EX4300 ETHERNET SWITCH

Product Overview

The Juniper Networks EX4300 line of Ethernet switches with Virtual Chassis technology delivers the high-performance networking solution that high-performance businesses demand. Combining the compact, pay-as-you-grow economics and low power and cooling requirements of stackable switches with the performance, availability, and port densities of chassis-based platforms, the EX4300 enables businesses to deploy innovative new technologies that increase revenue and improve productivity.

Product Description

The Juniper Networks® EX4300 line of Ethernet switches with Virtual Chassis technology combines the 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, the EX4300 satisfies a variety of high-performance applications, including branch, campus, and data center access deployments as well as Gigabit Ethernet (GbE) access 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 EX4300 switches to be interconnected and managed as a single device, delivering a scalable, pay-as-you-grow solution for expanding network environments. The EX4300 switches can be interconnected over multiple 40GbE quad small form-factor pluggable plus (QSFP+) transceiver ports to form a 320 gigabit per second (Gbps) backplane. Flexible 1GbE and 10GbE uplink options are also available, enabling high-speed connectivity to aggregation- or core-layer switches which connect multiple floors or buildings.

All EX4300 switches include high availability (HA) features such as redundant, hot-swappable internal power supplies and field-replaceable fans to ensure maximum uptime. In addition, Power over Ethernet (PoE)-enabled EX4300 switch models offer standards-based 802.3at PoE+ for delivering up to 30 watts on all ports for supporting high-density IP telephony and 802.11n wireless access point deployments.

Chassis-Like Features in a Stackable Form Factor

The fixed-configuration EX4300 switches include a number of HA features typically associated with chassis-based solutions, including the following:

- Hot-swappable fans
- Consistent modular Juniper Networks Junos® operating system control plane feature implementation
- Dual Routing Engines with graceful Routing Engine switchover (GRES)
- Single management interface
- Easy, centralized software upgrades
- Scalability from 24 to 480 10/100/1000BASE-T ports, with up to 40 10GbE uplinks and 40 40GbE uplinks
- Limited lifetime hardware warranty

Each EX4300 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. The EX4300 also leverages the same modular Junos OS as other Juniper Networks switches, routers, and security devices, ensuring a consistent implementation and operation of control plane features across the Juniper Networks infrastructure.

Architecture and Key Components

The EX4300 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 EX4300 supports four standard 40GbE QSFP+ ports which can support high-speed Virtual Chassis backplane connections or serve as uplinks to upstream aggregation devices (note that the 40GbE ports cannot be split into 4x10GbE ports). In addition, each EX4300 supports an optional front panel uplink module offering four 1GbE or 10GbE ports for high-speed backbone or link aggregation connections between wiring closets and upstream aggregation switches, providing up to 40GbE of aggregate bandwidth. 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, delivering the ultimate in flexible, high-performance interconnectivity.

The EX4300 also features a front panel LCD 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. When deployed as a member of a Virtual Chassis configuration, the LCD also displays the switch's chassis "slot number" and RE status for rapid identification and problem resolution.

The four preconfigured rear panel 40GbE QSFP+ ports support EX4300 Virtual Chassis deployment over a 320 Gbps virtual backplane. When deployed in close proximity such as in wiring closets or in top-of-rack data center applications, the EX4300

switches can be securely connected using standard 40GbE QSFP+ DAC cables (available in 50 cm, 1 m, and 3 m lengths). Switches deployed in Virtual Chassis configurations spread over larger areas can be interconnected using optical QSFP+ transceivers such as the QSFP+ SR4, which supports distances up to 150 m.

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. In addition, a dedicated front panel USB console port and a rear panel RJ-45 console port offer flexible out-of-band console options.

Virtual Chassis Technology

Up to 10 EX4300 switches can be interconnected using Virtual Chassis technology, creating a single logical device supporting up to 480 10/100/1000BASE-T ports, plus an additional 40 10GbE or 40GbE uplink ports. EX4300 Virtual Chassis configurations can be created to support a variety of port and density options for data center, campus, and branch deployments. Virtual Chassis connections can be formed using any of the 40GbE ports or 10GbE ports using standard DAC cables and optics. The EX4300 does not support Virtual Chassis technology on the GbE copper or fiber ports.

Virtual Chassis Deployments in Campus Wiring Closets
In campus wiring closets, flexible topologies can be created using standard QSFP+ optics on the 40GbE ports to extend the Virtual Chassis configuration across long distances spanning multiple wiring closets, floors, or even buildings while using 10GbE or 40GbE for uplink connectivity.

Virtual Chassis Deployments in the Data Center
When deployed in a Virtual Chassis configuration in the data center, all EX4300 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 40GbE DAC cables.
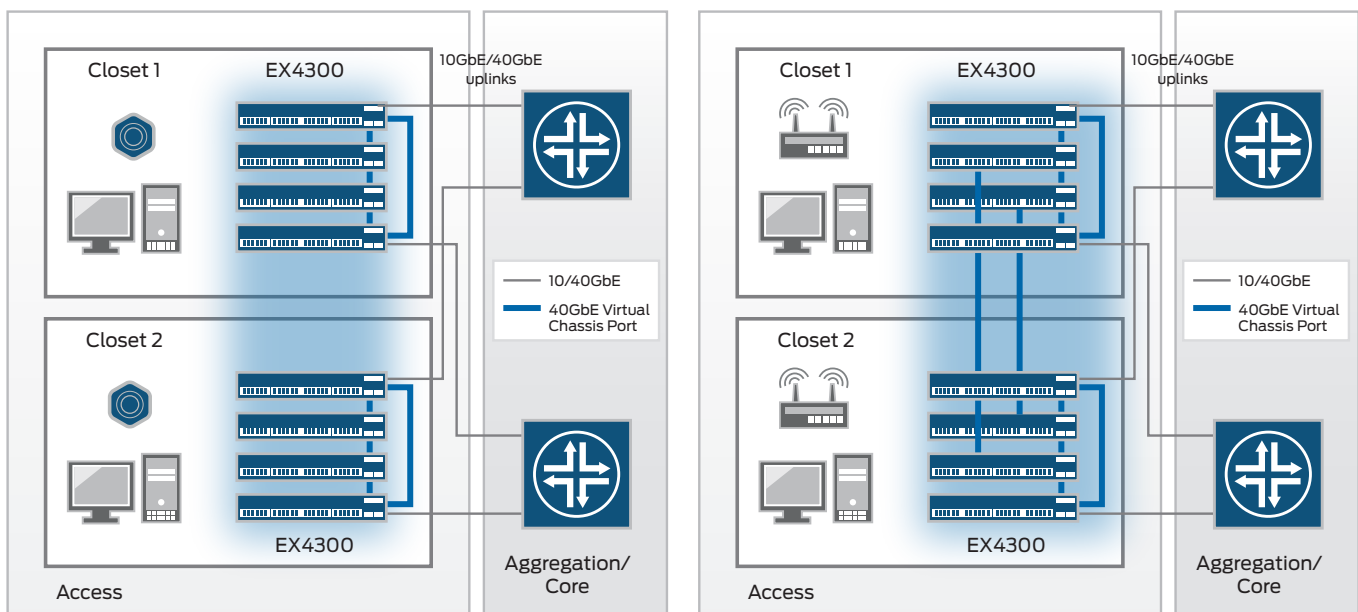

Figure 1: Using Virtual Chassis technology, up to 10 EX4300 switches can be interconnected to create a single logical device spanning multiple wiring closets, floors, or even buildings.
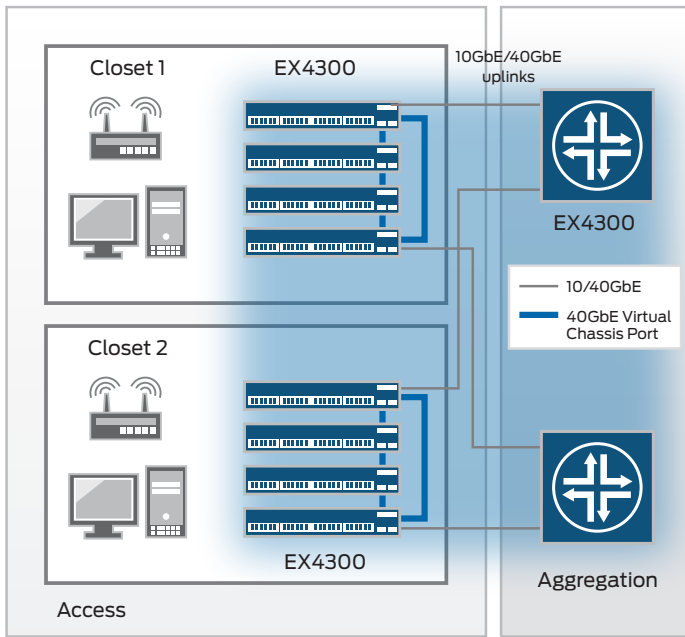
Figure 2: Using Virtual Chassis technology, up to 10 EX4300 switches can be interconnected to create a single logical device spanning an entire building.
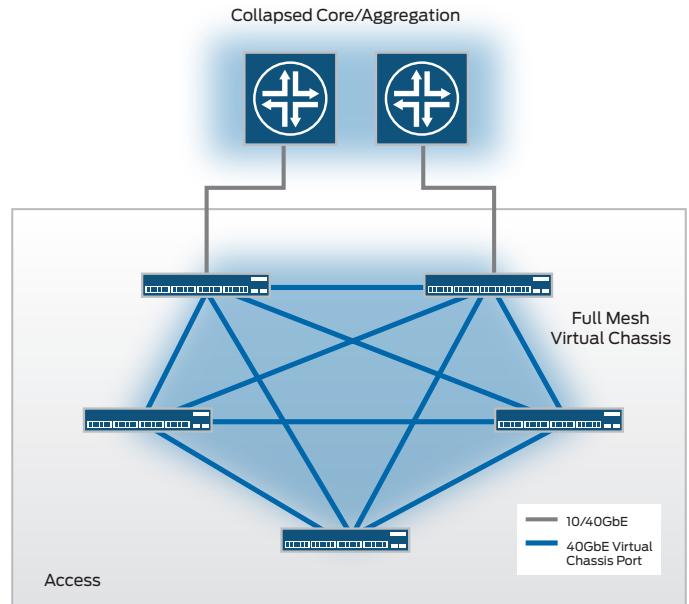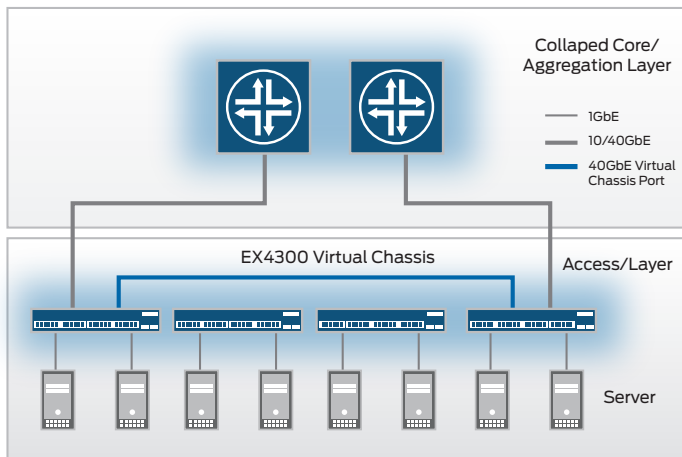

Figure 3: The EX4300 Ethernet switch with Virtual Chassis technology delivers a high-performance, scalable, and highly reliable solution for the data center.

Mesh Virtual Chassis Configurations for the Data Center

In data center top-of-rack deployments, a full mesh five-switch Virtual Chassis configuration can be created where every switch member is just one hop away from every other member, delivering the lowest possible latency. A mesh spanning distances of up to 150 meters can be created using standard QSFP+ optics and DAC cables on the 40GbE ports, while 10GbE ports can be used as uplinks to connect to upstream aggregation or core devices.

Figure 4: EX4300 switches in a full mesh Virtual Chassis configuration for the data center.

Features and Benefits

Chassis-Class Availability

The EX4300 line of Ethernet switches delivers the same HA functionality and supports many of the same failover capabilities as other Juniper chassis-based systems.

Each EX4300 switch is capable of functioning as a Routing Engine. When two or more EX4300 switches are interconnected, a single control plane is shared among all Virtual Chassis member switches. When two EX4300 switches are interconnected, Junos OS automatically initiates an election process to assign a master (active) and backup (hot-standby) Routing Engine. An integrated Layer 2 and Layer 3 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 to dictate the order of ascension; this N+1 RE redundancy, coupled with the GRES, assures a smooth transfer of control plane functions following unexpected failures.

The EX4300 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 EX4300 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 EX4300 with true carrier-class reliability.

- **Redundant power supplies:** The EX4300 line of Ethernet switches supports internal redundant, load-sharing, hot-swappable, and field-replaceable AC and DC power supplies to maintain uninterrupted operations. Thanks to its compact footprint, the EX4300 requires significantly less power than chassis-based switches delivering equivalent port densities.
- **Hot-swappable fans:** The EX4300 includes hot-swappable fans, providing sufficient cooling even if one of the blowers were to fail.
- **Redundant trunk group (RTG):** To avoid the complexities of Spanning Tree Protocol (STP) without sacrificing network resiliency, the EX4300 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 EX4300 leverages a purpose-built packet forwarding engine ASIC, the EX-PFE, which integrates much of the same intellectual property used in Juniper Networks carrier-class routers. As a result, the EX4300 delivers the same predictable, scalable functionality found in the world's largest networks.
- **IPv4 and IPv6 routing support:** IPv4 and IPv6 Layer 3 routing (OSPF and BGP) is available with an Enhanced license, enabling highly resilient networks.

Carrier-Class Operating System

The EX4300 runs on Junos OS, the same operating system software used by other Juniper Networks switches, routers, and security devices.

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 EX4300 line of Ethernet switches provides 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 15.4 watts of Class 3 802.3af PoE on all ports to power voice over IP (VoIP) telephones, closed-circuit security cameras, wireless access points, and other IP-enabled devices, the EX4300 delivers a future-proofed solution for converging disparate networks onto a single IP infrastructure. The EX4300 switches also support standards-based 802.3at PoE+, which delivers up to 30 watts per port for powering networked devices like multiple radio IEEE 802.11n wireless access points and video phones that may require more power than available with IEEE 802.3af.

Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED)-based granular PoE/PoE+ management allows the EX4300 to negotiate PoE/PoE+ usage down to a fraction of a watt on powered devices, enabling more efficient PoE utilization across the switch.

To ease deployment, the EX4300 supports the industry-standard LLDP and LLDP-MED, which enable the switches to automatically discover Ethernet-enabled devices, determine their power requirements, and assign virtual LAN (VLAN) parameters.

The EX4300 is hardware-ready (with future software support) to support the IEEE 802.3az standard for Energy Efficient Ethernet (EEE) functionality, reducing power consumption of copper physical layers (PHY) during periods of low link utilization.

In addition, the EX4300 supports rich quality of service (QoS) functionality for prioritizing data, voice, and video traffic. The switches support 12 quality-of-service (QoS) queues on every port, enabling them to maintain multilevel, end-to-end traffic prioritizations. The EX4300 also supports a wide range of policy options, including priority and shaped deficit weighted round-robin (SDWRR) queuing.

Security

The EX4300 line of Ethernet switches fully integrates with 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.

The UAC solution is composed of three main components: Juniper Networks Junos Pulse as the endpoint client (also available in an agent-less mode); the Junos Pulse Access Control Service running on a blade in a MAG Series Junos Pulse Gateway chassis or on a dedicated MAG Series appliance; and UAC enforcement points. Working as an enforcement point with the UAC solution, the EX4300 provides both standards-based 802.1X port-level access control as well as L2-L4 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.

Additionally, a captive portal redirection feature redirects URLs from the EX4300 to the MAG Series gateway running Pulse Access Control Service for user authentication and authorization, making the UAC solution a "single source of truth" for user and device authentication and for enforcing role-based security policies.

The EX4300 also provides a full complement of port security features, including Dynamic Host Configuration Protocol (DHCP) snooping, dynamic ARP inspection (DAI), IP Source Guard, and media access control (MAC) limiting (per port and per VLAN) to defend against internal and external spoofing, man-in-the-middle and denial-of-service (DoS) attacks.

In addition, EX4300 switches are hardware-ready (with future software support) to support IEEE 802.1ae MACsec on all 1GbE and 10GbE ports (on the uplink module), providing support for link-layer data confidentiality, data integrity, and data origin authentication.

Simplified Management and Operations

When employing Virtual Chassis technology, the EX4300 dramatically simplifies network management. Up to 10 interconnected EX4300 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 EX4300 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), Junos Web interface, or management system.

When managing a group of EX4300 switches, Juniper Networks Junos Space Network Director provides system-level management across all Juniper switches in the network, from a single console.

Finally, the EX4300 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 EX4300 includes a limited lifetime hardware warranty that provides return-to-factory switch replacement for as long as the original purchaser owns the product. The warranty includes lifetime software updates, advanced shipping of spares within one business day, and 24x7 Juniper Networks Technical Assistance Center (JTAC) support for 90 days after the purchase date. Power supplies and fan are covered for a period of five years. For complete details, please visit **www.juniper.net/support/warranty**.

Product Options

Seven EX4300 switch models are available (see Table 1 below).

Table 1: EX4300 Line of Ethernet Switches

Model	Access Port Configuration	PoE /PoE+ Ports	Height	PoE Budget	Power Supply Rating	Airflow
EX4300-24T	24-port 10/100/1000BASE-T	0	1 U	0 W	350 W AC	AFO (Front-to-back airflow)
EX4300-24P	24-port 10/100/1000BASE-T	24	1 U	550 W	715 W AC	AFO (Front-to-back airflow)
EX4300-48T	48-port 10/100/1000BASE-T	0	1 U	0 W	350 W AC	AFO (Front-to-back airflow)
EX4300-48P	48-port 10/100/1000BASE-T	48	1 U	900 W	1100 W AC	AFO (Front-to-back airflow)
EX4300-48T-AFI	48-port 10/100/1000BASE-T	0	1 U	0 W	350 W AC	AFI (Back-to-front airflow)
EX4300-48T-DC	48-port 10/100/1000BASE-T	0	1 U	0 W	550 W DC	AFO (Front-to-back airflow)
EX4300-48T-DC-AFI	48-port 10/100/1000BASE-T	0	1 U	0 W	550 W DC	AFI (Back-to-front airflow)

EX4300-48P

EX4300-48T

EX4300-24P

EX4300-24T

EX4300 Specifications

Physical Specifications

Backplane
- 320 Gbps Virtual Chassis interconnect to combine up to 10 units as a single logical device

Uplink Module Options
- Dual-mode 4-port 10GbE SFP+/4-port GbE SFP module with pluggable SFP+/SFP optics

Power Options
- Power supplies: Autosensing; 100-120 V/200-240 V; AC 350 W AFO, 350 W AFI, 715 W AFO, and 1,100 W AFO dual load-sharing hot-swappable internal redundant power supplies
- Maximum current inrush: 50 amps
- DC power supply: 550 W DC AFO and 550 W DC AFI; input voltage range 36-72 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)
- 17.41 x 1.72 x 16.43 in (44.21 x 4.32 x 41.73 cm)
- Desktop installation width noted above, rack-mount width is 17.5 in (44.5 cm)
- Height: 1 rack unit (1 U)

System Weight
- EX4300 switch (no power supply or fan module): 13 lb (5.9 kg)
- EX4300 switch (with single power supply and two fan modules): 16.1 lb (7.3 kg)
- 350 W AC power supply: 2.4 lb (1.1 kg)
- 715 W AC power supply: 2.4 lb (1.1 kg)
- 1100 W AC power supply: 2.4 lb (1.1 kg)
- 550 W DC power supply: 2.4 lb (1.1 kg)
- SFP+ uplink module: 0.44 lb (0.2 kg)
- Fan module: 0.33 lb (0.15 kg)

Environmental Ranges
- Operating temperature: 32º to 113º F (0º to 45º C)
- Storage temperature: -40º to 158º F (-40º to 70º 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 fans: 2
- Switch remains operational even if one fan fails
- Airflow: PSU-7.5 CFM, fan-22 CFM
- Total maximum airflow throughput with two power supplies: 59 CFM

Hardware Specifications

Switching Engine Model
- Store and forward

Memory
- DRAM: 2 GB with Error Correcting Code (ECC)
- Flash: 2 GB

CPU
- 1.5 GHz Dual-Core PowerPC CPU

GbE Port Density per System
- 24P/24T: 28 (24 host ports + four-port 1/10GbE uplink module)
- 48P/48T: 52 (48 host ports + four-port 1/10GbE uplink module)
- 10GbE port density per system (all models): 4 (uplink module)
- 40GbE port density per system (all models): 4

Supported Optics
- GbE SFP optic/connector type: LC SFP fiber supporting SX (multimode), LX (single-mode)
- 10GbE SFP+ optic/connector type: 10GbE SFP+ LC connector, SR (multimode), USR (multimode), LR (single-mode), ER (single-mode), LRM (multimode), and DAC (direct-attach copper)
- 40 GbE QSFP+ optic/connector type: 40GbE QSFP+ LC connector type, SR (multimode), DAC (direct-attach copper)

Physical Layer
- Time Domain Reflectometry (TDR) for detecting cable breaks and shorts: 24P/24T and 48P/48T only
- Auto medium-dependent interface/medium-dependent interface crossover (MDI/MDIX) support: 24P/24T and 48P/48T only (all ports)
- Port speed downshift/setting maximum advertised speed on 10/100/1000BASE-T ports: 24P/24T and 48P/48T only, on all ports
- Digital optical monitoring for optical ports

Packet Switching Capacities (Maximum with 64 Byte Packets)
- 24P/24T: 448 Gbps
- 48P/48T: 496 Gbps

Software Specifications

Security
- MAC limiting (per port and per VLAN)
- Allowed MAC addresses configurable per port
- Dynamic ARP inspection (DAI)
- IP source guard
- Local proxy ARP
- Static ARP support
- DHCP snooping
- Captive portal
- Persistent MAC address configurations
- Distributed denial of service (DDoS) protection (CPU control path flooding protection)

Layer 2/Layer 3 Throughput (Mpps) (Maximum with 64 Byte Packets)
- 24P/24T: 333 Mpps (wire speed)
- 48P/48T: 369 Mpps (wire speed)

Layer 2 Switching
- Maximum MAC addresses per system: 64,000
- Jumbo frames: 9,216 Bytes
- Number of VLANs: 4,093
- Virtual Spanning Tree (VST) instances: 510
- Port-based VLAN
- MAC-based VLAN
- Voice VLAN
- Physical port redundancy: Redundant trunk group (RTG)
- Compatible with Per-VLAN Spanning Tree Plus (PVST+)
- Routed VLAN Interface (RVI)
- Uplink Failure Detection (UFD)
- ITU-T G.8032 Ethernet Ring Protection Switching
- IEEE 802.1AB: Link Layer Discovery Protocol (LLDP)

Specifications (continued)

Layer 2 Switching (continued)
- LLDP-MED with VoIP integration
- IEEE 802.1p: CoS prioritization
- IEEE 802.1Q: VLAN tagging
- IEEE 802.1X: Port Access Control
- IEEE 802.1ak: Multiple Registration Protocol
- 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 802.3ba: 40-Gigabit Ethernet
- IEEE 802.3af: Power over Ethernet
- IEEE 802.3at: Power over Ethernet Plus
- IEEE 802.3x: Pause Frames/Flow Control
- IEEE 802.3ah: Ethernet in the First Mile

Spanning Tree
- IEEE 802.1D: Spanning Tree Protocol
- IEEE 802.1s: Multiple instances of Spanning Tree Protocol (MSTP)
- Number of MST instances supported: 64
- Number of VLAN Spanning Tree Protocol (VSTP) instances supported: 510
- IEEE 802.1w: Rapid reconfiguration of Spanning Tree Protocol

Link Aggregation
- IEEE 802.3ad: Link Aggregation Control Protocol
- 802.3ad (LACP) support:
  - Number of LAGs supported: 1,000
  - Maximum number of ports per LAG: 112
- LAG load-sharing algorithm bridged or routed (unicast or multicast) traffic:
  - IP: S/D IP
  - TCP/UDP: S/D IP, S/D Port
  - Non-IP: S/D MAC
- Tagged ports support in LAG

Layer 3 Features: IPv4
- Maximum number of ARP entries: 32,000
- Maximum number of IPv4 unicast routes in hardware: 32,000
- Maximum number of IPv4 multicast routes in hardware: 8,000
- Routing protocols: RIPv1/v2, OSPF, BGP, IS-IS
- Static routing
- Routing policy
- Bidirectional Forwarding Detection (BFD)
- Layer 3 redundancy: Virtual Router Redundancy Protocol (VRRP)

Layer 3 Features: IPv6
- Maximum number of Neighbor Discovery (ND) entries: 20,000 (shared with IPv4)
- Maximum number of IPv6 unicast routes in hardware: 18,000
- Maximum number of IPv6 multicast routes in hardware: 4,000
- Routing protocols: RIPng, OSPFv3, IPv6, ISIS
- Static routing

Access Control Lists (ACLs) (Junos OS Firewall Filters)
- Port-based ACL (PACL): Ingress and egress
- VLAN-based ACL (VACL): Ingress and egress
- Router-based ACL (RACL): Ingress and egress

- ACL entries (ACE) in hardware per system:
  - Port-based ACL (PACL) ingress: 3,500
  - VLAN-based ACL (VACL) ingress: 3,500
  - Router-based ACL (RACL) ingress: 7,000
  - Egress shared across PACL, VACL, and RACL: 1,000
- ACL counter for denied packets
- ACL counter for permitted packets
- Ability to add/remove/change ACL entries in middle of list (ACL editing)
- L2-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 Extensible Authentication Protocol (EAP types): Message Digest 5 (MD5), Transport Layer Security (TLS), Tunneled TLS (TTLS), Protected Extensible Authenticated Protocol (PEAP)
- MAC authentication (RADIUS)
- Control plane DoS protection

High Availability
- Redundant, hot-swappable power supplies
- Redundant, field-replaceable, hot-swappable fans
- Graceful Routing 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

Quality of Service
- Layer 2 QoS
- Layer 3 QoS
- Ingress policing: 1 rate 2 color
- Hardware queues per port: 12
- Scheduling methods (egress): Strict priority (SP), shaped deficit weighted round-robin (SDWRR)
- 802.1p, DiffCode (DSCP)/IP Precedence trust and marking
- L2-L4 classification criteria: Interface, MAC address, Ethertype, 802.1p, VLAN, IP address, DSCP/IP Precedence, TCP/UDP port numbers, and more
- Congestion avoidance capabilities: Tail drop

Multicast
- IGMP: v1, v2, v3
- IGMP snooping
- PIM-SM, PIM-SSM, PIM-DM

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: Juniper Networks Network and

Specifications (continued)

Services and Manageability (continued)

- Security Manager
- Remote performance monitoring
- 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 client and DHCP proxy
- DHCP relay and helper
- DHCP local server support
- RADIUS
- Junos Space Service Now for automated fault detection, simplified trouble ticket management, and streamlined operations
- TACACS+
- SSHv2
- Secure copy
- HTTP/HTTPs
- Domain Name System (DNS) resolver
- System logging
- Temperature sensor
- Configuration backup via FTP/secure copy

MPLS

- VRF-Lite

Supported RFCs

- RFC 768 UDP
- RFC 783 TFTP
- RFC 791 IP
- RFC 792 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 1027 Proxy ARP
- RFC 1058 RIP v1
- RFC 1112 IGMP v1
- RFC 1122 Host Requirements
- RFC 1195 Use of OSI IS-IS for Routing in TCP/IP and Dual Environments (TCP/IP transport only)
- RFC 1256 IPv4 ICMP Router Discovery (IRDP)
- RFC 1492 TACACS+
- RFC 1519 CIDR
- RFC 1587 OSPF NSSA Option
- RFC 1591 DNS
- RFC 1812 Requirements for IP Version 4 Routers
- RFC 1981 Path MTU Discovery for IPv6
- RFC 2030 SNTP, Simple Network Time Protocol
- RFC 2068 HTTP server
- RFC 2080 RIPng for IPv6
- RFC 2131 BOOTP/DHCP relay agent and DHCP server

- RFC 2138 RADIUS Authentication
- RFC 2139 RADIUS Accounting
- RFC 2154 OSPF w/Digital Signatures (Password, MD-5)
- RFC 2236 IGMP v2
- RFC 2267 Network Ingress Filtering
- RFC 2328 OSPF v2 (Edge-mode)
- RFC 2338 VRRP
- RFC 2362 PIM-SM (Edge-mode)
- RFC 2370 OSPF Opaque LSA Option
- RFC 2453 RIP v2
- RFC 2460 Internet Protocol, Version 6 (IPv6) Specification
- RFC 2461 Neighbor Discovery for IP Version 6 (IPv6)
- 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 2474 DiffServ Precedence, including 12 queues/port
- RFC 2475 DiffServ Core and Edge Router Functions
- RFC 2526 Reserved IPv6 Subnet Anycast Addresses
- RFC 2597 DiffServ Assured Forwarding (AF)
- RFC 2598 DiffServ Expedited Forwarding (EF)
- RFC 2740 OSPF for IPv6
- RFC 2784 Generic Routing Encapsulation (GRE)
- RFC 2925 MIB for Remote Ping, Trace
- RFC 3176 sFlow
- RFC 3376 IGMP v3
- RFC 3484 Default Address Selection for Internet Protocol Version 6 (IPv6)
- RFC 3513 Internet Protocol Version 6 (IPv6) Addressing Architecture
- RFC 3569 draft-ietf-ssm-arch-06.txt PIM-SSM PIM Source Specific Multicast
- RFC 3579 RADIUS EAP support for 802.1x
- RFC 3618 Multicast Source Discovery Protocol (MSDP)
- RFC 3623 OSPF Graceful Restart
- RFC 4213 Basic Transition Mechanisms for IPv6 Hosts and Routers
- RFC 4291 IP Version 6 Addressing Architecture
- RFC 4443 ICMPv6 for the IPv6 Specification
- RFC 4541 IBMP and MLD snooping services
- RFC 4861 Neighbor Discovery for IPv6
- RFC 4862 IPv6 Stateless Address Autoconfiguration
- RFC 4915 MT-OSPF
- RFC 5176 Dynamic Authorization Extensions to RADIUS
- RFC 5798 VRRPv3 for IPv6
- Draft-ietf-bfd-base-05.txt Bidirectional Forwarding Detection
- Draft-ietf-idr-restart-10.txt Graceful Restart Mechanism
- Draft-ietf-isis-restart-02 Restart Signaling for IS-IS
- Draft-ietf-isis-wg-multi-topology-11 Multi Topology (MT) Routing in IS-IS for BGP
- Internet draft-ietf-isis-ipv6-06.txt, Routing IPv6 with IS-IS
- LLDP Media Endpoint Discovery (LLDP-MED), ANSI/TIA-1057, draft 08
- PIM-DM Draft IETF PIM Dense Mode draft-ietf-idmr-pim-dm-05. txt, draft-ietf-pim-dm-new-v2-04.txt

Specifications (continued)

Supported MIBs
- RFC 1155 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 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 suing SMIv2
- RFC 2096 IPv4 Forwarding Table MIB
- RFC 2287 System Application Packages MIB
- 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 4188 STP and Extensions MIB
- RFC 4363 Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering, and VLAN extensions
- RFC 5643 OSPF v3 MIB support
- Draft – blumenthal – aes – usm - 08
- Draft – reeder - snmpv3 – usm - 3desede -00
- 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

Troubleshooting
- Debugging: CLI via console, Telnet, or SSH
- Diagnostics: Show and debug cmd, statistics
- Traffic mirroring (port)
- Traffic mirroring (VLAN)
- IP tools: Extended ping and trace
- Juniper Networks commit and rollback

Traffic Monitoring
- ACL-based mirroring
- Mirroring destination ports per system: 1
- LAG port monitoring
- Multiple destination ports monitored to 1 mirror (N:1)
- Maximum number of mirroring sessions: 1
- ·Mirroring to remote destination (over L2): 1 destination VLAN

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
- EN 60950-1 (2006 +A1:2009+A12:2010) Information Technology Equipment—Safety
- ·IEC 60950-1 (2005 +A1:2009) Information Technology Equipment—Safety

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-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment

Environmental
- Reduction of Hazardous Substances (ROHS) 6/6

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.

Table 2. EX4300 Power Supply Ratings and Acoustic Noise in dBA

Model	Power Supply Rating	Acoustic Noise
EX4300-24T	350 W AC AFO	38.5
EX4300-48T	350 W AC AFO	37.8
EX4300-48T-AFI	350 W AC AFI	38.9
EX4300-24P	715 W AC AFO	39.7
EX4300-48P	1100 W AC AFO	51.0
EX4300-48T-DC	350 W AC AFO	39.7
EX4300-48T-DC-AFI	350 W AC AFI	39.7

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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

Model Number	Name
Switches[1]	
EX4300-24T	24-port 10/100/1000BASE-T + 350 W AC PS (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48T	48-port 10/100/1000BASE-T + 350 W AC PS (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48T-AFI	48-port 10/100/1000BASE-T + 350 W AC PS (Back-to-front airflow) (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-24P	24-port 10/100/1000BASE-T PoE-plus + 715 W AC PS (provides 400 W PoE+ power) (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48P	48-port 10/100/1000BASE-T PoE-plus + 1,100 W AC PS (provides 800 W PoE+ power) (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48T-DC	24-port 10/100/1000BASE-T + 450 W DC PS (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48T-DC-AFI	48-port 10/100/1000BASE-T + 450 W DC PS (Back-to-front airflow) (QSFP+ DAC for Virtual Chassis ordered separately)
Mounting Options	
EX-4PST-RMK	Adjustable 4-post rack-mount kit for EX4200, EX4300, and EX3200
EX-WMK	EX4200, EX4300, and EX3200 wall-mount kit
EX-RMK	Rack Mount Kit for EX2200, EX3200, EX4200, EX4300 and EX4550
Feature Licenses[2]	
EX4300-24-EFL	Enhanced Feature License (EFL) for EX4300-24T and EX4300-24P
EX4300-48-EFL	Enhanced Feature License (EFL) for EX4300-48T, EX4300-48T-AFI, EX4300-48T-DC, EX4300-48T-AFI-DC, and EX4300-48P switches
EX4300-24-AFL	Advanced Feature License (AFL) for EX4300-24T and EX4300-24P
EX4300-48-AFL	Advanced Feature License (AFL) for EX4300-48T, EX4300-48T-AFI, EX4300-48T-DC, EX4300-48T-AFI-DC, and EX4300-48P switches
Uplink Modules	
EX-UM-4X4SFP	EX4300 4-port 1GbE/10GbE SFP+ Uplink Module

Model Number	Name
Power Supplies	
JPSU-350-AC-AFO	EX 4300 350 W AC power supply (power cord needs to be ordered separately) (Front-to-back airflow)
JPSU-350-AC-AFI	EX 4300 350 W AC power supply with airflow in (power cord needs to be ordered separately) (Back-to-front airflow)
JPSU-715-AC-AFO	EX 4300 715 W AC power supply (power cord needs to be ordered separately) (Front-to-back airflow)
JPSU-1100-AC-AFO	EX 4300 1100 W AC power supply (power cord needs to be ordered separately) (Front-to-back airflow)
JPSU-550-DC-AFO	EX 4300 550 W DC power supply (power cord needs to be ordered separately) (Front-to-back airflow)
JPSU-550-DC-AFI	EX 4300 550 W DC power supply with air flow in (power cord needs to be ordered separately) (Back-to-front airflow)
Pluggable Optics	
EX-QSFP-40GE-DAC-50CM	QSFP+ to QSFP+ 40GbE Direct Attach Copper (twinax copper cable) 50 cm passive
QFX-QSFP-40G-SR4	QSFP+ 40GBase-SR4 40GbE Optics, 850 nm for up to 150 m transmission on multimode fiber-optic (MMF)
QFX-QSFP-DAC-1M	QSFP+ to QSFP+ 40GbE Direct Attach Copper (twinax copper cable) 1 m passive
QFX-QSFP-DAC-3M	QSFP+ to QSFP+ 40GbE Direct Attach Copper (twinax copper cable) 3 m passive
EX-SFP-1GE-SX	SFP 1000BASE-SX; LC connector; 850 nm; 550 m reach on multimode fiber
EX-SFP-1GE-LX	SFP 1000BASE-LX; LC connector; 1,310 nm; 10 km reach on single-mode fiber
EX-SFP-10GE-SR	SFP+ 10GBASE-SR; LC connector; 850 nm; 300 m reach on 50 microns multimode fiber; 33 m on 62.5 microns multimode fiber
EX-SFP-10GE-LRM	SFP+ 10GBASE-LRM; LC connector; 1,310 nm; 220 m reach on multimode fiber
EX-SFP-10GE-LR	SFP+ 10GBASE-LR; LC connector; 1,310 nm; 10 km reach on single-mode fiber
EX-SFP-10GE-DAC-xM	SFP+ 10GbE Direct Attach Copper (twinax copper cable), where "x" denotes 1, 3, 5, or 7 meter lengths
EX-SFP-10GE-ER	SFP+ 10GBASE-ER 10GbE Optics, 1,550 nm for 40 km transmission on single-mode fiber
EX-SFP-10GE-USR	SFP+ 10GbE Ultra Short Reach Optics, 850 nm for 10 m on OM1, 20 m on OM2, 100 m on OM3 multimode fiber

[1] Each switch ships standard with one power supply (including a power cord for the country to which it is being shipped), RJ-45 cable, RJ-45-to-DB-9 serial port adapter, and a 19" rack-mount kit. A second power supply is optional to provide resiliency. The appropriate power cord accompanying that power supply needs to be ordered separately. Virtual Chassis cables must be ordered separately and can be for any of the optics supported (40GbE DAC recommended for Virtual Chassis connections).

[2] EFL includes license for OSPFv4/v6, PIM-SM/SSM/DM, IGMP v1/v2/v3 and VRF-Lite. AFL includes license for IS-IS and BGP (EFL needs to be purchased and installed separately before installing AFL).

About Juniper Networks

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