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Header @ 3

List View

General Information | Contact | Default Values | Discount | Document Information | Clarification Request

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Solicitation Description: Addendum No 1 Networking Equip for Fairmont & Clarksburg Bldg

Total of Header Attachments: 3

Total of All Attachments: 3

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	3.1.1 Extreme Networks 48 Port PoE Network Switch	25.00000	EA	3406.400000	85160.00

Comm Code	Manufacturer	Specification	Model #
43222612			

Commodity Line Comments: Juniper's Ex4100-48P exceeds or meets the Extreme model requirements.
Juniper exceeds the Stacking port requirement of SFP+ DD = with 25GbE stacking interfaces exceeding the Extreme SFP+ DD at 2x 10GbE

Extended Description:

3.1.1 Extreme Networks 48 Port PoE Network Switch (Model 5420F-48P-4XE), or equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	3.1.2 Extreme Networks Multi-Gigabit Network Switch	5.00000	EA	4494.600000	22473.00

Comm Code	Manufacturer	Specification	Model #
43222612			

Commodity Line Comments: Juniper's Ex4100-48P exceeds or meets the Extreme model requirements.
Juniper exceeds the Stacking port requirement of SFP+ DD = with 25GbE stacking interfaces exceeding the Extreme SFP+ DD at 2x 10GbE

Extended Description:

3.1.2 Extreme Networks Multi-Gigabit Network Switch (Model 5420F-16MW-32P-4XE), or equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	3.1.3 Extreme Networks Standard Power Cord, 15A, USA, NEMA 5	30.00000	EA	7.500000	225.00

Comm Code	Manufacturer	Specification	Model #
26121636			

Commodity Line Comments: Standard Black US power cord

Extended Description:

3.1.3 Extreme Networks Standard Power Cord, 15A, USA, NEMA 5-15, IEC320-C15(Part 10099), or equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	3.1.4 Extreme Network 20GBase Direct Attach Cable - 0.5 mete	30.00000	EA	64.750000	1942.50

Comm Code	Manufacturer	Specification	Model #
26121609			

Commodity Line Comments: Juniper Direct attach 0.5m cable connected at 25Gbps exceeds the speed of the Extreme 20Gbps cable.

Extended Description:

3.1.4 Extreme Network 20GBase Direct Attach Cable - 0.5 meters (Part#20G-DACP-SFPDDZ5m), or equal.

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
5	3.1.5 Extreme Networks 20GBase Direct Attach Cable - 1.0 met	5.00000	EA	59.500000	297.50

Comm Code	Manufacturer	Specification	Model #
26121609			

Commodity Line Comments: Juniper Direct attach 1m cable connected at 25Gbps exceeds the speed of the Extreme 20Gbps cable.

Extended Description:

3.1.5 Extreme Networks 20GBase Direct Attach Cable - 1.0 meter (Part# 20G-DACP-SFPDD1M), or equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
6	3.1.6 Extreme Networks 20GBase Direct Attach Cable - 3.0 met	5.00000	EA	96.250000	481.25

Comm Code	Manufacturer	Specification	Model #
26121609			

Commodity Line Comments: Juniper Direct attach 3m cable connected at 25Gbps exceeds the speed of the Extreme 20Gbps cable.

Extended Description:

3.1.6 Extreme Networks 20GBase Direct Attach Cable - 3.0 meters (Part# 20G-DACP-SFPDD3M), or equal.

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
7	3.1.7 Extreme Networks 10GBASE-LR SFP+ Transceiver Module -	30.00000	EA	66.850000	2005.50

Comm Code	Manufacturer	Specification	Model #
43201500			

Commodity Line Comments: Juniper Long Range (LR)Extended Temperature optics Exceed Extreme specifications

Extended Description:

3.1.7 Extreme Networks 10GBASE-LR SFP+ Transceiver Module - 10 Gigabit Ethernet (Part# 10302), or equal.

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
8	3.1.8 Extreme Networks 10GBASE-SR SFP+ Transceiver Module -	30.00000	EA	47.950000	1438.50

Comm Code	Manufacturer	Specification	Model #
43201500			

Commodity Line Comments: Juniper 10G industry Standard Optics. Equal to Extreme

Extended Description:

3.1.8 Extreme Networks 10GBASE-SR SFP+ Transceiver Module - 10 Gigabit Ethernet (Part# 10301), or equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
9	3.1.9 Extreme Networks ExtremeCloud IQ Pilot Subscription	30.00000	EA	462.000000	13860.00

Comm Code	Manufacturer	Specification	Model #
81162000			

Commodity Line Comments: Juniper's MIST 5 year Wired assurance subscription is the industry leading, Gartner recognized leader in network management for wired or wireless networks.
Exceeds Extreme IQ pilot - comparison attached

Extended Description:

3.1.9 Extreme Networks ExtremeCloud IQ Pilot Subscription, or equal

EX4100 LINE OF ETHERNET SWITCHES DATASHEET



Product Overview

The EX4100 line of Ethernet access switches offers secure, cloud-ready access for enterprise campus, branch, and data center networks in the AI era and optimized for the cloud. These platforms boost network performance and visibility, meeting the security demands of today—as well as for networks of the next decade. As part of the underlying infrastructure for [Juniper Mist Wired Assurance](#), the EX4100 line is purpose-built for, and managed by, the cloud. The switches leverage Mist AI to simplify operations and provide better visibility into the experience of connected devices, delivering a refreshing, experience-first approach to access layer switching.

Product Description

The Juniper Networks® EX4100 line of Ethernet Switches offers a secure, cloud-ready portfolio of access switches ideal for enterprise branch, campus, and data center networks. The EX4100 switches combine the simplicity of the cloud, the power of [Mist AI™](#), and a robust hardware foundation with best-in-class security and performance to deliver a differentiated approach to access switching in the cloud, mobile, and IoT era. With Juniper® Mist™ Wired Assurance, the EX4100 line of Switches can be effortlessly onboarded, configured, and managed from the cloud. This simplifies operations, improves visibility, and ensures a much better experience for connected devices.

Key features of the EX4100 include:

- Cloud-ready, driven by Mist AI with Juniper Mist Wired Assurance and [Marvis Virtual Network Assistant](#)
- Ethernet VPN–Virtual Extensible LAN ([EVPN-VXLAN](#)) to the access layer
- Standards-based microsegmentation using group-based policies (GBPs)
- Switch-to-switch encryption using Media Access Control Security (MACsec) AES256
- IEEE 802.3bz Multigigabit
- IEEE 802.3bt Power over Ethernet Plus (PoE++)
- Flow-based telemetry to monitor traffic flows for anomaly detection, ability to measure packet delays and report drop reasons
- Precision Timing Protocol–Transparent Clock
- 10-member Virtual Chassis support

Offering a full suite of Layer 2 and Layer 3 capabilities, the EX4100 enables multiple deployments, including campus, branch, and data center top-of-rack deployments. As scale requirements increase, Juniper's Virtual Chassis technology allows up to 10 EX4100 switches to be seamlessly interconnected and managed as a single device, delivering a scalable, pay-as-you-grow solution for expanding network environments.

The EX4100 family of Ethernet switches consists of the following models:

- The EX4100-48MP, which offers 16 x 100 MB/1GbE/2.5GbE and 32 x 10 MB/100 MB/1GbE Power over Ethernet (PoE++) access ports, delivering up to 90 W per PoE port with an overall total 1620 W of PoE power budget (using two power supplies)
- The EX4100-24MP, which offers 8 x 100 MB/1GbE/2.5GbE/5GbE/10GbE and 16 x 10 MB/100 MB/1GbE PoE++ access ports, delivering up to 90 W per port with an overall total 1620 W of PoE power budget (using two power supplies)
- The EX4100-24T, which offers 24 x 1GbE non-PoE access ports
- The EX4100-24P, which offers 24 x 1GbE PoE+ access ports, delivering up to 30 W per port with an overall total 1440 W of PoE power budget (using two power supplies)
- The EX4100-48T, which offers 48 x 1GbE non PoE-access ports
- The EX4100-48P, which offers 48 x 1GbE PoE+ access ports, delivering up to 30 W per port with an overall total 1440 W of PoE power budget (using two power supplies)

Each EX4100 model offers 4 x 1/10GbE small form-factor pluggable plus transceiver (SFP+) fixed uplink ports. The EX4100 switches include 4 x 10GbE/25GbE SFP28 ports to support Virtual Chassis connections, which can be reconfigured for use as Ethernet ports for uplink connectivity. EX4100 switches also include high availability (HA) features such as redundant, hot-swappable power supplies and field-replaceable fans to ensure maximum uptime. In addition, -24 port and -48 port Multi-Gigabit Ethernet EX4100 switch models offer standards-based 802.3af/at/bt (PoE/PoE+/PoE++) for delivering up to 90 watts on any access port. The EX4100 switches can be configured to deliver fast PoE capability, which enables the switches to deliver PoE power to connected PoE devices within a few seconds of power being applied to the switches.

Architecture and Key Components

Cloud Management with Juniper Mist Wired Assurance Driven by Mist AI

EX4100 switches can be quickly and easily onboarded (Day 0), provisioned (Day 1), and managed (Day 2+) from the cloud with Juniper Mist Wired Assurance, which brings AI-powered automation and insights that optimize experiences for end users and connected devices. The EX4100 provides rich Junos® operating system telemetry data for Mist AI, which helps achieve simpler operations, shorter mean time to repair (MTTR), and streamlined troubleshooting. For more information, read the [Juniper Mist Wired Assurance datasheet](#).

In addition to Juniper Mist Wired Assurance, Marvis Virtual Network Assistant—a key part of The Self-Driving Network™—makes the Mist AI engine interactive. A digital extension of the IT team, Marvis offers automatic fixes or recommended actions, allowing IT teams to streamline how they troubleshoot and manage their network operations.

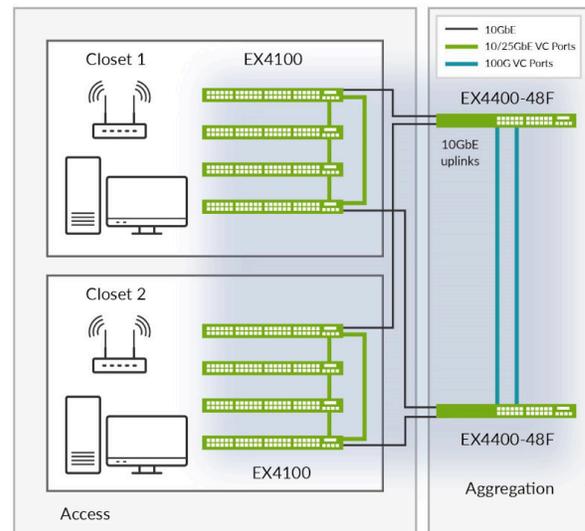


Figure 1: EX4100 Virtual Chassis configuration interconnected via dedicated front-panel 25GbE ports

EVPN-VXLAN Technology

Most traditional campus networks have a single-vendor, chassis-based architecture that worked well for smaller, static campuses with few endpoints. However, this approach is too rigid to support the changing needs of modern campus networks. The EX4100 supports EVPN-VXLAN, extending an end-to-end fabric from campus core to distribution to the access layer.

An EVPN-VXLAN fabric is a simple, programmable, highly scalable architecture built on open standards. This technology can be applied in both data centers and campuses for architectural consistency. A campus EVPN-VXLAN architecture uses a Layer 3 IP-based underlay network and an EVPN-VXLAN overlay network. A flexible overlay network based on a VXLAN overlay with an EVPN control plane efficiently provides Layer 2 and/or Layer 3 connectivity throughout the network. EVPN-VXLAN also offers a scalable way to build and interconnect multiple campus sites, delivering:

- Greater consistency and scalability across all network layers
- Multivendor deployment support
- Reduced flooding and learning
- Location-agnostic connectivity
- Consistent network segmentation
- Simplified management

Virtual Chassis Technology

Juniper's Virtual Chassis technology allows multiple interconnected switches to operate as a single, logical unit, enabling users to manage all platforms as one virtual device. Up to 10 EX4100 switches can be interconnected as a Virtual Chassis using 4 x 25GbE SFP28 dedicated front-panel ports. Although configured as Virtual Chassis ports by default, the 4 x 25GbE SFP28 uplinks can also be configured as uplink ports. The EX4100 switches can form a Virtual Chassis with any other models within the EX4100 product line.

Microsegmentation Using Group-Based Policy

GBP leverages underlying VXLAN technology to provide location-agnostic endpoint access control. This allows network administrators to implement consistent security policies across the enterprise network domains. The EX4100 supports a standards-based GBP solution, allowing different levels of access control for endpoints and applications even within the same VLAN. Customers can simplify their network configuration by using GBP, avoiding the need to configure large numbers of firewall filters on all their switches. GBP can block lateral threats by ensuring consistent application of security group policies throughout the network, regardless of the location of endpoints and/or users.

Flow-Based Telemetry

Flow-based telemetry enables flow-level analytics, allowing network administrators to monitor thousands of traffic flows on the EX4100 without burdening the CPU. This improves network security by monitoring, baselining, and detecting flow anomalies. For example, if predefined flow thresholds are breached due to an attack, IP Flow Information Export (IPFIX) alerts can be sent to an external server to quickly identify the attack. Network administrators can also automate specific workflows, such as further examining the traffic or quarantining a port, to triage the issue. In addition to DOS attacks, Flow-Based Telemetry on EX4100 switches can measure packet delays at ingress, chip, and egress points, as well as report drop reasons.

Features and Benefits

Simplified Operations with Juniper Mist Wired Assurance

The EX4100 is fully cloud onboarded, provisioned, and managed by Juniper Mist Wired Assurance. The EX4100 is designed from the ground up to deliver the rich telemetry that enables [AI for IT Operations \(AIOps\)](#) with simplified operations from Day 0 to Day 2 and beyond. Juniper Mist Wired Assurance provides detailed switch insights for easier troubleshooting and improved time to resolution by offering the following features:

- **Day 0 operations**—Onboard switches seamlessly by claiming a greenfield switch or adopting a brownfield switch with a single activation code for true plug-and-play simplicity.
- **Day 1 operations**—Implement a template-based configuration model for bulk rollouts of traditional and campus fabric deployments, while retaining the flexibility and control required to apply custom site- or switch-specific attributes. Automate provisioning of ports via Dynamic Port Profiles.
- **Day 2 operations**—Leverage the AI in Juniper Mist Wired Assurance to meet service-level expectations such as throughput, successful connects, and switch health with key pre- and post-connection metrics (see Figure 1). Add the self-driving capabilities in Marvis Actions to detect loops, add missing VLANs, fix misconfigured ports, identify bad cables, isolate flapping ports, and discover persistently failing clients (see Figure 2). And perform software upgrades easily through Juniper Mist Cloud.

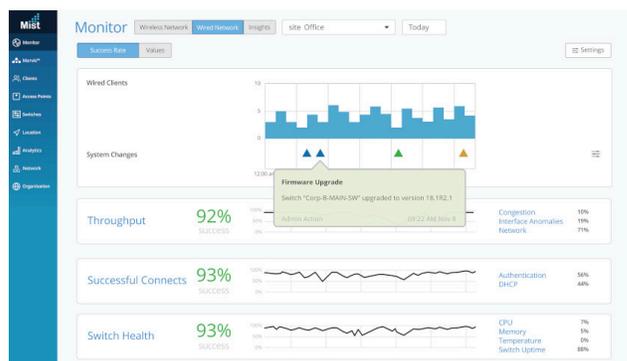


Figure 2: Juniper Mist Wired Assurance service-level expectations screen

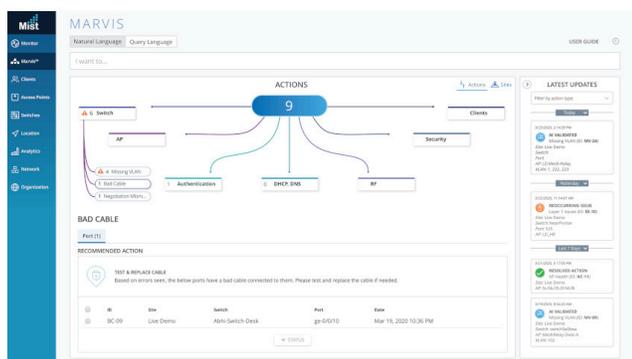


Figure 3: Marvis Actions for wired switches

The complimentary addition of Marvis 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 [Juniper Networks EX Series Switches](#) or recommended actions for external systems.

For more information, see [Juniper Mist Wired Assurance](#).

Campus Fabric Deployments

EVPN-VXLAN for Campus Core, Distribution, and Access

The main advantages of EVPN-VXLAN in campus networks are:

- Flexibility of consistent VLANs across the network: Endpoints can be placed anywhere in the network and remain connected to the same logical L2 network, enabling a virtual topology to be decoupled from the physical topology.
- Microsegmentation: The EVPN-VXLAN-based architecture lets you deploy a common set of policies and services across campuses with support for L2 and L3VPNs.
- Scalability: With an EVPN control plane, enterprises can scale out easily by adding more core, aggregation, and access layer devices as the business grows without having to redesign the network or perform a forklift upgrade. Using an L3 IP-based underlay coupled with an EVPN-VXLAN overlay, campus network operators can deploy much larger and more resilient networks than would otherwise be possible with traditional L2 Ethernet-based architectures.

Juniper offers complete flexibility in choosing any of the following validated EVPN-VXLAN campus fabrics that cater to networks of different sizes, scale, and segmentation requirements:

EVPN multihoming (on collapsed core or distribution): A collapsed core architecture combines the core and distribution layers into a single layer, turning the traditional three-tier hierarchical network into a two-tier network. EVPN Multihoming on a collapsed core eliminates the need for Spanning Tree Protocol (STP) across campus networks by providing link aggregation capabilities from the access layer to the core layer. This topology is best suited for small to medium distributed enterprise networks and allows for consistent VLANs across the network. This topology uses ESI (Ethernet Segment Identifier) LAG (Link Aggregation) and is a standards-based protocol.

Campus Fabric Core distribution: When EVPN VXLAN is configured across core and distribution layers, it becomes a campus Fabric Core Distribution architecture, which can be configured in two modes: centrally or edge routed bridging overlay. This architecture provides an opportunity for an administrator to move towards campus-fabric IP Clos without fork-lift upgrade of all access switches in the existing network, while bringing in the advantages of moving to a campus fabric and providing an easy way to scale out the network.

Campus Fabric IP Clos: When EVPN VXLAN is configured on all layers including access, it is called the campus fabric IP Clos architecture. This model is also referred to as “end-to-end,” given that VXLAN tunnels are terminated at the access layer. Due to the availability of VXLAN at access, it provides us with the opportunity to bring policy enforcement to the access layer (closest to the source) using Group Based Policy (GBP). Standards-based GBP tags bring the unique option to segment traffic both at a micro and macro level. GBP tags are assigned dynamically to clients as part of Radius transaction by Mist Cloud NAC. This topology works for small-medium and large campus architectures that need macro and micro segmentation.

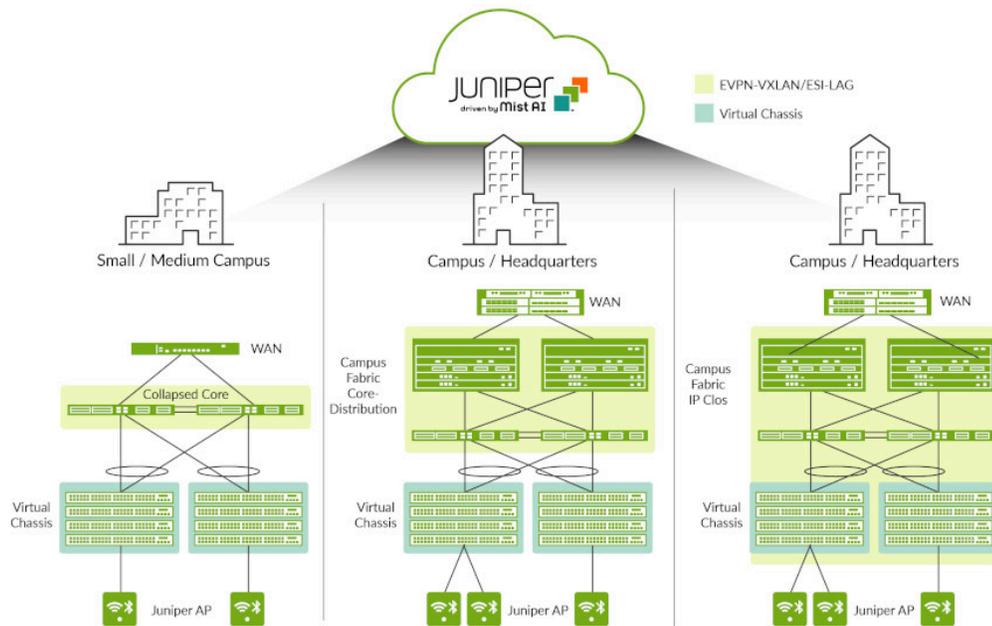


Figure 4: Campus fabrics showing Virtual Chassis and EVPN-VXLAN-based architectures

All three topologies are standards-based and interoperable with third-party vendors.

The EX4100 switches can be deployed in campus and branch access layer networks in the EVPN-VXLAN architectures shown in Figure 4.

Managing AI-Driven Campus Fabric with the Juniper Mist Cloud

Juniper Mist Wired Assurance brings cloud management and Mist AI to the campus fabric. It sets a new standard that moves away from traditional network management towards AI-driven operations, while delivering better experiences to connected devices. Juniper Mist Cloud streamlines deployment and management of campus fabric architectures by allowing:

- Automated deployment and zero-touch deployment (ZTD)
- Anomaly detection
- Root cause analysis

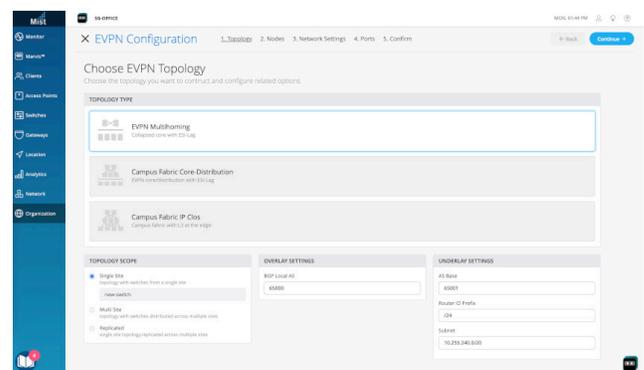


Figure 5: EVPN multihoming configuration via the Juniper Mist cloud

Chassis-Class Availability

The EX4100 switches deliver high availability through redundant power supplies and fans, graceful Routing Engine switchover (GRES), and nonstop bridging and routing when deployed in a Virtual Chassis configuration.

In a Virtual Chassis configuration, each EX4100 switch is capable of functioning as a Routing Engine (RE). When two or more EX4100 switches are interconnected, a single control plane is shared among all Virtual Chassis member switches. 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 RE 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 active routing (NSR), and nonstop bridging (NSB) capabilities of Junos OS, assures a smooth transfer of control plane functions following unexpected failures.

The EX4100 implements the same slot/module/port numbering scheme as other Juniper 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, greatly simplifying overall system maintenance and management.

Individually, the EX4100 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 EX4100 with true carrier-class reliability.

- **Redundant power supplies:** The EX4100 line of switches supports redundant, load-sharing, hot-swappable, and field-replaceable power supplies to maintain uninterrupted operations. Thanks to its compact footprint, the EX4100 requires significantly less power than chassis-based switches delivering equivalent port densities.
- **Hot-swappable fans:** The EX4100 includes hot-swappable fans, providing sufficient cooling (for a short duration) even if one of the fans were to fail.
- **Nonstop bridging and nonstop active routing:** NSB and NSR on the EX4100 ensure that control plane protocols, states, and tables are synchronized between primary and standby REs to prevent protocol flaps or convergence issues following an RE failover.
- **Redundant trunk group (RTG):** To avoid the complexities of STP without sacrificing network resiliency, the EX4100 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.
- **IPv4 and IPv6 routing support:** IPv4 and IPv6 Layer 3 routing (OSPF and BGP) is available with a Flex license, enabling highly resilient networks.

MACsec AES256

The EX4100 switches support IEEE 802.1ae MACsec with AES-256-bit encryption to increase security of point-to-point traffic communications. MACsec provides encrypted communication at the link layer that is capable of identifying and preventing threats from denial of service (DoS) and other 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 ports, the traffic is encrypted on the wire, but the traffic inside the switch is not. This allows the switch to apply network policies such as quality of service (QoS) or deep packet inspection (DPI) to each packet without compromising the security of packets on the wire.

PoE/PoE+/PoE++ Power, Perpetual and Fast PoE

The EX4100 delivers PoE for supporting connected devices such as phones, surveillance cameras, IoT devices, and 802.11AX/Wi-Fi 6 access points, offering a PoE power budget of up to 1620W and supporting up to 90W per port based on the IEEE 802.3bt PoE standard.

EX4100 switches support perpetual PoE, which provides uninterrupted power to connected PoE powered devices (PDs) even when the EX4100 switch is rebooting.

The EX4100 switches also support a fast PoE capability that delivers PoE power to connected endpoints during a switch power-up, even before the switch is fully operational. This is especially beneficial in situations where the endpoint only needs the power and is not necessarily dependent on network connectivity.

Junos Telemetry Interface

The EX4100 supports Junos telemetry interface (JTI), a modern telemetry streaming feature designed for switch health and performance monitoring. Sensor data can be streamed to a management system at configurable periodic intervals, enabling network administrators to monitor individual link and node utilization as well as troubleshoot issues such as network congestion in real time. JTI delivers the following features:

- Performance management by provisioning sensors to collect and stream data and analyze application and workload flow paths through the network
- Capacity planning and optimization by proactively detecting hotspots and monitoring latency and microbursts
- Troubleshooting and root cause analysis via high-frequency monitoring and correlation of overlay and underlay networks

Junos Operating System

The EX4100 switches run [Junos OS](#), Juniper's powerful and robust network operating system that powers all Juniper switches, routers, and firewalls. 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 and employs a highly available modular architecture to prevent isolated failures from bringing down an entire system.

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

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 Flex 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 EX4100 switches support both subscription and perpetual Flex licenses. Subscription licenses are offered for three- and five-year terms. In addition to Junos OS features, the Flex Advanced and Flex Premium subscription licenses include Juniper Mist Wired Assurance. Flex Advanced and Flex 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 about Junos OS EX Series licenses, please visit: <https://www.juniper.net/documentation/us/en/software/license/licensing/topics/concept/flex-licenses-for-ex.html>.

Enhanced Limited Lifetime Warranty

The EX4100 includes an enhanced 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 trays are covered for a period of five years. For complete details, please visit <https://support.juniper.net/support/pdf/warranty/990240.pdf>.

Product Options

Available EX4100 models are listed in Table 1.

Table 1. EX4100 Line of Ethernet Switches

Model/Product SKU	Access Port Configuration	PoE/PoE +Ports	PoE+ +Ports	PoE Budget 1 PSU/2 PSU	10GbE Ports	25GbE Ports	Power Supply Rating	Cooling
EX4100-24T	24-port 10/100/1000BASE-T	0	0	N/A	4	4	150 W AC	AFO (front-to-back airflow)
EX4100-48T	48-port 10/100/1000BASE-T	0	0	N/A	4	4	150 W AC	AFO (front-to-back airflow)
EX4100-48T-AFI	48-port 10/100/1000BASE-T	0	0	N/A	4	4	150 W AC	AFI (back-to-front airflow)
EX4100-24T-DC	24-port 10/100/1000BASE-T	0	0	N/A	4	4	150 W DC	AFO (front-to-back airflow)
EX4100-48T-DC	48-port 10/100/1000BASE-T	0	0	N/A	4	4	150 W DC	AFO (front-to-back airflow)
EX4100-24P	24-port 10/100/1000BASE-T	24	0	740 W/1440 W	4	4	920 W AC	AFO (front-to-back airflow)
EX4100-48P	48-port 10/100/1000BASE-T	48	0	740 W/1440 W	4	4	920 W AC	AFO (front-to-back airflow)
EX4100-24MP	8x 100 MB/1GbE/2.5GbE/5GbE/10GbE + 16x 10 MB/100 MB/1GbE	0	24	740W/1620 W	12	4	920 W AC	AFO (front-to-back airflow)
EX4100-48MP	16x 100 MB/1GbE/2.5GbE + 32x 10 MB/100 MB/1GbE	0	48	740 W/1620 W	4	4	920 W AC	AFO (front-to-back airflow)

The EX4100 also offers spare chassis options without power supplies or fans, providing customers with the flexibility to stock SKUs (see Table 2). See the Ordering Information section for additional details.

Table 2. EX4100 Spare Chassis SKUs

Spare Chassis SKU	Description	JPSU-150-AC-AFO + EX4100-FAN-AFO	JPSU-150-AC-AFI + EX4100-FAN-AFI	JPSU-150-DC-AFO + EX4100-FAN-AFO	JPSU-920-AC-AFO + EX4100-FAN-AFO
EX4100-24T-CHAS	Spare chassis, 24-port 10/100/1000BASE-T	Y	X	Y	X
EX4100-48T-CHAS	Spare chassis, 48-port 10/100/1000BASE-T	Y	Y	X	X
EX4100-24P-CHAS	Spare chassis, 24-port 10/100/1000BASE-T	X	X	X	Y
EX4100-48T-CHAS	Spare chassis, 48-port 10/100/1000BASE-T	X	X	Y	X
EX4100-24MP-CHAS	Spare chassis, 8x100 MB/1GbE/2.5GbE/5GbE/10GbE + 16x10 MB/100 MB/1GbE ports	X	X	X	Y
EX4100-48MP-CHAS	Spare chassis, 16x100 MB/1GbE/2.5GbE + 32x10 MB/100 MB/1GbE ports	X	X	X	Y

Y = supported; X = not supported



Figure 6: EX4100 line of Switches

EX4100 Line Specifications

Physical Specifications

Backplane

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

Power Options

- Power supplies: Autosensing; 100-120 V/200-240 V; 150 W, 920 W AC AFO, and 150 W AC AFI dual load sharing hot-swappable internal redundant power supplies
- Maximum current inrush: 30 amps
- DC power supply: 150 W DC AFO; input voltage range 48-60 V max; 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)

- Base Unit: 17.36 x 1.72 x 13.78 in (44.1 x 4.37 x 35 cm)
- With power supply installed: 17.36 x 1.72 x 15.05 in (44.1 x 4.37 x 38.24 cm)
- Height: 1 U

System Weight

- EX4100-24T switch (with no power supply or fan module): 9.72 lb (4.41 kg)
- EX4100-24P switch (with no power supply or fan module): 10 lb (4.54 kg)
- EX4100-48T switch (with no power supply or fan module): 10 lb (4.54 kg)
- EX4100-48P switch (with no power supply or fan module): 10.27 lb (4.66 kg)
- EX4100-24MP switch (with no power supply or fan module): 10.06 lb (4.57 kg)
- EX4100-48MP switch (with no power supply or fan module): 10.41 lb (4.72 kg)
- 150 W AC power supply: 1.43 lb (0.65 kg)
- 150 W DC power supply: 1.43 lb (0.65 kg)
- 920 W AC power supply: 1.87 lb (0.85 kg)
- Fan module: 0.16 lb (0.07 kg)

Environmental Ranges

- Operating temperature: 32° to 113° F (0° to 45° C)
- Storage temperature: -40° to 158° F (-40° to 70° C)

- Operating altitude: Up to 5000 ft at 40° C (1828.8 m)
- Nonoperating altitude: Up to 16,000 ft (4877 m)
- Relative humidity operating: 5% to 90% (noncondensing)
- Relative humidity non-operating: 0% to 90% (noncondensing)

Cooling [CFM] - Total maximum airflow with two power supplies and fans

- Field-replaceable fans: 2
- EX4100-24MP : 60.9
- EX4100-48MP : 61.7
- EX4100-24T : 65.6
- EX4100-24T-DC : 64.8
- EX4100-24P : 61.6
- EX4100-48T : 65.8
- EX4100-48T-DC : 66.2
- EX4100-48T-AFI : 61.8
- EX4100-48P : 64.1

Hardware Specifications Switching Engine Mode

- Store and forward

Memory

- DRAM: 4 GB with Error Correcting Code (ECC) on all models
- Storage: 8 GB on all models

CPU

- 1.7 GHz ARM CPU on all models

GbE Port Density per System

- EX4100-24P/24T: 32 (24 1GbE host ports + 4 10GbE/25GbE ports + 4 1GbE/10GbE ports)
- EX4100-48P/48T: 56 (48 1GbE host ports + 4 10GbE/25GbE ports + 4 1GbE/10GbE ports)
- EX4100-24MP: 32 (8 10GbE host ports + 16 1GbE host ports + 4 10GbE/25GbE ports + 4 1GbE/10GbE ports)
- EX4100-48MP: 56 (16 2.5GbE host ports + 32 1GbE host ports + 4 10GbE/25GbE ports + 4 port 1GbE/10GbE ports)

Physical Layer

- Time domain reflectometry (TDR) for detecting cable breaks and shorts: EX4100-24P/T and EX4100-48P/T, EX4100-24MP and EX4100-48MP

- Auto medium-dependent interface/medium-dependent interface crossover (MDI/MDIX) support: EX4100-24P/T, EX4100-48P/T, EX4100-24MP and EX4100-48MP
- Port speed downshift/setting maximum advertised speed on
 - 10/100/1000BASE-T ports on EX4100-24P/T and EX4100-48P/T
 - 100/1000BASE-T/2.5GBASE-T/5GBASE-T/10GBASE-T on EX4100-24MP
 - 100/1000BASE-T/2.5GBASE-T on EX4100-48MP

Packet Switching Capacities (Maximum with 64 Byte Packets)

- EX4100-24P/24T: 164 Gbps (unidirectional)/328 Gbps (bidirectional)
- EX4100-48P/48T: 188 Gbps (unidirectional)/376 Gbps (bidirectional)
- EX4100-24MP: 236 Gbps (unidirectional)/472 Gbps (bidirectional)
- EX4100-48MP: 212 Gbps (unidirectional)/424 Gbps (bidirectional)

Software Specifications

Layer 2/Layer 3 Throughput (Mpps) (Maximum with 64 Byte Packets)

- EX4100-48P/T 279 Mpps
- EX4100-24P/T 244 Mpps
- EX4100-48MP 315 Mpps
- EX4100-24MP 351 Mpps

Security

- Media Access Control (MAC) limiting (per port and per VLAN)
- Allowed MAC addresses: 64,000
- Dynamic Address Resolution Protocol (ARP) dynamic ARP inspection (DAI)
- IP source guard
- Local proxy ARP
- Static ARP support
- Dynamic Host Configuration Protocol (DHCP) snooping
- Captive portal
- Persistent MAC address configurations
- Distributed denial of service (DDoS) protection (CPU control path flooding protection)

Layer 2 Switching

- Maximum MAC addresses per system: 64,000
- Jumbo frames: 9216 bytes

- Range of possible VLAN IDs: 1 to 4094
- Virtual Spanning Tree (VST) instances: 253
- 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: Class of service (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 802.3bz: 2.5GBASE-T and 5GBASE-T
- IEEE 802.3ae: 10-Gigabit Ethernet
- IEEE 802.3by: 25-Gigabit Ethernet
- IEEE 802.3af: Power over Ethernet
- IEEE 802.3at: Power over Ethernet Plus
- IEEE 802.3bt: 90 W Power over Ethernet
- 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 Spanning Tree Protocol (MSTP)
- Number of MST instances supported: 64
- Number of VLAN Spanning Tree Protocol (VSTP) instances supported: 253
- 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: 8
- 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: 32,650 prefixes; 32,150 host routes
- Maximum number of IPv4 multicast routes in hardware: 16,100 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: 1000

Layer 3 Features: IPv6

- Maximum number of neighbor discovery (ND) entries: 16,000
- Maximum number of IPv6 unicast routes in hardware: 16,200 prefixes; 16,050 host routes
- Maximum number of IPv6 multicast routes in hardware: 8000 multicast routes
- Routing protocols: RIPv6, OSPFv3, IPv6, IS-IS
- Static routing

Access Control Lists (ACLs) (Junos OS Firewall Filters)

- ACL entries (ACE) in hardware per system:
 - Port-based ACL (PACL) ingress: 4092
 - VLAN-based ACL (VAACL) ingress: 4092
 - Router-based ACL (RAACL) ingress: 4092
 - Port-based ACL (PACL) egress: 1022
 - VLAN-based ACL (VAACL) egress: 511
 - Egress across RAACL: 1022
 - 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 router advertisement (RA) guard
- IPv6 Neighbor Discovery Inspection
- MACsec

High Availability

- Redundant, hot-swappable power supplies
- Redundant, field-replaceable, hot-swappable fans
- 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, IS-IS, IGMP v1, v2, v3

Quality of Service

- L2 QoS
- L3 QoS
- Ingress policing: 1 rate 2 color
- Hardware queues per port: 12 (8 unicast + 4 multicast)
- Scheduling methods (egress): Strict priority (SP), weighted deficit round-robin (WDRR)
- 802.1p, DiffServ code point (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
- Protocol Independent Multicast-Sparse Mode (PIM-SM), PIM Source-Specific Mode (PIM-SSM), PIM Dense Mode (PIM-DM)

Management and Analytics Platforms

- Juniper Mist Wired Assurance for campus
- Junos Space® Network Director for campus
- Junos Space Management Applications

Device Management and Operations

- Junos OS CLI
- Out-of-band management: Serial; 10/100/1000BASE-T Ethernet
- Rescue configuration
- Configuration rollback
- Image rollback
- RMON (RFC2819) groups 1, 2, 3, 9
- Remote performance monitoring
- SNMP: v1, v2c, v3
- 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 6614 RadSec
- 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-pimdm-05.txt, draft-ietf-pim-dm-new-v2-04.txt
- 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

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

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

Electromagnetic Compatibility (EMC) Requirements

- FCC 47 CFR Part 15
- ICES-003 / ICES-GEN
- EN 300 386 V1.6.1
- EN 300 386 V2.1.1
- EN 55032
- CISPR 32
- EN 55024
- CISPR 24
- EN 55035
- CISPR 35
- IEC/EN 61000 Series
- AS/NZS CISPR 32
- VCCI-CISPR 32
- BSMI CNS 13438
- KN 32 and KN 35
- KN 61000 Series
- TEC/SD/DD/EMC-221/05/OCT-16
- TCVN 7189
- TCVN 7317

Safety Requirements Chassis and Optics

- CAN/CSA-C22.2 No. 62368-1 and 60950-1
- UL 62368-1 and 60950-1
- IEC 62368-1 and 60950-1 (All country deviations): CB Scheme report
- IEC 62368-3 for USB and PoE: CB Scheme report
- CFR, Title 21, Chapter 1, Subchapter J, Part 1040
- REDR c 1370 OR CAN/CSA-E 60825-1-Part 1
- IEC 60825-1
- IEC 60825-2

Energy Efficiency

- AT&T TEER (ATIS-06000015.03.2013)
- ECR 3.0.1
- ETSI ES 203 136 V.1.1.1
- Verizon TEEER (VZ.TPR.9205)

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: Acoustic in dBA

Model Number	Acoustics Noise (dBA) – Typical (1 PSU)	Acoustics Noise (dBA) – Maximum (2 PSU)
EX4100-24T	NA	38.0
EX4100-48T	NA	39.2
EX4100-24T-DC	NA	37.6
EX4100-48T-DC	NA	37.7
EX4100-48T-AFI	NA	38.2
EX4100-24P	39.4	50.1
EX4100-48P	38.7	48.2
EX4100-24MP	38.9	51.1
EX4100-48MP	36.8	54.3

Typical: Acoustics measurement at 50% PoE load with 1 Power Supply Unit installed.
Maximum: Acoustics measurement at 100% PoE load with 2 Power Supply Units installed.

Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing costs and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit <https://www.juniper.net/us/en/products.html>.

Table 4: EX4100 Power Supply Ratings

Product	Power Supply Rating
EX4100-24T	150 W AC AFO
EX4100-48T	150 W AC AFO
EX4100-48T-AFI	150 W AC AFI
EX4100-24T-DC	150 W DC AFO
EX4100-48T-DC	150 W DC AFO
EX4100-24P	920 W AC AFO
EX4100-48P	920 W AC AFO
EX4100-24MP	920 W AC AFO
EX4100-48MP	920 W AC AFO

Ordering Information

Product	Description
EX4100-48MP	Multigigabit 48 port, PoE++ (up to 90 W) switch with 16x100 MB/1GbE/2.5GbE + 32x10 MB/100 MB/1GbE, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW, optics sold separately.
EX4100-48MP-TAA	Multigigabit 48 port, PoE++ (up to 90 W) switch with 16x100 MB/1GbE/2.5GbE + 32x10 MB/100 MB/1GbE, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW, optics sold separately, TAA-compliant.
EX4100-24MP	Multigigabit 24 port, PoE++(up to 90 W) switch with 8x100 MB/1GbE/2.5GbE/5GbE/10GbE + 16x10 MB/100 MB/1GbE, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW, optics sold separately.
EX4100-24MP-TAA	Multigigabit 24 port, PoE++(up to 90 W) switch with 8x100 MB/1GbE/2.5GbE/5GbE/10GbE + 16x10 MB/100 MB/1GbE, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW, optics sold separately, TAA-compliant.
EX4100-48P	48-port 10/100/1000BASE-T PoE+ switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW. optics sold separately.
EX4100-48P-TAA	48-port 10/100/1000BASE-T PoE+ switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW. optics sold separately, TAA-compliant.
EX4100-24P	24-port 10/100/1000BASE-T PoE+ switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW, optics sold separately.
EX4100-24P-TAA	24-port 10/100/1000BASE-T PoE+ switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-920-AC-AFO included with Standard SW, optics sold separately, TAA-compliant.
EX4100-48T	48-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-AC-AFO included with Standard SW, optics sold separately.
EX4100-48T-TAA	48-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-AC-AFO included with Standard SW, optics sold separately, TAA-compliant.
EX4100-24T	24-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-AC-AFO included with Standard SW, optics sold separately.
EX4100-24T-TAA	24-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-AC-AFO included with Standard SW, optics sold separately, TAA-compliant.
EX4100-48T-AFI	48-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, back-to-front airflow, 1x JPSU-150-AC-AFI included with Standard SW, optics sold separately.
EX4100-48T-AFI-TAA	48-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, back-to-front airflow, 1x JPSU-150-AC-AFI included with Standard SW, optics sold separately, TAA-compliant.
EX4100-48T-DC	48-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-DC-AFO included with Standard SW, optics sold separately.
EX4100-48T-DC-TAA	48-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-DC-AFO included with Standard SW, optics sold separately, TAA-compliant.

Product	Description
EX4100-24T-DC	24-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-DC-AFO included with Standard SW, optics sold separately.
EX4100-24T-DC-TAA	24-port 10/100/1000BASE-T switch, 4x10GbE uplinks, 4x25GbE stacking/uplink ports, MACsec AES256, redundant fans, 1x JPSU-150-DC-AFO included with Standard SW, optics sold separately, TAA-compliant.
Perpetual Licenses	
S-EX-A-C2-P	Software, EX Series Advanced license, Class 2 (24 ports), Perpetual license for EX4100 24-port switches
S-EX-P-C2-P	Software, EX Series Premium license, Class 2 (24 ports), Perpetual license for EX4100 24-port switches
S-EX-A-C3-P	Software, EX Series Advanced license, Class 3 (32 or 48 ports), Perpetual license for EX4100 48-port switches
S-EX-P-C3-P	Software, EX Series Premium license, Class 3 (32 or 48 ports), Perpetual license for EX4100 48-port switches
S-EX-MACSEC-C2-P	Software, EX Series MACsec license, Class 2 (24 ports), Perpetual license for EX4100 24-port switches
S-EX-MACSEC-C3-P	Software, EX Series MACsec license, Class 3 (48 ports), Perpetual license for EX4100 48-port switches
S-EX4100-FBT-P	Software, EX Series Flow Based Telemetry License. Perpetual license for all EX4100 switches.
Subscription Licenses	
S-EX-A-C2-1	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches, 1 year
S-EX-A-C2-3	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches, 3 year
S-EX-A-C2-5	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches, 5 year
S-EX-P-C2-1	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches, 1 year
S-EX-P-C2-3	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches, 3 year
S-EX-P-C2-5	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches, 5 year
S-EX-A-C3-1	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches, 1 year
S-EX-A-C3-3	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA 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 Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches, 5 year
S-EX-P-C3-1	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches, 1 year
S-EX-P-C3-3	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA 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 Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches, 5 year
S-EX-A-C2-1-COR	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC CORE support, 1 year
S-EX-A-C2-3-COR	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC CORE support, 3 year

Product	Description	Product	Description
S-EX-A-C2-5-COR	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC CORE support, 5 year	S-EX-A-C2-1-SD	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC SAME DAY support, 1 year
S-EX-P-C2-1-COR	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC CORE support, 1 year	S-EX-A-C2-3-SD	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC SAME DAY support, 3 year
S-EX-P-C2-3-COR	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC CORE support, 3 year	S-EX-A-C2-5-SD	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC SAME DAY support, 5 year
S-EX-P-C2-5-COR	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC CORE support, 5 year	S-EX-P-C2-1-SD	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC SAME DAY support, 1 year
S-EX-A-C3-1-COR	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC CORE support, 1 year	S-EX-P-C2-3-SD	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC SAME DAY support, 3 year
S-EX-A-C3-3-COR	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC CORE support, 3 year	S-EX-P-C2-5-SD	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC SAME DAY support, 5 year
S-EX-A-C3-5-COR	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC CORE support, 5 year	S-EX-A-C3-1-SD	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC SAME DAY support, 1 year
S-EX-P-C3-1-COR	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC CORE support, 1 year	S-EX-A-C3-3-SD	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC SAME DAY support, 3 year
S-EX-P-C3-3-COR	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC CORE support, 3 year	S-EX-A-C3-5-SD	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC SAME DAY support, 5 year
S-EX-P-C3-5-COR	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC CORE support, 5 year	S-EX-P-C3-1-SD	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC SAME DAY support, 1 year
S-EX-A-C2-1-ND	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC NEXT DAY support, 1 year	S-EX-P-C3-3-SD	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC SAME DAY support, 3 year
S-EX-A-C2-3-ND	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC NEXT DAY support, 3 year	S-EX-P-C3-5-SD	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC SAME DAY support, 5 year
S-EX-A-C2-5-ND	Software, EX Series Advanced license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC NEXT DAY support, 5 year		
S-EX-P-C2-1-ND	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC NEXT DAY support, 1 year	Power Supplies	
S-EX-P-C2-3-ND	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC NEXT DAY support, 3 year	JPSU-150-AC-AFO	EX Series 150 W AC power supply (power cord needs to be ordered separately) (front-to-back airflow)
S-EX-P-C2-5-ND	Software, EX Series Premium license, Class 2 (24 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 24-port switches with SVC NEXT DAY support, 5 year	JPSU-150-AC-AFI	EX Series 150 W AC power supply (power cord needs to be ordered separately) (back-to-front airflow)
S-EX-A-C3-1-ND	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC NEXT DAY support, 1 year	JPSU-150-DC-AFO	EX Series 150 W DC power supply (power cord needs to be ordered separately) (front-to-back airflow)
S-EX-A-C3-3-ND	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC NEXT DAY support, 3 year	JPSU-920-AC-AFO	EX Series 920 W DC power supply (power cord needs to be ordered separately) (front-to-back airflow)
S-EX-A-C3-5-ND	Software, EX Series Advanced license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC NEXT DAY support, 5 year		
S-EX-P-C3-1-ND	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC NEXT DAY support, 1 year	Fans	
S-EX-P-C3-3-ND	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC NEXT DAY support, 3 year	EX4100-FAN-AFO	Spare fan with front-to-back airflow
S-EX-P-C3-5-ND	Software, EX Series Premium license, Class 3 (32 or 48 ports), includes Juniper Mist Wired Assurance and VNA subscription for EX Series 48-port switches with SVC NEXT DAY support, 5 year	EX4100-FAN-AFI	Spare fan with back-to-front airflow
		Mounting Options	
		EX-4PST-RMK	Adjustable 4-post rack-mount kit for EX4100
		EX-WMK	Wall-mount kit for EX4100
		EX-RMK	EX Series Rack Mount Kit
		Spare Chassis	
		EX4100-48MP-CHAS	Spare chassis, 16x100 MB/1GbE/2.5GbE + 32x10 MB/100 MB/1GbE ports PoE++ (optics, power supplies, and fans sold separately)
		EX4100-24MP-CHAS	Spare chassis, 8x100 MB/1GbE/2.5GbE/5GbE/10GbE + 16x10 MB/100 MB/1GbE ports PoE++ (optics, power supplies, and fans sold separately)
		EX4100-48P-CHAS	Spare chassis, 48-port 10/100/1000BASE-T PoE+ (optics, power supplies, and fans sold separately)
		EX4100-24P-CHAS	Spare chassis, 24-port 10/100/1000BASE-T PoE+ (optics, power supplies, and fans sold separately)
		EX4100-48T-CHAS	Spare chassis, 48-port 10/100/1000BASE-T (optics, power supplies, and fans sold separately)

About Juniper Networks

Juniper Networks believes that connectivity is not the same as experiencing a great connection. Juniper's AI-Native Networking Platform is built from the ground up to leverage AI to deliver the best and most secure user experiences from the edge to the data center and cloud. Additional information can be found at Juniper Networks (www.juniper.net) or connect with Juniper on X (Twitter), LinkedIn, and Facebook.

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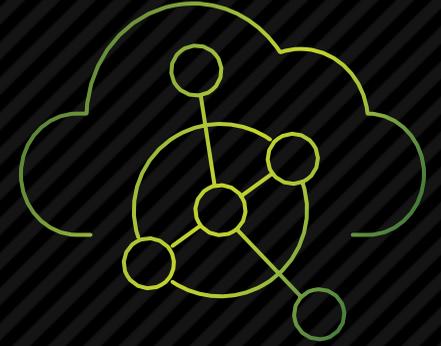
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Wired and Wireless LAN Solutions Comparison Guide

Uncover the differences: Juniper's AI-native vs traditional networking solutions for campus and branch



Explore Juniper's AI-native wired and wireless solutions

A side-by-side comparison with Cisco Meraki, Cisco Catalyst, Aruba ESP, Extreme Networks ExtremeCloud, and Arista CloudVision. Discover the key features to consider when building out your campus and branch network.



Essential wireless features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Installation	<p>●●●●●</p> <p>Mist installation app (iOS and Android) simplifies access point (AP) installation:</p> <ul style="list-style-type: none"> Scan QR code, claim AP, and place it on the site and map “Top-of-ladder” pictures remain in AP record if there are building changes <p>Auto provisioning increases provisioning speeds by more than 5x, enabling AP plug-and-play functionality for automatic:</p> <ul style="list-style-type: none"> Site assignment Dynamic profile assignment AP name generation <p>AP auto placement and auto orientation reduce on-site validation requirements (fewer truck rolls):</p> <ul style="list-style-type: none"> Machine learning for AP placement Automatically place all APs for greenfield, validate placements for brownfield ServiceNow Day 0/1 integration for enhanced automated provisioning/ configuration workflows 	<p>●</p> <p>App just for monitoring, no installation help</p> <p>No AP auto placement</p> <p>ServiceNow integration is complex, limited capabilities, dependent on additional ServiceNow paid applications</p>	<p>●●</p> <p>Basic app, many clicks, hard to use</p> <p>Self-locating APs</p> <ul style="list-style-type: none"> GPS required in APs (not available indoors) More configuration requirements may be needed depending on environmental factors 	<p>●●</p> <p>No Catalyst Center App</p> <p>AP Auto Location</p> <ul style="list-style-type: none"> GPS required in APs (not available indoors) More configuration requirements depending on environments Cisco Spaces license required for AP auto location for on-premises 	<p>●</p> <p>ExtremeCloud IQ companion, medium- class app with inventory, location, basic visibility, and summaries</p> <p>No AP auto placement</p>	N/A

Essential wireless features Day 1

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Fast AP boot	 APs boot under 20 seconds (AP45 boots under 45 seconds)	 Several minutes	 Several minutes	 Several minutes	 Several minutes	 Several minutes
Automation and optimization	 AI for AX to automate and optimize Wi-Fi 7, 6E, and 6 network settings	 Lacks AI capabilities Manual, static configuration of features Some basic automation, usually generating alerts	 Lacks AI capabilities Manual, static configuration of features All development done in AOS 10 while almost all customers are on AOS 8 and the transition process is manual	 Lacks AI capabilities	 No AI for optimization	 Automation via CloudVision for wired No automation support for Wireless in Cognitive Unified Edge (CUE)
Inline microsegmentation	 WLAN classifies IoT headless devices and segments by policy	 Adaptive policy with proprietary protocols	 Stateful firewall controller IoT classification requires ClearPass \$\$\$	 Manual, static configuration of features Requires ISE Catalyst Center	 Relies on a combination of several elements from Extreme Networks to provide microsegmentation Requires extra licenses, equipment, and/or software Containers supported on AP	 Supported in wired Endpoint identity and microperimeter tags "Zero Trust" policy planning with traffic map Microperimeter enforcement in the network or redirect to Firewall Continuous Traffic monitoring and visibility of policy violations No Microsegmentation in wireless. They only have U-PSK

Essential wireless features Day 2

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
<p>Personal WLAN (private user groups)</p> <p>●●●●●</p> <p>Self-serve personal WLAN for segmentation</p> <p>Unique PSK</p> <p>Scalable</p> <p>Watch video</p>	<p>●</p> <p>Shared PSK or requires one SSID per group</p>	<p>●●</p> <p>Requires ClearPass (\$\$\$) for user/role segmentation</p> <p>Shared PSK (24)</p>	<p>●</p> <p>Requires ISE (\$\$\$) for user/role segmentation</p> <p>Shared PSK</p>	<p>●●</p> <p>Controller allows limited user/role segmentation.</p> <p>Shared PSK</p> <p>PPSK supported, but unable to find maximum supported keys</p>	<p>●●●●</p> <p>Unique PSK that share a single SSID and a single VLAN</p>	
<p>AI-driven RF optimization (RRM)</p> <p>●●●●●</p> <p>Based on reinforcement learning:</p> <ul style="list-style-type: none"> Optimizes channel/power with AI-native reinforcement learning AI continuously optimizes user experience (Service Level Expectations (SLEs) and minimizes interference in real time Continuously and dynamically adapts and learns from client experiences as network capacity changes Learns and deprioritizes triggered DFS channels to boost network uptime Coverage SLE is an ongoing 'site survey' <p>Watch video</p>	<p>●●</p> <p>Meraki's AI-Powered Auto RF is significantly different than the AI-Enhanced RRM on the Cisco Catalyst Center</p> <p>AI-Powered Auto RF provides basic RRM:</p> <ul style="list-style-type: none"> Auto Channel dynamically adjusts the channels of the client-serving radios Will monitor DFS failure patterns APs remember their settings through power failures Won't make changes during 'busy hours' 	<p>●●</p> <p>ARM provides basic pattern recognition for comparing and optimizing low-level RF settings only across managed sites</p> <p>Not a true AI solution:</p> <ul style="list-style-type: none"> Doesn't leverage reinforcement learning to improve over time Doesn't adjust RF to maximize user experience Analyzes periodical and static data for daily but not ongoing dynamic updates Requires Controller and Mobility Master for AirMatch RF optimization Requires data collector appliances and NetInsight server 	<p>●●</p> <p>15-year-old algorithm</p> <ul style="list-style-type: none"> Based on how APs hear each other Optimizes channel/power based solely on AP interference graph RRM is performed on a static, periodic basis when the load is low AI-Enhanced RRM is only available on Cisco Catalyst Center for on-prem wireless solution 	<p>●</p> <p>No AI/ML</p> <p>Basic RRM that requires several days of tuning</p>	<p>●●●</p> <p>Only Basic RRM</p> <p>No AI Driven</p> <p>Dynamic Channel Selection</p> <p>Power Adjustment</p> <p>Self healing algorithm</p>	

Essential wired features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Wired assurance for provisioning and management	 Measure wired experiences with SLEs Switch templates offered within UI; use CLI for corner cases Dynamic port config that works with any RADIUS server Port profiles with manual or dynamic config based on endpoint type	 Limited insight into wired experience Switch templates are model-specific Dynamic port config only works for Meraki APs No concept of port profiles; ports must be tagged individually	 Limited insight into wired experience Many features require CLI templates Dynamic port config requires ClearPass and Mobility Controller with lock-in architectures Port profiles require cumbersome manual config	 Requires on-premises Catalyst Center appliance No UI-based templates and CLI is switch model- and version-specific Expertise required in template builder Dynamic port config not supported, but supported in greenfield with Cisco-only devices and ISE No port profiles	 Limited insight into wired experience Many features require CLI templates Port profiles very limited configurations No automatic RMA No user/client experience supported	 Wired Assurance is managed through CloudVision Monitors jitter and latency of applications
Telemetry	 API-driven and leverages telemetry data from Juniper EX Series Switches to offer anomaly detection and identify when switch health is trending negatively	 Limited telemetry	 Telemetry for wireless, but very limited for wired switching	 Limited telemetry No telemetry for user/device connections or experience	 Telemetry for wireless and limited for wired switching	 Real-time streaming of telemetry data from switch to CloudVision on Wired network No telemetry on wireless
Stacking capabilities	 10-member stacking with standards DAC and flexible optics of various lengths up to 960 Gbps	 8-member stacking	 10-member stacking	 8-member StackWise with proprietary cables and max of 3m length	 8-member stacking high bandwidth Can support up to 40km stacking distance Supports different Gbps links	 No stacking concept CloudVision can manage multiple switches as entity

Essential wired features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
High availability for redundancy	 <p>Virtual Chassis leads the wiring closet solution with NSSU, GRES, high-capacity backplane, and more</p> <p>Juniper switches support redundant hot-swappable power supplies and fans</p> <p>Offers a variety of choices: MC-LAG, ESI-LAG, EVPN- VXLAN</p>	 <p>Only stacking</p>	 <p>Only offers VSX for distribution</p>	 <p>Only stacking on Catalyst switching with stack power</p>	 <p>Virtual chassis: SummitStack</p> <p>Field-replaceable PSUs and fans</p> <p>Supports rolling stack upgrades</p>	 <p>Wired supports HA</p> <p>MLAG</p> <p>VRRP</p>
Multigigabit	 <p>1/2.5/5/10GbE speeds</p>	 <p>1/2.5/5/10GbE speeds</p>	 <p>1/2.5/5/10GbE speeds</p>	 <p>1/2.5/5/10GbE speeds</p>	 <p>1/2.5/5/10/40GbE speeds</p>	 <p>10M/1G/2.5G/5G/10G speeds</p>
Power over Ethernet	 <p>UPoE/PoE/PoE+</p>	 <p>UPoE/PoE/PoE+</p>	 <p>Up to 60W</p>	 <p>UPoE/PoE/PoE+</p>	 <p>UPoE/PoE/PoE+/UPoE+</p>	 <p>UPoE/PoE/PoE+</p>
Integrated network access control	 <p>Compatible with third parties, including Forescout, ClearPass, ISE, FreeRADIUS, and more</p>	 <p>Only ISE integration</p>	 <p>ClearPass is compatible with third parties such as Forescout, ISE, and Checkpoint</p>	 <p>ISE and Catalyst Center do not work with third parties</p>	 <p>Supported unified policy management</p> <p>For cloud-native management, ExtremeCloud IQ only supports Extreme Universal ZTNA with cloud-hosted RADIUS server</p>	 <p>NAC is achieved through AGNI for wired</p> <p>Better than ClearPass/ISE</p> <p>Good number of integration points</p> <p>But configuration is in separate portal</p>

Essential wired features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Security	<p>●●●●●</p> <p>Juniper Connected Security brings visibility and enforcement to every part of the network</p> <p>SecIntel leverages EX switches to quarantine compromised devices and Juniper APs to monitor signs of compromise in connected devices</p> <p>MACsec 256 on Select platforms</p> <p>FedRAMP</p>	<p>●●●</p> <p>ISE and Cisco Secure Cloud Analytics</p> <p>Integration with Open DNS</p>	<p>●●●●</p> <p>ClearPass and Policy Enforcement Firewalls (PEFs) deliver enhanced visibility and policy enforcement</p> <p>Reliance on partners for integrated security</p> <p>FedRAMP(cert)</p>	<p>●●●●</p> <p>ISE and Cisco Secure Cloud Analytics integration with Open DNS</p> <p>Additional licenses on top of DNA Essentials and DNA Advantage licenses, plus enterprise agreements</p>	<p>●●●</p> <p>Radsec IPsec</p>	<p>●●</p> <p>Needs 3rd party products like PaloAlto or Zscaler for security</p>
Common hardware building blocks	<p>●●●●●</p> <p>One operating system (Junos OS) across the Juniper hardware portfolio</p> <p>Common building blocks for WAN, WLAN, and wired networks</p>	<p>●●●</p> <p>One OS but requires complete different set of hardware (MX/MS/MR)</p> <p>Catalyst switching and wireless platforms only monitored from Meraki platform</p>	<p>●●</p> <p>Convergence of HP and Aruba switches</p> <p>New OS</p> <p>CX runs on specific hardware platforms leading to a mix of operating systems</p>	<p>●●</p> <p>Multiple non-integrated products that each have their own OS</p> <p>Some components can be migrated to the Meraki Cloud (losing features)</p> <p>Hardware dependencies force upgrades to be Catalyst Center-ready; Meraki requires a completely different set of hardware</p>	<p>●●●</p> <p>Different depending on the line</p> <p>New version of white-box- like open switch</p> <p>Two different switch OSs to choose from:</p> <p>ExtremeXOS (XOS) or VOSS (fabric OS), depending on the use case</p>	<p>●●●</p> <p>Wired: Switches runs on single EOS</p> <p>Wireless: Different APs might need different versions of code to run on them</p>
Fabric architectures	<p>●●●●●</p> <p>EVPN-VXLAN, GPB, MC-LAG, ESI-LAG, VC supports 10 devices for stacking and microsegmentation</p>	<p>—</p>	<p>●●</p> <p>Poor resiliency with limited EVPN-VXLAN capabilities</p>	<p>●●●●</p> <p>SDA only has support for EVPN-VXLAN (proprietary using LISP)</p> <p>EVPN-VXLAN supported on platforms, but no automation platform for large deployments</p>	<p>●●●</p> <p>Virtual Chassis for enterprise supports BPG-EVPN</p> <p>Lacks deep visibility on ExtremeCloud IQ</p>	<p>●●●</p> <p>EVPN for campus and wireless terminate on the switch</p>

Essential wired features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Multivendor support	 <p>Built on open standard technologies, such as EVPN-VXLAN, and NAC</p>	 <p>No fabric (EVPN-VXLAN) support in Meraki cloud</p>	 <p>On-premises AirWave can support multivendor</p> <p>Cloud Central has announced limited visibility</p>	 <p>Proprietary protocols</p>	 <p>Built with open standards but options are limited</p> <p>Extreme's on-premises solution, ExtremeCloud IQ-Site Engine, supports third-party devices using SNMP</p> <p>Supports visibility of third-party devices in ExtremeCloud IQ</p>	 <p>CloudVision, CUE, and AGNI works only with Arista products</p>

Essential access features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Cloud-native NAC	<p>●●●●●</p> <p>Juniper Access Assurance provides:</p> <ul style="list-style-type: none"> Automatic scaling Built-in redundancy and Geo redundancy Built-in Geo Affinity for lowest possible latency Automatic periodic hitless feature and security updates with no downtime Easy cloud-to-cloud integrations 	<p>●</p> <p>In Beta release</p> <ul style="list-style-type: none"> No third-party support, only Meraki managed MRs/ Switches. No migration plans for customers No support for true enterprise-grade use cases - Cloud-native vs “Shard-cloud” architecture 	<p>●●●</p> <p>With ClearPass, HPE’s on-prem NAC solution, customers need to design, plan, and deploy NAC infrastructure considering:</p> <ul style="list-style-type: none"> Number of client devices Redundancy requirements Geo-affinity requirements <p>Any feature or security update requires:</p> <ul style="list-style-type: none"> Downtime planning Manual execution for every server in the cluster Cloud Authentication & Authorization in Networking <p>Central considerations:</p> <ul style="list-style-type: none"> Tailored to a very limited number of use cases Oriented at small businesses 	<p>●</p> <p>Customers need to design, plan, and deploy NAC infrastructure considering:</p> <ul style="list-style-type: none"> Number of client devices Redundancy requirements Geo-affinity requirements <p>Feature and security updates require:</p> <ul style="list-style-type: none"> Downtime planning Manual execution for every server in the cluster 	<p>●</p> <p>Customers need to design, plan, and deploy NAC infrastructure considering:</p> <ul style="list-style-type: none"> Number of client devices Redundancy requirements Geo-affinity requirements <p>Feature or security updates require:</p> <ul style="list-style-type: none"> Downtime planning Manual execution for every server in the cluster 	<p>●●●●</p> <p>Cloud-native NAC AGNI CV-CUE for wireless</p>

Essential access features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Simplified policy management	<p>●●●●●</p> <p>Single page for policy creation and management with unified labels</p> <ul style="list-style-type: none"> Automated policy logic Hit count to maintain clean policy structure AI-infused device fingerprinting that is tied to policies 	<p>●</p> <p>In beta release</p> <p>No template-based port management</p> <p>Cumbersome hierarchical policy framework</p> <p>Error-prone policies that provide no visibility</p> <p>Policy pile-up is a common problem</p> <p>No Eduroam</p>	<p>●●●</p> <p>ClearPass</p> <p>Multiple pages in the UI to configure various Service Set elements (e.g., enforcement profiles, roles and role mapping policies, service sets, and dictionaries)</p> <p>No unified view to see all the policies</p> <p>Understanding and debugging hierarchy is complicated</p> <p>Cloud authorization</p> <p>Very simple configuration</p> <p>Extremely limited functionality</p>	<p>●●</p> <p>Multiple pages in the UI to configure various policy elements (e.g., authorization profiles, dictionaries, and conditions)</p> <p>No unified view to see all the policies</p> <p>Understanding and debugging hierarchy is complicated</p>	<p>●●</p> <p>Multiple tabs and no unified view to see all the policies</p> <p>Understanding and debugging hierarchy is difficult</p>	<p>●●●</p> <p>CloudVision for Wired</p> <p>CUE for wireless and AGNI for NAC does not talk to each other, you have to configure separately</p>

Essential access features

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
End-to-end visibility	<p>●●●●●</p> <p>Client visibility across wired, wireless, and NAC</p> <p>Complete visibility from onboarding to sequences of events</p>	<p>●</p> <p>In beta release</p> <p>No end-to-end client visibility</p>	<p>●</p> <p>No end-to-end client-event visibility</p> <p>No sequence of events across wired, wireless, and NAC</p> <p>When troubleshooting client connectivity experience issues, customers must check the debug access tracker on ClearPass for authentication failures and use a different product to troubleshoot the network (e.g., WLC, Central, Airwave)</p> <p>Cloud authorization</p> <p>Visibility is separate from network operations</p>	<p>●</p> <p>No end-to-end client-event visibility and no sequence of events across wired, wireless, and NAC</p> <p>When troubleshooting client connectivity experience issues, customers must check debug Live Logs on ISE for authentication failures and use a different product to troubleshoot the network (e.g., WLC, DNAC)</p>	<p>●●</p> <p>Limited end-to-end client-connection experience visibility in case of using Extreme Management Center and Extreme Control</p> <p>Not available inside the Extreme XIQ cloud</p> <p>No visibility into granular client network connectivity experience like DHCP, ARP, and DNS</p>	<p>●●</p> <p>No end-to-end visibility</p> <p>Have to look at CUE for data related to AP and check CloudVision for wired</p>
AI-infused NAC	<p>●●●●●</p> <p>Marvis AI Assistant validates every user networking experience across wired, wireless, WAN, and NAC</p> <p>Automatically identifies issues that could impact network and user experience</p> <p>Highlights persistently failing clients or offenders</p> <p>Allows admins to take action and ignore distracting “noise”</p> <p>Provides easy hierarchical debugging and troubleshooting</p>	<p>●</p> <p>In beta release</p> <p>No conversational interface or hierarchical debugging</p> <p>No built-in CMDB</p>	<p>●</p> <p>No conversational interface or hierarchical debugging</p> <p>Aruba Central AI Insights is nothing more than legacy alerting with all the noise</p> <p>All troubleshooting processes require manual investigation of per-client logs in different products</p>	<p>●</p> <p>No conversational interface or hierarchical debugging</p> <p>Troubleshooting processes require manual investigation of per-client logs in different products, such as ISE, Catalyst Center, and WLC</p>	<p>●</p> <p>No conversational interface or hierarchical debugging</p> <p>All troubleshooting processes require manual investigation of per-client logs in either Extreme Management Center or Extreme XIQ Cloud, with limited visibility provided by the logs</p> <p>Extreme XIQ AI-like features are still in early days and do not provide any substantial benefit</p>	<p>●●●</p> <p>No equivalent for Marvis Minis</p> <p>Sensor testing based by converting an AP</p>

Architecture

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Core design	<p>●●●●●</p> <p>Controller-free modern microservices architecture</p> <p>Service containerization</p> <p>Quick and focused low risk feature updates</p> <p>Near-real-time bug fixing without network disruption</p> <p>Watch video</p>	<p>●●●</p> <p>Server (data center) based cloud</p> <p>Legacy sharded database in hosted database “cloud” (containerized)</p> <p>Virtual controller-based</p> <p>Trying to implement shard-based microservices</p>	<p>●●</p> <p>Aruba ESP is the redesign of Aruba Central (updated Airwave) with management</p> <p>Controller-based architecture has four different clouds</p> <p>Users must upgrade, maintain and integrate all the software</p> <p>Monolithic code bases are expensive to scale and difficult to manage</p> <p>Limited API support</p>	<p>●</p> <p>Controller-based legacy monolithic software architecture</p> <p>Catalyst Center requires lots of hardware and boxes all needing proper versions</p> <p>Confusing cloud solution, if managed by Meraki (a new option)</p>	<p>●●●</p> <p>Third-generation cloud</p> <p>Legacy sharded database in hosted database “cloud”</p> <p>Virtual controller-based</p> <p>Controller-based legacy monolithic software architecture</p> <p>Lack of strong cloud solution</p> <p>Lots of hardware and boxes all needing proper versions</p>	<p>●●●</p> <p>Server (DC) based cloud</p> <p>Legacy sharded database in hosted database ‘cloud’ (containerized)</p> <p>No microservices</p>
Scalability	<p>●●●●●</p> <p>Elastic vertical and horizontal scale</p> <p>No expensive hardware required</p>	<p>●</p> <p>Complex and non-elastic</p> <p>Virtual controllers (containers) hosted in co-located data centers</p>	<p>●●</p> <p>Non-elastic with more gateways or controllers required</p> <p>Push to Aruba Central</p>	<p>●●</p> <p>Non-elastic with more controllers required</p>	<p>●●●</p> <p>Complex and non-elastic</p> <p>Virtual controllers hosted in co-located data centers</p> <p>Require separate servers and controllers to scale</p> <p>On-site controllers stacked</p>	<p>●</p> <p>Non elastic</p> <p>More complex</p>
User interface	<p>●●●●●</p> <p>Easy to configure with complete flexibility on what is visible and in what order</p>	<p>●●●</p> <p>Attractive dashboard with limited customizability</p>	<p>●●</p> <p>Aruba Central = Airwave with a new wrapper</p> <p>Not customizable</p> <p>Need to “look for things”</p>	<p>●</p> <p>Bulky user interface</p> <p>Non-intuitive</p> <p>Basic things are hard to find</p>	<p>●●●</p> <p>Attractive dashboard with limited customizability</p>	<p>●●</p> <p>CloudVision, CUE, AGNI looks similar but needs training and time to pick up, not as intuitive as Meraki</p>

Architecture

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Programmability	 <p>100% accessible through APIs</p> <p>Support for complete IT automation, such as ticketing or web alerts</p> <p>Watch video</p>	 <p>Limited set of APIs</p> <p>Configuration scale is only available via their APIs</p>	 <p>Limited set of APIs</p> <p>Main switching portfolio has limited APIs, and the new Aruba OS-CX-based switches with APIs lack features and have minimal customer traction</p>	 <p>Limited set of APIs</p>	 <p>API portal under ExtremeCloud IQ (the no-cost UI is not based on APIs)</p> <p>Limited set of APIs to input information</p> <p>Very confusing depending on the type of the controller and Swagger availability</p>	 <p>Wired – yes</p> <p>Switches have advanced programmability (Python, VI, linux)</p> <p>Wireless, no support</p>
Deployment flexibility and cloud management	 <p>Scale from the largest to the smallest enterprise businesses for rapid updates</p> <p>Single-click activation for streamlined rollouts</p> <p>Wired, Wi-Fi, and WAN Assurance for full lifecycle management</p> <p>ZTP Configuration across AP, Switch, and WAN gateway</p> <p>Template-driven</p> <p>Use site variables to easily customize as needed</p>	 <p>Virtual controllers hosted in co-located data centers</p>	 <p>Controller/gateway for large customers, Aruba Central for small to mid-size customers; monolithic architecture</p> <p>No hierarchical configuration</p> <p>Offers on-premises and cloud solutions</p> <p>Offered across different applications</p> <p>Will offer on-prem cloud option \$\$\$\$</p>	 <p>On-premises with no cloud offering for SDA</p> <p>Relies on a centralized, proprietary controller</p>	 <p>Microservices co-located data centers</p> <p>Controller/gateway for large customers; monolithic architecture</p> <p>Offers on-premises and cloud solutions</p> <p>Offered across different applications</p>	 <p>ZTP on wired</p> <p>No wireless ZTP</p> <p>Templates for Wired and Wireless</p>

Architecture

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Resiliency	<p>●●●●●</p> <p>Microservice containerization</p> <p>The failure of one service doesn't impact others</p> <p>Network remains running if not connected to cloud</p>	<p>●●●●</p> <p>Redundant virtual controllers</p> <p>Microservices implementation is in infancy</p>	<p>●●●●</p> <p>Very complex with more hardware required (controllers, mobility masters)</p> <p>Each piece of hardware needs proper software versions</p> <p>Version compatibility matrix is highly complex</p>	<p>●●●</p> <p>Complex with more hardware required</p> <p>Each piece of hardware needs proper software versions</p> <p>Requires Cisco Catalyst Center (3+) appliances</p> <p>Version compatibility matrix is complex and requires manual translation</p> <p>Complex licensing</p>	<p>●●●</p> <p>On-prem with more hardware required</p> <p>Each piece of hardware needs proper software versions</p> <p>Version compatibility matrix supports only some controllers, not all</p> <p>ExtremeCloud IQ not defined</p>	<p>●●●</p> <p>Arista has resiliency for Wired: VSS and ISSU</p>
Agility	<p>●●●●●</p> <p>Modern, microservices-based cloud, instead of monolithic code base</p> <p>Rapid updates without network disruption</p>	<p>●●</p> <p>Still building data centers</p> <p>Beginning to use microservices for specific applications such as 'splash pages'</p>	<p>●</p> <p>Controller software is monolithic (brittle) with poor ability to update for new devices/apps/fixes</p> <p>High risk to update Aruba Central</p> <p>Scheduled downtimes last for hours (not microservices)</p> <p>Aruba ClearPass scales by adding more ClearPass servers</p>	<p>●</p> <p>Cisco Catalyst Center</p> <p>Monolithic (brittle) software with poor ability to update for new devices/apps/fixes</p> <p>Multiple servers that all need right code versions</p> <p>High risk to update</p> <p>Steep learning curve</p>	<p>●●</p> <p>Controllers and hypervisors</p> <p>Slow updates</p> <p>Microservices architecture</p>	<p>●●</p> <p>Sharded architecture</p> <p>Cloud down for upgrades</p> <p>Management won't be available during upgrade of cloud</p>

Artificial Intelligence

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Virtual network assistant	 <p>Performs root cause analysis for most detected network issues</p> <p>Supports wireless, wired, and WAN at site level</p> <p>Troubleshoots issues instead of pulling logs</p> <p>Accessible through WebUI or API</p> <p>Built on 10+ years of continuous learning and rich data science toolbox</p>	<p>No virtual assistant</p>	<p>No virtual assistant</p>	<p>No virtual assistant</p>	 <p>Dashboard and network assistant only on cloud</p> <p>ExtremeCloud IQ CoPilot chatbot provides limited support:</p> <ul style="list-style-type: none"> No AI Allows NLP version 1.0 No query In beta since 2022 	 <p>Arista's AVA is not as advanced as Juniper's</p>
Digital experience twins	 <p>Full stack (wireless, wired, and WAN)</p> <p>Proactive digital simulation of user connection</p> <p>Auto learn scope</p> <p>Auto expands validation scope to identify if failure is specific to a device, switch, or site</p> <p>Included in Marvis AI Assistant subscription (no additional hardware or software needed)</p>	 <p>Requires a separate subscription for ThousandEyes support on MX</p>	 <p>Needs external cape sensor, no auto-learn and scope expansion</p>	 <p>Requires a separate subscription for ThousandEyes, support on Catalyst 9K switch</p>	 <p>CoPilot Digital Twin helps build network in demo mode</p> <p>No Day 1-365 applicability</p>	 <p>No equivalent for Marvis Minis</p>

Artificial Intelligence

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Application Experience Insights (Large Experience Model – LEM)	 <p>Application experience insights: Provide cloud integration with Zoom and Teams</p> <p>Identify bad user Call experience minutes</p> <p>Combine Teams and Zoom metrics with network and client parameters to provide a root cause for a bad user experience minute</p>	<p>No support for classifying good/bad voice call user minutes</p>	 <p>Aruba UCC still relies on Skype approach</p> <p>Classification solely based on Mean Opinion Score (MOS)</p>	 <p>Provides a list of MS Teams calls</p> <p>Shows network performance trends (latency, loss, jitter)</p>	<p>No support for classifying good/bad voice call user minutes</p>	 <p>No MS Teams or Zoom integration</p>
Location finding of devices and clients	 <p>AI-native creation of probability surfaces in the cloud and ongoing unsupervised machine learning to constantly update the model</p>	 <p>First-generation anomaly detection algorithm using six weeks of historic data</p>	 <p>Triangulation dependent on accurate map placement</p> <p>Errors introduced by variance in BLE clients</p>	 <p>Requires CMX appliance onsite (even for Cisco Spaces)</p> <p>Requires third-party BLE integration</p> <p>Triangulation dependent on accurate map placement</p> <p>Errors introduced by variance in BLE clients</p>	<p>Not available</p>	 <p>Supported for wireless</p>

Artificial Intelligence

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
LLM integration	 <p>Advanced NLP for user intent: Marvis AI Assistant leverages advanced Natural Language Processing (NLP) to understand the root of user questions and goals</p> <p>Conversational troubleshooting and insights: The conversational interface supports natural language inquiries for troubleshooting network issues or seeking user experience insights</p> <p>Human-like support with LLM: Juniper has integrated LLM capabilities to enhance Marvis AI Assistant's conversational interface, offering more human-like interactions for documentation and support needs</p>	 <p>Very early stages of LLM usage</p>	 <p>LLM support for Summarizing responses to config questions</p>	 <p>Very early stages of LLM usage</p>	 <p>Very early stages of LLM usage</p>	 <p>Very early stages of LLM usage</p>

Artificial Intelligence

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Anomaly detection	<p>●●●●●</p> <p>Proactively identifies anomalies and uses data science tools to determine root cause</p> <p>Leverages both wired and wireless SLEs for anomaly detection</p> <p>Third-generation algorithm with autoregressive integrated moving average (ARIMA) boosts efficacy</p> <p>Performs anomaly detection across Wi-Fi, LAN, WAN, data center, and security domains</p>	<p>●●</p> <p>First-generation anomaly detection algorithm using six weeks of historic data</p>	<p>●</p> <p>Limited set of anomaly detection (DHCP, AAA, RF utilization)</p> <p>Requires NetInsight data collector appliance</p>	<p>●</p> <p>First-generation anomaly detection algorithm</p> <p>Limited anomaly detection (DHCP, AAA, association, throughput)</p>	<p>●●●</p> <p>Client 360 tracks basic anomalies</p> <p>Pilot and CoPilot supported</p> <p>First-generation anomaly detection algorithm</p> <p>Limited anomaly detection (latency, throughput, airtime)</p>	N/A
Self-driving capabilities	<p>●●●●●</p> <p>Marvis Actions Framework for self-driving or driver-assist mode (e.g., RF optimization, proactive RMA, unhealthy APs, missing VLANs, bad cables, port stuck, misconfigured VLAN, and switch config errors)</p> <p>Validated by Marvis AI</p> <p>Customer service to solve or help train system</p> <p>Closed-loop feedback providing actionable intel to administrators "bottoms up"</p>	<p>●</p> <p>Dashboards</p> <p>No self-driving capabilities</p> <p>Will offer "suggestions"</p> <p>Top-down digging</p>	<p>●</p> <p>Dashboards</p> <p>No self-driving capabilities</p> <p>Includes basic "driver-assist" capabilities that provide recommendations to IT:</p> <p>Identifies channel utilization issues and poor DHCP/AAA performance for manual IT investigation</p> <p>Top-down digging for next-generation log files</p>	<p>●</p> <p>Dashboards</p> <p>No self-driving capabilities</p> <p>Top-down:</p> <p>Requires "nomination" of a troubled user to begin any active monitoring</p>	<p>●</p> <p>Dashboards generated by basic math</p> <p>Relies on "drive-assist" capabilities to provide recommendations to IT</p> <p>Limited self-driving capabilities (latency, throughput, airtime)</p>	No equivalent

Artificial Intelligence

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
AI-driven support	<p></p> <p>The Juniper Mist platform Support utilizes Marvis AI Assistant, the industry's only AI-native virtual network assistant, to troubleshoot issues</p> <p>Juniper continuously evaluates Marvis AI Assistant's efficacy</p> <p>When data or an answer is not available for a given support issue, we train Marvis AI Assistant or add the missing data</p> <p>When Marvis AI Assistant detects a hardware failure in an AP, it can perform an automatic RMA, minimizing the need to escalate issues with a vendor along with the "burden of proof" on IT teams</p> <p>Even with a rapid increase in AP deployments, Marvis has eliminated support ticket growth</p> <p>AI Care provides an AI-native support experience as part of Juniper Wi-Fi, Wired, or WAN Assurance subscription</p>	<p></p> <p>Dashboards</p> <p>No use of AI to automate support or support operations</p>	<p></p> <p>Dashboards</p> <p>Lacks automated support capabilities driven by AI</p> <p>Aruba AI Assist is a basic manual button to gather logs to email to Aruba Support for manual analysis</p>	<p></p> <p>Dashboards</p> <p>No use of AI to automate support or support operations</p>	<p></p> <p>Dashboards</p> <p>Lacks automated support capabilities driven by AI</p>	<p></p> <p>CV/AVA is not as advanced as Juniper</p>

AIOps

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Service level monitoring	 <p>Throughput, time to connect, roaming, coverage, capacity, AP uptime, switch health, switch bandwidth</p> <p>User, site, and device-level monitoring</p> <p>150+ states monitored</p> <p>Reduce “mean time to innocence”</p> <p>Zoom Insights, Microsoft Teams integration</p> <p>Watch video</p>	 <p>Meraki Health provides a basic overview of wireless network connections and performance (latency, packet loss, and SNR)</p>	 <p>Dashboards provide basic non-real-time event log monitoring</p> <p>Requires NetInsight appliances and subscription \$</p>	 <p>Dashboards provide basic non-real-time event log monitoring</p> <p>Requires DNA appliances \$\$\$</p>	 <p>Provides monitoring of services, but with false positives that may not be correlated</p>	 <p>No SLEs</p>
Virtual assistant to accelerate help desk	 <p>Simple queries with integrated helpdesk based on Marvis</p> <p>Continuous learning and evolution</p> <p>Watch video</p>	N/A	N/A	N/A	N/A	VNA in Arista not as advanced as Marvis
Root cause identification	 <p>Automated event correlation using machine learning across wireless, wired, and device domains</p> <p>Provides real, actionable intelligence</p> <p>Watch video</p>	 <p>Basic root cause analysis (RCA) based on event logs for DHCP, DNS, and radius failures</p>	 <p>Basic RCA for a few wireless scenarios and features</p> <p>Relies on Aruba OS CX-based switches that have a small installed base</p> <p>Log based suggestions are basic</p>	 <p>Limited RCA</p> <p>Requires DNA appliances \$\$\$</p>	 <p>Can detect root cause, but with some false positives that may not be correlated</p>	 <p>Limited Root cause analysis for DHCP, Bas PSK key, 802.1x failure, radius server down</p>

AIOps

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Dynamic packet capture	 <p>Proactively captures packets in real time when an error event occurs</p> <p>Eliminates need to reproduce issues as every failure has a PCAP starting before the failure and playing through it</p> <p>No more sending out staff with sniffers after the problem has happened</p> <p>Little to no config necessary</p> <p>Available in Wi-Fi, switching, and WAN</p> <p>Marvis Minis can trigger a PCAP</p> <p>Watch video</p>	 <p>Proactive packet capture on initial connection or roam only</p> <p>Does not automatically capture re-auth, DHCP renewal, or other events that occur after a join or roaming event</p> <p>Intelligent Packet Capture - needs manual configuration</p> <p>Requires additional license, needs feature to be manually enabled on specific apps or whole network</p> <p>Captures 1500-2000 frames - not very contextual, fails to provide detail drill downs to get to root cause</p>	 <p>Primarily manual and limited auto capture on authentication failure events</p> <p>Requires an additional, separate cloud dashboard for troubleshooting and analysis (Cape Networks)</p> <p>Requires overlay network of Aruba UXI wireless sensor hardware</p>	 <p>Non-automated intelligent packet capture that requires a client to file a ticket to tag data collection for the client going forward</p>	 <p>N/A</p>	 <p>Yes</p>
Dynamic spectrum capture	 <p>Industry-first Dynamic Spectrum Capture brings network rewind to wireless interference:</p> <p>Unprecedented visibility into RF spectrum that accelerates and minimizes site visits to identify root cause wireless interference issues</p>	N/A	N/A	N/A	N/A	N/A

AIOps

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Baselining and anomaly detection	 <p>Proactive device and OS baselining and anomaly detection by Marvis AI</p> <p>Watch video</p>	 <p>Medium anomaly detection</p>	 <p>Limited anomaly detection for a few states (DHCP, DNS, assoc, auth)</p>	 <p>Limited anomaly detection with MRE</p> <p>Requires DNA appliances \$\$\$</p>	 <p>Anomaly detection by Pilot and CoPilot</p>	 <p>Supports industry standard IPS/IDS</p>
Network analytics	 <p>Deep end user data, Freemium, and subscription (Premium Analytics) offering</p>	 <p>Full stack, very basic implementation</p>	 <p>Wi-Fi only</p> <p>Requires additional appliance (ALE)</p>	 <p>Wi-Fi only</p> <p>Requires additional appliance (DNAC)</p>	 <p>Requires additional software, licenses, and support</p>	 <p>Supports network analytics</p>

Location Engagement and Insights

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
BLE antenna in APs  Patented 16-element BLE antenna array enables dynamic beam forming See the product	 Single integrated omni-directional BLE antenna Additional third-party battery-powered BLE beacons required for coverage	 Single integrated omni-directional BLE antenna that has poor accuracy Additional Aruba battery-powered BLE beacons required for coverage	 Single integrated omni-directional BLE antenna Additional third-party battery-powered BLE beacons required for coverage	 Single integrated omni-directional BLE antenna	 HADM enabled BLE for high accuracy location	
Virtual beacons  Unlimited virtual beacons per AP Watch the video	No virtual beacons	No virtual beacons	No virtual beacons	No virtual beacons	No virtual beacons	
Site calibration (unsupervised machine learning)  Unsupervised machine learning Site and device calibration without administrator input	 Requires third-party integration, not native Does not adapt/learn radio performance for new devices	 Requires accurate BLE coverage planning and manual beacon placement with mobile app during installation Does not adapt/learn radio performance for new devices Meridian deprioritized	Requires third-party BLE integration Does not adapt/learn radio performance for new devices	 Wi-Fi/AP BLE and BLE beacon for integration Does not adapt/learn or auto calibrate GPS location	 Basic	

Location Engagement and Insights

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Location algorithm	<p>●●●●●</p> <p>Unsupervised machine learning Triangulates and adapts to varying BLE clients and changing RF</p>	<p>●</p> <p>Triangulation dependent on accurate map placement Errors introduced by variance in BLE clients</p>	<p>●</p> <p>AOS 8 to AOS 10 is a complete rebuild Must enter entire configuration from scratch No concept of sites, all devices in one group No site variables to simplify configuration Controllers become gateways No use for Mobility Master controllers ewaste Process usually done by partners with “weeks of work” All new feature development is done in AOS 10 while customer base is on AOS 8 and doesn’t want to upgrade</p>	<p>●</p> <p>Requires third-party BLE integration Triangulation dependent on accurate map placement Errors introduced by variance in BLE clients</p>	<p>●</p> <p>Triangulation dependent on accurate map placement Errors introduced by variance in BLE clients GPS location with microlocation support</p>	<p>●</p> <p>Very basic</p>
Location analytics	<p>●●●●●</p> <p>BLE and Wi-Fi Freemium and subscription services available API-first for ease of data sharing Watch video</p>	<p>●</p> <p>Wi-Fi only</p>	<p>●</p> <p>Wi-Fi only Requires additional appliance (ALE) Wi-Fi-based proximity tracing that has no BLE antenna array, no ML and poor accuracy</p>	<p>●●</p> <p>Wi-Fi only Requires additional appliance (DNAC) Requires Cisco DNA Spaces</p>	<p>●●</p> <p>Wi-Fi and BLE beacons Wi-Fi based proximity tracing that has no BLE antenna array, no machine learning, and poor accuracy Supports real time and historical analytics</p>	<p>●●</p> <p>Can show user’s location as they travel through the floor map No visitor counter</p>

Location Engagement and Insights

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Asset tracking	 Tracking of third-party BLE asset tags	No asset tracking	 Tracking of Aruba BLE asset tags Requires Aruba 3xx model APs with integrated BLE beacon or overlay deployment of Aruba AS-100 wireless sensors	 Wi-Fi RFID tags only Requires additional appliance (DNAC operational visibility) Requires Cisco Spaces	 Wi-Fi, BLE, 802.15.4 Requires additional software and third-party integration	 Yes
BLE overlay for existing Wi-Fi deployments	 vBLE APs available	No BLE overlay solution	 Requires many wall-plug battery-powered Aruba AS-100 wireless sensors	No BLE overlay solution	 BLE beacons require licenses, software, and support	 Yes
Open standards economics	 Interoperability, vendor-neutral, efficient use of existing resources	 Multiple solution offering	 Multiple solutions with proprietary limitations	 Multiple solution offering	 RESTful APIs	 Supports Rest API
Comprehensive built-in applications	 Best-of-breed solution via partnerships	 Multiple solution offering	 Single vendor with proprietary limitations (mapping)	 Workflow Asset visibility rules engine	 Presence, zone tracking, and asset visibility rules engine	 No
Technology versatility	 Native: Wi-Fi, vBLE Third-party integration: BLE, UWB LiDAR, Wi-Fi, RADAR	 Native: Wi-Fi Third-party integration: BLE, UWB	 Wi-Fi, BLE, UWB	 Native: Wi-Fi Third-party integration: BLE, UWB	 Wi-Fi, BLE, Thread 802.15.4	 No

Future Proofing

	Juniper Wired and Wireless Access ↗	Cisco Meraki	HPE Aruba ESP	Cisco Catalyst	Extreme Networks ExtremeCloud	Arista CloudVision
Architectural upgrades	 Microservices-based, always upgrading	 Quarterly upgrades	 AOS 8 to AOS 10 is a complete rebuild Must enter entire configuration from scratch No concept of sites, all devices in one group No site variables to simplify configuration Controllers become gateways No use for Mobility Master controllers ewaste Process usually done by partners with “weeks of work” All new feature development is done in AOS 10 while customer base is on AOS 8 and doesn't want to upgrade	 Monolithic upgrades to the Catalyst Center appliances Optional Meraki monitoring for apps Option to change Catalyst AP 'persona' to Meraki (results in feature loss)	 Extreme tries to release a cloud update every 30 days, although this has been inconsistent Past feature releases are very hard to find	 Monolithic architecture based on sharded architecture

Why Juniper

Juniper Networks believes that connectivity is not the same as experiencing a great connection. Mist™, Juniper's AI-native networking platform, is built from the ground up to leverage AI to deliver exceptional, highly secure, and sustainable user experiences from the edge to the data center and cloud. Additional information can be found at Juniper Networks (juniper.net) or connect with Juniper on [X](#) (Twitter), [LinkedIn](#), and [Facebook](#).

More information

To learn about our solutions, contact your Juniper Networks representative or visit our website at juniper.com.



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Juniper is positively glowing after being named a Leader

Just off the heels of our **AI-Native** Networking launch – and for the fourth time in a row – Juniper Networks is named a Leader in the Gartner Magic Quadrant for Enterprise Wired and Wireless LAN Infrastructure. And for the third time in a row, Juniper Mist is positioned farthest in “Completeness of Vision” and highest in “Ability to Execute”. We believe that what sets us apart is the ability for **Mist AI** to drive enhanced levels of productivity for operators and end users alike, offering the fastest deployment and easiest management of personalized **Wi-Fi** experiences.

The tangible, real-world results include:

- ✔ 90% reduction in wireless trouble tickets
- ✔ 85% decrease in truck rolls
- ✔ 9x faster deployment times

Figure 1: Magic Quadrant for Enterprise Wired and Wireless LAN Infrastructure

