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SO Doc Code: CRFQ

Procurement Type: Central Purchase Order

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Total of All Attachments: 2

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State of West Virginia
Solicitation Response

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Solicitation Closes	Solicitation Response	Version
2021-03-22 13:30	SR 1500 ESR03042100000006028	1

VENDOR
000000180526
SUN MANAGEMENT INC

Solicitation Number: CRFQ 1500 AGO2100000002
Total Bid: 33600
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Response Time: 09:42:18
Comments:

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Vendor		
Signature X	FEIN#	DATE

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Please see the attached Exhibit A Pricing Page	1.00000	LS	22950.000000	22950.00

Comm Code	Manufacturer	Specification	Model #
43222612			

Commodity Line Comments: Juniper EX4300-48P Proposed

Extended Description:

BLDG 6 Switches and Wireless Access Points

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	Please see the attached Exhibit A Pricing Page	1.00000	LS	10650.000000	10650.00

Comm Code	Manufacturer	Specification	Model #
43222640			

Commodity Line Comments: Juniper/Mist AP32 is proposed.

Extended Description:

Please see the attached Exhibit A Pricing Page

AP32 ACCESS POINT SERIES

High Performance 802.11ax (Wi-Fi 6) Driven by Mist AI Automates Network Operation

The AP32 series driven by Mist AI automates network operations and boosts Wi-Fi performance to automate network operation and boost Wi-Fi performance, delivering an aggregate data rate up to 3.0 Gbps concurrently on both 2.4GHz and 5GHz radios. Managed by Juniper Mist Cloud Architecture, the AP32 series delivers unprecedented user experiences at a lower cost for retail, warehouse, school, clinic and home office environments.

JUNIPER AI-DRIVEN NETWORK

Juniper brings true innovation to the wireless space with the world's first AI-driven Wireless LAN (WLAN).

The Juniper AI-Driven Network makes Wi-Fi predictable, reliable and measurable with unprecedented visibility into the user experience through customizable Service Level Expectation (SLE) metrics. Time consuming manual IT tasks are replaced with AI-driven proactive automation and self-healing, lowering Wi-Fi operational costs and saving substantial time and money.

All operations are managed via the open and programmable microservices with Juniper Mist Cloud Architecture. This delivers maximum scalability and performance while also bringing DevOps agility to wireless networking and location services.

THE JUNIPER MIST CLOUD ARCHITECTURE

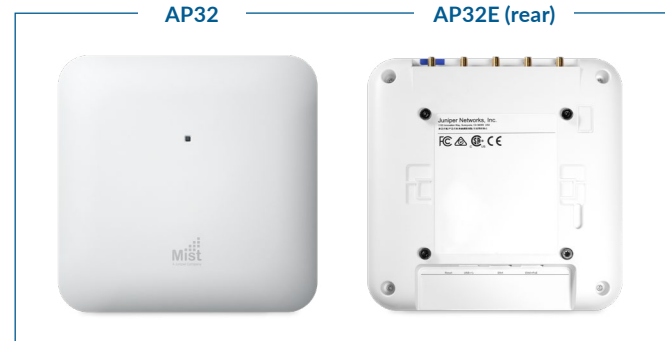
Juniper's Mist AI leverages a cloud-native microservices architecture in order to bring unparalleled agility, scale and resiliency to your network. It leverages an AI engine to lower OpEx and deliver unprecedented insight by using data science to analyze large amounts of rich metadata collected from Juniper Access Points driven by Mist AI.

JUNIPER ACCESS POINT FAMILY

The Mist enterprise-grade access point family consists of:

- AP32, AP33 and AP43 Series that support 802.11ax (Wi-Fi 6), Bluetooth® LE and IoT
- AP21, AP41 and AP61 Series that support 802.11ac Wave 2, Bluetooth LE and IoT
- BT11 that supports Bluetooth LE

These access points are all built on a real-time microservices platform and are managed by the Juniper Mist cloud.



The table below compares the supported major functions of the Juniper Wi-Fi 6 access points to help in selecting the model(s).

	AP43	AP63	AP33	AP32	AP12
Deployment	Indoor	Outdoor	Indoor	Indoor	Indoor Wall Plate
Wi-Fi Standard	802.11ax (Wi-Fi 6) 4x4 : 4SS	802.11ax (Wi-Fi 6) 4x4 : 4SS	802.11ax (Wi-Fi 6) 5GHz: 4x4 : 4SS 2.4GHz: 2x2 : 2SS	802.11ax (Wi-Fi 6) 5GHz: 4x4 : 4SS 2.4GHz: 2x2 : 2SS	802.11ax (Wi-Fi 6) 2x2 : 2SS
Wi-Fi Tri-Radio	✓	✓	✓	✓	✓
Antenna Options	Internal/ External	Internal/ External	Internal	Internal/ External	Internal
Virtual BLE	✓	✓	✓	—	—
IoT Interface	✓	—	—	—	—
IoT Sensors	Humidity, Pressure, Temperature	—	—	—	—
Warranty	Limited Lifetime	One Year	Limited Lifetime	Limited Lifetime	Limited Lifetime

SERVICES AVAILABLE FOR THE JUNIPER AP32

WI-FI CLOUD SERVICES

Juniper Mist Wi-Fi Assurance



For IT and NOC Teams

- Predictable and Measurable Wi-Fi
- Service Level Expectations (SLE)
- WxLAN Policy Fabric for Role-Based Access
- Customizable Guest Wi-Fi Portal
- Radio Resource Management

Marvis Virtual Assistant



For IT Helpdesk Teams

- AI-powered Virtual Network Assistant
- Natural Language Processing Interface
- Anomaly Detection
- Client SLE Visibility and Enforcement
- Data Science Driven Root Cause Analysis

BLUETOOTH LE CLOUD SERVICES

Juniper Mist Asset Visibility



For Process & Resource Improvement Teams

- Identify Assets by Name and View Location
- Zonal/Room Accuracy for 3rd Party Tags
- Historical Analytics for Asset Tags

- Telemetry for Asset Tags (temp., motion, ...)
- APIs for Viewing Assets and Analytics

ANALYTICS CLOUD SERVICES

Juniper Mist Premium Analytics



For Network Teams

- Base Features are Included with Wi-Fi Assurance, Mobile Engagement, and Asset Visibility Subscriptions
- End-to-end Network Visibility
- Orchestrated Networking and Application Performance Queries
- Simplified Network Transparency

For Business Teams

- Base Features are Included with Wi-Fi Assurance, Mobile Engagement, and Asset Visibility Subscriptions
- Customer Segmentation and Reporting Based on Visitor Telemetry
- Customized* Dwell and 3rd Party Reporting for Traffic and Trend Analysis
- Correlate Customer-Guest Traffic and Trend Analysis

*Juniper Mist Premium Analytics service subscription is needed

ACCESS POINT FEATURES

High Performance Wi-Fi

The AP32 series are 6 stream access points. They support 4x4:4SS in the 5GHz band, delivering a maximum data rate of 2,400 Mbps for high bandwidth applications; and 2x2:2SS in the 2.4 GHz band, delivering a maximum data rate of 575 Mbps. The integrated 3rd radio functions as a network, location, and security sensor, a synthetic test client radio, as well as a spectrum monitor.

By adding 802.11ax Orthogonal Frequency Division Multiple Access (OFDMA), Multi-User Multiple Input Multiple Output (MU-MIMO) and BSS Coloring technologies into the AP32 Series, performance is boosted to unprecedented levels to support new bandwidth-hungry applications and soaring device densities.

AI for AX

With the new features that 802.11ax (Wi-Fi 6) introduces to boost performance and efficiency, the complexity of configuring and operating an access point has soared. Juniper is applying its industry-leading Mist AI technology to automate and optimize these features with its AI for AX capabilities. We are leveraging AI in order to optimize BSS Coloring, to improve data transmission scheduling within OFDMA and MU-MIMO and to assign clients to the best radio to boost the overall performance of the network.

Boosts Spectral Efficiency

OFDMA improves spectral efficiency so that an increasing density of devices can be supported on the network, especially with IoT devices that often utilize smaller data packets than mobile devices and hence increase the burden and contention on the network. Additionally, BSS Coloring improves the co-existence of overlapping BSS' and allows spatial reuse within a given channel by reducing the packet collisions. This helps you improve spectral efficiency for dense networks where channel reuse is increasing.

Automatic RF optimization

Radio resource management (RRM) automates dynamic channel and power assignment, taking Wi-Fi and external sources of interference into account with its dedicated sensor radio. The AI engine continuously monitors the coverage and capacity SLE metrics to learn and optimize the RF environment. The RRM learning algorithm uses hysteresis on a 24-hour window to conduct a site-wide rebalancing for optimal channel and power assignment.

Unprecedented Insight and Action

A dedicated dual band 3rd radio collects data for Juniper's patent-pending Proactive Analytics and Correlation Engine (PACE), which leverages machine learning to analyze user experience, correlate problems and automatically detect the root cause of problems. These metrics are used to monitor service level expectations and provide proactive recommendations to ensure problems don't occur (or are fixed as quickly as possible when they do). This radio also is able to function as a synthetic test client to proactively detect and mitigate network anomalies.

Dynamic Packet Capture

The Juniper Mist platform automatically captures packets and streams them to the cloud when major issues are detected. This saves IT time and effort and eliminates the need for truck rolls with sniffers to reproduce and capture data for troubleshooting.

Client Events		47 Total	31 Good	7 Neutral	9 Bad
Association	Scanner 2	12:25:50.827 AM, Jun 30			
Fast BSS Assoc Failure	Scanner 2	12:25:48.458 AM, Jun 30			
IP Assigned	Scanner 2	12:25:47.380 AM, Jun 30			
DNS OK	Scanner 2	12:25:45.023 AM, Jun 30			
Default Gateway ARP Success	Scanner 2	12:25:42.897 AM, Jun 30			
DHCP Stuck - Bind Failure	Scanner 2	12:25:39.947 AM, Jun 30			
Authorization	Scanner 2	12:25:38.207 AM, Jun 30			
DNS OK	Scanner 2	12:25:36.104 AM, Jun 30			
Fast Roaming 802.11R	Scanner 2	12:25:37.098 AM, Jun 30			
Reassociation	Scanner 2	12:25:36.098 AM, Jun 30			

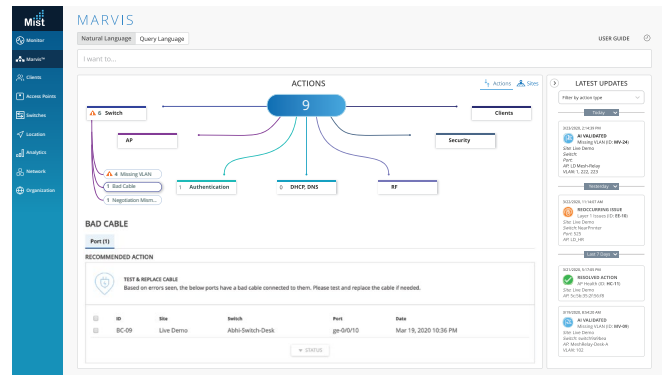
AP	Main	Server IP Address	10.1.1.1
Reason	Failing DHCP DISCOVER from 54:54:25:10:10:42 on vlan 1 with Xid 12345672B- No DHCP Request seen from client in response to Offer from the Server	BSSID	54:54:25:10:10:42
		SSID	Network 1
		Subnet	10.1.1.1/24
		Transaction ID	92234945

AP	Reason	Failure Count	1
VLAN	1		
Failure Count	1		

Download Packet Capture

Marvis Virtual Network Assistant

The NLP-based assistant, Marvis, simplifies troubleshooting and collection of insights for your network by leveraging AI and data science to proactively identify issues, determine the root causes and scope of impact and to gain insight into your network and users by eliminating the need to manually hunt through endless dashboards and CLI commands.

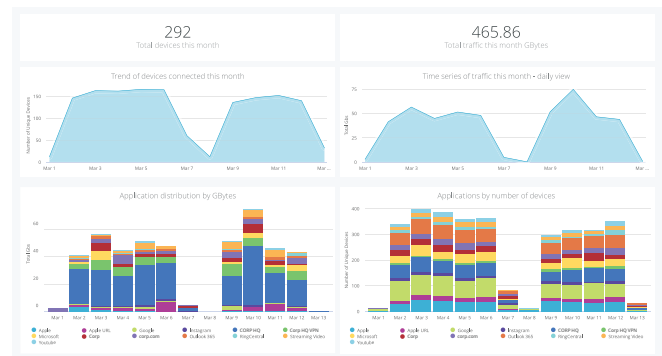


Effortless, Cloud-based Setup and Updates

The AP32 Series automatically connects to the Juniper Mist cloud, downloads its configuration, and joins the appropriate network. Firmware updates are retrieved and installed automatically, ensuring that the network is always up to date with new features, bug fixes, and security updates.

Premium Analytics

Juniper Mist Wi-Fi Assurance, Engagement and Asset Tracking services include a base analytics capability for analyzing up to 30 days of data which enables you to simplify the process of extracting network insights from data and analytics across your enterprise. To extend these capabilities for more dynamic insights like motion paths* and other 3rd Party* data, along with the option to generate customized reports, the Juniper Mist Premium Analytics service is available as an additional subscription.



Improves Battery Efficiency for IoT Devices

By incorporating the 802.11ax target wake time (TWT) capability and Bluetooth 5.0, battery life for IoT devices can be extended as new IoT devices enter the network.

Dynamic Debugging

Constantly monitor services running on the AP32 Series and send alerts whenever a service behaves abnormally. Dynamic debugging relieves IT of having to worry about an AP going offline or any services running on becoming unavailable.

SPECIFICATIONS	
Wi-Fi Standard	802.11ax (Wi-Fi 6), including support for OFDMA, 1024-QAM, MU MIMO, Target Wake Time (TWT), Spatial Frequency Reuse (BSS Coloring). Backwards compatibility with 802.11a/b/g/n/ac
Combined Highest Supported Data Rates	3.0 Gbps
2.4 GHz	2x2 : 2 802.11b/g/n/ac up to 400 Mbps data rate; 2x2 : 2 802.11ax up to 575 Mbps data rate
5 GHz	4x4 : 4 802.11ax up to 2,400 Mbps data rate
MIMO Operation	Four spatial stream Single User (SU) MIMO for up to 2,400 Mbps wireless data rate to individual 4x4 HE80 Four spatial stream Multi User (MU) MIMO for up to 2,400 Mbps wireless data rate to up to four MU-MIMO capable client devices simultaneously
Dedicated Third Radio	2.4GHz and 5GHz dual-band WIDS/WIPS, spectrum analysis, synthetic client and location analytics radio
Internal Antennas	Two 2.4GHz omni-directional antennas with 4 dBi peak gain Four 5GHz omni-directional antennas with 6 dBi peak gain
Bluetooth 5.0	Omni-directional Bluetooth Antenna Supports superbeacon mode with iBeacon and Eddystone
Beam Forming	Transmit Beamforming and Maximal Ratio Combining
Power Options	802.3at PoE, 802.3bt PoE
Dimensions	202 x 202 x 44 mm (7.95 x 7.95 x 1.73 in)
Weight	0.83 kg (1.83 lbs) excluding mount and accessories AP32E: 0.81 kg (1.78 lbs) excluding mount and accessories
Operating Temperature	Internal antenna: 0° to 40° C External antenna: -20° to 50° C
Operating Humidity	10% to 90% maximum relative humidity, non-condensing
Operating Altitude	3,048 m (10,000 ft)

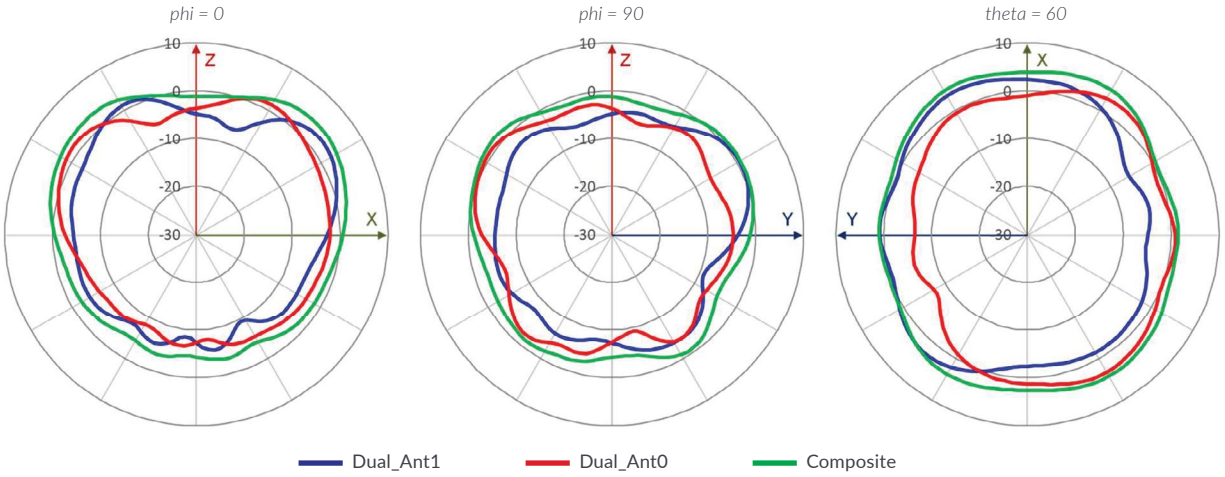
I/O AND INDICATORS	
USB	USB2.0 support interface
Eth0	100/1000Base-T, 2.5GBase-T (802.3bz); RJ45; PoE PD
Eth1	10/100/1000Base-T; RJ45
External Antennas (AP32E)	Five RP-SMA; four for Wi-Fi data; one for sensor. Male connectors
Reset	Reset to the factory default settings
Indicators	One multi-color status LED

MOUNTING BRACKETS	
APBR-U*	Universal Bracket
APBR-T58	$\frac{3}{8}$ " Threaded Rod
APBR-M16	16mm Threaded Rod (M16-2)
APBR-ADP-CR9	$\frac{9}{16}$ " T-Rail
APBR-ADP-RT15	$\frac{15}{16}$ " T-Rail
APBR-ADP-WS15	1 $\frac{1}{2}$ " T-Rail
APBR-ADP-T12	$\frac{1}{2}$ " Threaded Rod

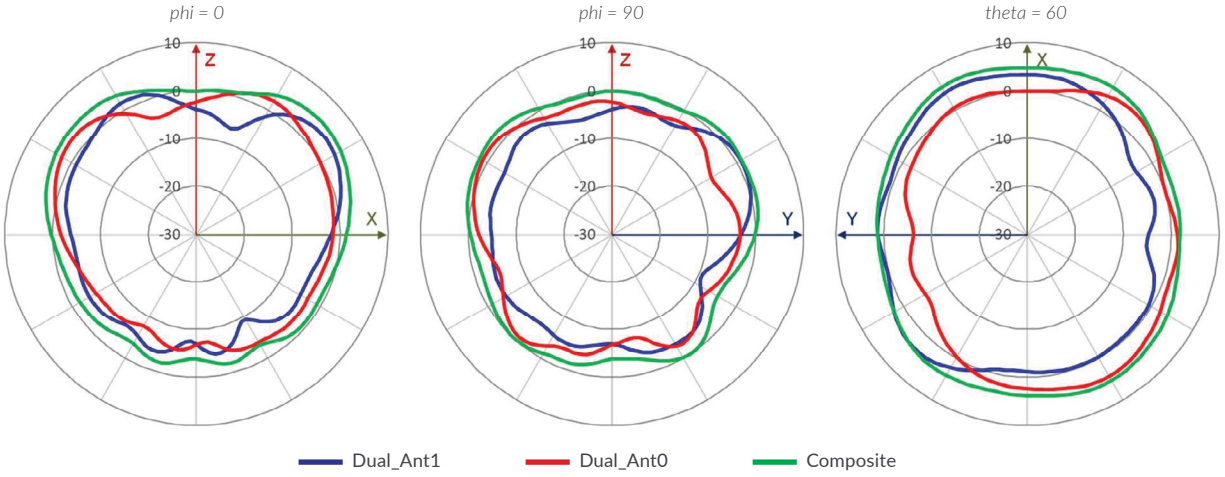
*The AP package includes one Universal Bracket. APBR-U is available separately as an accessory.

AP32 WI-FI ANTENNA PLOTS

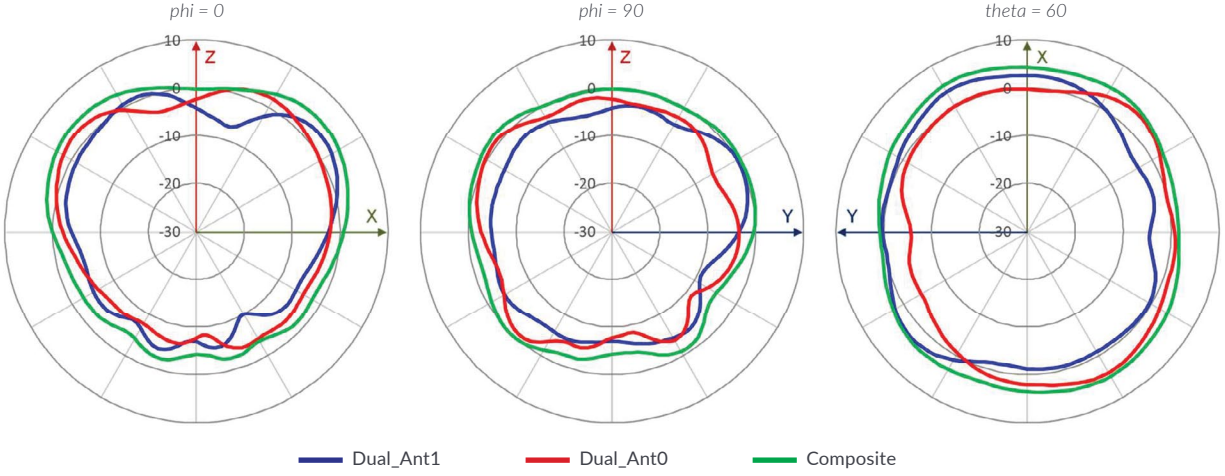
Wi-Fi @ 2400MHz (R1)



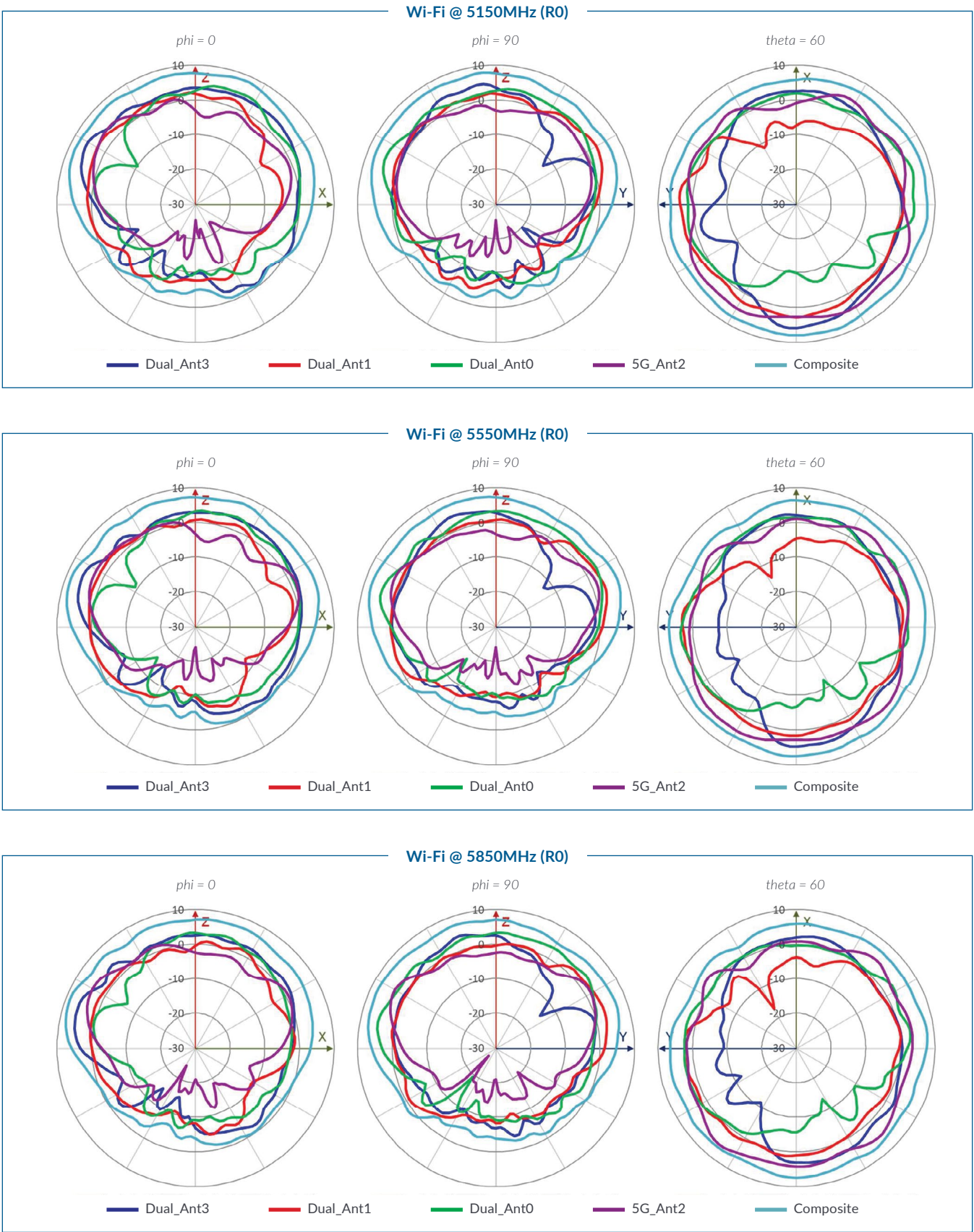
Wi-Fi @ 2450MHz (R1)



Wi-Fi @ 2500MHz (R1)

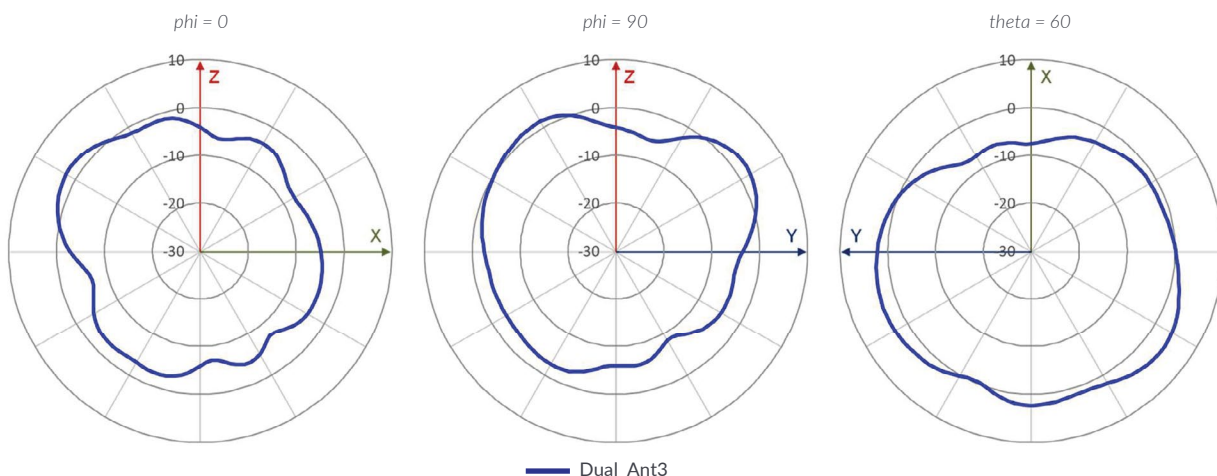


AP32 WI-FI ANTENNA PLOTS

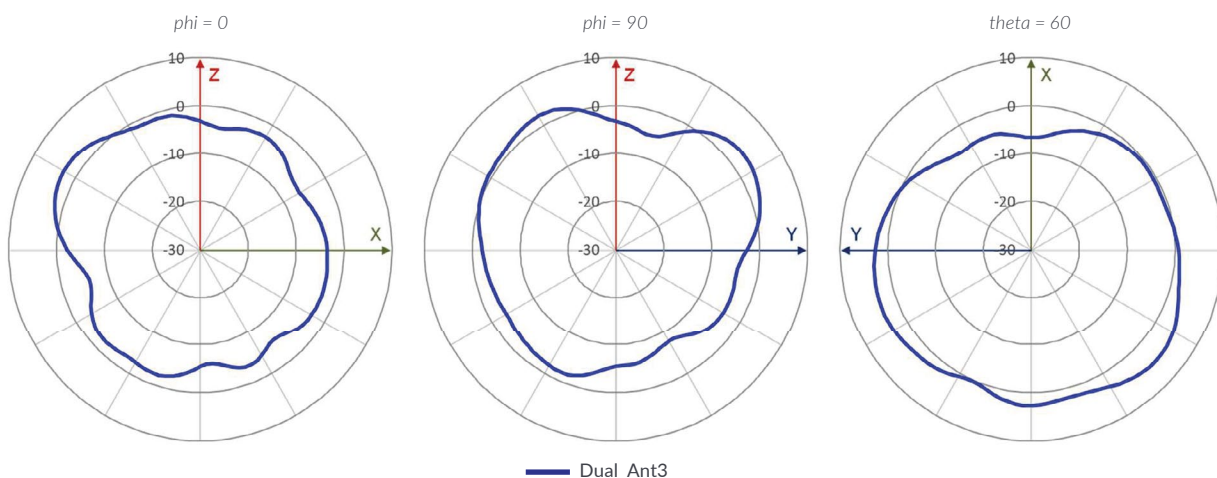


AP32 OMNI BLE ANTENNA PLOTS

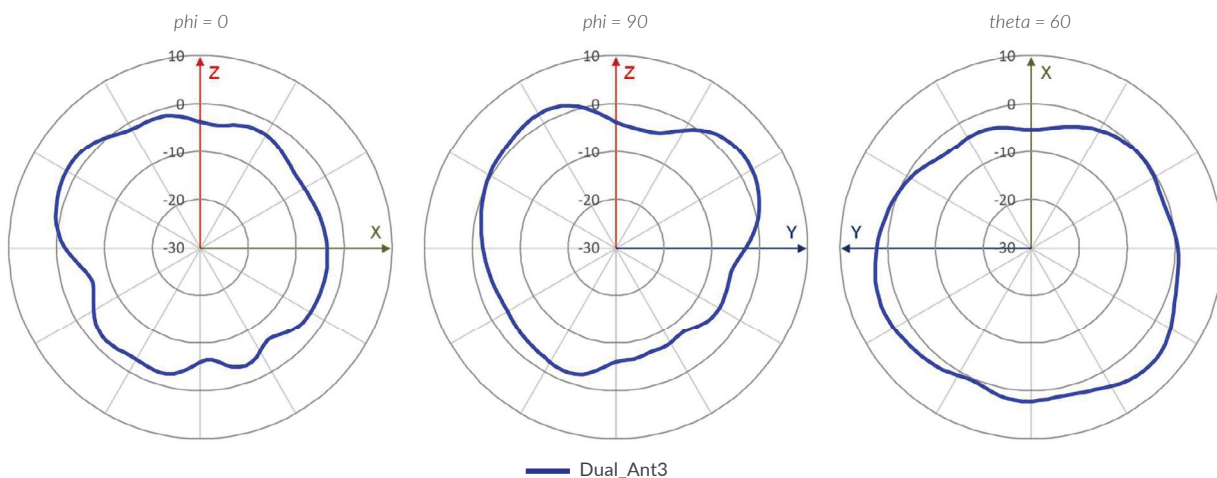
Omni BLE @ 2400MHz



Omni BLE @ 2440MHz



Omni BLE @ 2480MHz





EX4300 LINE OF ETHERNET SWITCHES

Product Overview

The EX4300 line of Ethernet switches delivers the performance, flexibility, and scale required for both campus and data center Gigabit Ethernet (GbE) access switch environments. When deployed in a Virtual Chassis configuration, the EX4300 delivers the operational simplicity and higher logical scale that businesses demand. Combining compact, pay-as-you-grow economics and low power and cooling with the performance, availability, and port densities of chassis-based platforms, the EX4300 enables businesses to deploy with speed and agility to increase revenue and improve productivity. The EX4300 is onboarded, provisioned, and managed in the Juniper Mist Cloud Architecture. Mist Wired Assurance delivers better experiences for connected devices through AI-powered automation and service levels.

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. Both 1GbE access and multigigabit switch options are available.

Offering a full suite of Layer 2 and Layer 3 switching capabilities, the EX4300 enables a variety of deployments, including campus, branch, and data center access. A single 24-port or 48-port EX4300 switch can be deployed initially. As requirements grow, Juniper's Virtual Chassis technology allows any combination of up to 10 EX4300 and/or EX4600 switches to be seamlessly interconnected and managed as a single device, delivering a scalable, pay-as-you-grow solution for expanding network environments. A pair of 32-port EX4300 fiber switches can also be deployed as a consolidated aggregation or small core switch. Additionally, the EX4300 can integrate with the Juniper Networks QFX5100 line of 10GbE and 40GbE data center access switches in a single stack or Virtual Chassis configuration, enabling nondisruptive 10GbE server upgrades and simplified management of a mixed access environment.

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. A flexible uplink module that supports both 1GbE and 10GbE options is 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 to support high-density IP telephony and 802.11n wireless access point deployments.

Additionally, a multigigabit model, the EX4300-48MP, supports IEEE 802.3bz-compliant 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps speeds on access ports. This enables 802.11ac Wave 2 access points, which require higher bandwidth, to connect to the switch. The EX4300 multigigabit switch also supports up to 95 watts of power on any of the access ports, enabling PoE++ devices requiring more than 30 watts to connect to and draw power from the switch.

The EX4300 multigigabit switch also enables higher levels of Media Access Control Security (MACsec) AES256 encryption on all access and uplink ports, protecting customer traffic from unauthorized access. The EX4300-48MP includes four dedicated 40GbE QSFP+ transceiver ports that can be used as Virtual Chassis ports to create a 320 Gbps backplane.

Chassis-Like Features in an Expandable Form Factor

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

- Hot-swappable fans
- Modular Juniper Networks Junos® operating system (consistent with chassis systems)
- Dual Routing Engines (REs) with graceful Routing Engine switchover (GRES) in a Virtual Chassis configuration
- Single management interface
- Easy, centralized software upgrades
- Scalability from 24 to 480 10/100/1000BASE-T ports and 24 to 240 100/1000/2500/5000/10000BASE-T ports, with up to 40 10GbE uplinks and 40 40GbE uplinks (up to 40 10GbE uplinks, 20 40GbE uplinks, or 20 100GbE uplinks on multigigabit models, in addition to four dedicated 40 Gbps Virtual Chassis ports per switch)

Each EX4300 switch includes a single ASIC-based Packet Forwarding Engine, the EX-PFE. The 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 (1 U) 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 standard 40GbE QSFP+ ports which are preconfigured to support high-speed Virtual Chassis backplane connections; on the 1GbE access switches, these ports can also serve as uplinks to upstream aggregation devices. In addition, each EX4300 supports an optional front panel uplink module offering 1GbE or 10GbE ports for high-speed backbone or link aggregation connections between wiring closets and upstream aggregation switches; the multigigabit model offers a choice between a 4-port 10GbE SFP+ uplink module or a 2-port 40GbE QSFP+/2-port 100GbE QSFP28 uplink module. 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 1GbE access EX4300 models also feature 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 integrated 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+ direct attach copper (DAC) cables (available in 50 cm, 1 m, 3 m, and 5 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.

Cloud Management with Juniper Mist Wired Assurance

Juniper Mist Wired Assurance, a cloud-based service driven by Mist AI to claim, configure, manage, and troubleshoot the EX4300, delivers AI-powered automation and service levels to ensure a better experience for connected devices. Wired Assurance leverages rich Junos switch telemetry data to simplify operations, reduce mean time to repair, and improve visibility. Wired Assurance offers the following features.

Day 0/Day 1: Simplified Onboarding and Provisioning

- Single-click activation adds true plug-and-play capabilities to the cloud-ready, ZTP-enabled EX4300 driven by Mist AI.
- Configuration models use global templates for bulk rollouts while retaining the flexibility to apply custom site- or switch-specific attributes.
- Device, port, and interface profiles allows for the manual provisioning of colored ports or auto-provisioning of colorless ports.
- Open APIs support third-party integrations such as ServiceNow and Splunk to automate troubleshooting, ticketing, and more.

Day 2 and Beyond: AI-Driven Operations

- Wired service level expectation (SLEs) allow you to set, monitor, and measure wired user experiences such as throughput, successful connections, and switch health with pre- and post-connection performance metrics.
- AI-driven switch insights reveal exactly how switches are performing, including detailed device-level metrics such as CPU, memory utilization, and Virtual Chassis status.

The addition of Marvis, a complementary Virtual Network Assistant driven by Mist AI, lets you start building a self-driving network that simplifies network operations and streamlines troubleshooting via automatic fixes for EX Series switches or recommended actions for external systems.

EVPN-VXLAN Technology

The EX4300-48MP embraces open standards and extends the industry-standard Ethernet VPN (EVPN)-Virtual Extensible LAN (VXLAN) technology already supported for campus fabric IP Clos networks. An IP Clos network between the distribution and the core layers can exist in two modes: centrally routed bridging overlay or edge routed bridging overlay.

With enterprise applications moving to the cloud, it has become necessary to deploy IP fabrics as enterprise fabrics with L2 extensions using VXLAN. The EX4300-48MP is capable of both L2 and L3 VXLAN gateway services, allowing you to deploy networks that provide L2 adjacencies for applications over L3 fabrics. EVPN-VXLAN offers a scalable way to build and interconnect multiple campuses, delivering:

- Greater network efficiency
- Compliance with industry standards
- Scalability across all network layers
- Faster convergence
- Flexible and secure architecture

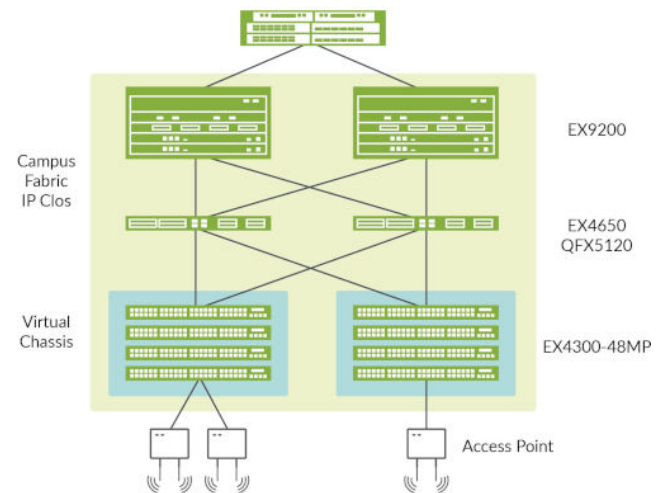


Figure 1: Campus Fabric: IP Clos with EX4300-MP

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 up to 40 10GbE or 40 40GbE uplink ports. For mixed 1GbE and 10GbE access environments, the EX4300 can be interconnected with the EX4600 enterprise campus and QFX5100 high-performance data center access switches. 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.

With the EX4300 multigigabit model, up to 10 switches can be interconnected using dedicated 40GbE ports through Virtual Chassis technology, creating a single logical device supporting up to 240 10/100/1000BASE-T ports and 240 100/1000/2500/5000/10000BASE-T ports, with up to 40 10GbE uplinks, 20 40GbE uplinks, or 20 100GbE uplinks. The multigigabit EX4300 can also participate in a 10-member mixed-mode Virtual Chassis configuration with other 1GbE EX4300 access switches.

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 VirtualChassis configuration across long distances spanning multiple wiring closets, floors, or even buildings while using 10GbE or 40GbE for uplink connectivity. EX4300 fiber-based switches can also be used for campus aggregation or small core deployments.

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.

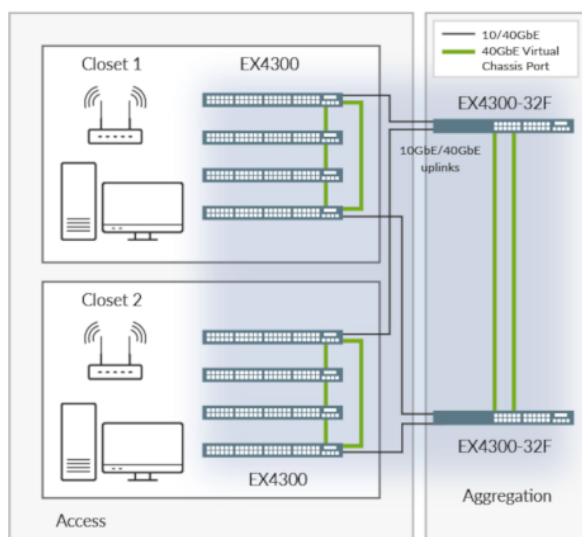


Figure 2: Using Virtual Chassis technology, up to 10 EX4300 switches can be interconnected to create a single logical device spanning an entire building.

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 on the 40GbE ports (DAC cables up to 3 m in length are available for shorter distances), while 10GbE ports can be used as uplinks to connect to upstream aggregation or core devices.

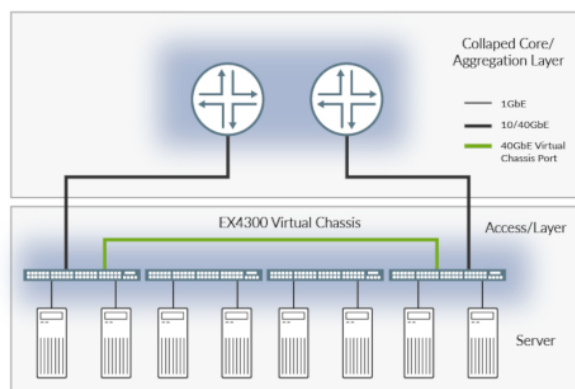


Figure 3: The EX4300 Ethernet Switch with Virtual Chassis technology delivers a high-performance, scalable, and highly reliable solution for the data center.

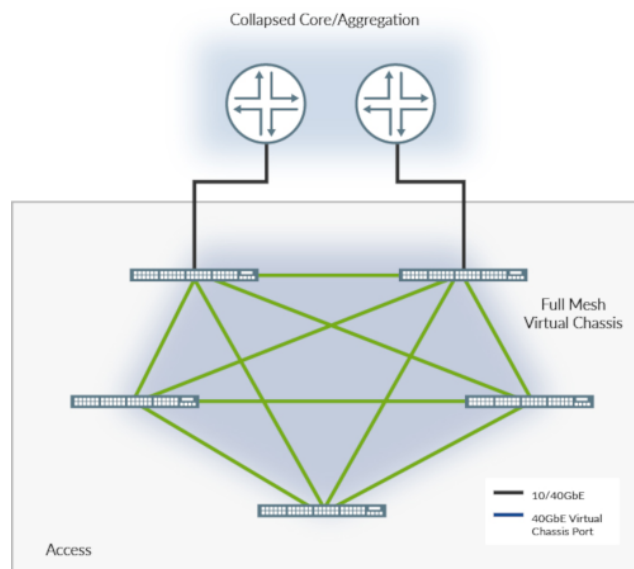


Figure 4: EX4300 switches in a full mesh Virtual Chassis configuration for the data center.

Virtual Chassis Fabric Switching Architecture

Existing Virtual Chassis technology is further scaled and enhanced to support a spine-and-leaf topology that is ideal for high-performance and low-latency data center deployments. In its first instance, this topology, called Virtual Chassis Fabric, enables up to 20 switches to be deployed in a spine-and-leaf configuration, with two to four QFX5100 switches in the spine and up to 18 QFX5100 or EX4300 switches as leaf nodes. This architecture provides any-rack-to-any-rack deterministic throughput and low latency, while significantly simplifying network operations through a single point of management. A Virtual Chassis Fabric configuration supports mixed 1GbE, 10GbE, and 40GbE servers¹.

¹The EX4300 multigigabit switch is not supported in the Virtual Chassis Fabric configuration

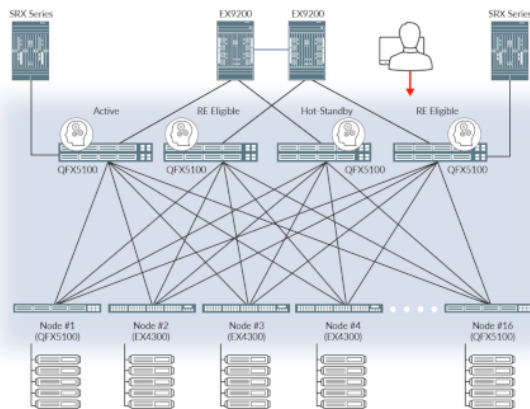


Figure 5: EX4300, QFX3500, QFX3600, and QFX5100 at the access layer of a Virtual Chassis Fabric configuration.

Features and Benefits

Wired Service-Level Expectations

The Wired Assurance feature provides operational visibility into the wired experience with service-level expectations (SLEs) for EX Series Switches. Pre- and post-connection performance metrics help you monitor successful connects and switch health throughout the system, using Mist AI to measure and manage networks and simplify troubleshooting.

Chassis-Class Availability

The EX4300 line of Ethernet switches delivers high availability through redundant power supplies and fans, GRES, and nonstop bridging and routing when deployed in a Virtual Chassis configuration.

In a Virtual Chassis configuration, 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 primary (active) and backup (hot-standby) RE. An integrated L2 and L3 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 primary fail. Primary, backup, and line card priority status can be assigned to dictate the order of ascension; this N+1 RE redundancy, coupled with the GRES, nonstop routing (NSR), and nonstop bridging (NSB) capabilities of Junos OS, 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 using 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.

In a mixed Virtual Chassis configuration with both EX4300 1GbE access and multigigabit switches, the EX4300 multigigabit switches must assume the role of the RE, while the 1GbE access EX4300 switches can only act as line cards.

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 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. The EX4300 1GbE access switches offer both AC and DC options, while the EX4300 multigigabit switch supports only AC power supplies.
- **Hot-swappable fans:** The EX4300 includes hot-swappable fans, providing sufficient cooling even if one of the fans were to fail.
- **Nonstop bridging and nonstop routing:** NSB and NSR on the EX4300 ensure that control plane protocols, states, and tables are synchronized between primary and standby REs to prevent protocol flaps or convergence issues following a Routing Engine failover.

- **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's 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 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 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.

The EX4300 supports rich quality of service (QoS) functionality for prioritizing data, voice, and video traffic. The switches support 12 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 weighted deficit round-robin (WDRR) queuing.

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 such as multiple radio IEEE 802.11n wireless access points and video phones that may require more power than available with IEEE 802.3af. The EX4300 multigigabit switch supports pre-standard IEEE 802.3bt PoE++, which delivers up to 95 watts per port for powering devices requiring more than the 30 watts of power provided by PoE+.

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 supports 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.

Security

The EX4300 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.

MACsec

EX4300 switches support IEEE 802.1AE MACsec, providing support for link-layer data confidentiality, data integrity, and data origin authentication. The MACsec feature enables the EX4300 to support 88 Gbps of near line-rate hardware-based traffic encryption on all GbE and 10GbE ports, including the base unit and optional uplink modules. The multigigabit EX4300 model supports the MACsec AES 256 standard for encrypting traffic on all access and uplink ports.

Defined by IEEE 802.1AE, MACsec provides secure, encrypted communication at the link layer that is capable of identifying and preventing threats from denial of service (DoS) and intrusion attacks, as well as man-in-the-middle, masquerading, passive wiretapping, and playback attacks launched from behind the firewall. When MACsec is deployed on switch ports, all traffic is encrypted on the wire but traffic inside the switch is not. This allows the switch to apply all network policies such as QoS, deep packet inspection, and sFlow to each packet without compromising the security of packets on the wire.

Hop-by-hop encryption enables MACsec to secure communications while maintaining network intelligence. In addition, Ethernet-based WAN networks can use MACsec to provide link security over long haul connections. MACsec is transparent to Layer 3 and higher layer protocols and is not limited to IP traffic; it works with any type of wired or wireless traffic carried over Ethernet links.

Simplified 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 uses 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 primary 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 L2 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.

Flex Licensing

Juniper Flex licensing offers a common, simple, and flexible licensing model for EX Series access switches, enabling customers to purchase features based on their network and business needs.

Flex licensing is offered in Standard, Advanced, and Premium tiers. Standard tier features are available with the Junos OS image that ships with EX Series switches. Additional features can be unlocked with the purchase of a Flex Advanced or Flex Premium license.

The Flex Advanced and Premium licenses for the EX Series platforms are class based, determined by the number of access ports on the switch. Class 1 (C1) switches have 12 ports, Class 2 (C2) switches have 24 ports, and Class 3 (C3) switches have 32 or 48 ports.

The EX4300 switches support both subscription and perpetual Flex licenses. Subscription licenses are offered for three- and five-year terms. In addition to Junos features, the Flex Advanced and Premium subscription licenses include Juniper Mist Wired Assurance. Flex Advanced and Premium subscription licenses also allow portability across the same tier and class of switches, ensuring investment protection for the customer.

For a complete list of features supported by the Flex Standard, Advanced, and Premium tiers, or to learn more about Junos EX Series licenses, please visit https://www.juniper.net/documentation/en_US/release-independent/licensing/topics/topic-map/understanding_software_licenses.html.

Warranty

For warranty information, please visit www.juniper.net/support/warranty.

Product Options

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

Table 1. EX4300 Line of Ethernet Switches

Model/Product SKU	Access Port Configuration	PoE / PoE+ Ports	PoE Budget	10GbE Ports (max. with module)	40GbE Ports (max. with module)	100GbE Ports (max. with module)	Power Supply Rating	Airflow
EX4300-24T	24-port 10/100/1000BASE-T	0	0 W	0 (4)	4	0	350 W AC	AFO (Front-to-back airflow)
EX4300-24P	24-port 10/100/1000BASE-T	24	550 W	0 (4)	4	0	715 W AC	AFO (Front-to-back airflow)
EX4300-48T	48-port 10/100/1000BASE-T	0	0 W	0 (4)	4	0	350 W AC	AFO (Front-to-back airflow)
EX4300-48P	48-port 10/100/1000BASE-T	48	900 W	0 (4)	4	0	1100 W AC	AFO (Front-to-back airflow)
EX4300-48T-AFI	48-port 10/100/1000BASE-T	0	0 W	0 (4)	4	0	350 W AC	AFI (Back-to-front airflow)
EX4300-48T-DC	48-port 10/100/1000BASE-T	0	0 W	0 (4)	4	0	550 W DC	AFO (Front-to-back airflow)
EX4300-48T-DC-AFI	48-port 10/100/1000BASE-T	0	0 W	0 (4)	4	0	550 W DC	AFI (Back-to-front airflow)
EX4300-48MP	24-port 10/100/1000BASE-T, 24-port 100/1000/2500/5000/10000BASE-T	48	1100	24 (28)	4* (2+4*)	0 (2)	1400 W AC	AFO (Front-to-back airflow)
EX4300-32F	32-port 100/1000BASE-X	0	0 W	4 (12)	2 (4)	0	350 W AC	AFO (Front-to-back airflow)
EX4300-32F-DC	32-port 100/1000BASE-X	0	0 W	4 (12)	2 (4)	0	550 W DC	AFO (Front-to-back airflow)

*Dedicated Virtual Chassis ports cannot be used in Ethernet mode

The EX4300 also offers spare chassis options without power supplies or fans, providing customers with the flexibility to create custom SKUs. The supportability matrix for the EX4300 spare chassis SKUs is shown in Table 2. See Ordering Information section for registration details.

Table 2. Supportability Matrix for EX4300 Spare Chassis SKUs

Spare Chassis SKU	Description	PSU-350-AC-AFO + EX4300-FAN	JPSU-715-AC-AFO + EX4300-FAN	JPSU-1100-AC-AFO + EX4300-FAN	JPSU-1400-AC-AFO + EX4300-FAN	JPSU-550-DC-AFO + EX4300-FAN	JPSU-350-AC-AFI + EX4300-FAN-AFI	JPSU-550-DC-AFI + EX4300-FAN-AFI
EX4300-48T-S	Spare chassis, 48-port 10/100/1000BASE-T	P EX4300-48T	X	Y	X	P EX4300-48T-DC	P EX4300-48T-AFI	P EX4300-48T-DC-AFI
EX4300-48P-S	Spare chassis, 48-port 10/100/1000BASE-T PoE+	Y	Y	P EX4300-48P	X	Y	Y	Y
EX4300-48MP-S	Spare chassis, 24-port 10/100/1000BASE-T, 24-port 100/1000/2500/5000/10000BASE-T 95 W PoE	X	Y	Y	Y	X	X	X
EX4300-24T-S	Spare chassis, 24-port 10/100/1000BASE-T	P EX4300-24T	X	Y	X	Y	Y	Y
EX4300-24P-S	Spare chassis, 24-port 10/100/1000BASE-T PoE+	Y	P EX4300-24P	Y	X	Y	Y	Y
EX4300-32F-S	Spare chassis, 32-port 100/1000BASE-X SFP, 4x10GBASE-X SFP+, 2x40GBASE-X QSFP+	P EX4300-32F	X	Y	X	P EX4300-32F-DC	Y	Y

Note: P: supported as a SKU; Y: supported combination; X: unsupported combination



EX4300-48MP



EX4300-48P



EX4300-48T



EX4300-24P



EX4300-24T



EX4300-32F

EX4300 Specifications

Physical Specifications

Backplane

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

Uplink Module Options

- EX4300-32F/EX4300-32F-DC: 8-port dual-mode 10GbE/1GbE module with pluggable SFP+/SFP optics
- EX4300-32F/EX4300-32F-DC: 2-port dual-mode 40GbE module with pluggable QSFP+ optics
- EX4300-48MP: 4-port dual-mode 10GbE/1GbE module with pluggable SFP+/SFP optics or 2-port QSFP+/1-port QSFP28 module
- Others: 4-port dual-mode 10GbE/1GbE 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 1100 W AFO dual load-sharing hot-swappable internal redundant power supplies
- Maximum current inrush: 50 amps
- EX4300-48MP: 100-120 V/200-240 V; AC 715 W AFO, 1100 W AFO, 1400 W AFO dual load-sharing hot-swappable internal redundant power supplies
- DC power supply: 550 W DC AFO and 550 W DC AFI; input voltage range 43.5-60 V max (+/- 0.5 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)

- EX4300-24P, -24T, -48P, -48T:
 - Base unit: 17.36 x 1.72 x 16.38 in (44.1 x 4.37 x 41.6 cm)
 - With power supply installed: 17.36 x 1.72 x 17.51 in (44.1 x 4.37 x 44.47 cm)
 - With power supply and front module installed: 17.36 x 1.72 x 18 in (44.1 x 4.37 x 45.73 cm)
- EX4300-32F:
 - Base unit: 17.36 x 1.72 x 17.87 in (44.1 x 4.37 x 45.4 cm)
 - With power supply installed: 17.36 x 1.72 x 19 in (44.1 x 4.37 x 48.28 cm)
 - With power supply and front module installed: 17.36 x 1.72 x 19.31 in (44.1 x 4.37 x 49.1 cm)
- EX4300-48MP:
 - Base unit: 17.36 x 1.72 x 18.39 in (44.1 x 4.37 x 46.7 cm)
 - With power supply installed: 17.36 x 1.72 x 19.63 in (44.1 x 4.37 x 49.99 cm)
 - With power supply and front module installed: 17.36 x 1.72 x 20.06 in (44.1 x 4.37 x 50.96 cm)

System Weight

- EX4300 switch (with 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:
 - AFO models: 32° to 113° F (0° to 45° C)
 - AFI models: 32° to 95° F (0° to 35° 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 fans: 2
- Airflow: PSU-7.5 cubic feet per minute (CFM); fan-22 CFM
- Total maximum airflow throughput with two power supplies: 59 CFM

Hardware Specifications

Switching Engine Mode

- Store and forward

Memory

- DRAM: 8 GB with Error Correcting Code (ECC) on EX4300-48MP, 3 GB with ECC on EX4300-32F and EX4300-32F-DC; 2 GB with ECC on all other EX4300 switches
- Storage: 50 GB on EX4300-48MP, 4 GB on EX4300-32F and EX4300-32F-DC; 2 GB on all other EX4300 switches

CPU

- EX4300-48MP: 2.2 GHz Dual-Core Intel Broadwell CPU
- Other EX4300s: 1.5 GHz Dual-Core PowerPC CPU

GbE Port Density per System

- 24P/24T: 32 (24 host ports + four 40GbE ports + optional four-port 1/10GbE uplink module)
- 32F: 46 (32 host ports + four 10GbE ports + two 40GbE ports + optional eight-port 1/10GbE uplink module or two-port 40GbE uplink module)
- 48P/48T/48MP: 56 (48 host ports + four 40GbE ports + optional four-port 1/10GbE uplink module)
- 10GbE port density per system:
 - 32F: 4 (fixed) + 8 (uplink module)
 - 48MP: 24 (fixed) = 4 (uplink module)
 - All others: 4 (uplink module)
- 40GbE port density per system:
 - 32F: 2 (fixed) + 2 (uplink module)
 - 48MP: 4 (fixed) + 2 (uplink module)
 - All others: 4 (fixed)
- 100GbE port density per system:
 - 48MP: 2 (uplink module)

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)
- 100 GbE QSFP28 optic type: 100GbE QSFP SR4, LR4, 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/48MP only (all ports)
- Port speed downshift/setting maximum advertised speed on 10/100/1000BASE-T ports: 24P/24T and 48P/48T/48MP only, on all ports
- Digital optical monitoring for optical ports

Packet Switching Capacities (Maximum with 64 Byte Packets)

- 24P/24T: 224 Gbps (unidirectional)/448 Gbps (bidirectional)
- 48P/48T: 248 Gbps (unidirectional)/496 Gbps (bidirectional)
- 48MP: 464 Gbps (unidirectional)/928 Gbps (bidirectional)
- 32F: 232 Gbps (unidirectional)/464 Gbps (bidirectional)

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)

- EX4300-24P/24T: 333 Mpps (wire speed)
- EX4300-48P/48T: 369 Mpps (wire speed)
- EX4300-48MP: 714 Mpps
- EX4300-32F: 345 Mpps (wire speed)

Layer 2 Switching

- Maximum MAC addresses per system: 64,000
- Jumbo frames: 9216 Bytes
- Number of VLANs supported: 4093
- Range of possible VLAN IDs: 1 to 4094
- Virtual Spanning Tree (VST) instances: 510
- Port-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)
- LLDP-MED with VoIP integration
- Default VLAN and multiple VLAN range support
- MAC learning deactivate
- Persistent MAC learning (sticky MAC)
- MAC notification
- Private VLANs (PVLANS)
- Explicit congestion notification (ECN)
- Layer 2 protocol tunneling (L2PT)
- IEEE 802.1ak: Multiple VLAN Registration Protocol (MVRP)
- 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: 128
 - Maximum number of ports per LAG: 16
- 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: 64,000
- Maximum number of IPv4 unicast routes in hardware: 16,000 prefixes; 32,000 host routes
- Maximum number of IPv4 multicast routes in hardware: 8000 multicast groups; 16,000 multicast routes
- Routing protocols: RIPv1/v2, OSPF, BGP, IS-IS
- Static routing
- Routing policy
- Bidirectional Forwarding Detection (BFD)
- L3 redundancy: Virtual Router Redundancy Protocol (VRRP)
- VRF-Lite

Layer 3 Features: IPv6

- Maximum number of Neighbor Discovery (ND) entries: 32,000
- Maximum number of IPv6 unicast routes in hardware: 4000 prefixes; 15,000 host routes
- Maximum number of IPv6 multicast routes in hardware: 8000 multicast groups; 16,000 multicast routes
- Routing protocols: RIPv6, 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: 3072
 - VLAN-based ACL (VACL) ingress: 3500
 - Router-based ACL (RACL) ingress: 7000
 - Egress shared across PACL and VACL: 512
 - Egress across RACL: 1024
 - 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

Access Security

- 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
- Radius functionality over IPv6 for authentication, authorization, and accounting (AAA)
- DHCPv6 snooping
- IPv6 neighbor discovery
- IPv6 source guard
- IPv6 RA guard
- IPv6 Neighbor Discovery Inspection
- Media Access Control security (MACsec)

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
- Nonstop bridging: LACP, xSTP
- Nonstop routing: PIM, OSPF v2 and v3, RIP v2, RIPv6, BGP, BGPv6, ISIS, IGMP v1, v2, v3
- Online insertion and removal (OIR) uplink module

Quality of Service

- L2 QoS
- L3 QoS
- Ingress policing: 1 rate 2 color
- Hardware queues per port: 12
- Scheduling methods (egress): Strict priority (SP), WDRR
- 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, weighted random early detection (WRED)

Multicast

- IGMP: v1, v2, v3
- IGMP snooping
- Multicast Listener Discovery (MLD) snooping
- PIM-SM, PIM-SSM, PIM-DM

Services and Manageability

- Juniper Mist Wired Assurance
- Junos OS CLI
- Junos Web interface (J-Web)
- Junos Space Management Applications
- Junos Space Network Director
- Junos Space Service Now for automated fault detection, simplified trouble ticket management, and streamlined operations
- 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 Security Manager (NSM)
- 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
- TACACS+
- SSHv2
- Secure copy
- HTTP/HTTPS
- Domain Name System (DNS) resolver
- System logging
- Temperature sensor
- Configuration backup via FTP/secure copy

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 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 IPv6 Addressing Architecture
 - RFC 4443 ICMPv6 for the IPv6 Specification
 - RFC 4541 IBMP and MLD snooping services
 - RFC 4552 OSPFv3 Authentication
 - RFC 4861 Neighbor Discovery for IPv6
 - RFC 4862 IPv6 Stateless Address Autoconfiguration
 - RFC 4915 MT-OSPF
 - RFC 5095 Deprecation of Type 0 Routing Headers
 - 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
- 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 using 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 command, 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: 4
 - LAG port monitoring
 - Multiple destination ports monitored to 1 mirror (N:1)
- Maximum number of mirroring sessions: 4
- Mirroring to remote destination (over L2): 1 destination VLAN

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 23° C in compliance with ISO 7779.

Table 3. EX4300 Power Supply Ratings and Acoustic Noise in dBA

Product	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
EX4300-48MP	1400 W AC AFO	53.7
EX4300-48T-DC	550 W DC AFO	39.7
EX4300-48T-DC-AFI	550 W DC AFI	39.7
EX4300-32F	350 W AC AFO	39
EX4300-32F-DC	550 W DC AFO	41.2

Juniper Networks Service 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/uk/en/products-services.

Ordering Information

Product Number	Description
Switches¹	
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 565 W PoE+ power) (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48P	48-port 10/100/1000BASE-T PoE-plus + 1100 W AC PS (provides 950 W PoE+ power) (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48MP	24-port 10/100/1000BASE-T, 24-port 100/1000/2500/5000/10000BASE-T, 95 W PoE + 1400 W AC PS (provides up to 1100 W PoE+ power) (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48T-DC	48-port 10/100/1000BASE-T + 550 W DC PS (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-48T-DC-AFI	48-port 10/100/1000BASE-T + 550 W DC PS (back-to-front airflow) (QSFP+ DAC for Virtual Chassis ordered separately)
EX4300-32F	32-port 100/1000BASE-X SFP, 4x10GBASE-X SFP+, 2x40GBASE-X QSFP+, and 350 W AC PS (optics sold separately)
EX4300-32F-DC	32-port 100/1000BASE-X SFP, 4x10GBASE-X SFP+, 2x40GBASE-X QSFP+, and 550 W DC PS (optics sold separately)
EX4300-24T-TAA	Trade Agreement Act-compliant EX4300, 24-port 10/100/1000BASE-T + 350 W AC PS (QSFP+ DAC for Virtual Chassis and optics ordered separately)
EX4300-48T-TAA	Trade Agreement Act-compliant EX4300, 48-port 10/100/1000BASE-T + 350 W AC PS (QSFP+ DAC for Virtual Chassis and optics ordered separately)
EX4300-48T-AFI-TAA	Trade Agreement Act-compliant EX4300, 48-port 10/100/1000BASE-T + 350 W AC PS (back-to-front airflow) (QSFP+ DAC for Virtual Chassis and optics ordered separately)
EX4300-48T-DC-TAA	Trade Agreement Act-compliant EX4300, 48-port 10/100/1000BASE-T + 550 W DC PS (QSFP+ DAC for Virtual Chassis and optics ordered separately)
EX4300-48T-DCI-TAA	Trade Agreement Act-compliant EX4300, 48-port 10/100/1000BASE-T + 550 W DC PS (back-to-front airflow) (QSFP+ DAC for Virtual Chassis and optics ordered separately)
EX4300-24P-TAA	Trade Agreement Act-compliant EX4300, 24-port 10/100/1000BASE-T PoE-plus + 715 W AC PS (provides 565 W PoE+ power) (QSFP+ DAC for Virtual Chassis and optics ordered separately)
EX4300-48P-TAA	Trade Agreement Act-compliant EX4300, 48-port 10/100/1000BASE-T PoE-plus + 1100 W AC PS (provides 950 W PoE+ power) (QSFP+ DAC for Virtual Chassis and optics ordered separately)
EX4300-32F-TAA	Trade Agreement Act-compliant EX4300, 32-port 100/1000BASE-X SFP, 4x10GBASE-X SFP+, 2x40GBASE-X QSFP+, and 350 W AC PS (optics sold separately)

Product Number	Description
EX4300-32F-	Trade Agreement Act-compliant EX4300,
DC-TAA	32-port 100/1000BASE-X SFP, 4x10GBASE-X SFP+, 2x40GBASE-X QSFP+, and 550 W DC PS (optics sold 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 Licenses²	
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, EX4300-48P, and EX4300-48MP
EX4300-32F-EFL	Enhanced Feature License (EFL) for EX4300-32F and EX4300-32F-DC
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, EX4300-48P, and EX4300-48MP
EX4300-32F-AFL	Advanced Feature License (AFL) for EX4300-32F and EX4300-32F-DC
EX-QFX-MACSEC-ACC3	MACsec Software License for EX4300 and EX4200 access switches
Subscription Licenses	
S-EX-A-C2-3	Software, EX Series Advanced license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches, 3 year
S-EX-A-C2-5	Software, EX Series Advanced license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches, 5 year
S-EX-P-C2-3	Software, EX Series Premium license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches, 3 year
S-EX-P-C2-5	Software, EX Series Premium license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches, 5 year
S-EX-A-C3-3	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 3 year
S-EX-A-C3-5	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 5 year
S-EX-P-C3-3	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 3 year
S-EX-P-C3-5	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 5 year
S-EX-A-C2-3-COR	Software, EX Series Advanced license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches, 3 year with SVC CORE support, 3 year
S-EX-A-C2-5-COR	Software, EX Series Advanced license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches with SVC CORE support, 5 YEAR
S-EX-P-C2-3-COR	Software, EX Series Premium license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches with SVC CORE support, 3 YEAR
S-EX-P-C2-5-COR	Software, EX Series Premium license, Class 2 (24 ports), includes Wired Assurance subscription for EX Series 24-port switches with SVC CORE support, 5 YEAR
S-EX-A-C3-3-COR	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 3 year with SVC CORE support, 3 YEAR
S-EX-A-C3-5-COR	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 3 year with SVC CORE support, 5 YEAR

Product Number	Description
S-EX-P-C3-3-COR	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 3 year with SVC CORE support, 3 YEAR
S-EX-P-C3-5-COR	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Wired Assurance subscription for EX Series 48-port switches, 3 year with SVC CORE support, 5 YEAR
Perpetual Licenses	
S-EX-A-C2-P	Software, EX Series Advanced license, Class 2 (24 ports), Perpetual license for EX4300 24-port switches
S-EX-P-C2-P	Software, EX Series Premium license, Class 2 (24 ports), Perpetual license for EX4300 24-port switches
S-EX-A-C3-P	Software, EX Series Advanced license, Class 3 (32 or 48 ports), Perpetual license for EX4300 48-port switches
S-EX-P-C3-P	Software, EX Series Premium license, Class 3 (32 or 48 ports), Perpetual license for EX4300 48-port switches
EX-QFX-MACSEC-ACC4	MACsec software license for EX3400, EX4300, and EX4200 access switches
Uplink Modules	
EX-UM-4X4SFP	EX4300 4-port 1GbE/10GbE SFP+ Uplink Module for EX4300-24T, EX4300-48T, EX4300-48T-AFI, EX4300-48T-DC, EX4300-48T-DC-AFI, EX4300-24P and EX4300-48P
EX-UM-8X8SFP	EX4300 8-port 1GbE/10GbE SFP+ Uplink Module for EX4300-32F and EX4300-32F-DC
EX-UM-2QSFP	EX4300 2-port 40GbE QSFP+ Uplink Module for EX4300-32F and EX4300-32F-DC
EX-UM-4SFPP-MR	EX4300MP 4-port 1GbE/10GbE SFP+ Uplink Module for EX4300-48MP
EX-UM-2QSFP-MR	EX4300MP 2-port 40GbE QSFP+/2-port 100GbE QSPF28 Uplink Module for EX4300-48MP
Power Supplies	
JPSU-350-AC-AFO	EX4300 350 W AC power supply (power cord needs to be ordered separately) (front-to-back airflow)
JPSU-350-AC-AFI	EX4300 350 W AC power supply with airflow in (power cord needs to be ordered separately) (back-to-front airflow)
JPSU-715-AC-AFO	EX4300 715 W AC power supply (power cord needs to be ordered separately) (front-to-back airflow)
JPSU-1100-AC-AFO	EX4300 1100 W AC power supply (power cord needs to be ordered separately) (front-to-back airflow)
JPSU-1400-AC-AFO	EX4300 1400 W AC power supply for EX4300-48MP (power cord needs to be ordered separately) (front-to-back airflow)
JPSU-550-DC-AFO	EX4300 550 W DC power supply (power cord needs to be ordered separately) (front-to-back airflow)
JPSU-550-DC-AFI	EX4300 550 W DC power supply with air flow in (power cord needs to be ordered separately) (back-to-front airflow)
Fans	
EX4300-FAN	Spare fan with front-to-back airflow
EX4300-FAN-AFI	Spare fan with back-to-front airflow
EX4300-48MP-FAN	Spare fan with front-to-back airflow for EX4300-48MP
Spare Chassis	
EX4300-24P-S	Spare chassis, 24-port 10/100/1000BASE-T PoE-plus (optics, power supplies, and fans sold separately)
EX4300-24T-S	Spare chassis, 24-port 10/100/1000BASE-T (optics, power supplies, and fans sold separately)
EX4300-32F-S	Spare chassis, 32-port 1000BASE-X SFP, 4x10GBASE-X SFP+, 2x40GBASE-X QSFP+ (optics, power supplies, and fans sold separately)
EX4300-48P-S	Spare chassis, 48-port 10/100/1000BASE-T PoE-plus (optics, power supplies, and fans sold separately)
EX4300-48T-S	Spare chassis, 48-port 10/100/1000BASE-T (optics, power supplies, and fans sold separately)

Product Number	Description
EX4300-48MP-S	Spare chassis, 24-port 10/100/1000BASE-T, 48-port 100/1000/2500/5000/10000BASE-T, 95 W PoE (optics, power supplies, and fans sold separately)
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
JNP-QSFP-DAC-5M	QSFP+ to QSFP+ 40GbE Direct Attach Copper (twinax copper cable) 5 m passive
EX-SFP-1FE-FX	SFP 100BASE-FX; LC connector; 1310 nm; 2 km reach on multimode fiber (supported on EX4300-32F and EX4300-32F-DC 100BASE-X fixed ports only)
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; 1310 nm; 10 km reach on single-mode fiber
EX-SFP-1GE-T	SFP 10/100/1000BASE-T copper; RJ-45 connector; 100 m reach on unshielded twisted pair (UTP) (supported on EX4300-32F and EX4300-32F-DC 1000BASE-X fixed ports only)
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; 1310 nm; 220 m reach on multimode fiber
EX-SFP-10GE-LR	SFP+ 10GBASE-LR; LC connector; 1310 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, 1550 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
EX-SFP-GE10KT13R14	SFP 1000BASE-BX; Tx 1310 nm/Rx 1490 nm for 10 km transmission on single-strand, single-mode fiber
EX-SFP-GE10KT14R13	SFP 1000BASE-BX; Tx 1490 nm/Rx 1310 nm for 10 km transmission on single-strand, single-mode fiber
EX-SFP-GE10KT13R15	SFP 1000BASE-BX; Tx 1310 nm/Rx 1550 nm for 10 km transmission on single-strand, single-mode fiber
EX-SFP-GE10KT15R13	SFP 1000BASE-BX; Tx 1550 nm/Rx 1310 nm for 10 km transmission on single-strand, single-mode fiber

*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 in. 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 is recommended for Virtual Chassis connections).

* 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).

* Not available in Russia and CIS countries.

About Juniper Networks

Juniper Networks brings simplicity to networking with products, solutions and services that connect the world. Through engineering innovation, we remove the constraints and complexities of networking in the cloud era to solve the toughest challenges our customers and partners face daily. At Juniper Networks, we believe that the network is a resource for sharing knowledge and human advancement that changes the world. We are committed to imagining groundbreaking ways to deliver automated, scalable and secure networks to move at the speed of business.

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