



EX4300 ETHERNET SWITCH

Product Overview

The Juniper Networks EX4300 line of Ethernet switches delivers the performance and scale required for both campus and data center Gigabit Ethernet (GbE) access switch deployments. Combined with Juniper's market leading Virtual Chassis technology, the EX4300 scales up to 10 members, delivering the high availability and plug-and-play scale that businesses demand. Combining compact, pay-as-you-grow economics and low power and cooling with the performance, availability, and port densities of chassis-based platforms, the EX4300 with Virtual Chassis technology enables businesses to deploy with speed and agility to increase revenue and improve productivity.

Product Description

The Juniper Networks® EX4300 line of Ethernet switches with Virtual Chassis technology combines the carrier-class reliability of modular systems with the economics and flexibility of stackable platforms, delivering a high-performance, scalable solution for data center, campus and branch office environments.

Offering a full suite of Layer 2 and Layer 3 switching capabilities, the EX4300 enables a variety of deployments, including campus, branch and data center access. A single 24-port or 48-port EX4300 switch can be deployed initially. As requirements grow, Juniper Networks Virtual Chassis technology allows up to 10 EX4300 switches to be seamlessly interconnected and managed as a single device, delivering a scalable, pay-as-you-grow solution for expanding network environments. A pair of 32-port EX4300 fiber switches can also be deployed as a consolidated aggregation or small core switch. Additionally, the EX4300 integrates with QFX3500, QFX3600 and QFX5100 10GbE and 40GbE data center access switches in a single stack or a Virtual Chassis configuration, enabling non-disruptive 10GbE server upgrades and simplified management of a mixed access environment.

The EX4300 switches can be interconnected over multiple 40GbE quad small form-factor pluggable plus (QSFP+) transceiver ports to form a 320 gigabit per second (Gbps) backplane. A flexible uplink module that supports both 1GbE and 10GbE options is also available, enabling high-speed connectivity to aggregation- or core-layer switches which connect multiple floors or buildings.

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

Chassis-Like Features in an Expandable Form Factor

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

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

Each EX4300 switch includes a single application-specific integrated circuit (ASIC)-based Packet Forwarding Engine, the EX-PFE. The integrated Routing Engine (RE) delivers all control plane functionality. The EX4300 also leverages the same modular Junos OS as other Juniper Networks switches, routers, and security devices, ensuring a consistent implementation and operation of control plane features across the Juniper Networks infrastructure.

Architecture and Key Components

The EX4300 switches are single rack unit devices that deliver a compact solution for crowded wiring closets and access switch locations where space and power are at a premium. Each EX4300 supports standard 40GbE QSFP+ ports which are preconfigured to support high-speed Virtual Chassis backplane connections. These ports can also serve as uplinks to upstream aggregation devices. In addition, each EX4300 supports an optional front panel uplink module offering 1GbE or 10GbE ports for high-speed backbone or link aggregation connections between wiring closets and upstream aggregation switches. Uplink modules can be installed without powering down the switch, enabling users to add high-speed connectivity at any time or migrate from one uplink type to the other, delivering the ultimate in flexible, high-performance interconnectivity.

The EX4300 also features a front panel LCD that offers a flexible interface for performing device bring-up and configuration rollbacks, reporting switch alarm and LED status, or restoring the switch to its default settings. When deployed as a member of a Virtual Chassis configuration, the LCD also displays the switch's chassis "slot number" and RE status for rapid identification and problem resolution.

The four integrated rear panel 40GbE QSFP+ ports support EX4300 Virtual Chassis deployment over a 320 Gbps virtual backplane. When deployed in close proximity such as in wiring closets or in top-of-rack data center applications, the EX4300 switches can be securely connected using standard 40GbE QSFP+ DAC cables (available in 50 cm, 1 m, 3 m and 5m lengths).

Switches deployed in Virtual Chassis configurations spread over larger areas can be interconnected using optical QSFP+ transceivers such as the QSFP+ SR4, which supports distances up to 150 m.

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

Virtual Chassis Technology

Up to 10 EX4300 switches can be interconnected using Virtual Chassis technology, creating a single logical device supporting up to 480 10/100/1000BASE-T ports, plus up to 40 additional 10GbE and 40 additional 40GbE uplink ports. For mixed 1GbE and 10GbE access environments, the EX4300 can be interconnected with the QFX3500, QFX3600 and QFX5100 high-performance data center access switches. EX4300 Virtual Chassis configurations can be created to support a variety of port and density options for data center, campus and branch deployments. Virtual Chassis connections can be formed using any of the 40GbE ports or 10GbE ports using standard DAC cables and optics. The EX4300 does not support Virtual Chassis technology on the GbE copper or fiber ports.

Virtual Chassis Deployments in Campus Wiring Closets

In campus wiring closets, flexible topologies can be created using standard QSFP+ optics on the 40GbE ports to extend the Virtual Chassis configuration across long distances spanning multiple wiring closets, floors, or even buildings while using 10GbE or 40GbE for uplink connectivity. EX4300 fiber-based switches can also be used for campus aggregation or small core deployments.

Virtual Chassis Deployments in the Data Center

When deployed in a Virtual Chassis configuration in the data center, all EX4300 switches are monitored and managed as a single device, enabling enterprises to separate physical topology from logical groupings of endpoints and allowing more efficient resource utilization. Highly resilient topologies can also be created using the 40GbE DAC cables.

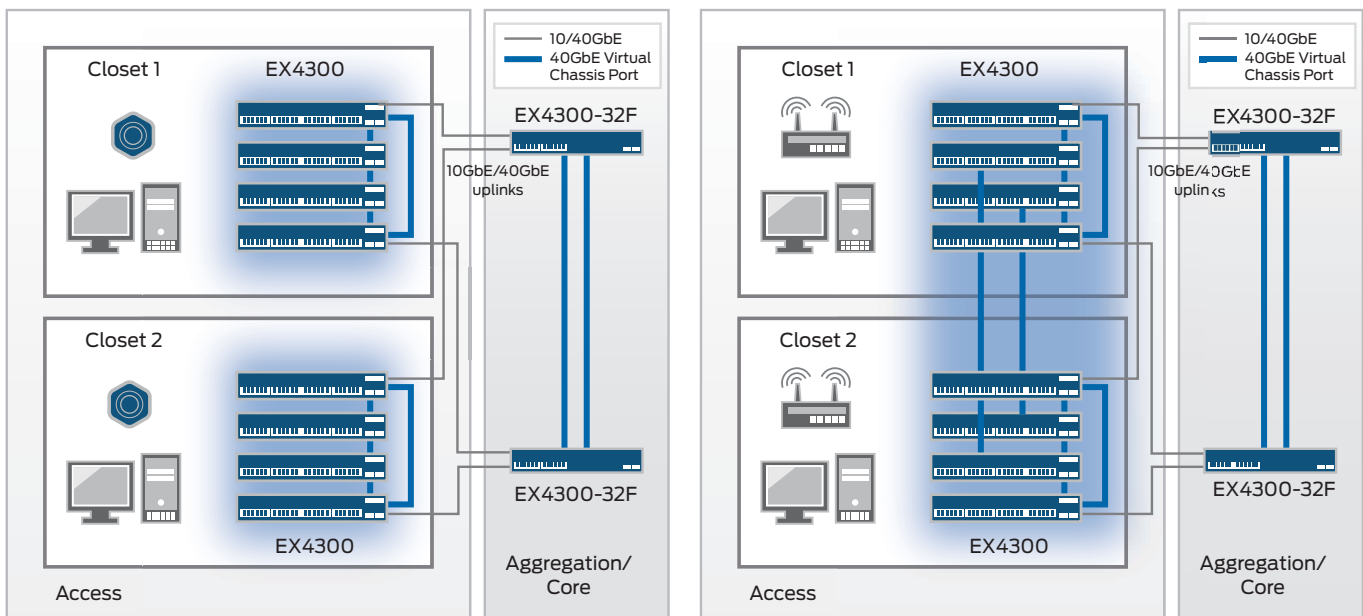


Figure 1: Using Virtual Chassis technology, up to 10 EX4300 switches can be interconnected to create a single logical device spanning multiple wiring closets.

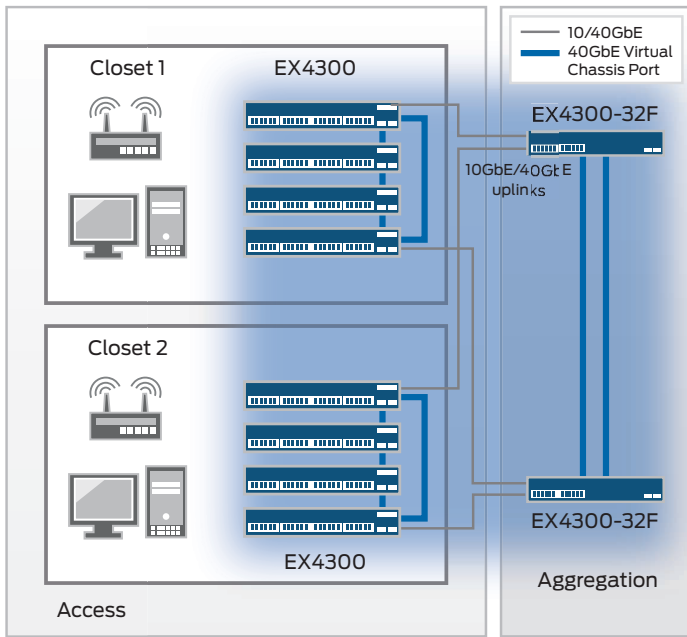


Figure 2: Using Virtual Chassis technology, up to 10 EX4300 switches can be interconnected to create a single logical device spanning an entire building.

Mesh Virtual Chassis Configurations for the Data Center

In data center top-of-rack deployments, a full mesh five-switch Virtual Chassis configuration can be created where every switch member is just one hop away from every other member, delivering the lowest possible latency. A mesh spanning distances of up to 150 meters can be created using standard QSFP+ optics on the 40GbE ports (DAC cables up to 3m in length available for shorter distances), while 10GbE ports can be used as uplinks to connect to upstream aggregation or core devices.

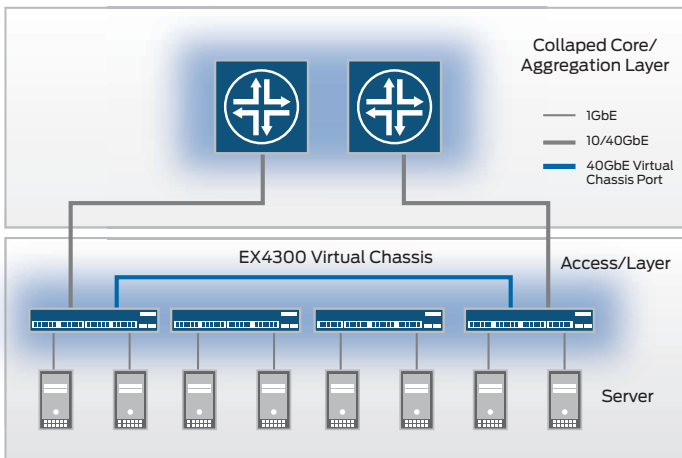


Figure 3: The EX4300 Ethernet switch with Virtual Chassis technology delivers a high-performance, scalable, and highly reliable solution for the data center.

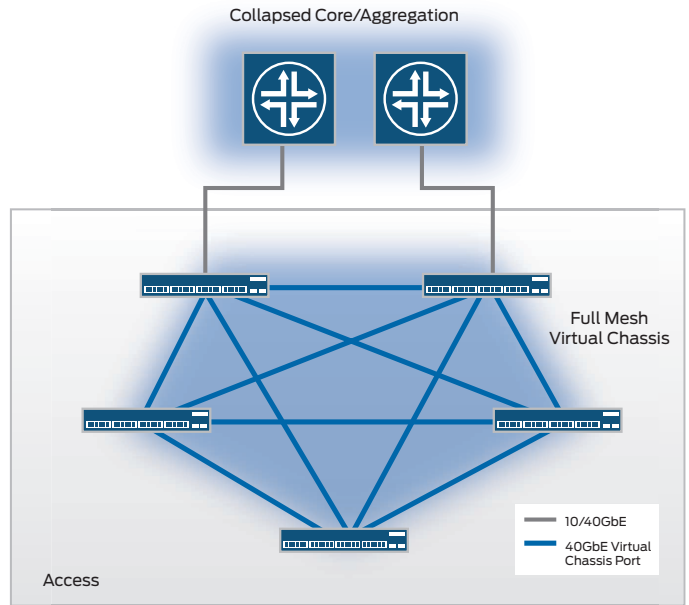


Figure 4: EX4300 switches in a full mesh Virtual Chassis configuration for the data center.

Virtual Chassis Fabric Switching Architecture

Existing Virtual Chassis technology is further scaled and enhanced to support a spine-and-leaf topology that is ideal for high-performance and low-latency data center deployments. In its first instance, this topology, called Virtual Chassis Fabric, enables up to 20 switches to be deployed in a spine-and-leaf configuration, with two to four QFX5100 switches in the spine and up to 18 QFX5100, QFX3500, QFX3600 or EX4300 switches as leaf nodes. This architecture provides any rack-to-any rack deterministic throughput and low latency, while significantly simplifying network operations through a single point of management. A Virtual Chassis Fabric configuration supports mixed 1GbE, 10GbE and 40GbE servers.

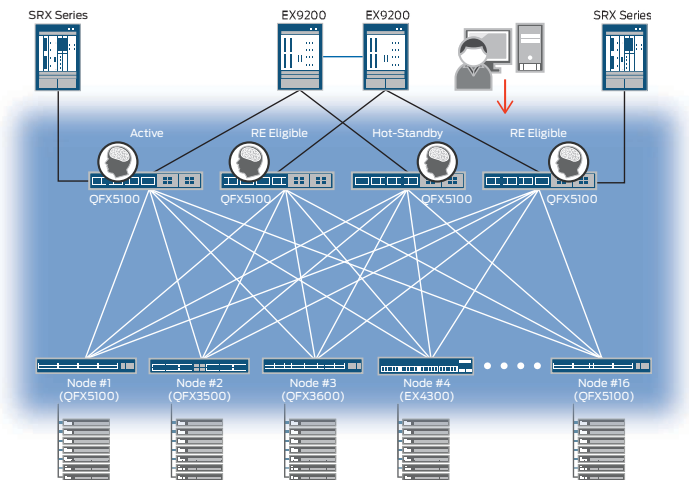


Figure 5: EX4300, QFX3500, QFX3600 and QFX5100 at the access layer of Virtual Chassis Fabric configuration.

Features and Benefits

Chassis-Class Availability

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

In a Virtual Chassis configuration, each EX4300 switch is capable of functioning as a Routing Engine. When two or more EX4300 switches are interconnected, a single control plane is shared among all Virtual Chassis member switches. When two EX4300 switches are interconnected, Junos OS automatically initiates an election process to assign a master (active) and backup (hot-standby) Routing Engine. An integrated Layer 2 and Layer 3 GRES feature maintains uninterrupted access to applications, services, and IP communications in the unlikely event of a primary RE failure.

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

The EX4300 implements the same slot/module/port numbering schema as other Juniper Networks chassis-based products when numbering Virtual Chassis ports, providing true chassis-like operations. By utilizing a consistent operating system and a single configuration file, all switches in a Virtual Chassis configuration are treated as a single device, simplifying overall system maintenance and management.

Individually, the EX4300 offers a number of HA features that are typically associated with modular chassis-based switches. When combined with the field-proven Junos OS and L2/L3 failover capabilities, these features provide the EX4300 with true carrier-class reliability.

- **Redundant power supplies:** The EX4300 line of Ethernet switches supports internal redundant, load-sharing, hot-swappable, and field-replaceable AC and DC power supplies to maintain uninterrupted operations. Thanks to its compact footprint, the EX4300 requires significantly less power than chassis-based switches delivering equivalent port densities.
- **Hot-swappable fans:** The EX4300 includes hot-swappable fans, providing sufficient cooling even if one of the fans were to fail.
- **Non-Stop Bridging (NSB) and Non-Stop Routing (NSR):** NSB and NSR on the EX4300 ensure control plane protocols, states and tables are synchronized between Master and Standby REs to prevent protocol flaps or convergence issues following a Routing Engine failover.
- **Redundant trunk group (RTG):** To avoid the complexities of Spanning Tree Protocol (STP) without sacrificing network resiliency, the EX4300 employs redundant trunk groups to provide the necessary port redundancy and simplify switch configuration.
- **Cross-member link aggregation:** Cross-member link aggregation allows redundant link aggregation connections between devices in a single Virtual Chassis configuration, providing an additional level of reliability and availability.
- **Carrier-class hardware:** The EX4300 leverages a purpose-built packet forwarding engine ASIC, the EX-PFE, which integrates

much of the same intellectual property used in Juniper Networks carrier-class routers. As a result, the EX4300 delivers the same predictable, scalable functionality found in the world's largest networks.

- **IPv4 and IPv6 routing support:** IPv4 and IPv6 Layer 3 routing (OSPF and BGP) is available with an Enhanced license, enabling highly resilient networks.

Carrier-Class Operating System

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

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

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

Converged Networks

The EX4300 line of Ethernet switches provides the highest levels of availability for the most demanding converged data, voice, and video environments, delivering the most reliable platform for unifying enterprise communications.

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

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

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

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

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

Security

The EX4300 line of Ethernet switches fully integrates with Juniper Networks Unified Access Control (UAC), which consolidates all aspects of a user's identity, device, and location, enabling administrators to enforce access control and security down to the individual port or user levels.

The UAC solution is composed of three main components: Juniper Networks Junos Pulse as the endpoint client (also available in an agent-less mode); the Junos Pulse Access Control Service running on a blade in a MAG Series Junos Pulse Gateway chassis or on a dedicated MAG Series appliance; and UAC enforcement points. Working as an enforcement point with the UAC solution, the EX4300 provides both standards-based 802.1X port-level access control as well as L2-L4 policy enforcement based on user identity, location, and/or device. A user's identity, device type, machine posture check, and location can be used to determine whether access should be granted and for how long. If access is granted, the switch assigns the user to a specific VLAN based on authorization levels. The switch can also apply QoS policies or mirror user traffic to a central location for logging, monitoring, or threat detection by intrusion prevention systems.

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

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

MACsec

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

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

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

Simplified Management and Operations

When employing Virtual Chassis technology, the EX4300 dramatically simplifies network management. Up to 10 interconnected EX4300 switches can be managed as a single device. Each Virtual Chassis group utilizes a single Junos OS image file and a single configuration file, reducing the overall number of units to monitor and manage. When Junos OS is upgraded on the master switch in a Virtual Chassis configuration, the software is automatically upgraded on all other member switches at the same time.

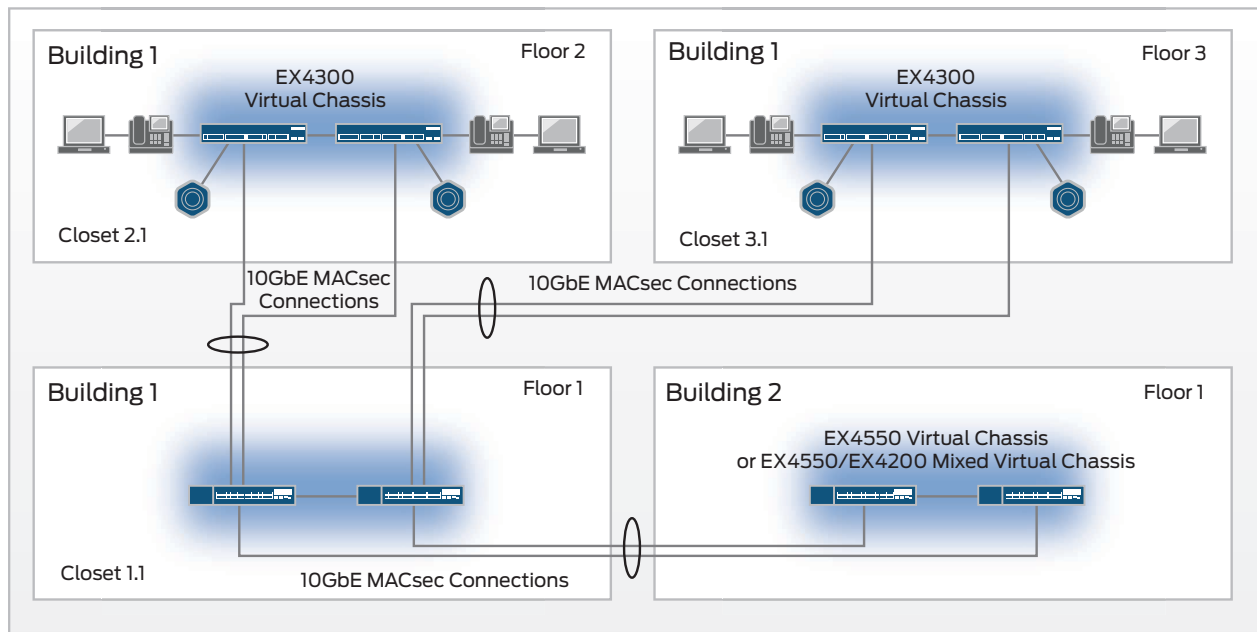


Figure 6: MACsec deployment with EX4300 and EX4550 switches.

*Excluding EX4300-32F; software support for MACsec will be added to the fiber switches in a future release.

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