

Juniper Networks EX4500 10GbE Switch

IBM System x at-a-glance guide

The Juniper Networks EX4500 10GbE Switch features up to 48 wire-speed 10 Gb Ethernet ports in a 2U rack platform and delivers Layer 2 and Layer 3 connectivity to networked devices such as IBM® System x® servers and other networking switches. The EX4500 supports the Juniper Networks unique Virtual Chassis technology, which enables multiple interconnected switches to operate as a single, logical device with a single IP address. Two optional high-speed uplink modules offer four additional 10GbE small form-factor pluggable transceiver (SFP+) ports each for connecting to upstream devices. The EX4500 base switch provides 40 fixed 10GbE pluggable ports that can also support GbE connectors for added flexibility.

By targeting high-density 10GbE top-of-rack and aggregation deployments in the data center, campus, and service provider environments, EX4500 switches perfectly complement the Juniper Networks EX Series Ethernet Switch product family: the Juniper Networks EX2200 line and the IBM J48E line designed for data center and campus GbE access and aggregation deployments. Figure 1 shows the switch.



Figure 1. Front of the Juniper EX4500

Did you know

Key features of the Juniper Networks EX4500 10 GbE Switch are that it:

- Virtualizes the data center with Virtual Chassis (VC): It delivers 128 G of East-West traffic that out-performs traditional stacking solutions.
- Virtualizes economically: VC across a EX4500 10GbE Switch and an IBM J48E 1GbE Switch to enable price and performance optimized solutions.
- Simplifies configuration, administration, and diagnostics: VC presents multiple switches to appear as one switching entity.
- Simplifies upgrades, configuration, and support: A Single Junos OS across all networking tiers.

Part number information

Table 1 lists the models of the Juniper EX4500 and its options.

Table 1. Part number overview

IBM model number	Description	# Ports (base)	Port type (SFP+/SFP)	Uplink module
0719-410	Juniper EX4500 - Front to back airflow	40	10GbE or 1Gbe	4xSFP+ (Up to two per switch)
0719-420	Juniper EX4500 - Back to front airflow	40	10GbE or 1Gbe	4xSFP+ (Up to two per switch)

Cables

Table 2 lists the cable part numbers and their descriptions.

Table 2. Cable part numbers and descriptions

IBM part number	Description
40K5679	0.6 m Blue Cat5e Cable
40K8785	1.5 m Blue Cat5e Cable
40K5581	3 m Blue Cat5e Cable
40K8927	10 m Blue Cat5e Cable
40K8930	25 m Blue Cat5e Cable
81Y8295	1 m 10GE Twinax Act Copper SFP+
81Y8296	3 m 10GE Twinax Act Copper SFP+
81Y8297	5 m 10GE Twinax Act Copper SFP+
68Y6927	Twin-ax Active 1 m
68Y6947	Twin-ax Active 3 m
68Y6999	Twin-ax Active 5 m
88Y6851	1 m LC-LC Fiber Cable (networking) - Optical
88Y6854	5 m LC-LC Fiber Cable (networking) - Optical
88Y6857	25 m LC-LC Fiber Cable (networking) - Optical

Virtual Chassis cables



Figure 2. Virtual Chassis cables

Table 3 lists the Virtual Chassis cables and their descriptions.

Table 3. Virtual Chassis cables

IBM part number	Description
88Y6863	EX- Virtual Chassis Port cable 0.5M
88Y6890	EX- Virtual Chassis Port cable 1M
88Y6894	EX- Virtual Chassis Port cable 3M
88Y6898	EX- Virtual Chassis Port cable 5M

Optical transceivers



Figure 3. Optical transceivers

Table 4 lists the optical transceivers and their descriptions.

Table 4. Optical transceivers

IBM part number	Description
88Y6839	1000B-LX GbE 1310 nm 10 km SFP
88Y6836	1000B-SX GbE 850 nm 550 m SFP
68Y6923	10GE Short Reach 850 nm 300 m SFP+ on MM fiber
88Y6877	10GE Long Reach 1310 nm 10 km SFP+

Miscellaneous switch parts

Table 5 lists miscellaneous items and their descriptions.

Table 5. Miscellaneous

IBM part number	Description
88Y6887	Juniper Advance Features (Layer 3)
95Y0356	EX4500 4-post rack mount kit for iDataPlex™
81Y8298	EX4500 4-post rack mount kit (supports IC 1410)

Power cables

Table 6 lists power cables and their descriptions.

Table 6. Power cables

IBM part number	Description
88Y6905	AC Power Cable - Australia (15A/250 V, 2.5 m)
88Y6909	AC Power Cable - China (16A/250 V, 2.5 m)
88Y6913	AC Power Cable - EU (16A/250 V, 2.5 m)
88Y6917	AC Power Cable - Italy (16A/250 V, 2.5 m)
88Y6921	AC Power Cable - Japan Locking (16A/250 V, L6-20, 2.5 m)
88Y6925	AC Power Cable - Korea/EU (16A/250 V, 2.5 m)
88Y6929	AC Power Cable - Switzerland (16A/250 V, 2.5 m)
88Y6933	AC Power Cable - UK (13A/250 V, 2.5 m)
88Y6937	AC Power Cable - US (15A/125 V, NEMA 5-15, 2.5 m)
88Y6941	AC Power Cable - Argentina (16A/250 V, 2.5 m)
88Y6945	AC Power Cable - Brazil (16A/250 V, 2.5 m)
88Y6949	AC Power Cable - India (16A/250 V, 2.5 m)
88Y6953	AC Power Cable - Israel (16A/250 V, 2.5 m)
88Y6957	AC Power Cable - South Africa (16A/250 V, 2.5 m)
88Y6961	AC Power Cable - Taiwan (16A/250 V, 2.5 m)

Specifications

Table 7 lists the specifications of the Juniper Networks EX4500 10 GbE Switch.

Table 7. Juniper Networks EX4500 10 GbE Switch specifications

Specification	Value
Form factor	2U
Dimensions	(W × H × D) 17.3 in. × 3.4 in. × 21 in. (43.9 cm × 8.6 cm × 50.2 cm)
Ports	
1000BASE-X (SFP) Port Densities	40x 1000BASE-X SFP ports in base unit; 48 total with optional uplink modules
10GBASE-X Port Densities	40x in base unit; 48 total with optional uplink modules
Virtual Chassis	2x Virtual Chassis ports or 8x SFP+ LAGs Single Switch Mgt across Virtual Chassis Up to 2xEX4500 or up to 8xJ48E and 2xEX4500
Performance	
Backplane speed	128 Gbps (Virtual Chassis)
Data rate	960 Gbps
Throughput	714 Mpps
Latency	2.7 uSec
Switching and routing features (highlights)	
MAC addresses	24000
Jumbo frames	9,216 bytes
IPv4 Unicast/Multicast Routes	8,000/2,000
Number of VLANs	4096
ARP entries	8000
QoS queues/port	8
Routing	Optional SW (OSPFv3, IPv6, BGP, MLDv2, ISIS, RIP, VRRP, BFD)
DCB/CEE	Supported
Miscellaneous	
VC configuration max	Up to 2xEX4500 or up to 8xJ48E and 2xEX4500
Management	1× 10/100/1000 Ethernet RJ-45 port, Console port
Resiliency	Dual internal load-sharing AC power supplies; redundant variable-speed fans (One AC power supply is standard.)
Air flow	Two models: Front to back airflow, back to front airflow
Rack mount kits	2 Post kit is included with each switch; upgrades include 4 Post rack mount kit for a standard rack, and a iDataplex Rack
Power options	Autosensing; 110/220 V ac; 60/50 Hz
Operating system	Juniper Networks JUNOS Software

Virtual Chassis technology

Figure 4 shows the rear of the Juniper EX4500 with the Juniper Virtual Chassis Technology cable connection plugs vacant.



Figure 4. Rear of the Juniper EX4500

Figure 5 shows the Juniper Virtual Chassis Technology cable connection implemented on a pair of switches.



Figure 5. Juniper Virtual Chassis Technology cable connection

The EX4500 supports the Juniper Networks unique Virtual Chassis technology, which enables multiple interconnected switches to operate as a single, logical device with a single IP address. When deployed in a Virtual Chassis configuration, the EX4500 switches are connected over a 128-Gbps backplane using Virtual Chassis interconnect cables. EX4500 switches can also be interconnected using a link aggregation (LAG) of up to eight SFP+ 10GbE line-rate links, allowing switches to reside in different locations. Interconnected 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.

In the data center, using Virtual Chassis technology at the top of rack or end of row to aggregate servers provides flexibility in the deployment of uplinks. Rather than requiring redundant links for each physical switch to ensure high availability, redundant links are only needed for each Virtual Chassis group. EX4500 and J48E switches can be combined within a single Virtual Chassis configuration to support environments where both GbE and 10GbE servers are present.

Data center and campus advantages

The EX4500 is an ideal switch for both data center and campus aggregation deployments. It offers an economical, power-efficient, and compact solution for aggregating 10GbE uplinks. Its feature set provides simplicity, scalability, availability, adaptability, and modularity to your network:

- Simple

Virtual Chassis on the EX4500 brings important simplification features to the campus aggregation layer. It eliminates the need for Spanning Tree, VRRP, complex routing, or VLAN configuration, therefore simplifying the management of the network. The EX4500 with Virtual Chassis reduces the number of virtual devices to manage and can even lead to a reduction in the number of network tiers. A single Virtual Chassis configuration can also span multiple nodes, reducing the need for uplinks and limiting the need for larger and more expensive nodes on superior tiers.

- Scalable

With Juniper Networks Junos® operating system shared across the entire EX Series platform and the EX4500 positioned in the top-of-rack and campus aggregation, the short learning curve enables you to quickly manage a complete architecture from one common set of instructions and one pane of glass. In addition, a single EX4500 can support up to forty-eight 10GbE ports at line rate, enabling you to scale even in the most demanding environments. In addition, Virtual Chassis technology makes it easy to scale while reducing the complexity of managing a larger network. By adding switches to a Virtual Chassis configuration, it is possible to increase the number of ports without increasing the number of devices to manage.

- Available

The EX4500 offers redundant cooling and is available with redundant power supplies. A Virtual Chassis configuration – with several EX4500 switches – provides redundant routing engines and a network fabric. In addition, the EX4500 offers many other features that increase the availability of your network, including Open Shortest Path First (OSPF), Equal-cost multipath (ECMP), link aggregation group (LAG), links distributed across multiple slots, Graceful Routing Engine switchover (GRES), graceful protocol restart, and Quality of Service (QoS) to prioritize time-sensitive data.

- Adaptable and modular

As your business grows, your needs change and your network needs to evolve. With its small form factor (2RU) and complete switch features (with a supervisor, up to forty-eight 10GbE ports, available in one box), the EX4500 can be redeployed easily in different environments and physical layouts. The dual-speed interfaces of the EX4500 enable you to transition your environments from GbE to 10GbE. The capacity of your EX4500 switch can easily be virtually increased by simply adding more switches to the Virtual Chassis configuration, without increasing the number of switches that you have to manage. The modularity of an EX4500 with Virtual Chassis is comparable to the adaptability of a modular switch.

- Campus deployments

The EX4500 also offers an economical, power-efficient, and compact solution for aggregating 10GbE uplinks from access devices in building and campus deployments. The switch's dual-speed interfaces also support environments transitioning from GbE to 10GbE. The EX4500 easily meets enterprise core switch requirements, delivering wire-speed performance on every port, full device redundancy, support for Layer 3 dynamic routing protocols such as RIP and OSPF, and a comprehensive security and QoS feature set.

Data center deployments

The EX4500 Ethernet Switch is designed for demanding data center applications where high performance, high availability, and energy efficiency are key requirements. Operating at wire speed, the EX4500 switches deliver 714 Mpps throughput and a data rate of 960 Gbps (full duplex) for both Layer 2 and Layer 3 protocols. An industry first and only, EX4500s can be interconnected in a Virtual Chassis configuration that also includes J48Es, creating a single logical switch that offers a variety of port and density options for mixed server environments.

Flexible deployment options enable the EX4500 to support back-to-front and front-to-back cooling, which ensures consistency with server designs for hot and cold aisle deployments. Front-facing and rear-facing configuration options ensure closer proximity to server ports, optimizing performance and keeping cable lengths short and manageable. The EX4500 is also very environmentally conscious, drawing less than eight watts per port under maximum load.

For small data centers, the EX4500, in a Virtual Chassis configuration, is ideally deployed as the aggregation/core switch, aggregating 10GbE uplinks from J48E Virtual Chassis configurations in the access layer. Customers introducing 10GbE into their racks will be able to use the EX4500 to add 10GbE-attached servers, iSCSI, and network-attached storage (NAS) with minimal impact to the current switching infrastructure.

The EX4500 also includes hardware support for the Data Center Bridging (DCB) feature set, also referred to as Converged Enhanced Ethernet (CEE). DCB is a collection of individual IEEE standards that allow for Ethernet-based I/O and network convergence, including support for FCoE.

Junos operating system

The EX4500 runs the same Juniper Networks Junos operating system that is used by other EX Series Ethernet Switches, as well as all Juniper Networks routers and Juniper Networks SRX Series Services Gateways. By utilizing a common operating system, Juniper Networks delivers a consistent implementation and operation of control plane features across all products. To maintain that consistency, Junos OS adheres to a highly disciplined development process that uses a single source code, follows a single quarterly release train, and employs a highly available modular architecture that prevents isolated failures from bringing 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 will be maintained and operate in the same way.

Management options

Up to four system management options are available for the EX4500 Ethernet switches:

- The standard Junos OS command-line interface (CLI) offers the same granular management capabilities and scripting parameters found in any router powered by the Junos OS.
- The EX4500 also includes the integrated Juniper Networks J-Web Software, an embedded web-based device manager that allows users to configure, monitor, troubleshoot, and perform system maintenance on individual switches via a browser-based graphical interface.

- EX4500 performance, configuration, and fault data can also be exported to leading third-party management systems such as IBM Tivoli®, HP OpenView, and Computer Associates Unicenter software, providing a complete consolidated view of network operations.
- The EX4500 is also supported by Juniper Networks Junos® Space*, an open, programmable application platform for hosting a comprehensive suite of network operational application tools that provide a smart, simple, and open approach for automating the deployment and operation of a Juniper infrastructure.

Explicitly designed to allow partners and customers to build and deploy smart, simple, and easy-to-use applications, Junos Space provides multiple management and infrastructure applications for managing Juniper resources and assets, including inventory management, device and interface configuration, automated software management and deployment, and event-driven fault management. These Junos Space applications offer predefined automation schemes and best practice templates to enable rapid and accurate deployments.

Features and benefits

The EX4500 Ethernet switches include the following key features and benefits:

- High performance

Each EX4500 supports 480 Gbps of bandwidth with up to 48 line-rate 10 Gbps ports at all packet sizes or 14.88 Mpps per port at the minimum Ethernet frame size.
- High availability

The EX4500 offers dual internal load-sharing AC power supplies (a single power supply is standard) and redundant variable-speed fans as standard features, protecting the switch from a single power supply or fan failure. DC power options will be available in the future.
- Energy efficient

Consuming less than eight watts per 10GbE interface, the EX4500 offers a low-power solution for 10GbE top-of-rack, end-of-row, and aggregation deployments. The EX4500 also improves cooling efficiency with redundant variable-speed fans that automatically adjust their speed based on existing conditions to reduce power consumption.
- Small footprint

The EX4500 supports up to 48 wire-speed 10GbE ports in a single 2U platform (40 ports of 10 GbE is standard).

Additional features

The additional features of the Juniper EX4500 are:

- System status LEDs
- LCD status display
- Versatile two-post and four-post rack-mounting options
- Front-to-back and back-to-front airflow options
- Support for Jumbo frames (9,000)
- Quality of service (IEEE 802.1p marking)

- Multicast (IGMP v1/v2/v3 snooping)
- Layer 2 features including support for 4,096 VLAN IDs, Spanning Tree (802.1s and 802.1w), bridge protocol data unit (BPDU) guard, 802.3as Link Aggregation
- Management features including Telnet and SSH v1/v2, SNMP v1-v3, RADIUS, TACACS+, and RMON

EX4500 10GbE Ethernet Switch specifications

The switch specifications for the hardware components are:

- Interface options
 - 10GbE/1GbE small form-factor pluggable transceiver (SFP/ SFP+) fiber connectors
 - Eight 10GbE SFP+ uplink ports (via two optional four-port uplink modules)
 - 1x 10/100/1000 Ethernet RJ-45 ports for management
 - Console port for management
 - 128 Gbps Virtual Chassis module standard
- Supported optics
 - 10GbE SFP+ LC connector type: SR (multimode), LR (single mode)
 - 10GbE SFP+ copper: Direct-attached copper (1/3/7 m)
- Dimensions
 - Height: 3.5 in (8.9 cm); 2U
 - Width: 17.25 in (43.8 cm)
 - Depth: 21.1 in (53.6 cm)
 - Weight: 37 lbs (17 kg) with one AC power supply
- Rack Installation Kit: Versatile two-post and four-post mounting options for 19-in server rack or datacom rack
- LEDs: System LEDs that indicate status
- Airflow:
 - Front-to-back or back-to-front cooling
 - Redundant variable-speed fans to reduce power draw
- CPU: 1.5 GHz PowerPC®
- Power: Dual hot-swappable load-sharing AC power supplies (One AC power supply is standard.)

The switch specifications for the software components are:

- Security
 - RADIUS
 - TACACS+
 - Access control lists (ACLs): Allow and deny
 - SSH v1, v2
 - Secure interface login and password
 - Local proxy Address Resolution Protocol (ARP)
 - Static ARP support
- Layer 2 Switching
 - Maximum media access control (MAC) addresses per system: 24,000
 - Static MAC entries: 24,000
 - Jumbo frames: 9,216 bytes
 - Number of VLANs: 4,096
 - Port-based VLAN
 - 4,096 VLAN IDs supported
 - Routed VLAN interface (RVI)
- Link aggregation
 - 802.3ad support
 - Number of Link Aggregation Groups (LAGs) supported: 64
 - 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
- Spanning Tree
 - RSTP and VSTP running concurrently
 - Spanning Tree Protocol (802.1D)
 - Multiple Spanning Tree Protocol (MSTP) (802.1s)
 - Rapid Spanning Tree Protocol (RSTP) (802.1w)
 - VSTP - VLAN Spanning Tree
 - BPDU protect
 - Loop protect
 - Root protect
- Quality of service
 - EZQoS
 - CoS on L3 VLAN
 - Per interface rewrite
 - Per interface classification
 - Policer mark down action
 - Remarking of bridged packets
 - Layer 2 QoS
 - Layer 3 QoS
 - Rate limiting
 - Ingress policing: 1 rate 2 color

- Egress shaping: per-queue, per-port
 - Eight hardware queues per port
 - Scheduling methods (egress): Strict priority (SP), shaped deficit weighted round-robin (SDWRR)
 - 802.1p remarking
 - Layer 2 - 4 classification criteria: Interface, MAC address, Ethertype, 802.1p, VLAN, IP address, DSCP/IP precedence, TCP/ UDP port numbers, and so on
 - Congestion avoidance capabilities: Weighted tail drop eight queues
- Layer 3 Features: IPv4
 - VRF-lite (ISIS, RIP, OSPF, BGP, BGP, ISIS)
 - IP directed broadcast traffic forwarding
 - Routing protocols: RIPv1/v2, OSPF, BGP, ISIS
 - Max number of IPv4 unicast routes in hardware: 10,000
 - Max number of IPv4 multicast routes in hardware: 4,000
 - Static routing
 - Routing policy
 - Virtual Router Redundancy Protocol (VRRP)
 - Bidirectional Forwarding Detection (BFD) protocol
- Layer 3 Features: IPv6
 - Max number of Neighbor Discovery (ND) entries: 1,000
 - Max number of IPv6 unicast routes in hardware: 1,000
 - Max number of IPv6 multicast routes in hardware: 1,000
 - Routing protocols: RIPng, OSPFv3, IPv6, BGP, MLDv2
 - Static routing
- Multicast
 - VRF-lite (PIM, IGMP)
 - IGMP static
 - Internet Group Management Protocol (IGMP): v1, v2, v3
 - IGMP snooping
 - PIM-SM, PIM-SSM
 - Multicast Source Directory Protocol (MSDP)
- Access control lists (ACLs) (Junos OS firewall filters)
 - Port-based ACL (PACL): Ingress and egress
 - VLAN-based ACL (VACL): Ingress and egress
 - Router-based ACL (RACL): Ingress and egress
 - ACL entries (ACE) in hardware per system: 1,500
 - ACL counter for denied packets
 - ACL counter for permitted packets
 - Ability to add/remove/change ACL entries in middle of list (ACL editing)
 - Layer 2-L4 ACL
 - Trusted Network Connect (TNC) certified
 - MAC authentication (RADIUS)
 - Control plane denial-of-service (DoS) protection
- Supported RFCs
 - RFC 2925 MIB for Remote Ping, Trace
 - RFC 1122 Host Requirements
 - RFC 768 UDP

- RFC 791 IP
 - RFC 783 Trivial File Transfer Protocol (TFTP)
 - RFC 792 ICMP
 - RFC 793 TCP
 - RFC 826 ARP
 - RFC 894 IP over Ethernet
 - RFC 903 RARP
 - RFC 906 TFTP Bootstrap
 - RFC 1027 Proxy ARP
 - RFC 2068 HTTP server
 - RFC 1812 Requirements for IP Version 4 Routers
 - RFC 1519 Classless Interdomain Routing (CIDR)
 - RFC 1256 IPv4 ICMP Router Discovery (IRDP)
 - RFC 1058 RIP v1
 - RFC 2453 RIP v2
 - RFC 1112 IGMP v1
 - RFC 2236 IGMP v2
 - RFC 3618 MSDP
 - RFC 4915 MT-OSPF
 - RFC 3376 IGMP v3
 - RFC 1492 TACACS+
 - RFC 2138 RADIUS Authentication
 - RFC 2139 RADIUS Accounting
 - RFC 3579 RADIUS EAP support for 802.1x
 - RFC 5176 Dynamic Authorization Extensions to RADIUS
 - RFC 2267 Network Ingress Filtering
 - RFC 2030 SNTP, Simple Network Time Protocol
 - RFC 854 Telnet client and server
 - RFC 951, 1542 BootP
 - RFC 2131 BOOTP/DHCP relay agent and Dynamic Host Configuration Protocol (DHCP) server
 - RFC 1591 Domain Name System (DNS)
 - RFC 2338 VRRP
 - RFC 2328 OSPF v2 (edge mode)
 - RFC 1587 OSPF not-so-stubby area (NSSA) Option
 - RFC 2154 OSPF w/Digital Signatures (Password, MD-5)
 - RFC 2370 OSPF Opaque link-state advertisement (LSA) Option
 - RFC 3623 OSPF Graceful Restart
 - RFC 2362 PIM-SM (edge mode)
 - RFC 3569 draft-ietf-ssm-arch-06.txt PIM-SSM PIM Source Specific Multicast
 - RFC 2474 DiffServ Precedence, including 8 queues/port
 - RFC 2598 DiffServ Expedited Forwarding (EF)
 - RFC 2597 DiffServ Assured Forwarding (AF)
 - RFC 2475 DiffServ Core and Edge Router Functions
 - LLDP Media Endpoint Discovery (LLDP-MED), ANSI/TIA-1057, draft 08
 - PIM-DM Draft IETF PIM Dense Mode draft-ietf-idmr-pimdm-05.txt, draft-ietf-pim-dm-new-v2-04.txt
 - Draft-ietf-bfd-base-05.txt Bidirectional Forwarding Detection
- Supported MIBs
 - RFC 1155 SMI
 - RFC 1157 SNMPv1
 - RFC 1905 RFC 1907 SNMP v2c, SMIv2 and Revised MIB-II
 - RFC 2570 - 2575 SNMPv3, user based security, encryption and authentication
 - RFC 2576 Coexistence between SNMP Version 1, Version 2, and Version 3
 - RFC 1212, RFC 1213, RFC 1215 MIB-II, Ethernet-Like MIB and TRAPs
 - RFC 2578 SNMP Structure of Management Information MIB

- RFC 2579 SNMP Textual Conventions for SMIv2
 - RFC 2925 Ping/Traceroute MIB
 - RFC 2665 Ethernet-like interface MIB
 - RFC 1643 Ethernet MIB
 - RFC 1493 Bridge MIB
 - RFC 2096 IPv4 Forwarding Table MIB
 - RFC 2011 SNMPv2 for Internet protocol using SMIv2
 - RFC 2012 SNMPv2 for transmission control protocol using SMIv2
 - RFC 2013 SNMPv2 for user datagram protocol using SMIv2
 - RFC 2863 Interface MIB
 - RFC 3413 SNMP Application MIB
 - RFC 3414 User-based Security Model for SNMPv3
 - RFC 3415 View-based Access Control Model for SNMP
 - RFC 1724 RIPv2 MIB
 - RFC 2863 Interface Group MIB
 - RFC 2932 IPv4 Multicast MIB
 - RFC 2787 VRRP MIB
 - RFC 1850 OSPFv2 MIB
 - RFC 2819 RMON MIB
 - RFC 2287 System Application Packages MIB
 - RFC 4188 STP and Extensions MIB
 - RFC 4363 Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering, and VLAN extensions
 - RFC 2922 LLDP MIB
 - Draft - blumenthal - aes - usm - 08
 - Draft - reeder - snmpv3 - usm - 3desede -00
 - Draft - ietf-idmr-igmp-mib-13
 - Draft - ietf-idmr-pim-mib-09
 - Draft - ietf-bfd-mib-02.txt
- Troubleshooting
 - Debugging: CLI via console, Telnet, or SSH
 - Diagnostics: Show and debug command, statistics
 - Traffic monitoring/mirroring (port, VLAN)
 - IP tools: Extended ping and trace
 - Junos OS commit and rollback
- Traffic mirroring
 - Port-based
 - VLAN-based
 - ACL-based mirroring
 - Mirroring destination ports per system: 1
 - LAG port monitoring
 - Multiple destination ports monitored to 1 mirror (N:1)
 - Maximum number of mirroring sessions: 1
 - Mirroring to remote destination (over L2): 1 destination VLAN

Safety and compliance

The safety and compliance certifications are:

- Safety certifications
 - UL-UL60950-1 (First Edition)
 - C-UL to CAN/CSA 22.2 No.60950-1 (First Edition)
 - TUV/GS to EN 60950-1, Amendment A1-A4, A11
 - CB-IEC60950-1, all country deviations
- Electromagnetic compatibility certifications
 - FCC 47CFR Part 15 Class A
 - EN 55022 Class A
 - ICES-003 Class A
 - VCCI Class A
 - AS/NZS CISPR 22 Class A
 - CISPR 22 Class A
 - EN 55024
 - EN 300386
 - CE
- Environmental
 - Reduction of Hazardous Substances (ROHS) 5
- Telco
 - CLEI code
- Environmental ranges
 - Operating temperature: 32 to 113° F (0 to 45° C)
 - Storage temperature: -40 to 158° F (-40 to 70° C)
 - Operating altitude: up to 10,000 ft (3,048 m)
 - Non-operating altitude: up to 16,000 ft (4,877 m)
 - Relative humidity operating: 10 to 85% (noncondensing)
 - Relative humidity non-operating: 0 to 95% (noncondensing)
- Telecom Quality Management
 - TL9000

Why IBM

IBM is your trusted source to provide the right solutions as you design your data center network. Our experience in workload optimization, virtualization, and network convergence will deliver a solution that meets your unique network needs. IBM is your single point of contact for consultation, product, and service. IBM offers a broad choice of networking partners that leverages industry innovation, avoids costly vendor lock-in, and helps you evolve your data center using your current supplier and management tools, avoiding a forced “rip and replace.”

Warranty

When purchased from IBM System x®, the Juniper Networks EX4500 includes world-renowned IBM service and support. This includes a standard 3-year service agreement, with next-business-day replacement, software fixes, and telephone support.

Related publications

For more information, refer to these documents:

- Juniper EX4500 Switch Quick Start
http://www.juniper.net/techpubs/en_US/release-independent/junos/information-products/topic-collections/hardware/ex-series/ex4500/quick-start-ex4500.pdf
- Junos® OS CLI User Guide
https://www.juniper.net/techpubs/en_US/junos11.1/information-products/topic-collections/swconfig-cli/swconfig-cli.pdf
- Menu-based CLI Reference
https://www.juniper.net/techpubs/en_US/junos11.1/information-products/pathway-pages/junos-cli/junos-cli.html#configuration
- Complete Software Guide for Junos® OS for EX Series Switches
http://www.juniper.net/techpubs/en_US/junos11.1/information-products/topic-collections/ex-series/software-all/book-software-ex-series-111-all.pdf
- Juniper EX4500 Hardware Documentation (Planning, Installation, Maintenance and Troubleshooting)
http://www.juniper.net/techpubs/en_US/release-independent/junos/information-products/pathway-pages/ex-series/ex4500/ex4500.html#overview
- Complete Hardware Guide for EX4500 Ethernet Switches
http://www.juniper.net/techpubs/en_US/release-independent/junos/information-products/topic-collections/hardware/ex-series/ex4500/book-hw-ex4500.pdf
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