EX4200 ETHERNET SWITCHES WITH VIRTUAL CHASSIS TECHNOLOGY

Product Overview

High-performance businesses demand high-performance networking solutions. These solutions include a new class of secure, scalable and always-on enterprise switch that advances the economics of networking by enabling businesses to deploy innovative new technologies that increase revenue and improve productivity. The Juniper Networks EX4200 line of Ethernet switches with Virtual Chassis technology combine the compact, pay-as-you-grow economics and low power and cooling requirements of stackable switches with the performance, availability, operational ease and port densities of chassis-based platforms to meet the demands of today's high-performance enterprises.

Product Description

The Juniper Networks® EX4200 line of Ethernet switches with Virtual Chassis technology combine the high availability (HA) and carrier-class reliability of modular systems with the economics and flexibility of stackable platforms, delivering a high-performance, scalable solution for data center, campus and branch office environments.

Offering a full suite of Layer 2 and Layer 3 switching capabilities as part of the base software, the EX4200 satisfies a variety of high-performance applications, including branch, campus and data center access deployments as well as Gigabit Ethernet (GbE) aggregation deployments. A single 24-port or 48-port switch can be deployed initially; as requirements grow, Juniper Networks Virtual Chassis technology allows up to 10 EX4200 switches to be interconnected over a 128 gigabit-per-second (Gbps) backplane and managed as a single device, delivering a scalable, pay-as-you-grow solution for expanding network environments. Flexible Gigabit Ethernet (GbE) and 10-Gigabit Ethernet (10 GbE) uplink options enable high-speed connectivity to aggregation- or core-layer switches which connect multiple floors or buildings.

All EX4200 switches include HA features such as redundant, hot-swappable internal power supplies and field-replaceable, multi-blower fan trays to ensure maximum uptime. In addition, the base EX4200 switch models offer Class 3 Power over Ethernet (PoE), delivering 15.4 watts on the first eight ports to support networked devices such as telephones, video cameras and wireless LAN (WLAN) access points for low-density converged networks. Full PoE options delivering 15.4 watts on all 24 or 48 ports are also available, making them ideal for high-density IP telephony deployments.

Juniper Networks Virtual Chassis Technology: Chassis-like Switch Features in a Stackable Form Factor

· Redundant, internal hot-swappable power supplies
· Hot-swappable fan tray with redundant blowers
· Consistent modular Junos® operating system control plane feature implementation
· Dual Route Engines with Graceful Routing Engine Switchover (GRES)
· Single management interface
· Easy, centralized software upgrades
· Scales from 24 to 480 ports with up to 20 10 GbE uplinks
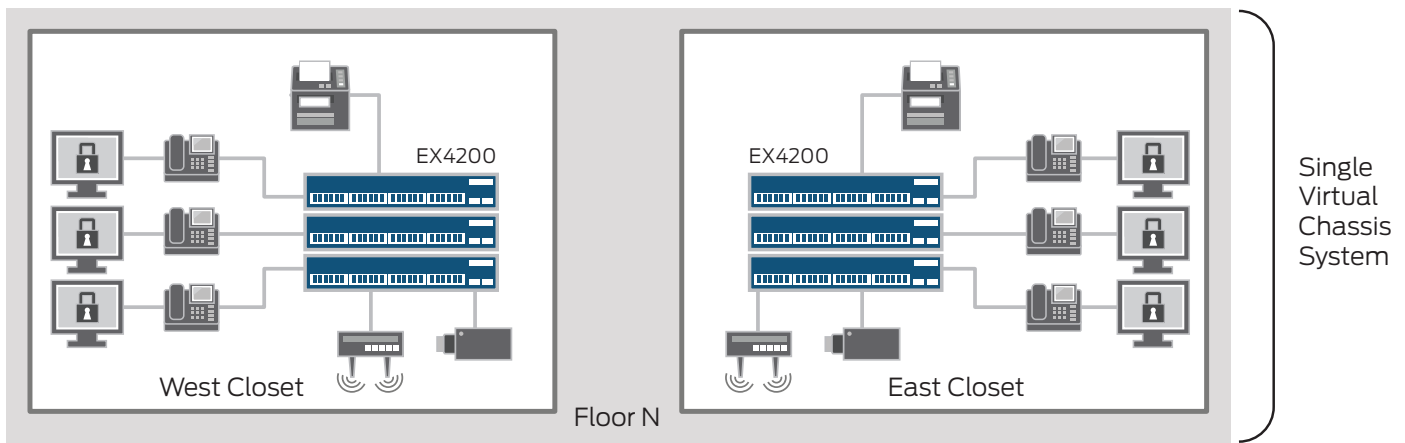· Limited lifetime switch hardware warranty

Figure 1: Using Virtual Chassis technology, up to 10 EX4200 switches can be interconnected to create a single logical device spanning multiple wiring closets, floors or even buildings.

Each EX4200 switch includes an integrated application-specific integrated circuit (ASIC)-based Packet Forwarding Engine, the EX-PFE, while an integrated Routing Engine (RE) delivers all control plane functionality. Based on field-proven Juniper Networks technology, the Route Engine brings the same level of carrier-class performance and reliability to the EX4200 line of Ethernet switches that Juniper Networks routers bring to the world's largest service provider networks.

The EX4200 also leverages the same modular Juniper Networks Junos OS as Juniper Networks router products, ensuring a consistent implementation and operation of each control plane feature across an entire Juniper Networks infrastructure.

Architecture and Key Components

The EX4200 switches are single rack-unit devices that deliver a compact solution for crowded wiring closets and access switch locations where space and power are at a premium. Each EX4200 supports optional front-panel uplink modules offering either four GbE ports or two 10 GbE ports for high-speed backbone or link-aggregation connections between wiring closets and upstream aggregation switches. Uplink modules can be installed without powering down the switch, enabling users to add high-speed connectivity at any time or migrate from one uplink type to the other to deliver the ultimate in flexible, high-performance interconnectivity.

The EX4200 also features a front-panel LCD display that offers a flexible interface for performing device bring-up and configuration rollbacks, reporting switch alarm and LED status, or restoring the switch to its default settings. The LCD also displays a Virtual Chassis member switch's chassis "slot number" and Route Engine status for rapid identification and problem resolution.

Dual rear-panel Virtual Chassis ports enable EX4200 switches to be interconnected over the 128 Gbps virtual backplane. Switches deployed in close proximity, such as wiring closets or top-of-rack data center applications, can be securely connected using a Virtual Chassis cable and cable lock supplied by Juniper Networks.

In addition, a dedicated rear-panel RJ-45 port is available for out-of-band management, while a rear-panel USB port can be used to easily upload Junos OS and configuration files.

Virtual Chassis Technology

Up to 10 EX4200 switches can be interconnected using Virtual Chassis technology to create a single logical device supporting up to 480 10/100/1000BASE-T ports or 240 100/1000BASE-X ports, plus an additional 40 GbE or 20 10 GbE uplink ports. Different models can be mixed in a Virtual Chassis configuration to provide a variety of port and density options.

In a Virtual Chassis configuration, all switches are monitored and managed as a single device, enabling enterprises to separate physical topology from logical groupings of endpoints and allowing more efficient resource utilization. Highly resilient topologies can also be created using the GbE or 10 GbE uplink ports to extend the Virtual Chassis configuration across long distances spanning multiple wiring closets, floors or even buildings.

Features and Benefits

Chassis-Class Availability

The EX4200 line of Ethernet switches deliver the same HA functionality and support many of the same failover capabilities as other Juniper chassis-based systems.

Each EX4200 switch is capable of functioning as a Route Engine. When two or more EX4200 switches are interconnected, they share a single control plane among all Virtual Chassis member switches. When two EX4200 switches are interconnected, Junos OS automatically initiates an election process to assign a master (active) and backup (hot-standby) Route Engine. An integrated Layer 2 and Layer 3 Graceful Route Engine Switchover (GRES) feature maintains uninterrupted access to applications, services and IP communications in the unlikely event of a primary RE failure.

When more than two switches are interconnected in a Virtual Chassis configuration, the remaining switch elements act as line cards and are available to assume the backup RE position should the designated master fail. Master, backup and line card priority status can be assigned by the network operations team to dictate the order of ascension; this N+1 RE redundancy, coupled with the GRES and, in the future, the nonstop routing (NSR) and nonstop bridging (NSB) capabilities of the Junos OS, assures a smooth transfer of control plane functions following unexpected failures.

The EX4200 implements the same slot/module/port numbering schema as other Juniper Networks chassis-based products when numbering Virtual Chassis ports, providing true chassis-like operations. By utilizing a consistent operating system and a single configuration file, all switches in a Virtual Chassis configuration are treated as a single device, simplifying overall system maintenance and management.

Individually, the EX4200 offers a number of HA features that are typically associated with modular chassis-based switches. When combined with the field-proven Junos OS and L2/L3 failover capabilities, these features provide the EX4200 with true carrier-class reliability.

Master RE

Backup RE

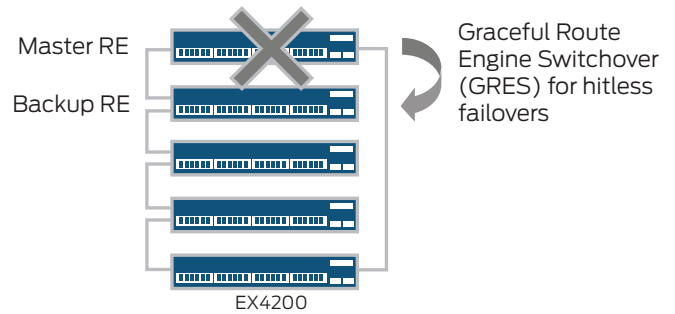Graceful Route Engine Switchover (GRES) for hitless failovers

EX4200

Figure 2: Support for Graceful Route Engine Switchover (GRES) ensures a smooth and seamless transfer of control plane functions following a master Route Engine failure.

- **Redundant power supplies:** The EX4200 line of Ethernet switches support internal redundant, load-sharing, hot-swappable and field-replaceable AC and DC power supplies to maintain uninterrupted operations. Thanks to their compact footprint, the EX4200 requires significantly less power than chassis-based switches delivering equivalent port densities.

- **Hot-swappable fan tray with multiple blowers:** The EX4200 includes a hot-swappable, field-replaceable fan tray with three blowers, providing sufficient cooling even if one of the blowers were to fail.

- **Redundant Trunk Group (RTG):** To avoid the complexities of the Spanning Tree Protocol (STP) without sacrificing network resiliency, the EX4200 employs redundant trunk groups to provide the necessary port redundancy and simplify switch configuration.

- **Cross-member link aggregation:** Cross-member link aggregation allows redundant link aggregation connections between devices in a single Virtual Chassis configuration, providing an additional level of reliability and availability.

- **Carrier-class hardware:** The EX4200 leverages a purpose-built packet forwarding engine ASIC, the EX-PFE, which integrates much of the same intellectual property used in Juniper Networks carrier routers. As a result, the EX4200 delivers the same predictable, scalable functionality found in the world's largest networks.
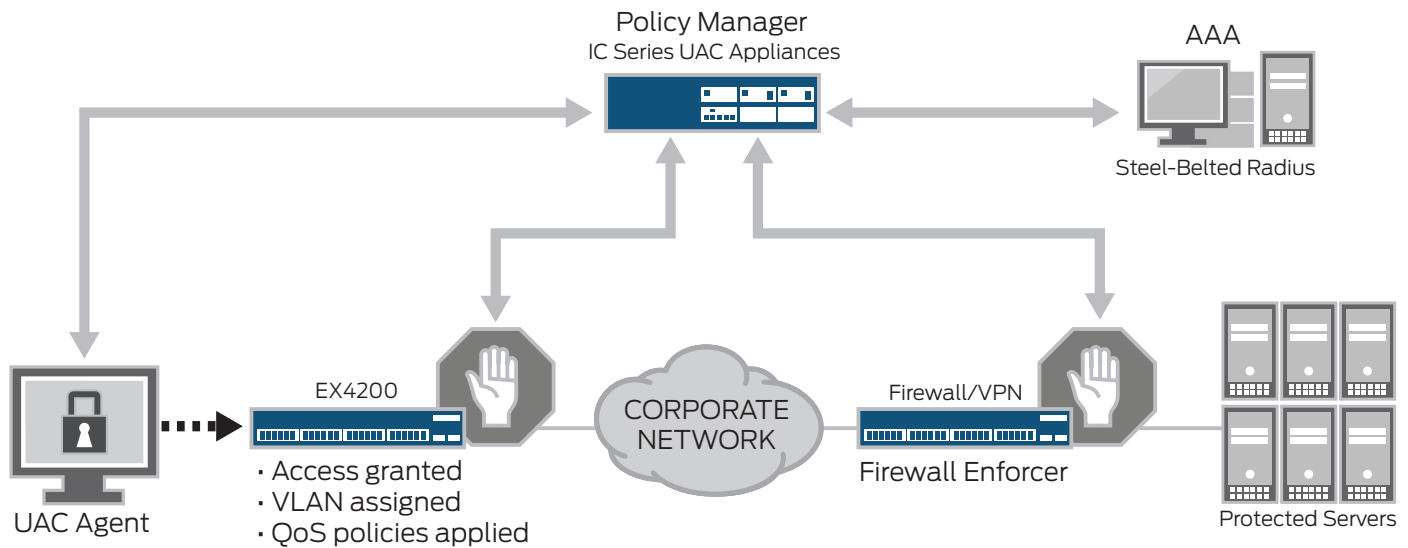
Figure 3: The EX4200 works with the Juniper Networks UAC to enforce access control down to the individual port level.

Carrier-Class Operating System

The EX4200 runs on Junos OS, the same operating system software used by Juniper Networks routers to power the world's largest and most complex networks.

By utilizing a common operating system, Juniper 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 utilizes 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 products powered by Junos OS 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.

Converged Networks

The EX4200 line of Ethernet switches provide the highest levels of availability for the most demanding converged data, voice and video environments, delivering the most reliable platform for unifying enterprise communications.

By providing Class 3 PoE with 15.4 watts on some or all ports to power voice over IP (VoIP) telephones, closed-circuit security cameras, wireless access points, and other IP-enabled devices, the EX4200 delivers a future-proofed solution for converging disparate networks onto a single IP infrastructure.

To ease deployment, the EX4200 supports the industry-standard Link Layer Discovery Protocol (LLDP) and LLDP-Media Endpoint Discovery (LLDP-MED), which enable the switches to automatically discover Ethernet-enabled devices, determine their power requirements and assign virtual LAN (VLAN) parameters.

In addition, the EX4200 supports rich quality of service (QoS) functionality for prioritizing data, voice and video traffic. The switches support eight QoS queues on every port, enabling them to maintain multi-level, end-to-end traffic prioritizations. The EX4200 also supports a wide range of policy options, including priority and shaped deficit weighted round-robin (SDWRR) queuing.

Security

The EX4200 line of Ethernet switches fully integrate with the Juniper Networks Unified Access Control (UAC), which consolidates all aspects of a user's identity, device and location, enabling administrators to enforce access control and security down to the individual port or user levels.

Figure 4: Junos OS utilizes a single source code, adheres to a consistent and predictable release train, and employs a single modular architecture.

Working as an enforcement point within the UAC, the EX4200 provides both standards-based 802.1X port-level access control as well as Layer 2–4 policy enforcement based on user identity, location and/or device. A user's identity, device type, machine posture check and location can be used to determine whether access should be granted and for how long. If access is granted, the switch assigns the user to a specific VLAN based on authorization levels. The switch can also apply QoS policies or mirror user traffic to a central location for logging, monitoring or threat detection by intrusion prevention systems.

The EX4200 also provides a full complement of port security features including DHCP (Dynamic Host Configuration Protocol) snooping, DAI (dynamic ARP inspection) and MAC limiting to defend against internal and external spoofing, man-in-the-middle and denial-of-service (DoS) attacks.

Simplified Management and Operations

When employing Virtual Chassis technology, the EX4200 dramatically simplifies network management. Up to 10 interconnected EX4200 switches can be managed as a single device. Each Virtual Chassis group utilizes a single Junos OS image file and a single configuration file, reducing the overall number of units to monitor and manage. When Junos OS is upgraded on the master switch in a Virtual Chassis configuration, the software is automatically upgraded on all other member switches at the same time.

The EX4200 also includes port profiles that allow network administrators to automatically configure ports with security, QoS and other parameters based on the type of device connected to the port. Six preconfigured profiles are available, including default, desktop, desktop plus IP phone, wireless access point, routed uplink and Layer 2 uplink. Users can select from the existing profiles or create their own and apply them through the command line interface (CLI), J-Web interface or management system.

Four system management options are available for the EX4200. The standard Junos OS CLI management interface offers the same granular capabilities and scripting parameters found in any device powered by Junos OS. The EX4200 also includes the integrated J-Web management tool, an embedded device manager that allows users to configure, monitor, troubleshoot and perform system maintenance on individual switches via a browser-based graphical interface.

When managing a group of EX4200 switches, the Juniper Networks Network and Security Manager (NSM) provides system-level management across all Juniper switches in the network, from a single console.

Finally, the EX4200 switch system, performance and fault data can be exported to leading third-party management systems such as HP OpenView, IBM Tivoli and Computer Associates Unicenter software, to provide a complete, consolidated view of network operations.

Limited Lifetime Warranty

The EX4200 includes a limited lifetime hardware warranty that provides return-to-factory switch replacement for as long as the original purchaser owns the product. Power supplies and fan trays are covered for a period of five years. For complete details please visit **www.juniper.net/support/warranty/.**

Product Options

Eight EX4200 switch models are available (see Table 1 below).

Table 1: EX4200 Line of Ethernet Switches

MODEL	ACCESS PORT CONFIGURATION	POE PORTS*	HEIGHT	SYSTEM POWER (WITH POE)
EX4200-24T**	24-port 10/100/1000BASE-T	8	1 RU	190 W AC (320 W AC)
EX4200-24P	24-port 10/100/1000BASE-T	24	1 RU	190 W AC (600 W AC)
EX4200-48T**	48-port 10/100/1000BASE-T	8	1 RU	190 W AC (320 W AC)
EX4200-48P	48-port 10/100/1000BASE-T	48	1 RU	190 W AC (930 W AC)
EX4200-24F**	24-port 100/1000BASE-X (SFP)	N/A	1 RU	190 W AC
EX4200-24T-DC**	24-port 10/100/1000BASE-T	0	1 RU	190 W DC
EX4200-48T-DC**	48-port 10/100/1000BASE-T	0	1 RU	190 W DC
EX4200-24F-DC**	24-port 100/1000BASE-X (SFP)	N/A	1 RU	190 W DC

* All PoE ports 802.3af-compliant @ 15.4 W
** NEBS certified

EX4200-24F

EX4200-24P

EX4200-24T

EX4200-48T

EX4200-48P
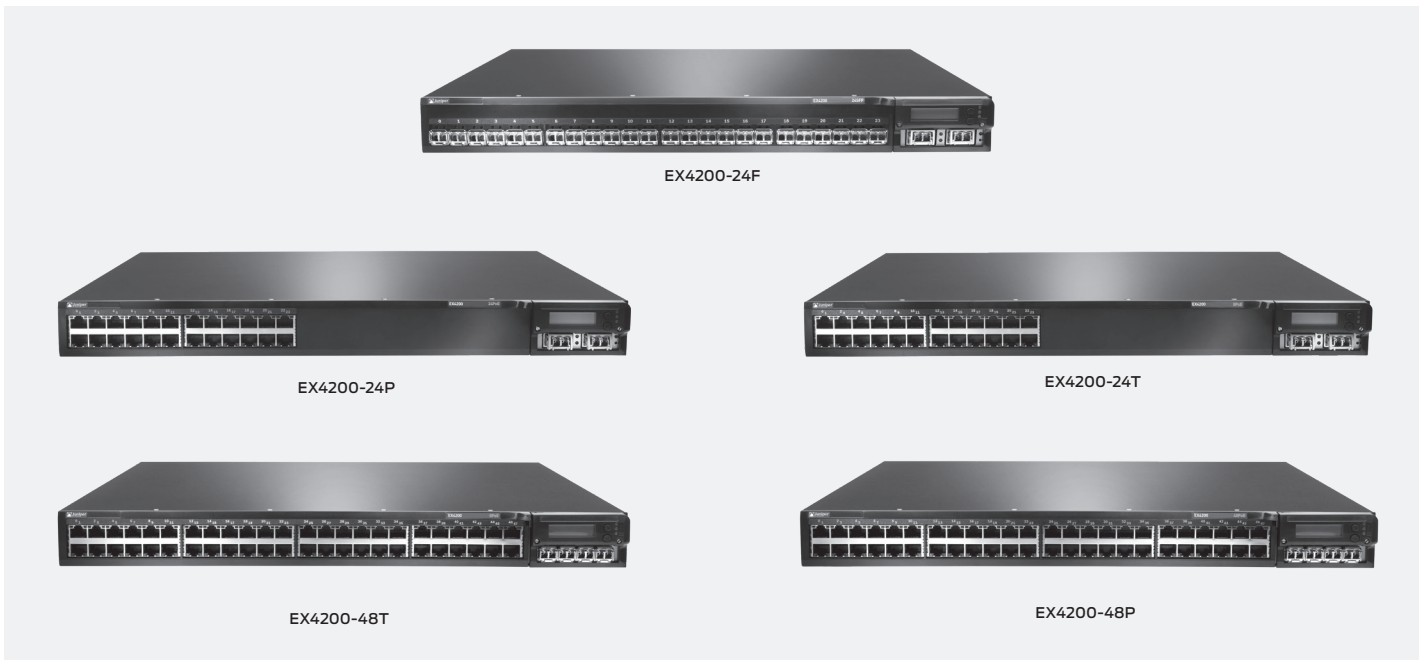
EX4200 Specifications

Physical Specifications

- Backplane: 128 Gbps Virtual Chassis interconnect to combine up to 10 units as a single logical device
- Uplink module options:
  - 4-port GbE module with pluggable SFP optics
  - 2-port 10 GbE module with pluggable XFP optics
  - Dual-mode 2-port 10 GbE SFP+ / 4-port GbE SFP module with pluggable SFP+/SFP optics

Power Options

- Power supplies: Autosensing; 100-120 V / 200-240 V; AC 320 W, 600 W and 930 W dual load-sharing hot-swappable internal redundant power supplies
- DC power supply: 190 W DC, input voltage range 36 V - 72 V, dual input feed, dual load-sharing hot-swappable internal redundant power supplies
- Minimum number of PSUs required for fully loaded chassis: 1 per switch

Dimensions (W x H x D)

- 17.4[1] x 1.7[2] x 16.4[3] in (44.2[1] x 4.3[2] x 41.7[3] cm)
  [1] Desktop installation width noted above, rack-mount width is 17.5 in (44.5 cm)
  [2] Height: 1 RU
  [3] Depth with 320 W AC PSU and 190 W DC PSU noted above, 18.8 in (47.8 cm) with 600/930 W AC PSU

System Weight

- EX4200-24T with 320 W AC PSU: 16.5 lb (7.5 kg)
- EX4200-24P with 600 W AC PSU: 17.2 lb (7.8 kg)
- EX4200-48T with 320 W AC PSU: 17.1 lb (7.8 kg)
- EX4200-48P with 930 W AC PSU: 18.2 lb (8.3 kg)
- EX4200-24F with 320 W AC PSU: 16.1 lb (7.3 kg)
- EX4200-24T-DC with 190 W DC PSU: 16.5 lb (7.5 kg)
- EX4200-48T-DC with 190 W DC PSU: 17.1 lb (7.8 kg)
- EX4200-24F-DC with 190 W DC PSU: 16.1 lb (7.3 kg)

Environmental Ranges

- Operating temperature: 32° to 113° F (0° to 45° C)
- Storage temperature: -40° to 158° F (-40° to 70° C)
- Operating altitude: up to 10,000 ft (3,049 m)
- Non-operating altitude: up to 16,000 ft (4,877 m)
- Relative humidity operating: 10% to 85% (noncondensing)
- Relative humidity non-operating: 0% to 95% (noncondensing)

Cooling

- Field-replaceable fan tray with multiple blowers (3)
- Switch remains operational even if one blower fails
- Airflow: 20.3 cfm

Hardware Specifications

- Switching Engine Model: Store and forward
- DRAM – 1 GB with ECC
- Flash – 1 GB
- CPU – 1 GHz PowerPC CPU
- GbE port density per system:
  - 24P/24T/24F: 28 (24 host ports + four-port GbE uplink module)
  - 48P/48T: 52 (48 host ports + four-port GbE uplink module)
- 10 GbE port density per system (all models): 2 (uplink module)

Optics

- 100 Mbps optic/connector type: LC SFP fiber supporting 100BASE-FX SFP (multimode), LX (single-mode) and BX (single-strand)
- 10/100/1000BASE-T connector type: RJ-45
- GbE SFP optic/connector type: RJ-45 or LC SFP fiber supporting 1000BASE-T SFP, SX (multimode), LX (single-mode), LH/ZX (single-mode) and BX (single strand)
- 10 GbE XFP optic/connector type: 10GE XFP LC connector, SR (multimode), LR (single-mode), ER (single-mode) or ZR (single-mode)
- 10 GbE SFP+ optic/connector type: 10GE SFP+ LC connector, SR (multimode), LR (single-mode) and LRM (multimode)

EX4200 Specifications (continued)

Physical Layer

- Time Domain Reflectometry (TDR) for detecting cable breaks and shorts: 24P/24T and 48P/48T only
- Auto MDI/MDIX support: 24P/24T and 48P/48T only (all ports)
- Port speed downshift/setting max advertised speed on 10/100/1000BASE-T ports: 24P/24T and 48P/48T only, on all ports

Packet Switching Capacities

- 24P/24T: 88 Gbps
- 48P/48T: 136 Gbps
- 24F: 88 Gbps

Aggregate Switch Capacities

- 24P/24T/24F: 216 Gbps
- 48P/48T: 256 Gbps

Layer 2 Throughput (Mpps)

- 24P/24T: 65 Mpps (wire speed)
- 48P/48T: 101 Mpps (wire speed)
- 24F: 65 Mpps (wire speed)

Layer 2 Switching

- Max MAC addresses per system: 24,000
- Static MAC entries: 24,000
- Jumbo frames: 9216 Bytes
- Number of VLANs: 4,096
- Port-based VLAN
- MAC-based VLAN
- GVRP
- Voice VLAN
- Physical port redundancy: Redundant trunk group (RTG)
- Compatible with PVST+
- RVI (Routed VLAN Interface)
- IEEE 802.1AB: Link Layer Discovery Protocol (LLDP)
- LLDP-MED with VoIP integration
- IEEE 802.1D: Spanning Tree Protocol
- IEEE 802.1p: CoS prioritization
- IEEE 802.1Q: VLAN tagging
- IEEE 802.1s: Multiple instances of Spanning Tree Protocol (MSTP)
- Number of MST instances supported: 64
- IEEE 802.1w: Rapid reconfiguration of Spanning Tree Protocol
- IEEE 802.1X: Port Access Control
- 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 802.3af: Power over Ethernet
- IEEE 802.3x: Pause Frames/Flow Control
- IEEE 802.3ad: Link Aggregation Control Protocol
- IEEE 802.3ah: Ethernet in the First Mile

Layer 3 Features: IPv4

- Max number of ARP entries: 16,000
- Max number of IPv4 unicast routes in hardware: 10,000
- Max number of IPv4 multicast routes in hardware: 2,000
- Routing protocols: RIPv1/v2, OSPF, BGP, IS-IS
- Static routing
- Routing policy
- Bidirectional Forwarding Detection
- Layer 3 redundancy: VRRP

Layer 3 Features: IPv6

- Max number of Neighbor Discovery (ND) entries: 16,000 (shared with IPv4)
- Max number of IPv6 unicast routes in hardware: 1,000
- Routing protocols: RIPng, OSPFv3
- Static routing

MPLS

- Circuit Cross Connect (CCC)

Supported RFCs

- RFC 3176 sFlow
- RFC 2925 MIB for Remote Ping, Trace
- RFC 2460 Internet Protocol, Version 6 (IPv6) Specification
- RFC 2461 Neighbor Discovery for IP Version 6 (IPv6)
- RFC 2462 IPv6 Stateless Address Autoconfiguration
- RFC 2463 Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
- RFC 2464 Transmission of IPv6 Packets over Ethernet Networks
- RFC 2526 Reserved IPv6 Subnet Anycast Addresses
- RFC 2283 Multiprotocol Extensions for BGP-4
- RFC 2545 Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing
- RFC 2740 OSPF for IPv6
- RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers
- RFC 2080 RIPng for IPv6
- RFC 3484 Default Address Selection for Internet Protocol Version 6 (IPv6)
- RFC 3513 Internet Protocol Version 6 (IPv6) Addressing Architecture
- Internet draft-ietf-isis-ipv6-06.txt, Routing IPv6 with IS-IS
- RFC 1122 Host Requirements
- RFC 768 UDP
- RFC 791 IP
- RFC 783 TFTP
- RFC 792 ICMP
- RFC 793 TCP
- RFC 826 ARP
- RFC 894 IP over Ethernet
- RFC 903 RARP
- RFC 906 TFTP Bootstrap
- RFC 1027 Proxy ARP
- RFC 2068 HTTP server
- RFC 1812 Requirements for IP Version 4 Routers
- RFC 1519 CIDR
- RFC 1256 IPv4 ICMP Router Discovery (IRDP)

EX4200 Specifications (continued)

Supported RFCs (continued)

- RFC 1058 RIP v1
- RFC 2453 RIP v2
- RFC 1112 IGMP v1
- RFC 2236 IGMP v2
- RFC 3618 MSDP
- RFC 4916 MT-OSPF
- RFC 3376 IGMP v3
- RFC 1492 TACACS+
- RFC 2138 RADIUS Authentication
- RFC 2139 RADIUS Accounting
- RFC 3579 RADIUS EAP support for 802.1x
- RFC 5176 Dynamic Authorization Extensions to RADIUS
- RFC 2267 Network Ingress Filtering
- RFC 2030 SNTP, Simple Network Time Protocol
- RFC 854 Telnet client and server
- RFC 951, 1542 BootP
- RFC 2131 BOOTP/DHCP relay agent and DHCP server
- RFC 1591 DNS
- RFC 2338 VRRP
- RFC 2328 OSPF v2 (Edge-mode)
- RFC 1587 OSPF NSSA Option
- RFC 2154 OSPF w/Digital Signatures (Password, MD-5)
- RFC 2370 OSPF Opaque LSA Option
- RFC 3623 OSPF Graceful Restart
- RFC 2362 PIM-SM (Edge-mode)
- RFC 3569 draft-ietf-ssm-arch-06.txt PIM-SSM PIM Source Specific Multicast
- RFC 1771 Border Gateway Protocol 4
- RFC 1965 Autonomous System Confederations for BGP
- RFC 2796 BGP Route Reflection (supersedes RFC 1966)
- RFC 1997 BGP Communities Attribute
- RFC 1745 BGP4/IDRP for IP-OSPF Interaction
- RFC 2385 TCP MD5 Authentication for BGPv4
- RFC 2439 BGP Route Flap Damping
- RFC 2918 Route Refresh Capability for BGP-4
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 2796 Route Reflection
- RFC 4360 BGP Extended Communities Attribute
- RFC 4486 Subcodes for BGP Cease Notification message
- RFC 1195 Use of OSI IS-IS for Routing in TCP/IP and Dual Environments (TCP/IP transport only)
- RFC 2474 DiffServ Precedence, including 8 queues/port
- RFC 2598 DiffServ Expedited Forwarding (EF)
- RFC 2597 DiffServ Assured Forwarding (AF)
- RFC 2475 DiffServ Core and Edge Router Functions
- LLDP Media Endpoint Discovery (LLDP-MED), ANSI/TIA-1057, draft 08
- Draft-ietf-idr-restart-10.txt Graceful Restart Mechanism for BGP
- Draft-ietf-isis-restart-02 Restart Signaling for IS-IS
- PIM-DM Draft IETF PIM Dense Mode draft-ietf-idmr-pim-dm-05.txt, draft-ietf-pim-dm-new-v2-04.txt
- Draft-ietf-isis-wg-multi-topology-11 Multi Topology (MT) Routing in IS-IS
- Draft-ietf-bfd-base-05.txt Bidirectional Forwarding Detection

Security

- MAC limiting
- Allowed MAC addresses – configurable per port
- Dynamic ARP inspection (DAI)
- Local proxy ARP
- Static ARP support
- DHCP snooping

Access Control Lists (ACLs) (Junos OS firewall filters)

- Port-based ACL (PACL) – Ingress
- VLAN-based ACL (VACL) – Ingress and Egress
- Router-based ACL (RACL) – Ingress and Egress
- ACL entries (ACE) in hardware per system: 7,000
- ACL counter for denied packets
- ACL counter for permitted packets
- Ability to add/remove/change ACL entries in middle of list (ACL editing)
- Layer 2 – L4 ACL
- 802.1X port-based
- 802.1X multiple supplicants
- 802.1X with VLAN assignment
- 802.1X with authentication bypass access (based on host MAC address)
- 802.1X with VoIP VLAN support
- 802.1X dynamic ACL based on RADIUS attributes
- 802.1X Supported EAP types: MD5, TLS, TTLS, PEAP
- TNC certified
- MAC Authentication (local)
- Control Plane DoS protection

High Availability

- Redundant, hot-swappable power supplies
- Redundant, field-replaceable, hot-swappable fans
- Graceful Route Engine Switchover (GRES) for Layer 2 hitless forwarding and Layer 3 protocols on RE failover
- Graceful protocol restart – OSPF, BGP
- Layer 2 hitless forwarding on RE failover
- Online insertion and removal (OIR) uplink module

EX4200 Specifications (continued)

Link Aggregation

- 802.3ad (LACP) support:
  - Number of LAGs supported: 64
  - Max number of ports per LAG: 8
- LAG load-sharing algorithm – Bridged Unicast Traffic:
  - IP: S/D MAC, S/D IP
  - TCP/UDP: S/D MAC, S/D IP, S/D Port
  - Non-IP: S/D MAC
- LAG-sharing algorithm – Routed Unicast Traffic:
  - IP: S/D MAC, S/D IP
  - TCP/UDP: S/D MAC, S/D IP, S/D Port
  - Non-IP: S/D MAC
- LAG load-sharing algorithm – Bridged Multicast Traffic:
  - IP: S/D MAC, S/D IP
  - TCP/UDP: S/D MAC, S/D IP, S/D Port
  - Non-IP: S/D MAC
- LAG-sharing algorithm – Routed Multicast Traffic:
  - IP: S/D MAC, S/D IP
  - TCP/UDP: S/D MAC, S/D IP, S/D Port
  - Non-IP: S/D MAC
- Tagged ports support in LAG

QoS

- Layer 2 QoS
- Layer 3 QoS
- Ingress policing: 1 rate 2 color
- Hardware queues per port: 8
- Scheduling methods (egress): Strict priority (SP), Shaped Deficit Weighted Round-Robin (SDWRR)
- 802.1p, DSCP/IP Precedence trust and marking
- Layer 2-4 classification criteria: Interface, MAC address, Ethertype, 802.1p, VLAN, IP address, DSCP/IP Precedence, TCP/UDP port numbers, etc.
- Congestion avoidance capabilities: Tail Drop

Multicast

- IGMP: v1, v2, v3
- IGMP snooping
- PIM-SM
- IPv4 Multicast hardware entries: 2,000

Services and Manageability

- Junos OS CLI
- Web interface
- Out-of-band management: Serial; 10/100/1000BASE-T Ethernet
- ASCII configuration
- 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
- NTP
- DHCP server
- DHCP client and DHCP proxy
- DHCP relay and helper
- RADIUS
- TACACS+
- SSHv2
- Secure copy
- HTTP/HTTPs
- DNS resolver
- Syslog logging
- Temperature sensor
- Config-backup via FTP / secure copy

EX4200 Specifications (continued)

Supported MIBs

- RFC 1155 SMI
- RFC 1157 SNMPv1
- RFC 1905 RFC 1907 SNMP v2c, SMIv2 and Revised MIB-II
- RFC 2570 – 2575 SNMPv3, user based security, encryption and authentication
- RFC 2576 Coexistence between SNMP Version 1, Version 2 and Version 3
- RFC 1212, RFC 1213, RFC 1215 MIB-II, Ethernet-Like MIB & TRAPs
- RFC 2578 SNMP Structure of Management Information MIB
- RFC 2579 SNMP Textual Conventions for SMIv2
- RFC 2925 Ping/Traceroute MIB
- RFC 2665 Ethernet-like interface MIB
- RFC 1643 Ethernet MIB
- RFC 1493 Bridge MIB
- RFC 2096 IPv4 Forwarding Table MIB
- RFC 2011 SNMPv2 for internet protocol using SMIv2
- RFC 2012 SNMPv2 for transmission control protocol using SMIv2
- RFC 2013 SNMPv2 for user datagram protocol suing SMIv2
- RFC 2863 Interface 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 1724 RIPv2 MIB
- RFC 2863 Interface Group MIB
- RFC 2932 IPv4 Multicast MIB
- RFC 2787 VRRP MIB
- RFC 1850 OSPFv2 MIB
- RFC 1657 BGP-4 MIB
- RFC 2819 RMON MIB
- RFC 2287 System Application Packages MIB
- RFC 4188 STP & Extensions MIB
- RFC 4363 Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering and VLAN extensions
- RFC 2922 LLDP MIB
- Draft-ietf-idr-bgp4-mibv2-02.txt – Enhanced BGP-4 MIB
- Draft-ietf-isis-wg-mib-07
- Draft – blumenthal – aes – usm - 08
- Draft – reeder - snmpv3 – usm - 3desede -00
- Draft-ietf-idmr-igmp-mib-13
- Draft-ietf-idmr-pim-mib-09
- Draft-ietf-bfd-mib-02.txt

Troubleshooting

- Debugging: CLI via console, Telnet or SSH
- Diagnostics: Show and debug cmd, statistics
- Traffic mirroring (port)
- Traffic mirroring (VLAN)
- ACL-based mirroring
- Mirroring destination ports per system: 1
- LAG port monitoring

Troubleshooting (continued)

- Multiple destination ports monitored to 1 mirror (N:1)
- Max number of mirroring sessions: 1
- Mirroring to remote destination (over L2): 1 destination VLAN
- IP tools: Extended ping & trace
- Juniper Networks commit and rollback

Warranty

- Limited lifetime switch hardware warranty

Safety and Compliance

Safety Certifications

- UL-UL60950-1(First Edition)
- 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

Electromagnetic Compatibility Certifications

- FCC 47CFR Part 15 Class A
- EN 55022 Class A
- ICES-003 Class A
- VCCI Class A
- AS/NZS CISPR 22 Class A
- CISPR 22 Class A
- EN 55024
- EN 300386
- CE

NEBS

- GR-63-Core: NEBS, Physical Protection
- GR-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment
- All models except EX4200-24P and EX4200-48P

Environmental

- Reduction of Hazardous Substances (ROHS) 5

Telco

- CLEI code

Noise Specifications

Noise measurements based on operational tests taken from bystander position (front) and performed at 23º C in compliance with ISO 7779.

MODEL	POWER SUPPLY RATING	ACOUSTIC NOISE IN DBA
EX4200-24T	320 W AC	51.6
EX4200-24P	600 W AC	53.2
EX4200-24F	320 W AC	50.8
EX4200-48T	320 W AC	51.6
EX4200-48P	930 W AC	54.0
EX4200-24T-DC	190 W DC	48.0
EX4200-48T-DC	190 W DC	48.3
EX4200-24F-DC	190 W DC	46.7

Juniper Networks 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 and faster rollouts of new business models and ventures. 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/us/en/ products-services/.**

Ordering Information

MODEL NUMBER	DESCRIPTION
Switches*	
EX4200-24T	24-port 10/100/1000BASE-T (8 PoE ports) + 320 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-24P	24-port 10/100/1000BASE-T (24 PoE ports) + 600 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-48T	48-port 10/100/1000BASE-T (8 PoE ports) + 320 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-48P	48-port 10/100/1000BASE-T (48 PoE ports) + 930 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-24F	24-port 100/1000BASE-X SFP + 320 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-24T-DC	24-port 10/100/1000BASE-T + 190 W DC PSU. Includes 50cm Virtual Chassis cable.
EX4200-48T-DC	48-port 10/100/1000BASE-T + 190 W DC PSU. Includes 50cm Virtual Chassis cable.
EX4200-24F-DC	24-port 100/1000BASE-X SFP + 190 W DC PSU. Includes 50cm Virtual Chassis cable.
EX4200-24T-TAA	Trade Agreement Act-compliant 24-port 10/100/1000BASE-T (8 PoE ports) + 320 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-24P-TAA	Trade Agreement Act-compliant 24-port 10/100/1000BASE-T (24 PoE ports) + 600 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-48T-TAA	Trade Agreement Act-compliant 48-port 10/100/1000BASE-T (8 PoE ports) + 320 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-48P-TAA	Trade Agreement Act-compliant 48-port 10/100/1000BASE-T (48 PoE ports) + 930 W AC PSU. Includes 50cm Virtual Chassis cable.
EX4200-24F-TAA	Trade Agreement Act-compliant 24-port 100BASE-FX/1000BASE-X SFP + 320 W AC PSU. Includes 50cm Virtual Chassis cable.
Advanced Feature Licenses**	
EX-24-AFL	Advanced Feature License for EX 4200-24T, EX 4200-24T-DC, EX 4200-24P, EX 4200-24F and EX 4200-24F-DC switches
EX-48-AFL	Advanced Feature License for EX 4200-48T, EX 4200-48T-DC and EX 4200-48P switches

MODEL NUMBER	DESCRIPTION
Uplink Modules	
EX-UM-2XFP	2-port 10GbE XFP Uplink Module
EX-UM-4SFP	4-port GbE SFP Uplink Module
EX-UM-2X4SFP	2-port 10G SFP+ / 4-port 1G SFP Uplink Module

* Each switch comes with one power supply, RJ-45 cable, RJ-45-to-DB-9 serial port adapter, 19" rack mount kit, and Virtual Chassis cable and connector retainer. Each system also ships with a power cord for the country to which it is being shipped. The EX4200-24F also comes with fiber port dust covers.
** AFL includes licenses for IS-IS, BGP, MPLS and IPv6 routing

MODEL NUMBER	DESCRIPTION
Power Supplies	
EX-PWR-320-AC	320 W AC Power Supply Unit (PSU)
EX-PWR-600-AC	600 W AC Power Supply Unit (PSU)
EX-PWR-930-AC	930 W AC Power Supply Unit (PSU)
EX-PWR-190-DC	190 W DC Power Supply Unit (PSU)
Pluggable Optics	
EX-SFP-1FE-FX	SFP 100BASE-FX; LC connector; 1310nm; 2km reach on multimode fiber
EX-SFP-1FE-LX	SFP 100BASE-LX; LC connector; 1310nm; 10km reach on single-mode fiber
EX-SFP-FE20KT13R15	SFP 100BASE-BX; LC connector; TX 1310nm/ RX 1550nm; 20km reach on single-strand, single-mode fiber
EX-SFP-FE20KT15R13	SFP 100BASE-BX; LC connector; TX 1550nm/ RX 1310nm; 20km reach on single-strand, single-mode fiber
EX-SFP-1GE-T	SFP 10/100/1000BASE-T copper; RJ-45 connector; 100m reach on UTP
EX-SFP-1GE-SX	SFP 1000BASE-SX; LC connector; 850nm; 550m reach on multimode fiber
EX-SFP-1GE-LX	SFP 1000BASE-LX; LC connector; 1310nm; 10km reach on single-mode fiber
EX-SFP-GE10KT13R14	SFP 1000BASE-BX; Tx 1310nm/Rx 1490nm for 10km transmission on single-strand, single-mode fiber
EX-SFP-GE10KT13R15	SFP 1000BASE-BX; Tx 1310nm/Rx 1550nm for 10km transmission on single-strand, single-mode fiber
EX-SFP-GE10KT14R13	SFP 1000BASE-BX; Tx 1490nm/Rx 1310nm for 10km transmission on single-strand, single-mode fiber
EX-SFP-GE10KT15R13	SFP 1000BASE-BX; Tx 1550nm/Rx 1310nm for 10km transmission on single-strand, single-mode fiber
EX-SFP-1GE-LX40K	SFP 1000BASE-LX; LC connector; 1310nm; 40km reach on single-mode fiber
EX-SFP-GE40KT13R15	SFP 1000BASE-BX; Tx 1310nm/Rx 1550nm for 40km transmission on single-strand, single-mode fiber
EX-SFP-GE40KT15R13	SFP 1000BASE-BX; Tx 1550nm/Rx 1310nm for 40km transmission on single-strand, single-mode fiber
EX-SFP-1GE-LH	SFP 1000BASE-LH; LC connector; 1550nm; 70km reach on single-mode fiber

MODEL NUMBER	DESCRIPTION
Pluggable Optics (continued)	
EX-XFP-10GE-SR	XFP 10GBASE-SR; LC connector; 850nm; 300m reach on 50 microns multimode fiber; 33m on 62.5 microns multimode fiber
EX-XFP-10GE-ER	XFP 10GBASE-ER; LC connector; 1550nm; 40km reach on single-mode fiber
EX-XFP-10GE-ZR	XFP 10GBASE-ZR; LC connector; 1550nm; 80km reach on single-mode fiber
EX-SFP-10GE-SR	SFP+ 10GBASE-SR; LC connector; 850nm; 300m reach on 50 microns multimode fiber; 33m on 62.5 microns multimode fiber
EX-SFP-10GE-LRM	SFP+ 10GBASE-LRM; LC connector; 1310nm; 220m reach on multimode fiber
EX-SFP-10GE-LR	SFP+ 10GBASE-LR; LC connector; 1310nm; 10km reach on single-mode fiber

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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