



JUNOS® Software Guide for EX Series Ethernet Switches

**JUNOS® Software Guide for EX Series Ethernet Switches,
Release 9.6: User and Access Management**

Juniper Networks, Inc.

1194 North Mathilda Avenue
Sunnyvale, California 94089

USA

408-745-2000

www.juniper.net

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Part 1

User Access and Management on EX Series Switches

Chapter 1

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How to Use This Guide

Complete documentation for the EX Series product family is provided on web pages at http://www.juniper.net/techpubs/en_US/release-independent/information-products/pathway-pages/ex-series/product/index.html. We have selected content from these web pages and created a number of EX Series guides that collect related topics into a book-like format so that the information is easy to print and easy to download to your local computer.

The release notes are at

http://www.juniper.net/techpubs/en_US/junos9.6/information-products/topic-collections/release-notes/9.6/junos-release-notes-9.6.pdf.

List of EX Series Guides for JUNOS Release 9.6

Title	Description
<i>Complete Hardware Guide for EX3200 and EX4200 Ethernet Switches</i>	Component descriptions, site preparation, installation, replacement, and safety and compliance information for EX3200 and EX4200 switches
<i>Complete Hardware Guide for EX8208 Ethernet Switches</i>	Component descriptions, site preparation, installation, replacement, and safety and compliance information for EX8208 switches
<i>Complete Hardware Guide for EX8216 Ethernet Switches</i>	Component descriptions, site preparation, installation, replacement, and safety and compliance information for EX8216 switches





Title	Description
<i>Complete Software Guide for JUNOS® Software for EX Series Ethernet Switches, Release 9.6</i>	Software feature descriptions, configuration examples, and tasks for JUNOS Software for EX Series switches and reference pages for configuration statements and operational commands
Software Topic Collections	Software feature descriptions, configuration examples and tasks, and reference pages for configuration statements and operational commands. (This information also appears in the <i>Complete Software Guide for JUNOS® Software for EX Series Ethernet Switches, Release 9.6.</i>)
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Access Control</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Alarms and System Log Messages</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Configuration and File Management</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Class of Service</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Device Security</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Ethernet Switching</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Interfaces</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Layer 3 Protocols</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: MPLS</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Multicast</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Network Management and Monitoring</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Port Security</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Routing Policy and Packet Filtering</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Spanning-Tree Protocols</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: System Setup</i>	

Title	Description
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: User and Access Management</i>	
<i>JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Virtual Systems</i>	
<i>J-Web User Interface Guide for JUNOS Software for EX Series Ethernet Switches</i>	How to use the J-Web graphical user interface (GUI) with JUNOS Software for EX Series switches

Downloading Software

You can download the JUNOS Software for EX Series switches from the Download Software area at <http://www.juniper.net/customers/support/>. To download the software, you must have a Juniper Networks user account. For information about obtaining an account, see <http://www.juniper.net/entitlement/setupAccountInfo.do>.

Documentation Symbols Key

Notice Icons		
Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Text and Syntax Conventions		
Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active

Text and Syntax Conventions		
Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> ■ Introduces important new terms. ■ Identifies book names. ■ Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> ■ A policy <i>term</i> is a named structure that defines match conditions and actions. ■ <i>JUNOS System Basics Configuration Guide</i> ■ RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Plain text like this	Represents names of configuration statements, commands, files, and directories; IP addresses; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> ■ To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. ■ The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> ■ In the Logical Interfaces box, select All Interfaces. ■ To cancel the configuration, click Cancel.

Text and Syntax Conventions		
Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select Protocols > Ospf .

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We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. Send e-mail to techpubs-comments@juniper.net with the following:

- Document URL or title
- Page number if applicable
- Software version
- Your name and company

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the JTAC User Guide located at <http://www.juniper.net/customers/support/downloads/710059.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC Hours of Operation —The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

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- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>

- Search technical bulletins for relevant hardware and software notifications:
<https://www.juniper.net/alerts/>
- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool located at <https://tools.juniper.net/SerialNumberEntitlementSearch/>.

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/> .
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting support.html>

Part 1

User Access and Management on EX Series Switches

- User Access and Management on EX Series Switches on page 3

Chapter 1

User Access and Management on EX Series Switches

- JUNOS Software—Overview on page 3
- Configuring User Access on page 14
- Monitoring the Switch, Users, and Traffic on page 17

JUNOS Software—Overview

- EX Series Switch Software Features Overview on page 3
- Understanding Software Infrastructure and Processes on page 12

EX Series Switch Software Features Overview

Table 1 on page 3 lists the Juniper Networks EX Series Ethernet Switch software features and the Juniper Networks JUNOS Software release in which they were introduced.

Table 1: Summary of Software Features Available on EX Series Switches

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
Activity Logging and Monitoring	J-Web event view for system log messages	JUNOS 9.0R2	JUNOS 9.4R1
	Real-time performance monitoring (RPM)	JUNOS 9.3R2	Not supported
	System logging (syslog) over IPv4	JUNOS 9.0R2	JUNOS 9.4R1
	System logging (syslog) over IPv6	JUNOS 9.3R2	Not supported
	Traceroute tool in J-Web interface	JUNOS 9.0R2	JUNOS 9.4R1

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
Administration	Automatic software download	JUNOS 9.6R1	Not supported
	Configuration rollback	JUNOS 9.0R2	JUNOS 9.4R1
	Confirmation of configuration changes	JUNOS 9.0R2	JUNOS 9.4R1
	Software upgrades	JUNOS 9.0R2	JUNOS 9.4R1
	Support for RADIUS external administrator databases	JUNOS 9.0R2	JUNOS 9.4R1
	Supports the following features for automating network operations and troubleshooting: <ul style="list-style-type: none"> <li>■ Commit scripts <li>■ Operation scripts <li>■ Event policies 	JUNOS 9.0R2	JUNOS 9.4R1
Encapsulation	802.1Q encapsulation tags	JUNOS 9.0R2	JUNOS 9.4R1
	802.1Q filtering and forwarding	JUNOS 9.0R2	JUNOS 9.4R1
	Ethernet: <ul style="list-style-type: none"> <li>■ Media access control (MAC) encapsulation <li>■ 802.1p tagging 	JUNOS 9.0R2	JUNOS 9.4R1

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
High Availability and Resiliency	Graceful protocol restart for IS-IS	JUNOS 9.3R2	JUNOS 9.4R1
	Graceful protocol restart for OSPF and BGP	JUNOS 9.0R2	JUNOS 9.4R1
	Graceful Routing Engine switchover (GRES) for EX4200 Virtual Chassis configurations	JUNOS 9.1R1	Not applicable
	Graceful Routing Engine switchover (GRES) for ARP entries	JUNOS 9.2R1	JUNOS 9.4R1
	Graceful Routing Engine switchover (GRES) for the forwarding database	JUNOS 9.2R1	JUNOS 9.4R1
	Graceful Routing Engine switchover (GRES) for port security	JUNOS 9.2R1	JUNOS 9.6R1
	Link aggregation control protocol (LACP)	JUNOS 9.0R2	JUNOS 9.4R1
	Link aggregation groups (LAGs)	JUNOS 9.0R2	JUNOS 9.4R1
	Link aggregation groups (LAGs) over Virtual Chassis ports (VCPs)	JUNOS 9.6R1	Not applicable
	Redundant trunk groups	JUNOS 9.0R2	JUNOS 9.4R1
	Virtual Chassis <ul style="list-style-type: none"> ■ Atomic software upgrade ■ Fast failover ■ Split and merge 	JUNOS 9.3R2	Not applicable
	Virtual Chassis <ul style="list-style-type: none"> ■ Autoprovisioning of Virtual Chassis ports (VCPs) 	JUNOS 9.5R1	Not applicable
	Virtual Chassis support for SFP uplink module ports	JUNOS 9.2R1	Not applicable
	Virtual Router Redundancy Protocol (VRRP)	JUNOS 9.0R2	JUNOS 9.4R1
Interfaces	Power over Ethernet (PoE)	JUNOS 9.0R2	Not applicable
	VLAN-tagged Layer 3 subinterfaces	JUNOS 9.2R1	JUNOS 9.4R1
Internet Protocols	IPv4	JUNOS 9.0R2	JUNOS 9.4R1
	IPv6 (except multicast protocols)	JUNOS 9.3R2	Not supported
	A separate software license is required for IPv6. See Software Licenses for the EX Series Switch Overview.		

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
IP Address Management	DHCP server and relay with option 82 for Layer 2 VLANs	JUNOS 9.3R2	JUNOS 9.4R1
	DHCPv6 and IPv6 DNS	JUNOS 9.3R2	Not supported
	Dynamic Host Configuration Protocol (DHCP)	JUNOS 9.0R2	JUNOS 9.4R1
	Local DHCP server	JUNOS 9.3R2	JUNOS 9.4R1
	Static addresses	JUNOS 9.0R2	JUNOS 9.4R1
Layer 2 Network Protocols	BPDU protection for spanning-tree protocols	JUNOS 9.1R1	JUNOS 9.4R1
	Extended Q-in-Q VLAN support for multiple S-VLANs per access interface, firewall-filter-based VLAN assignment, and routed VLAN interfaces (RVIs)	JUNOS 9.6R1	Not supported
	GARP VLAN Registration Protocol (GVRP)	JUNOS 9.1R1	JUNOS 9.4R1
	Link Layer Discovery Protocol (LLDP)	JUNOS 9.0R2	JUNOS 9.4R1
	Link Layer Discovery Protocol-Media Endpoint Discovery (LLDP-MED) with voice over IP (VoIP) integration	JUNOS 9.0R2	Not supported
	Loop protection for spanning-tree protocols	JUNOS 9.1R1	JUNOS 9.4R1
	Private VLANs (PVLANS)	JUNOS 9.3R2	Not supported
	Q-in-Q tunneling	JUNOS 9.3R2	Not supported
	Root protection for spanning-tree protocols	JUNOS 9.1R1	JUNOS 9.4R1
	Routed VLAN interfaces (RVIs)	JUNOS 9.0R2	JUNOS 9.4R1
	Spanning tree: <ul style="list-style-type: none"> ■ Spanning Tree Protocol (STP) ■ Rapid Spanning Tree Protocol (RSTP) ■ Multiple Spanning Tree Protocol (MSTP) 	JUNOS 9.0R2	JUNOS 9.4R1
	Spanning tree: <ul style="list-style-type: none"> ■ VLAN Spanning Tree Protocol (VSTP) 	JUNOS 9.4R1	JUNOS 9.6R1
	Storm control	JUNOS 9.1R1	JUNOS 9.4R1
	Unknown Layer 2 unicast forwarding	JUNOS 9.3R2	Not supported
	Virtual routing and forwarding (VRF)—virtual routing instances	JUNOS 9.2R1	JUNOS 9.6R1
VLAN range	JUNOS 9.2R1	JUNOS 9.4R1	

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
Layer 3 Protocols	Bidirectional Forwarding Detection (BFD)	JUNOS 9.0R2	JUNOS 9.4R1
	Border Gateway Protocol (BGP)	JUNOS 9.0R2	JUNOS 9.4R1
	A separate software license is required for BGP and MBGP. See Software Licenses for the EX Series Switch Overview.		
	Intermediate System-to-Intermediate System (IS-IS)	JUNOS 9.0R2	JUNOS 9.4R1
	A separate software license is required for IS-IS. See Software Licenses for the EX Series Switch Overview.		
	IGMPv1 and IGMPv2	JUNOS 9.1R1	JUNOS 9.4R1
	IGMPv3	JUNOS 9.3R2	JUNOS 9.4R1
	Internet Group Management Protocol (IGMP)	JUNOS 9.0R2	JUNOS 9.4R1
	IPv6 protocols: Open Shortest Path First version 3 (OSPFv3), RIPng, IS-IS for IPv6, IPv6 BGP	JUNOS 9.3R2	Not supported
	Jumbo frames on routed VLAN interfaces (RVIs)	JUNOS 9.4R1	JUNOS 9.4R1
	Multicast Source Discovery Protocol (MSDP)	JUNOS 9.4R1	JUNOS 9.4R1
	See the <i>JUNOS Software Routing Protocols Guide</i> at http://www.juniper.net/techpubs/software/junos/junos96/index.html .		
	OSPF Multitopology Routing (MT-OSPF)	JUNOS 9.5R1	JUNOS 9.5R1
	See the <i>JUNOS Software Routing Protocols Guide</i> at http://www.juniper.net/techpubs/software/junos/junos96/index.html .		
	OSPFv2	JUNOS 9.0R2	JUNOS 9.4R1
	Protocol Independent Multicast dense mode (PIM DM)	JUNOS 9.2R1	JUNOS 9.4R1
See the <i>JUNOS Software Multicast Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/junos96/index.html .			
Protocol Independent Multicast source specific multicast (PIM SSM)	JUNOS 9.2R1	Not supported	
See the <i>JUNOS Software Multicast Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/junos96/index.html .			
Protocol Independent Multicast sparse mode (PIM SM)	JUNOS 9.0R2	JUNOS 9.4R1	
See the <i>JUNOS Software Multicast Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/junos96/index.html .			

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
	Routing Information Protocol version 1 (RIPv1) and RIPv2	JUNOS 9.0R2	JUNOS 9.4R1
	Single-source multicast	JUNOS 9.0R2	JUNOS 9.4R1
	Static routes	JUNOS 9.0R2	JUNOS 9.4R1
Multicast	IGMP snooping with routed VLAN interfaces (RVIs)	JUNOS 9.2R1	JUNOS 9.4R1
	IGMPv3 snooping	JUNOS 9.6R1	JUNOS 9.6R1
	Multicast VLAN registration (MVR)	JUNOS 9.6R1	Not supported
MPLS	MPLS with RSVP-based label switched paths (LSPs) and MPLS-based circuit cross-connects (CCCs)	JUNOS 9.5R1	Not supported
	A separate software license is required for MPLS. See Software Licenses for the EX Series Switch Overview.		

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
Network Management and Monitoring	Class of service (CoS)—Class-based queuing with prioritization	JUNOS 9.0R2	JUNOS 9.4R1
	Class of service (CoS)—DSCP, IEEE 801.p, and IP precedence packet rewrites are enabled on routed VLAN interfaces (RVIs).	JUNOS 9.5R1	Not supported
	Class of service (CoS)—Interface-specific classifiers on routed VLAN interfaces (RVIs)	JUNOS 9.4R1	Not supported
	Class of service (CoS) multidestination	Not applicable	JUNOS 9.5R1
	Class-of-service (CoS) support on LAGs	JUNOS 9.2R1	JUNOS 9.4R1
	Class-of-service (CoS) support on routed VLAN interfaces (RVIs)	JUNOS 9.4R1	JUNOS 9.4R1
	Ethernet OAM link fault management (LFM)	JUNOS 9.4R1	Not supported
	Interface-specific CoS rewrite rules	JUNOS 9.4R1	Not supported
	JUNOS EZQoS for CoS	JUNOS 9.3R2	JUNOS 9.4R1
	Policing	JUNOS 9.0R2	JUNOS 9.4R1
	Port shaping and queue shaping	JUNOS 9.3R2	Not supported
	Port mirroring	JUNOS 9.0R2	JUNOS 9.4R1
	Port mirroring enhancements	JUNOS 9.5R1	JUNOS 9.5R1
	<ul style="list-style-type: none"> ■ Multiple VLAN support ■ Layer 3 interface support 		
	RMON	JUNOS 9.0R2	JUNOS 9.4R1
	Real-time performance monitoring (RPM)	JUNOS 9.3R2	Not supported
sFlow monitoring technology	JUNOS 9.3R2	Not supported	
Simple Network Management Protocol version 1 (SNMPv1) and SNMPv2	JUNOS 9.0R2	JUNOS 9.4R1	
Transparent bridging	JUNOS 9.0R2	JUNOS 9.4R1	

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
Security	802.1X authentication	JUNOS 9.0R2	Not supported
	Denial-of-service (DoS) and distributed DoS (DDoS) protection	JUNOS 9.0R2	JUNOS 9.4R1
	Dynamic firewall filters for 802.1X authentication	JUNOS 9.0R2	Not supported
	Filter-based forwarding	JUNOS 9.4R1	JUNOS 9.6R1
	Firewall filters and rate limiting	JUNOS 9.0R2	JUNOS 9.4R1
	Firewall filters on LAGs	JUNOS 9.0R2	Not supported
	Firewall filter on loopback interface	JUNOS 9.2R1	JUNOS 9.6R1
	Firewall filter processing points, additional	JUNOS 9.3R2	Not applicable
	Local proxy ARP	JUNOS 9.3R2	Not supported
	MAC-based VLAN	JUNOS 9.2R1	Not supported
	MAC RADIUS authentication	JUNOS 9.3R2	Not supported
	Port security: ■ DHCP option 82	JUNOS 9.3R2	Not supported
	Port security: ■ DHCP snooping ■ Dynamic ARP inspection (DAI) ■ MAC limiting ■ MAC move limiting	JUNOS 9.0R2	Not supported
	Port security: ■ IP source guard	JUNOS 9.2R1	Not supported
	Port security: ■ Persistent storage for DHCP snooping	JUNOS 9.4R1	Not supported
	Port security: ■ Static ARP support	JUNOS 9.0R2	JUNOS 9.4R1
	Port security and storm control: ■ Automatic recovery for port error disable conditions	JUNOS 9.6R1	Not supported
	Server fail fallback	JUNOS 9.3R2	JUNOS 9.4R1

Table 1: Summary of Software Features Available on EX Series Switches (continued)

Feature Category	Feature	First Release EX3200 and EX4200 Switches	First Release EX8200 Switches
	TACACS+	JUNOS 9.0R2	JUNOS 9.4R1
	Unicast reverse-path forwarding (RPF)	JUNOS 9.3R2	JUNOS 9.4R1
	Unrestricted proxy ARP	JUNOS 9.6R1	Not supported
System Management	Autoinstallation	JUNOS 9.4R1	Not supported
	IP directed broadcast	JUNOS 9.4R1	JUNOS 9.4R1
	JUNOS command-line interface (CLI)—For switch configuration and management through the console, Telnet, SSH, or J-Web CLI editor	JUNOS 9.0R2	JUNOS 9.4R1
	J-Web interface, for switch configuration and management	JUNOS 9.0R2	JUNOS 9.4R1
	J-Web interface enhancements: <ul style="list-style-type: none"> ■ The dashboard displays the DC power supply. ■ The Monitoring Chassis Information page displays details about the DC power supply. ■ The Virtual Chassis Monitoring page displays details of Virtual Chassis port (VCP) error and drop counts, VCP maximum bandwidth, and VCP actual bandwidth. 	JUNOS 9.4R1	Not applicable
	J-Web interface enhancements: <ul style="list-style-type: none"> ■ The Interface Configuration page displays details about port role configuration. ■ The Link Aggregation Configuration page supports aggregating interfaces with any speed setting. ■ Configuring spanning-tree protocols, GVRP, IGMP snooping, and redundant trunk groups is supported. ■ Monitoring Ethernet switching, spanning-tree protocols, GVRP, and IGMP snooping is supported. ■ Setting up real-time performance monitoring (RPM) and viewing monitoring results is supported. 	JUNOS 9.5R1	JUNOS 9.5R1
	J-Web license-management tool	JUNOS 9.1R1	JUNOS 9.4R1
	J-Web Port Troubleshooting tool	JUNOS 9.2R1	JUNOS 9.4R1
	Platform-specific JUNOS Software installation packages—EX Series switches have specific installation packages for each family of switches. Names of the installation packages include the switch family name.	JUNOS 9.4R1	JUNOS 9.4R1
	Power over Ethernet (PoE) power management mode	JUNOS 9.3R2	Not supported

- Related Topics**
- Features in JUNOS Software for EX-series Switches, Release 9.1
 - Features in JUNOS Software for EX-series Switches, Release 9.2
 - New Features in JUNOS Software for EX-series Switches, Release 9.3
 - New Features in JUNOS Software for EX-series Switches, Release 9.4
 - New Features in JUNOS Software for EX-series Switches, Release 9.5
 - New Features in JUNOS Release 9.6 for EX Series Switches
 - EX3200 and EX4200 Switches Hardware Overview
 - EX8208 Switch Hardware Overview
 - EX8216 Switch Hardware Overview
 - High Availability Features for EX Series Switches Overview
 - Layer 3 Protocols Supported on EX Series Switches
 - Layer 3 Protocols Not Supported on EX Series Switches

Understanding Software Infrastructure and Processes

Each switch runs the Juniper Networks JUNOS Software for Juniper Networks EX Series Ethernet Switches on its general-purpose processors. JUNOS Software includes processes for Internet Protocol (IP) routing and for managing interfaces, networks, and the chassis.

The JUNOS Software runs on the Routing Engine. The Routing Engine kernel coordinates communication among the JUNOS Software processes and provides a link to the Packet Forwarding Engine.

With the J-Web interface and the command-line interface (CLI) to the JUNOS Software, you configure switching features and routing protocols and set the properties of network interfaces on your switch. After activating a software configuration, use either the J-Web or CLI user interface to monitor the switch, manage operations, and diagnose protocol and network connectivity problems.

- Routing Engine and Packet Forwarding Engine on page 12
- JUNOS Software Processes on page 13

Routing Engine and Packet Forwarding Engine

A switch has two primary software processing components:

- Packet Forwarding Engine—Processes packets; applies filters, routing policies, and other features; and forwards packets to the next hop along the route to their final destination.
- Routing Engine—Provides three main functions:
 - Creates the packet forwarding switch fabric for the switch, providing route lookup, filtering, and switching on incoming data packets, then directing outbound packets to the appropriate interface for transmission to the network

- Maintains the routing tables used by the switch and controls the routing protocols that run on the switch.
- Provides control and monitoring functions for the switch, including controlling power and monitoring system status.

JUNOS Software Processes

The JUNOS Software running on the Routing Engine and Packet Forwarding Engine consists of multiple processes that are responsible for individual functions.

The separation of functions provides operational stability, because each process accesses its own protected memory space. In addition, because each process is a separate software package, you can selectively upgrade all or part of the JUNOS Software, for added flexibility.

Table 2 on page 13 describes the primary JUNOS Software processes.

Table 2: JUNOS Software Processes

Process	Name	Description
Chassis process	chassisd	<p>Detects hardware on the system that is used to configure network interfaces.</p> <p>Monitors the physical status of hardware components and field-replaceable units (FRUs), detecting when environment sensors such as temperature sensors are triggered.</p> <p>Relays signals and interrupts—for example, when devices are taken offline, so that the system can close sessions and shut down gracefully.</p>
Ethernet switching process	eswd	<p>Handles Layer 2 switching functionality such as MAC address learning, Spanning Tree protocol and access port security. The process is also responsible for managing Ethernet switching interfaces, VLANs, and VLAN interfaces.</p> <p>Manages Ethernet switching interfaces, VLANs, and VLAN interfaces.</p>
Forwarding process	pfem	<p>Defines how routing protocols operate on the switch. The overall performance of the switch is largely determined by the effectiveness of the forwarding process.</p>
Interface process	dcd	<p>Configures and monitors network interfaces by defining physical characteristics such as link encapsulation, hold times, and keepalive timers.</p>
Management process	mgd	<p>Provides communication between the other processes and an interface to the configuration database.</p> <p>Populates the configuration database with configuration information and retrieves the information when queried by other processes to ensure that the system operates as configured.</p> <p>Interacts with the other processes when commands are issued through one of the user interfaces on the switch.</p> <p>If a process terminates or fails to start when called, the management process attempts to restart it a limited number of times to prevent thrashing and logs any failure information for further investigation.</p>

Table 2: JUNOS Software Processes (continued)

Process	Name	Description
Routing protocol process	rpd	Defines how routing protocols such as RIP, OSPF, and BGP operate on the device, including selecting routes and maintaining forwarding tables.

- Related Topics**
- For more information about processes, see the *JUNOS Network Operations Guide* at <http://www.juniper.net/techpubs/software/junos/junos90/index.html>.
 - For more information about basic system parameters, supported protocols, and software processes, see *JUNOS System Basics Configuration Guide* at <http://www.juniper.net/techpubs/software/junos/junos94/index.html>.

Configuring User Access

- [Configuring Management Access for the EX Series Switch \(J-Web Procedure\)](#) on page 14
- [Generating SSL Certificates to Be Used for Secure Web Access](#) on page 17

Configuring Management Access for the EX Series Switch (J-Web Procedure)

You can manage an EX Series switch remotely through the J-Web interface. To communicate with the switch, the J-Web interface uses Hypertext Transfer Protocol (HTTP). HTTP allows easy Web access but no encryption. The data that is transmitted between the Web browser and the switch by means of HTTP is vulnerable to interception and attack. To enable secure Web access the switch supports HTTP over Secure Sockets Layer (HTTPS). You can enable HTTP or HTTPS access on specific interfaces and ports as needed.

Navigate to the Secure Access Configuration page by selecting **Configure > System Properties > Management Access**. On this page, you can enable HTTP and HTTPS access on interfaces for managing the EX Series switch through the J-Web interface. You can also install SSL certificates and enable JUNOScript over SSL with the Secure Access page.

1. Click **Edit** to modify the configuration. Enter information into the Management Access Configuration page, as described in Table 3 on page 15.
2. To verify that Web access is enabled correctly, connect to the switch using the appropriate method:
 - For HTTP access—In your Web browser, type `http://URL` or `http://IP address`.
 - For HTTPS access—In your Web browser, type `https://URL` or `https://IP address`.
 - For SSL JUNOScript access— To use this option, you must have a JUNOScript client such as JUNOScope. For information about how to log into JUNOScope, see the *JUNOScope Software User Guide*.

Table 3: Secure Management Access Configuration Summary

Field	Function	Your Action
Management Access tab		
Management Port IP/Management Port IPv6	Specifies the management port IP address. The software supports both IPv4 (displayed as IP) and IPv6 address.	<p>To specify an IPv4 address:</p> <ol style="list-style-type: none"> 1. Select the check box IPv4 address. 2. Type an IP address — for example: 10.10.10.10. 3. Enter the subnet mask or address prefix. For example, 24 bits represents 255.255.255.0. 4. Click OK. <p>To specify an IPv6 address:</p> <ol style="list-style-type: none"> 1. Select the check box IPv6 address. 2. Type an IP address—for example:2001:ab8:85a3::8a2e:370:7334. 3. Enter the subnet mask or address prefix. 4. Click OK.
Default Gateway	Defines a default gateway through which to direct packets addressed to networks that are not explicitly listed in the bridge table constructed by the switch.	For IPv4 address type a 32-bit IP address, in dotted decimal notation. Type a 128-bit IP address for IPv6 address type.
Loopback address	Specifies the IP address of the loopback interface.	Type an IP address.
Subnet Mask	Specifies the subnet mask for the loopback interface.	Enter the subnet mask or address prefix.
Services tab		
Services	Specifies services to be enabled: telnet and SSH.	Select to enable the required services.
Enable JUNOScript over Clear Text	Enables clear text access to the JUNOScript XML scripting API.	To enable clear text access, select the Enable JUNOScript over Clear Text check box.
Enable JUNOScript over SSL	Enables secure SSL access to the JUNOScript XML scripting API.	To enable SSL access, select the Enable JUNOScript over SSL check box.
JUNOScript Certificate	Specifies SSL certificates to be used for encryption. This field is available only after you create at least one SSL certificate.	To enable an SSL certificate, select a certificate from the JUNOScript SSL Certificate list—for example, new .

Table 3: Secure Management Access Configuration Summary (continued)

Field	Function	Your Action
Enable HTTP	Enables HTTP access on interfaces.	<p>To enable HTTP access, select the Enable HTTP access check box.</p> <p>Select and clear interfaces by clicking the direction arrows:</p> <ul style="list-style-type: none"> ■ To enable HTTP access on an interface, add the interface to the HTTP Interfaces list. You can either select all interfaces or specific interfaces.
Enable HTTPS	Enables HTTPS access on interfaces.	<p>To enable HTTPS access, select the Enable HTTPS access check box.</p> <p>Select and deselect interfaces by clicking the direction arrows:</p> <ul style="list-style-type: none"> ■ To enable HTTPS access on an interface, add the interface to the HTTPS Interfaces list. You can either select all interfaces or specific interfaces. <p>NOTE: Specify the certificate to be used for HTTPS access.</p>

Certificates tab

Certificates	<p>Displays digital certificates required for SSL access to the switch.</p> <p>Allows you to add and delete SSL certificates.</p>	<p>To add a certificate:</p> <ol style="list-style-type: none"> 1. Have a general SSL certificate available. See Generating SSL Certificates for more information. 2. Click Add. The Add a Local Certificate page opens. 3. Type a name in the Certificate Name box—for example, new. 4. Open the certificate file and copy its contents. 5. Paste the generated certificate and RSA private key in the Certificate box. <p>To edit a certificate, select it and click Edit.</p> <p>To delete a certificate, select it and click Delete.</p>
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- Related Topics**
- Security Features for EX Series Switches Overview
 - Understanding J-Web User Interface Sessions

Generating SSL Certificates to Be Used for Secure Web Access

You can set up secure web access for an EX Series switch. To enable secure Web access, you must generate a digital Secure Sockets Layer (SSL) certificate and then enable HTTPS access on the switch.

To generate an SSL certificate:

1. Enter the following `openssl` command in your SSH command-line interface on a BSD or Linux system on which `openssl` is installed. The `openssl` command generates a self-signed SSL certificate in the privacy-enhanced mail (PEM) format. It writes the certificate and an unencrypted 1024-bit RSA private key to the specified file.

```
% openssl req -x509 -nodes -newkey rsa:1024 -keyout filename.pem -out
filename.pem
```

where *filename* is the name of a file in which you want the SSL certificate to be written—for example, `new`.

2. When prompted, type the appropriate information in the identification form. For example, type `US` for the country name.
3. Display the contents of the file that you created.

```
cat new.pem
```



NOTE: When you are ready to install the SSL certificate, copy the file containing the certificate from the BSD or Linux system to the switch. Open the file and copy its contents so that you can paste it into the Certificate box on the J-Web Secure Access Configuration page.

You can use J-Web Configuration page to install the SSL certificate and enable HTTPS.

- Related Topics**
- Configuring Management Access for the EX Series Switch (J-Web Procedure) on page 14
 - Security Features for EX Series Switches Overview

Monitoring the Switch, Users, and Traffic

- Managing Users (J-Web Procedure) on page 18
- Configuring MS-CHAPv2 to Provide Password-Change Support (CLI Procedure) on page 20
- Monitoring Hosts Using the J-Web Ping Host Tool on page 20
- Monitoring Switch Control Traffic on page 22
- Monitoring Network Traffic Using Traceroute on page 24

- Monitoring System Properties on page 26
- Monitoring System Process Information on page 27

Managing Users (J-Web Procedure)

You can use the Users Configuration page for user information to add new users to a switching platform. For each account, you define a login name and password for the user and specify a login class for access privileges.

To configure users:

1. In the J-Web interface, select **Configure > System Properties > User Management**.

The User Management page displays details of users, the authentication order, the RADIUS servers and TACACS servers present.

2. Click **Edit**.
3. Click any of the following options on the **Users** tab:
 - **Add**—Select this option to add a user. Enter details as described in Table 4 on page 19.
 - **Edit**—Select this option to edit an existing user's details. Enter details as described in Table 4 on page 19.
 - **Delete**—Select this option to delete a user.
4. Click any desired option on the **Authentication Methods and Order** tab:
 - **Authentication Order**—Drag and drop the authentication type from the Available Methods section to the Selected Methods. Click the up or down buttons to modify the authentication order.
 - **RADIUS server**—Click one:
 - **Add**—Select this option to add an authentication server. Enter details as described in Table 5 on page 19.
 - **Edit**—Select this option to modify the authentication server details. Enter details as described in Table 5 on page 19.
 - **Delete**—Select this option to delete an authentication server from the list.
 - **TACACS server**—Click one:
 - **Add**—Select this option to add an authentication server. Enter details as described in Table 5 on page 19.
 - **Edit**—Select this option to modify the authentication server details. Enter details as described in Table 5 on page 19.
 - **Delete**—Select this option to delete an authentication server from the list.

Table 4: User Management > Add a User Configuration Page Summary

Field	Function	Your Action
User Information		
Username (required)	Specifies the name that identifies the user.	Type the username. It must be unique within the switching platform. Do not include spaces, colons, or commas in the username.
User Id	Specifies the user identification.	Type the user's ID.
Full Name	Specifies the user's full name.	Type the user's full name. If the full name contains spaces, enclose it in quotation marks. Do not include colons or commas.
Login Class (required)	Defines the user's access privilege.	Select the user's login class from the list: <ul style="list-style-type: none"> ■ operator ■ read-only ■ super-user/superuser ■ unauthorized <p>This list also includes any user-defined login classes.</p>
Password	Specifies the login password for this user.	Type the login password for this user. The login password must meet these criteria: <ul style="list-style-type: none"> ■ The password must be at least 6 characters long. ■ It can include alphabetic, numeric, and special characters, but not control characters. ■ It must contain at least one change of case or character class.
Confirm Password	Verifies the login password for this user.	Retype the login password for this user.

Table 5: Add an Authentication Server

Field	Function	Your Action
IP Address	Specifies the IP address of the server.	Type the server's 32-bit IP address, in dotted decimal notation.
Password	Specifies the password of the server.	Type the password of the server.
Confirm Password	Verifies that the password of the server is entered correctly.	Retype the password of the server.
Server Port	Specifies the port with which the server is associated.	Type the port number.
Source Address	Specifies the source address of the server.	Type the server's 32-bit IP address, in dotted decimal notation.

Table 5: Add an Authentication Server (continued)

Field	Function	Your Action
Retry Attempts	Specifies the number of login retries allowed after a login failure.	Type the number. NOTE: Only 1 retry is permitted for a TACACS server.
Time out	Specifies the time interval to wait before the connection to the server is closed.	Type the interval in seconds.

- Related Topics**
- Configuring Management Access for the EX Series Switch (J-Web Procedure) on page 14

Configuring MS-CHAPv2 to Provide Password-Change Support (CLI Procedure)

JUNOS Software for EX Series switches enables you to configure the Microsoft Corporation implementation of the Challenge Handshake Authentication Protocol version 2 (MS-CHAPv2) on the switch to provide password-change support. Configuring MS-CHAPv2 on the switch provides users accessing a switch the option of changing the password when the password expires, is reset, or is configured to be changed at next login.

See RFC 2433 at [http://www.ietf.org/rfc/rfc2433.txt](#), Microsoft PPP CHAP Extensions, for information about MS-CHAP.

Before you configure MS-CHAPv2 to provide password-change support, ensure that you have:

- Configured RADIUS server authentication. Configure users on the authentication server and set the first-trying option in the authentication order to radius. See Example: Connecting a RADIUS Server for 802.1X to an EX Series Switch.

To configure MS-CHAPv2, specify the following:

```
[edit system radius-options]
user@switch# set password-protocol mschap-v2
```

You must have the required access permission on the switch in order to change your password.

- Related Topics**
- Managing Users (J-Web Procedure) on page 18
 - For more about configuring user access, see the JUNOS Software Access Privilege Configuration Guide at [http://www.juniper.net/documentation/en_US/junos/topics/concept/privilege-access-configuration.html](#)

Monitoring Hosts Using the J-Web Ping Host Tool

- Purpose** Use the J-Web ping host tool to verify that the host can be reached over the network. The output is useful for diagnosing host and network connectivity problems. The switch sends a series of ICMP echo (ping) requests to a specified host and receives ICMP echo responses.

Action To use the J-Web ping host tool:

1. Select Troubleshoot>Ping Host.
2. Next to Advanced options, click the expand icon.
3. Enter information into the Ping Host page, as described in Table 6 on page 21.

The Remote Host field is the only required field.

4. Click **Start**.

The results of the ping operation are displayed in the main pane . If no options are specified, each ping response is in the following format:

```
bytes bytes from ip-address: icmp_seq=number ttl=number time=time
```

5. To stop the ping operation before it is complete, click **OK**.

Meaning Table 6 on page 21 lists the fields.

Table 6: J-Web Ping Host Field Summary

Field	Function	Your Action
Remote Host	Identifies the host to ping.	Type the hostname or IP address of the host to ping.
Advanced Options		
Don't Resolve Addresses	Determines whether to display hostnames of the hops along the path.	<ul style="list-style-type: none"> ■ To suppress the display of the hop hostnames, select the check box. ■ To display the hop hostnames, clear the check box.
Interface	Specifies the interface on which the ping requests are sent.	Select the interface on which ping requests are sent from the list. If you select any , the ping requests are sent on all interfaces.
Count	Specifies the number of ping requests to send.	Select the number of ping requests to send from the list.
Don't Fragment	Specifies the Don't Fragment (DF) bit in the IP header of the ping request packet.	<ul style="list-style-type: none"> ■ To set the DF bit, select the check box. ■ To clear the DF bit, clear the check box.
Record Route	Sets the record route option in the IP header of the ping request packet. The path of the ping request packet is recorded within the packet and displayed in the main pane.	<ul style="list-style-type: none"> ■ To record and display the path of the packet, select the check box. ■ To suppress the recording and display of the path of the packet, clear the check box.
Type-of-Service	Specifies the type-of-service (TOS) value in the IP header of the ping request packet.	Select the decimal value of the TOS field from the list.
Routing Instance	Name of the routing instance for the ping attempt.	Select the routing instance name from the list.
Interval	Specifies the interval, in seconds, between transmissions of individual ping requests.	Select the interval from the list.

Table 6: J-Web Ping Host Field Summary (continued)

Field	Function	Your Action
Packet Size	Specifies the size of the ping request packet.	Type the size, in bytes, of the packet. The size can be from 0 through 65468. The switch adds 8 bytes of ICMP header to the size.
Source Address	Specifies the source address of the ping request packet.	Type the source IP address.
Time-to-Live	Specifies the time-to-live (TTL) hop count for the ping request packet.	Select the TTL value from the list.
Bypass Routing	Determines whether ping requests are routed by means of the routing table. If the routing table is not used, ping requests are sent only to hosts on the interface specified in the Interface box. If the host is not on that interface, ping responses are not sent.	<ul style="list-style-type: none"> ■ To bypass the routing table and send the ping requests to hosts on the specified interface only, select the check box. ■ To route the ping requests using the routing table, clear the check box.

Related Topics ■ Monitoring Interface Status and Traffic

Monitoring Switch Control Traffic

Purpose Use the packet capture feature when you need to quickly capture and analyze switch control traffic on a switch. The packet capture feature allows you to capture traffic destined for or originating from the Routing Engine.

Action To use the packet capture feature in the J-Web interface, select **Troubleshoot>Packet Capture**.

To use the packet capture feature in the CLI, enter the following CLI command:

```
monitor traffic
```

Meaning You can use the packet capture feature to compose expressions with various matching criteria to specify the packets that you want to capture. You can decode and view the captured packets in the J-Web interface as they are captured. The packet capture feature does not capture transient traffic.

Table 7: Packet Capture Field Summary

Field	Function	Your Action
Interface	Specifies the interface on which the packets are captured. If you select default, packets on the Ethernet management port 0, are captured.	From the list, select an interface—for example, <code>ge-0/0/0</code> .

Table 7: Packet Capture Field Summary (continued)

Field	Function	Your Action
Detail level	<p>Specifies the extent of details to be displayed for the packet headers.</p> <ul style="list-style-type: none"> ■ Brief—Displays the minimum packet header information. This is the default. ■ Detail—Displays packet header information in moderate detail. ■ Extensive—Displays the maximum packet header information. 	From the list, select Detail .
Packets	Specifies the number of packets to be captured. Values range from 1 to 1000 . Default is 10 . Packet capture stops capturing packets after this number is reached.	From the list, select the number of packets to be captured—for example, 10 .
Addresses	<p>Specifies the addresses to be matched for capturing the packets using a combination of the following parameters:</p> <ul style="list-style-type: none"> ■ Direction—Matches the packet headers for IP address, hostname, or network address of the source, destination or both. ■ Type—Specifies if packet headers are matched for host address or network address. <p>You can add multiple entries to refine the match criteria for addresses.</p>	<p>Select address-matching criteria. For example:</p> <ol style="list-style-type: none"> 1. From the Direction list, select source. 2. From the Type list, select host. 3. In the Address box, type 10.1.40.48. 4. Click Add.
Protocols	Matches the protocol for which packets are captured. You can choose to capture TCP, UDP, or ICMP packets or a combination of TCP, UDP, and ICMP packets.	From the list, select a protocol—for example, tcp .
Ports	Matches packet headers containing the specified source or destination TCP or UDP port number or port name.	<p>Select a direction and a port. For example:</p> <ul style="list-style-type: none"> ■ From the Type list, select src. ■ In the Port box, type 23.
Advanced Options		
Absolute TCP Sequence	Specifies that absolute TCP sequence numbers are to be displayed for the packet headers.	To display absolute TCP sequence numbers in the packet headers, select this check box.
Layer 2 Headers	Specifies that link-layer packet headers are to be displayed.	To include link-layer packet headers while capturing packets, select this check box.
Non-Promiscuous	Specifies not to place the interface in promiscuous mode, so that the interface reads only packets addressed to it. In promiscuous mode, the interface reads every packet that reaches it.	To read all packets that reach the interface, select this check box.
Display Hex	Specifies that packet headers, except link-layer headers, are to be displayed in hexadecimal format.	To display the packet headers in hexadecimal format, select this check box.
Display ASCII and Hex	Specifies that packet headers are to be displayed in hexadecimal and ASCII format.	To display the packet headers in ASCII and hexadecimal formats, select this check box.

Table 7: Packet Capture Field Summary (continued)

Field	Function	Your Action
Header Expression	Specifies the match condition for the packets to be captured. The match conditions you specify for Addresses, Protocols, and Ports are displayed in expression format in this field.	You can enter match conditions directly in this field in expression format or modify the expression composed from the match conditions you specified for Addresses, Protocols, and Ports. If you change the match conditions specified for Addresses, Protocols, and Ports again, packet capture overwrites your changes with the new match conditions.
Packet Size	Specifies the number of bytes to be displayed for each packet. If a packet header exceeds this size, the display is truncated for the packet header. The default value is 96 bytes.	Type the number of bytes you want to capture for each packet header—for example, 256.
Don't Resolve Addresses	Specifies that IP addresses are not to be resolved into hostnames in the packet headers displayed.	To prevent packet capture from resolving IP addresses to hostnames, select this check box.
No Timestamp	Suppresses the display of packet header timestamps.	To stop displaying timestamps in the captured packet headers, select this check box.
Write Packet Capture File	Writes the captured packets to a file in PCAP format in /var/tmp. The files are named with the prefix jweb-pcap and the extension .pcap. If you select this option, the decoded packet headers are not displayed on the packet capture page.	To decode and display the packet headers on the J-Web page, clear this check box.

Related Topics ■ Using the CLI Terminal

Monitoring Network Traffic Using Traceroute

Purpose Use the Traceroute page in the J-Web interface to trace a route between the switch and a remote host. You can use a traceroute task to display a list of waypoints between the switch and a specified destination host. The output is useful for diagnosing a point of failure in the path from the switch platform to the destination host and addressing network traffic latency and throughput problems.

Action To use the traceroute tool:

1. Select **Troubleshoot>Traceroute**.
2. Next to **Advanced options**, click the expand icon.
3. Enter information into the Traceroute page.

The **Remote Host** field is the only required field.

4. Click **Start**.
5. To stop the traceroute operation before it is complete, click **OK** while the results of the traceroute operation are being displayed.

Meaning The switch generates the list of waypoints by sending a series of ICMP traceroute packets in which the time-to-live (TTL) value in the messages sent to each successive waypoint is incremented by 1. (The TTL value of the first traceroute packet is set to 1.) In this manner, each waypoint along the path to the destination host replies with a Time Exceeded packet from which the source IP address can be obtained.

The results of the traceroute operation are displayed in the main pane. If no options are specified, each line of the traceroute display is in the following format:

```
hop-number host (ip-address) [as-number] time1 time2 time3
```

The switch sends a total of three traceroute packets to each waypoint along the path and displays the round-trip time for each traceroute operation. If the switch times out before receiving a Time Exceeded message, an asterisk (*) is displayed for that round-trip time.

Table 8: Traceroute field summary

Field	Function	Your Action
Remote Host	Identifies the destination host of the traceroute.	Type the hostname or IP address of the destination host.
Advanced Options		
Don't Resolve Addresses	Determines whether hostnames of the hops along the path are displayed, in addition to IP addresses.	To suppress the display of the hop hostnames, select the check box.
Gateway	Specifies the IP address of the gateway to route through.	Type the gateway IP address.
Source Address	Specifies the source address of the outgoing traceroute packets.	Type the source IP address.
Bypass Routing	Determines whether traceroute packets are routed by means of the routing table. If the routing table is not used, traceroute packets are sent only to hosts on the interface specified in the Interface box. If the host is not on that interface, traceroute responses are not sent.	To bypass the routing table and send the traceroute packets to hosts on the specified interface only, select the check box.
Interface	Specifies the interface on which the traceroute packets are sent.	From the list, select the interface on which traceroute packets are sent. If you select any, the traceroute requests are sent on all interfaces.
Time-to-live	Specifies the maximum time-to-live (TTL) hop count for the traceroute request packet.	From the list, select the TTL.
Type-of-Service	Specifies the type-of-service (TOS) value to include in the IP header of the traceroute request packet.	From the list, select the decimal value of the TOS field.
Resolve AS Numbers	Determines whether the autonomous system (AS) number of each intermediate hop between the router and the destination host is displayed.	To display the AS numbers, select the check box.

- Related Topics**
- Connecting and Configuring an EX Series Switch (CLI Procedure)
 - Connecting and Configuring an EX Series Switch (J-Web Procedure)
 - Configuring Gigabit Ethernet Interfaces (J-Web Procedure)
 - Monitoring Interface Status and Traffic

Monitoring System Properties

Purpose Use the monitoring functionality to view system properties such as the name and IP address of the switch and resource usage.

Action To monitor system properties in the J-Web interface, select **Monitor > System View > System Information**.

To monitor system properties in the CLI, enter the following commands:

- `show system uptime`
- `show system users`
- `show system storage`

Meaning Table 9 on page 26 summarizes key output fields in the system properties display.

Table 9: Summary of Key System Properties Output Fields

Field	Values	Additional Information
General Information		
Serial Number	Serial number for the switch.	
JUNOS Software Version	Version of JUNOS Software active on the switch, including whether the software is for domestic or export use.	Export software is for use outside of the U.S. and Canada.
Hostname	The name of switch.	
IP Address	The IP address of the switch.	
Loopback Address	The loopback address.	
Domain Name Server	The address of the domain name server.	
Time Zone	The time zone on the switch.	
Time		
Current Time	Current system time, in Coordinated Universal Time (UTC).	

Table 9: Summary of Key System Properties Output Fields (continued)

Field	Values	Additional Information
System Booted Time	Date and time when the switch was last booted and how long it has been running.	
Protocol Started Time	Date and time when the switching protocols were last started and how long they have been running.	
Last Configured Time	Date and time when a configuration was last committed. This field also shows the name of the user who issued the last <code>commit</code> command, through either the J-Web interface or the CLI.	
Load Average	The CPU load average for 1, 5, and 15 minutes.	
Storage Media		
Internal Flash Memory	Memory usage details of internal flash.	
External Flash Memory	Usage details of external flash memory.	
Logged in Users Details		
User	Username of any user logged in to the switching platform.	
Terminal	Terminal through which the user is logged in.	
From	System from which the user has logged in. A hyphen indicates that the user is logged in through the console.	
Login Time	Time when the user logged in.	This is the LOGIN@ field in <code>show system users</code> command output.
Idle Time	How long the user has been idle.	

- Related Topics**
- Monitoring System Process Information on page 27
 - Understanding J-Web User Interface Sessions

Monitoring System Process Information

Purpose Use the monitoring functionality to view the processes running on the switch.

Action To view the software processes running on the switch in the J-Web interface, select **Monitor > System View > Process Details**.

To view the software processes running on the switch in the CLI, enter the following command.

```
show system processes
```

Meaning Table 10 on page 28 summarizes the output fields in the system process information display.

The display includes the total CPU load and total memory utilization.

Table 10: Summary of System Process Information Output Fields

Field	Values	Additional Information
PID	Identifier of the process.	
Name	Owner of the process.	
State	Current state of the process.	
CPU Load	Percentage of the CPU that is being used by the process.	
Memory Utilization	Amount of memory that is being used by the process.	
Start Time	Time of day when the process started.	

- Related Topics**
- Monitoring System Properties on page 26
 - For more information about show system properties command, see show system uptime