



JUNOS® Software Guide for EX Series Ethernet Switches

**JUNOS® Software Guide for EX Series Ethernet Switches,
Release 9.6: Layer 3 Protocols**

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JUNOS® Software Guide for EX Series Ethernet Switches JUNOS® Software Guide for EX Series Ethernet Switches, Release 9.6: Layer 3 Protocols

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Table of Contents

About This Topic Collection	ix
How to Use This Guide	ix
List of EX Series Guides for JUNOS Release 9.6	ix
Downloading Software	xi
Documentation Symbols Key	xi
Documentation Feedback	xiii
Requesting Technical Support	xiii
Self-Help Online Tools and Resources	xiii
Opening a Case with JTAC	xiv

Part 1

Layer 3 Protocols

Chapter 1

Layer 3 Protocols	3
Layer 3 Protocols—Overview	3
Layer 3 Protocols Supported on EX Series Switches	3
Layer 3 Protocols Not Supported on EX Series Switches	4
Configuring Layer 3 Protocols	6
Configuring BGP Sessions (J-Web Procedure)	6
Configuring an OSPF Network (J-Web Procedure)	7
Configuring a RIP Network (J-Web Procedure)	8
Configuring Static Routing (CLI Procedure)	10
Configuring Static Routing (J-Web Procedure)	11
Verifying Layer 3 Protocols Configuration	12
Monitoring BGP Routing Information	12
Monitoring OSPF Routing Information	14
Monitoring RIP Routing Information	16
Monitoring Routing Information	17

About This Topic Collection

- How to Use This Guide on page ix
- List of EX Series Guides for JUNOS Release 9.6 on page ix
- Downloading Software on page xi
- Documentation Symbols Key on page xi
- Documentation Feedback on page xiii
- Requesting Technical Support on page xiii

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

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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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- Search for known bugs: <http://www2.juniper.net/kb/>
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- 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

Layer 3 Protocols

- Layer 3 Protocols on page 3

Chapter 1

Layer 3 Protocols

- Layer 3 Protocols—Overview on page 3
- Configuring Layer 3 Protocols on page 6
- Verifying Layer 3 Protocols Configuration on page 12

Layer 3 Protocols—Overview

- Layer 3 Protocols Supported on EX Series Switches on page 3
- Layer 3 Protocols Not Supported on EX Series Switches on page 4

Layer 3 Protocols Supported on EX Series Switches

EX Series switches support the JUNOS layer 3 features and configuration statements listed in Table 1 on page 3:

Table 1: Supported JUNOS Layer 3 Protocol Statements and Features

Protocol	Notes	For More Information
BGP	Fully supported.	See the <i>JUNOS Software Routing Protocols Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
BFD	Fully supported.	See the <i>JUNOS Software Routing Protocols Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
ICMP	Fully supported.	See the <i>JUNOS Software Routing Protocols Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
IGMPv1, v2 and v3	Fully supported.	See the <i>JUNOS Software Multicast Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
IS-IS	Supported, with the exceptions noted in “Layer 3 Protocols Not Supported on EX Series Switches” on page 4.	See the <i>JUNOS Software Routing Protocols Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
MPLS	Supported, with the exceptions noted in “Layer 3 Protocols Not Supported on EX Series Switches” on page 4.	See the <i>JUNOS MPLS Applications Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .

Table 1: Supported JUNOS Layer 3 Protocol Statements and Features (continued)

Protocol	Notes	For More Information
OSPFv1, v2 and v3	Supported, with the exceptions noted in “Layer 3 Protocols Not Supported on EX Series Switches” on page 4.	See the <i>JUNOS Software Routing Protocols Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
PIM	Supported, with the exception of IPv6.	See the <i>JUNOS Software Multicast Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
RIP	Fully supported.	See the <i>JUNOS Software Routing Protocols Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
RIPng	Fully supported.	See the <i>JUNOS Software Routing Protocols Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
SNMP	Fully supported.	See the <i>JUNOS Software Network Management Configuration Guide</i> at http://www.juniper.net/techpubs/software/junos/ .
VRRP	Fully supported with exception of IPv6 support of VRRP on routed VLAN interfaces.	See High Availability Features for EX Series Switches Overview. See also the <i>JUNOS Software High Availability Guide</i> at http://www.juniper.net/techpubs/software/junos/ .

- Related Topics**
- Layer 3 Protocols Not Supported on EX Series Switches on page 4
 - EX Series Switch Software Features Overview

Layer 3 Protocols Not Supported on EX Series Switches

EX Series switches do not support the JUNOS Layer 3 protocols and features listed in Table 2 on page 4:

Table 2: JUNOS Layer 3 Protocol Statements and Features That Are Not Supported

Feature	Configuration Statements Not Supported on EX Series Switches
DVMRP	■ dvmrp and subordinate statements
Flow aggregation (cflowd)	■ cflow and subordinate statements
GRE	■ Not supported
IPSec	■ [edit services] statements related to IPSec

Table 2: JUNOS Layer 3 Protocol Statements and Features That Are Not Supported (continued)

Feature	Configuration Statements Not Supported on EX Series Switches
IS-IS: <ul style="list-style-type: none"> ■ ES-IS ■ IPv6 in multicast routing protocols 	<ul style="list-style-type: none"> ■ <code>clns-routing</code> statement ■ <code>ipv6-multicast</code> statement ■ <code>lsp-interval</code> statement ■ <code>label-switched-path</code> statement ■ <code>lsp-lifetime</code> statement ■ <code>te-metric</code> statement
Layer 2 Tunneling Protocol (L2TP)	<ul style="list-style-type: none"> ■ <code>l2tp</code> and subordinate statements
Logical routers	<ul style="list-style-type: none"> ■ <code>logical-routers</code> and subordinate statements
MLD	<ul style="list-style-type: none"> ■ <code>mld</code> and all subordinate statements
MPLS: <ul style="list-style-type: none"> ■ Fast Reroute (FRR) ■ Label Distribution Protocol (LDP) ■ Layer 3 VPNs ■ Multiprotocol BGP (MP-BGP) for VPN-IPv4 family ■ Pseudowire emulation (PWE3) ■ Routing policy statements related to Layer 3 VPNs and MPLS ■ Virtual Private LAN Service (VPLS) 	<ul style="list-style-type: none"> ■ <code>ldp</code> and all subordinate statements
Network Address Translation (NAT)	<ul style="list-style-type: none"> ■ <code>nat</code> and subordinate statements ■ Policy statements related to NAT
OSPF	<ul style="list-style-type: none"> ■ <code>demand-circuit</code> statement ■ <code>label-switched-path</code> and subordinate statements ■ <code>neighbor</code> statement within an OSPF area ■ <code>peer-interface</code> and subordinate statements within an OSPF area ■ <code>sham-link</code> statement ■ <code>te-metric</code> statement
PIM: <ul style="list-style-type: none"> ■ IPv6 	<ul style="list-style-type: none"> ■ <code>inet6</code> family
Routing instances: <ul style="list-style-type: none"> ■ Routing instance forwarding 	<ul style="list-style-type: none"> ■ <code>l2vpn</code> and subordinate statements ■ <code>ldp</code> and subordinate statements ■ <code>vpls</code> and subordinate statements

Table 2: JUNOS Layer 3 Protocol Statements and Features That Are Not Supported (continued)

Feature	Configuration Statements Not Supported on EX Series Switches
SAP and SDP	<ul style="list-style-type: none"> ■ sap and all subordinate statements
General routing options in the routing-options hierarchy: <ul style="list-style-type: none"> ■ MPLS and label-switched-paths 	<ul style="list-style-type: none"> ■ auto-export and subordinate statements ■ dynamic-tunnels and subordinate statements ■ lsp-next-hop and subordinate statements ■ multicast and subordinate statements ■ p2mp-lsp-next-hop and subordinate statements ■ route-distinguisher-id statement
Traffic sampling and forwarding in the forwarding-options hierarchy	<ul style="list-style-type: none"> ■ accounting and subordinate statements ■ family mpls and family multiservice under hash-key hierarchy ■ Under monitoring <i>group-name</i> family inet output hierarchy: <ul style="list-style-type: none"> ■ cflowd statement ■ export-format-cflowd-version-5 statement ■ flow-active-timeout statement ■ flow-export-destination statement ■ flow-inactive-timeout statement ■ interface statement ■ port-mirroring statement (On EX Series switches, port mirroring is implemented using the analyzer statement.) ■ sampling and subordinate statements

- Related Topics**
- Layer 3 Protocols Supported on EX Series Switches on page 3
 - EX Series Switch Software Features Overview

Configuring Layer 3 Protocols

- Configuring BGP Sessions (J-Web Procedure) on page 6
- Configuring an OSPF Network (J-Web Procedure) on page 7
- Configuring a RIP Network (J-Web Procedure) on page 8
- Configuring Static Routing (CLI Procedure) on page 10
- Configuring Static Routing (J-Web Procedure) on page 11

Configuring BGP Sessions (J-Web Procedure)

J-Web Configuration allows you to create BGP peering sessions.



NOTE: To configure BGP sessions a license must be installed on the EX Series switch.

To configure a BGP peering session :

1. In the J-Web user interface, select **Configure > Routing > BGP Routing**.
2. Enter information into the configuration page for BGP, as described in Table 3 on page 7.
3. To apply the configuration, click **Apply**.

Table 3: BGP Routing Configuration Summary

Field	Function	Your Action
Router Identification		
Router Identifier (required)	Uniquely identifies the device.	Type the switch's 32-bit IP address, in dotted decimal notation.
BGP		
Enable BGP	Enables or disables BGP.	<ul style="list-style-type: none"> ■ To enable BGP, select the check box. ■ To disable BGP, clear the check box.
Autonomous System Number	Sets the unique numeric identifier of the AS in which the switch is configured.	<p>Type the switch's 32-bit AS number, in dotted decimal notation.</p> <p>If you enter an integer, the value is converted to a 32-bit equivalent. For example, if you enter 3, the value assigned to the AS is 0.0.0.3.</p>
Peer Autonomous System Number	Sets the unique numeric identifier of the AS in which the peer host resides.	<p>Type the peer host's 32-bit AS number, in dotted decimal notation.</p> <p>If you enter an integer, the value is converted to a 32-bit equivalent. For example, if you enter 3, the value assigned to the AS is 0.0.0.3.</p>
Peer Address	Specifies the IP address of the peer host's interface to which the BGP session is being established.	Type the IP address of the peer host's adjacent interface, in dotted decimal notation.
Local Address	Specifies the IP address of the local host's interface from which the BGP session is being established.	Type the IP address of the local host's adjacent interface, in dotted decimal notation.
Related Topics		
<ul style="list-style-type: none"> ■ EX Series Switch Software Features Overview ■ Monitoring BGP Routing Information on page 12 		

Configuring an OSPF Network (J-Web Procedure)

J-Web Configuration allows you to create single-area OSPF networks.

To configure a single-area OSPF network:

1. In the J-Web user interface, select **Configure > Routing > OSPF Routing**.
2. Enter information into the Configuration Routing page for OSPF, as described in Table 4 on page 8.

- To apply the configuration, click **Apply**.

Table 4: OSPF Routing Configuration Summary

Field	Function	Your Action
Router Identification		
Router Identifier (required)	Uniquely identifies the device.	Type the switch's 32-bit IP address, in dotted decimal notation.
OSPF		
Enable OSPF	Enables or disables OSPF.	<ul style="list-style-type: none"> ■ To enable OSPF, select the check box. ■ To disable OSPF, clear the check box.
OSPF Area ID	Uniquely identifies the area within its AS.	<p>Type a 32-bit numeric identifier for the area, or type an integer.</p> <p>If you enter an integer, the value is converted to a 32-bit equivalent. For example, if you enter 3, the value assigned to the area is 0.0.0.3.</p>
Area Type	Designates the type of OSPF area.	<p>Select the type of OSPF area you are creating from the list :</p> <ul style="list-style-type: none"> ■ regular—A regular OSPF area, including the backbone area ■ stub—A stub area ■ nssa—A not-so-stubby area (NSSA)
OSPF-Enabled Interfaces	Designates one or more interfaces on which OSPF is enabled.	<p>The first time you configure OSPF, the Logical Interfaces box displays a list of all the logical interfaces configured on the switch. Do any of:</p> <ul style="list-style-type: none"> ■ To enable OSPF on an interface, click the interface name to highlight it, and click the left arrow to add the interface to the OSPF interfaces list. ■ To enable OSPF on multiple interfaces at once, press Ctrl while you click multiple interface names to highlight them. Then click the left arrow to add the interfaces to the OSPF interfaces list. ■ To enable OSPF on all logical interfaces except the special me0 management interface, select All Interfaces in the Logical Interfaces list and click the left arrow. ■ To enable OSPF on all the interfaces displayed in the Logical Interfaces list, click All to highlight every interface. Then click the left arrow to add the interfaces to the OSPF interfaces list. ■ To disable OSPF on one or more interfaces, highlight the interface or interfaces in the OSPF interfaces box and click the right arrow to move them back to the Logical Interfaces list.

Related Topics ■ Monitoring OSPF Routing Information on page 14

Configuring a RIP Network (J-Web Procedure)

J-Web allows you to create RIP networks.

To configure a RIP network:

- In the J-Web user interface, select **Configure > Routing > RIP Routing**.

2. Enter information into the Configuration page for RIP, as described in Table 5 on page 9.
3. To apply the configuration, click **Apply**.

Table 5: RIP Routing Configuration Summary

Field	Function	Your Action
RIP		
Enable RIP	Enables or disables RIP.	<ul style="list-style-type: none"> ■ To enable RIP, select the check box. ■ To disable RIP, clear the check box.
Advertise Default Route	Advertises the default route using RIPv2.	<ul style="list-style-type: none"> ■ To advertise the default route using RIPv2, select the check box. ■ To disable the default route advertisement, clear the check box.
RIP-Enabled Interfaces	Designates one or more interfaces on which RIP is enabled.	<p>The first time you configure RIP, the Logical Interfaces box displays a list of all the logical interfaces configured on the switch. Do any of the following:</p> <ul style="list-style-type: none"> ■ To enable RIP on an interface, click the interface name to highlight it, and click the left arrow to add the interface to the RIP interfaces list. ■ To enable RIP on multiple interfaces at once, press Ctrl while you click multiple interface names to highlight them. Then click the left arrow to add the interfaces to the RIP interfaces list. ■ To disable RIP on one or more interfaces, highlight the interface or interfaces in the RIP interfaces box and click the right arrow to move them back to the Logical Interfaces list.

- Related Topics** ■ Monitoring RIP Routing Information on page 16

Configuring Static Routing (CLI Procedure)

Static routes are routes that are manually configured and entered into the routing table. Dynamic routes, in contrast, are learned by the EX Series switch and added to the routing table using a protocol such as OSPF or RIP.

The switch uses static routes:

- When the switch does not have a route to a destination that has a better (lower) *preference* value. The preference is an arbitrary value in the range from 0 through 255 that the software uses to rank routes received from different protocols, interfaces, or remote systems. The routing protocol process generally determines the active route by selecting the route with the lowest preference value. In the given range, 0 is the lowest and 255 is the highest.
- When the switch cannot determine the route to a destination.
- When the switch is forwarding unroutable packets.

To configure basic static route options using the CLI:

- To configure the switch's default gateway:

```
[edit]
user@switch# set routing-options static route 0.0.0.0/0 next-hop 10.0.1.1
```

- To configure a static route and specify the next address to be used when routing traffic to the static route:

```
[edit]
user@switch# set routing-options static route 20.0.0.0/24 next-hop
10.0.0.2.1
```

- To always keep the static route in the forwarding table:

```
[edit]
user@switch# set routing-options static route 20.0.0.0/24 retain
```

- To prevent the static route from being readvertised:

```
[edit]
user@switch# set routing-options static route 20.0.0.0/24 no-readvertise
```

- To remove inactive routes from the forwarding table:

```
[edit]
user@switch# set routing-options static route 20.0.0.0/24 active
```

- Related Topics** ■ Configuring Static Routing (J-Web Procedure) on page 11

- Monitoring Routing Information on page 17

Configuring Static Routing (J-Web Procedure)

J-Web configuration allows you to configure static routes.

To configure static routes:

1. In the J-Web user interface, select **Configure > Routing > Static Routing**.
2. Enter information into the routing page, as described in Table 6 on page 11.
3. To apply the configuration, click **Apply**.

Table 6: Static Routing Configuration Summary

Field	Function	Your Action
Default Route		
Default Route	Specifies the default gateway for the switch.	Type the 32-bit IP address of the switch's default route in dotted decimal notation.
Static Routes		
Static Route Address (required)	Specifies the static route to add to the routing table.	<ol style="list-style-type: none"> 1. On the main static routing Configuration page, click Add. 2. In the Static Route Address box, type the 32-bit IP address of the static route in dotted decimal notation.
Next-Hop Addresses	Specifies the next-hop address or addresses to be used when routing traffic to the static route.	<ol style="list-style-type: none"> 1. In the Add box, type the 32-bit IP address of the next-hop host. 2. Click Add. 3. Add more next-hop addresses as necessary. <p>NOTE: If a route has multiple next-hop addresses, traffic is routed across each address in round-robin fashion.</p> <ol style="list-style-type: none"> 4. When you have finished adding next-hop addresses, click OK.

- Related Topics**
- Configuring Static Routing (CLI Procedure) on page 10
 - Monitoring Routing Information on page 17

Verifying Layer 3 Protocols Configuration

- Monitoring BGP Routing Information on page 12
- Monitoring OSPF Routing Information on page 14
- Monitoring RIP Routing Information on page 16
- Monitoring Routing Information on page 17

Monitoring BGP Routing Information

Purpose Use the monitoring functionality to monitor BGP routing information.

Action To view BGP routing information in the J-Web interface, select **Monitor > Routing > BGP Information**.

To view BGP routing information in the CLI, enter the following commands:

- `show bgp summary`
- `show bgp neighbor`

Meaning Table 7 on page 12 summarizes key output fields in the BGP routing display.

Table 7: Summary of Key BGP Routing Output Fields

Field	Values	Additional Information
BGP Summary		
Total Groups	Number of BGP groups.	
Total Peers	Number of BGP peers.	
Down Peers	Number of unavailable BGP peers.	
Peer	Address of each BGP peer.	
InPkt	Number of packets received from the peer.	
OutPkt	Number of packets sent to the peer.	
Flaps	Number of times a BGP session has changed state from Down to Up.	A high number of flaps might indicate a problem with the interface on which the BGP session is enabled.
Last Up/Down	Last time that a session became available or unavailable, since the neighbor transitioned to or from the established state.	If the BGP session is unavailable, this time might be useful in determining when the problem occurred.

Table 7: Summary of Key BGP Routing Output Fields (continued)

Field	Values	Additional Information
State	<p>A multipurpose field that displays information about BGP peer sessions. The contents of this field depend upon whether a session is established.</p> <ul style="list-style-type: none"> ■ If a peer is not established, the field shows the state of the peer session: Active, Connect, or Idle. ■ If a BGP session is established, the field shows the number of active, received, and damped routes that are received from a neighbor. For example, 2/4/0 indicates two active routes, four received routes, and no damped routes. 	
BGP Neighbors		
Peer Address	Address of the BGP neighbor.	
Autonomous System	AS number of the peer.	
Type	Type of peer: Internal or External .	
State	<p>Current state of the BGP session:</p> <ul style="list-style-type: none"> ■ Active—BGP is initiating a TCP connection in an attempt to connect to a peer. If the connection is successful, BGP sends an open message. ■ Connect—BGP is waiting for the TCP connection to become complete. ■ Established—The BGP session has been established, and the peers are exchanging BGP update messages. ■ Idle—This is the first stage of a connection. BGP is waiting for a Start event. ■ OpenConfirm—BGP has acknowledged receipt of an open message from the peer and is waiting to receive a keepalive or notification message. ■ OpenSent—BGP has sent an open message and is waiting to receive an open message from the peer. 	<p>Generally, the most common states are Active, which indicates a problem establishing the BGP connection, and Established, which indicates a successful session setup. The other states are transition states, and BGP sessions normally do not stay in those states for extended periods of time.</p>
Export	Names of any export policies configured on the peer.	
Import	Names of any import policies configured on the peer.	
Number of flaps	Number of times the BGP sessions has changed state from Down to Up .	A high number of flaps might indicate a problem with the interface on which the session is established.

- Related Topics**
- Configuring BGP Sessions (J-Web Procedure) on page 6
 - Layer 3 Protocols Supported on EX Series Switches on page 3

Monitoring OSPF Routing Information

Purpose Use the monitoring functionality to monitor OSPF routing information.

Action To view OSPF routing information in the J-Web interface, select **Monitor > Routing > OSPF Information**.

To view OSPF routing information in the CLI, enter the following CLI commands:

- show ospf neighbor
- show ospf interface
- show ospf statistics

Meaning Table 8 on page 14 summarizes key output fields in the OSPF routing display.

Table 8: Summary of Key OSPF Routing Output Fields

Field	Values	Additional Information
OSPF Neighbors		
Address	Address of the neighbor.	
Interface Name	Interface through which the neighbor is reachable.	
State	State of the neighbor: Attempt, Down, Exchange, ExStart, Full, Init, Loading, or 2way.	Generally, only the Down state, indicating a failed OSPF adjacency, and the Full state, indicating a functional adjacency, are maintained for more than a few seconds. The other states are transitional states that a neighbor is in only briefly while an OSPF adjacency is being established.
ID	ID of the neighbor.	
Priority	Priority of the neighbor to become the designated switch.	
OSPF Interfaces		
Interface	Name of the interface running OSPF.	
State	State of the interface: BDR, Down, DR, DRother, Loop, PtToPt, or Waiting.	The Down state, indicating that the interface is not functioning, and PtToPt state, indicating that a point-to-point connection has been established, are the most common states.
Area	Number of the area that the interface is in.	
DR ID	Address of the area's designated device.	
BDR ID	Address of the area's backup designated device.	
Neighbors	Number of neighbors on this interface.	

Table 8: Summary of Key OSPF Routing Output Fields (continued)

Field	Values	Additional Information
Adjacency Count	Number of devices in the area using the same area identifier.	
Stub Type	The areas into which OSPF does not flood AS external advertisements	
Passive Mode	In this mode the interface is present on the network but does not transmit or receive packets.	
Authentication Type	The authentication scheme for the backbone or area.	
Interface Address	The IP address of the interface.	
Address Mask	The subnet mask or address prefix.	
MTU	The maximum transmission unit size.	
Interface Cost	The path cost used to calculate the root path cost from any given LAN segment is determined by the total cost of each link in the path.	
Hello Interval	Displays how often the switch sends hello packets out of the interface.	
Dead Interval	The interval during which the switch receives no hello packets from the neighbor.	
Retransmit Interval	The interval for which the switch waits to receive a link-state acknowledgment packet before retransmitting link-state advertisements to an interface's neighbors.	
OSPF Statistics		
Packet Type	Type of OSPF packet.	
Packets Sent	Total number of packets sent.	
Packets Received	Total number of packets received.	
Depth of flood Queue	Number of entries in the extended queue.	
Total Retransmits	Number of retransmission entries enqueued.	
Total Database Summaries	Total number of database description packets.	

- Related Topics**
- Configuring an OSPF Network (J-Web Procedure) on page 7
 - Layer 3 Protocols Supported on EX Series Switches on page 3

Monitoring RIP Routing Information

Purpose Use the monitoring functionality to monitor RIP routing.

Action To view RIP routing information in the J-Web interface, select **Monitor > Routing > RIP Routing**.

To view RIP routing information in the CLI, enter the following CLI commands:

- show rip statistics
- show rip neighbor

Meaning Table 9 on page 16 summarizes key output fields in the RIP routing display.

Table 9: Summary of Key RIP Routing Output Fields

Field	Values	Additional Information
RIP Statistics		
RIP Protocol Name	The RIP protocol name.	
RIP Port	The port on which RIP is enabled.	
Hold Down	The interval during which routes are neither advertised nor updated.	
Routes Learned	Number of RIP routes learned on the logical interface.	
Routes Held Down	Number of RIP routes that are not advertised or updated during hold-down.	
Requests Dropped	Number of requests dropped.	
Responses Dropped	Number of responses dropped.	
RIP Neighbors		
Neighbor	Name of the RIP neighbor.	This value is the name of the interface on which RIP is enabled. Click the name to see the details for this neighbor.
State	State of the RIP connection: Up or Dn (Down).	
Source Address	Local source address.	This value is the configured address of the interface on which RIP is enabled.

Table 9: Summary of Key RIP Routing Output Fields (continued)

Field	Values	Additional Information
Destination Address	Destination address.	This value is the configured address of the immediate RIP adjacency.
Send Mode	The mode of sending RIP messages.	
Receive Mode	The mode in which messages are received.	
In Metric	Value of the incoming metric configured for the RIP neighbor.	

- Related Topics**
- Configuring a RIP Network (J-Web Procedure) on page 8
 - Layer 3 Protocols Supported on EX Series Switches on page 3

Monitoring Routing Information

Purpose Use the monitoring functionality to view inet.0 routing table.

Action To view the routing tables in the J-Web interface, select **Monitor > Routing > Static Routing**

To view the routings table in the CLI, enter the following commands in the CLI interface:

- show route terse
- show route detail

Meaning Table 10 on page 17 summarizes key output fields in the routing information display.

Table 10: Summary of Key Routing Information Output Fields

Field	Values	Additional Information
n destinations	Number of destinations for which there are routes in the routing table.	
n routes	Number of routes in the routing table: <ul style="list-style-type: none"> ■ active—Number of routes that are active. ■ hold down—Number of routes that are in hold-down state (neither advertised nor updated) before being declared inactive. ■ hidden—Number of routes not used because of routing policies configured on the switching platform. 	
Destination	Destination address of the route.	

Table 10: Summary of Key Routing Information Output Fields (continued)

Field	Values	Additional Information
Protocol/ Preference	Protocol from which the route was learned: Static , Direct , Local , or the name of a particular protocol. The preference is the individual preference value for the route.	The route preference is used as one of the route selection criteria.
Next-Hop	Network layer address of the directly reachable neighboring system (if applicable) and the interface used to reach it.	<p>If a next hop is listed as Discard, all traffic with that destination address is discarded rather than routed. This value generally means that the route is a static route for which the discard attribute has been set.</p> <p>If a next hop is listed as Reject, all traffic with that destination address is rejected. This value generally means that the address is unreachable. For example, if the address is a configured interface address and the interface is unavailable, traffic bound for that address is rejected.</p> <p>If a next hop is listed as Local, the destination is an address on the host (either the loopback address or Ethernet management port 0 address, for example).</p>
Age	How long the route has been known.	
State	Flags for this route.	There are many possible flags.
AS Path	AS path through which the route was learned. The letters of the AS path indicate the path origin: <ul style="list-style-type: none"> ■ I — IGP. ■ E — EGP. ■ ? — Incomplete. Typically, the AS path was aggregated. 	

- Related Topics**
- Configuring Static Routing (J-Web Procedure) on page 11
 - Configuring Static Routing (CLI Procedure) on page 10