stateless Address Autoconfiguration
- RFC 2463: ICMPv6
- RFC 2464: Transmission of IPv6 Packets over Ethernet Networks
- RFC 2474: DiffServ Precedence, including 8 queues/port
- RFC 2475: DiffServ Core and Edge Router Functions
- RFC 2526: Reserved IPv6 Subnet Anycast Addresses
- RFC 2545: Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing
- RFC 2547: BGP/MPLS VPN's
- RFC 2597: DiffServ Assured Forwarding (AF)
- RFC 2598: DiffServ Expedited Forwarding (EF)
- RFC 2702: Requirements for Traffic Engineering over MPLS

* Shared route table—actual capacity depends on prefix distribution

**Up to 52,000 with aggregate Ethernet interfaces, routed VLAN interfaces or Virtual Chassis technology

† Requires extra-scale line cards

EX8208 Modular Switch Specifications (continued)

RFC Compliance (continued)

- RFC 2710: Multicast Listener Discovery (MLD) for IPv6
- RFC 2711: IPv6 Router Alert Option
- RFC 2796: BGP Route Reflection (supersedes RFC 1966)
- RFC 2796: Route Reflection
- RFC 2918: Route Refresh Capability for BGP-4
- RFC 3376: IGMP v3
- RFC 3392: Capabilities Advertisement with BGP-4
- RFC 3484 Default Address Selection for IPv6
- RFC 3569: Draft-ietf-ssm-arch-06.txt PIM-SSM PIM Source Specific Multicast
- RFC 3623: OSPF Graceful Restart
- RFC 4213: Basic Transition Mechanisms for IPv6 Hosts and Routers
- RFC 4360: BGP Extended Communities Attribute
- RFC 4443: ICMPv6 for the IPv6 Specification
- RFC 4486: Subcodes for BGP Cease Notification message
- RFC 4861: Neighbor Discovery for IPv6
- RFC 4862: IPv6 Stateless Address Autoconfiguration
- Draft-ietf-idr-restart-10.txt: Graceful Restart Mechanism for BGP
- Draft-ietf-isis-restart-02: Restart Signaling for IS-IS
- Draft-ietf-bfd-base-05.txt: Bidirectional Forwarding Detection
- PIM-DM Draft IETF PIM: Dense Mode draft-ietf-idmr-pim-dm-05.txt, draft-ietf-pim-dm-new-v2-04.txt

Services and Manageability

- Junos OS CLI
- Junos Web (embedded Web-based management)
- Out-of-band management: Serial; 10/100/1000BASE-T Ethernet
- ASCII configuration file
- Rescue configuration
- Configuration rollback
- Image rollback
- LCD management
- Element management tools: Network and Security Manager (NSM)
- Proactive services support via Advanced Insight Solutions (AIS)
- SNMP: v1, v2c, v3
- RMON (RFC 2819) Groups 1, 2, 3, 9
- Network Time Protocol (NTP)
- DHCP server
- DHCP relay with Option 82
- RADIUS
- TACACS+
- SSHv2
- Secure copy
- HTTP/HTTPs
- DNS resolver
- Syslog logging
- Environment monitoring
- Temperature sensor
- Config-backup via FTP/secure copy

Network Management—MIB Support*

- RFC 1155: Structure of Management Information (SMI)
- RFC 1157: SNMPv1
- RFC 1212: RFC 1213, RFC 1215: MIB-II, Ethernet-like MIB and traps
- RFC 1493: Bridge MIB
- RFC 1643: Ethernet MIB
- RFC 1657: BGP-4 MIB
- RFC 1724: RIPv2 MIB
- RFC 1850: OSPFv2 MIB
- RFC 1901: Introduction to Community-based SNMPv2
- RFC 1902: Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2)
- RFC 1905, RFC 1907: SNMP v2c, SMIv2 and Revised MIB-II
- RFC 2011: SNMPv2 for internet protocol using SMIv2
- RFC 2012: SNMPv2 for transmission control protocol using SMIv2
- RFC 2013: SNMPv2 for user datagram protocol using SMIv2
- RFC 2096: IPv4 Forwarding Table MIB
- RFC 2287: System Application Packages MIB
- RFC 2465: Management Information Base for IP Version 6
- RFC 2570–2575: SNMPv3, user-based security, encryption and authentication
- RFC 2576: Coexistence between SNMP Version 1, Version 2 and Version 3
- RFC 2578: SNMP Structure of Management Information MIB
- RFC 2579: SNMP Textual Conventions for SMIv2
- RFC 2665: Ethernet-like interface MIB
- RFC 2787: VRRP MIB
- RFC 2819: RMON MIB
- RFC 2863: Interface Group MIB
- RFC 2863: Interface MIB
- RFC 2922: LLDP MIB
- RFC 2925: Ping/Traceroute MIB
- RFC 2932: IPv4 Multicast MIB
- RFC 3413: SNMP Application MIB
- RFC 3414: User-based Security model for SNMPv3
- RFC 3415: View-based Access Control Model for SNMP
- RFC 3621: PoE-MIB (PoE switches only)
- RFC 3826: The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP
- RFC 4188: STP and Extensions MIB
- RFC 4291: IPv6 Addressing Architecture
- RFC 4363: Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and VLAN extensions
- Draft-ietf-bfd-mib-02.txt
- Draft-ietf-idmr-igmp-mib-13
- Draft-ietf-idmr-pim-mib-09
- Draft-ietf-idr-bgp4-mibv2-02.txt: Enhanced BGP-4 MIB
- Draft-ietf-isis-wg-mib-07
- Draft-reeder-snmpv3-usm-3desede-00

Troubleshooting

- Debugging: CLI via console, Telnet or SSH
- Diagnostics: Show, debug, and statistics commands
- Analyzer session: Ingress and/or egress traffic on multiple source ports monitored to one destination port or VLAN
- Local port and remote VLAN analyzers (up to seven sessions)
- IP tools: Extended ping and trace
- Juniper Networks' commit and rollback

*Unless explicitly specified for any particular MIB table or variables, Junos OS does not support SNMP set operations.

EX8208 Modular Switch Specifications (continued)

Environmental Ranges

- Operating temperature: 32º to 104º F (0º to 40º C)
- Storage temperature: -40º to 158º F (-40º to 70º C)
- Operating altitude: up to 10,000 ft (3,048 m)
- Non-operating altitude: up to 16,000 ft (4,877 m)
- Relative humidity operating: 5% to 90% (non-condensing)
- Relative humidity non-operating: 0% to 95% (non-condensing)
- Acoustic noise: 62 dBA (based on operational tests taken from bystander position [front] and performed at 23º C in compliance with ISO 7779)

Safety and Compliance

- CSA 60950-1 (2003) Safety of Information Technology Equipment
- UL 60950-1 (2003) Safety of Information Technology Equipment
- EN 60950-1 (2001) Safety of Information Technology Equipment
- IEC 60950-1 (2001) Safety of Information Technology Equipment (with country deviations)
- EN 60825-1 +A1+A2 (1994) Safety of Laser Products—
- Part 1: Equipment Classification
- EN 60825-2 (2000) Safety of Laser Products—Part 2: Safety of Optical Fiber Comm. Systems
- C-UL to CAN/CSA 22.2 No.60950-1(First Edition)
- TUV/GS to EN 60950-1, Amendment A1-A4, A11
- CB-IEC60950-1, all country deviations
- CE

EMC

- EN 300 386 V1.3.3 (2005) Telecom Network Equipment—EMC requirements
- FCC Part 15 Class A (2007) USA Radiated Emissions
- EN 55022 Class A (2006) European Radiated Emissions
- VCCI Class A (2007) Japanese Radiated Emissions
- ICES-003 Class A
- AS/NZS CISPR 22 Class A
- CISPR 22 Class A

Immunity

- EN 55024 +A1+A2 (1998) Information Technology Equipment Immunity Characteristics
- EN-61000-3-2 (2006) Power Line Harmonics
- EN-61000-3-3 +A1 +A2 +A3 (1995) Power Line Voltage Fluctuations
- EN-61000-4-2 +A1 +A2 (1995) Electrostatic Discharge
- EN-61000-4-3 +A1+A2 (2002) Radiated Immunity
- EN-61000-4-4 (2004) Electrical Fast Transients
- EN-61000-4-5 (2006) Surge
- EN-61000-4-6 (2007) Immunity to Conducted Disturbances
- EN-61000-4-11 (2004) Voltage Dips and Sags

Customer-Specific Requirements

- GR-63-Core (2006) Network Equipment, Building Systems (NEBS) Physical Protection
- GR-1089-Core (2006) EMC and Electrical Safety for Network Telecommunications Equipment
- SR-3580 (1995) NEBS Criteria Levels (Level 3)

Environmental

- Reduction of Hazardous Substances (ROHS) 5/6

Telco

- Common Language Equipment Identifier (CLEI) code

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

Hardware

Model Number	Description
EX8208-BASE-AC	Base EX8208 2000 W AC system configuration: 8-slot chassis with passive backplane and 1x fan tray, 1x routing engine with switch fabric, 1x switch fabric module, 2x 2000 W AC PSUs with power cords, and all necessary blank panels
EX8208-BASE-AC3	Base EX8208 3000 W AC system configuration: 8-slot chassis with passive backplane and 1x fan tray, 1x routing engine with switch fabric, 1x switch fabric module, 2x 3000 W AC PSUs with power cords, and all necessary blank panels
EX8208-DENSE-BNDL	EX8208 dense bundle: EX8208-BASE-AC system, 1x EX8200-2XS-40T line card and 1x EX8200-40XS line card
EX8208-PERF-BNDL	EX8208 performance bundle: EX8208-BASE-AC system, 1x EX8200-2XS-40T line card and 1xs EX8200-8XS line card
EX8208-REDUND-AC	Redundant EX8208 2000 W AC system bundle: 8-slot chassis with passive backplane and 1x fan tray, 2x routing engine with switch fabric, 1x switch fabric module, 6x 2000 W AC PSUs with power cords, and all necessary blank panels
EX8208-REDUND-DC	Redundant EX8208 DC power system configuration: 8-slot chassis with passive backplane and 1x fan tray, 2x routing engine with switch fabric, 1x switch fabric module, 4x 2000 W redundant-input DC PSUs, and all necessary blank panels
EX8208-SRE320	Switch and Routing Engine for EX8208, redundant
EX8208-SF320-S	Switch Fabric module for EX8208, spare
EX8208-CHAS-S	EX8208 chassis with backplane, spare
EX8208-FAN-S	EX8208 fan tray, spare
EX8200-PWR-AC2K	AC power supply, 2000 W at 220 V (1200 W at 110 V), redundant (AC power cords sold separately)
EX8200-PWR-AC3K	AC power supply, 3000 W at 220 V, redundant (AC power cords sold separately)
EX8200-PWR-DC2KR	DC power supply with dual redundant inputs, 2000 W at -48V, redundant

EX8200 Line Cards

Model Number	Description
EX8200-48T	48-port 10/100/1000BASE-T RJ-45 line card
EX8200-48T-ES	48-port 10/100/1000BASE-T RJ-45 extra scale line card
EX8200-48F	48-port 100FX/1000BASE-X SFP line card; requires SFP optics sold separately
EX8200-48F-ES	48-port 100FX/1000BASE-X SFP extra scale line card; requires SFP optics sold separately
EX8200-8XS	8-port 10 GbE SFP+ line card; requires SFP+ optics sold separately
EX8200-8XS-ES	8-port 10GbE SFP+ extra scale line card; requires SFP+ optics sold separately
EX8200-40XS	40-port GbE / 10GbE line card; requires SFP and/or SFP+ optics sold separately
EX8200-40XS-ES	40-port GbE / 10GbE extra scale line card; requires SFP and/or SFP+ optics sold separately
EX8200-48TL	48-port oversubscribed (2.4:1) 10/100/1000BASE-T RJ-45 line card
EX8200-48PL	48-port PoE+ oversubscribed (2.4:1) 10/100/1000BASE-T RJ-45 line card
EX8200-2XS-40T	Combination line card with 40 oversubscribed (2.5:1) 10/100/1000BASE-T RJ-45 ports, four line-rate 100/1000BASE-SX SFP ports and two line-rate 10GbE SFP+ ports; requires SFP and/or SFP+ optics sold separately
EX8200-2XS-40P	Combination line card with 40 PoE+ oversubscribed (2.5:1) 10/100/1000BASE-T RJ-45 ports, four line-rate 100/1000BASE-SX SFP ports and two line-rate 10GbE SFP+ ports; requires SFP and/or SFP+ optics sold separately

Software

Model Number	Description
EX8208-AFL	EX8208 Advanced Feature License

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at **www.juniper.net**.

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