

## About This Manual

This chapter provides a high-level overview of the *JUNOS Internet Software Configuration Guide: Routing and Routing Protocols*:

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## Objectives

This manual provides an overview of the routing policy and protocols for the JUNOS Internet software and describes how to configure protocols on the router.

This manual fully documents the routing policy and protocol configuration in Release 4.2 of the JUNOS Internet software.

To obtain the most current version of this manual and the most current version of the software release notes, refer to the product documentation page on the Juniper Networks Web site, which is located at <http://www.juniper.net>.

To order printed copies of this manual or to order a documentation CD-ROM, which contains this manual, please contact your sales representative.

## Audience

This manual is designed for network administrators who are configuring a Juniper Networks router. It assumes that you have a broad understanding of networks in general, the Internet in particular, networking principles, and network configuration. This manual assumes that you are familiar with one or more of the following Internet routing protocols: Border Gateway Protocol (BGP), Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), Internet Control Message Protocol (ICMP) router discovery, Internet Group Management Protocol (IGMP), Distance Vector Multicast Routing Protocol (DVMRP), Protocol-Independent Multicast (PIM), Multicast Source Discovery Protocol (MSDP), Multiprotocol Label Switching (MPLS), Resource Reservation Protocol (RSVP), Routing Information Protocol (RIP), and Simple Network Management Protocol (SNMP).

## Document Organization

This manual is divided into several parts. Each part describes a major functional area of the JUNOS software, and the individual chapters within a part describe the software components of that functional area.

This manual contains the following parts and chapters:

Part 1, “Overview,” provides an overview of the policy and protocol configuration components of the router:

Chapter 1, “Routing Protocols Concepts,” provides an overview of routing protocol. It discusses routing protocol terminology and concepts, including addresses, tracing operations, and route preferences.

Chapter 2, “Complete Routing and Routing Protocol Configuration Statements,” lists the complete configuration statement hierarchy for the statements discussed in this manual. For a complete list of all configuration mode statements and commands, see the *JUNOS Internet Software Configuration Guide: Installation and System Management*.

Part 2, “Routing Policy,” describes how to configure the JUNOS software routing policy:

Chapter 3, “Routing Policy Overview,” provides an overview of the JUNOS software routing policy, which allows you to control the routing information that is transferred between the routing protocols and the JUNOS software routing table.

Chapter 4, “Routing Policy Configuration Statements,” lists all the statements that can be included when you create a routing policy.

Chapter 5, “Configure Routing Policy,” describes how to configure JUNOS software routing policy.

Chapter 6, “Configure Route Lists,” describes how to use the JUNOS routing policy software to create route lists, which allows you to group routes and perform common actions on them.

Chapter 7, “Configure AS Path Regular Expressions and Communities,” describes how to use the JUNOS routing policy software to create AS path regular expressions.

- Chapter 8, “Configure Damping Parameters,” describes how to define the policy actions required to effect BGP damping.
- Chapter 9, “Summary of Routing Policy Configuration Statements,” explains all the routing policy configuration statements.
- Part 3, “Protocol-Independent Routing Properties,” describes how to configure routing properties that are independent of a particular routing protocol:
  - Chapter 11, “Protocol-Independent Routing Properties Overview,” provides an overview of protocol-independent routing properties and how they affect systemwide routing operations.
  - Chapter 10, “Configure Routing Tables and Routes,” describes how to configure routing tables, static routes, aggregate routes, generated routes, and martian addresses.
  - Chapter 12, “Configure Other Protocol-Independent Routing Properties,” describes how to configure the AS number, router identifier, AS confederation members, and other protocol-independent routing properties.
  - Chapter 13, “Summary of Protocol-Independent Routing Property Configuration Statements,” explains all the protocol-independent routing property configuration statements.
- Part 4, “Routing Instances,” describes how to configure multiple OSPF routing instances.
  - Chapter 14, “Configure Routing Instances,” describes how to configure multiple instances of OSPF to segregate and identify certain traffic entities within of a very large network.
- Part 5, “Interior Gateway Protocols,” describes how to configure the JUNOS software interior gateway protocols (IGPs):
  - Chapter 15, “IS-IS Overview,” provides an overview of the Intermediate System-to-Intermediate System (IS-IS) protocol, which is an IGP that uses link-state information to make routing decisions, and describes how to configure IS-IS.
  - Chapter 16, “IS-IS Configuration Guidelines,” describes how to configure IS-IS.
  - Chapter 17, “Summary of IS-IS Configuration Statements,” explains all the IS-IS configuration statements.
  - Chapter 18, “OSPF Overview,” provides an overview of the Open Shortest Path First (OSPF) protocol, which is an IGP that routes packets within a single AS.
  - Chapter 19, “OSPF Configuration Guidelines,” describes how to configure OSPF.
  - Chapter 20, “Summary of OSPF Configuration Statements,” explains all the OSPF configuration statements.
  - Chapter 21, “RIP Overview,” provides an overview of the Routing Information Protocol (RIP), which is a distance-vector IGP.
  - Chapter 22, “RIP Configuration Guidelines,” describes how to configure RIP.

Chapter 23, "Summary of RIP Configuration Statements," explains all the RIP configuration statements.

Chapter 24, "ICMP Router Discovery Overview," describes router discovery, which uses Internet Control Message Protocol (ICMP) router advertisements and router solicitation messages to allow a host to discover the addresses of operational routers on the subnet.

Chapter 25, "ICMP Router Discovery Configuration Guidelines," describes how to configure router discovery.

Chapter 26, "Summary of ICMP Router Discovery Configuration Statements," explains all the ICMP configuration statements.

Part 6, "BGP," describes how to configure BGP:

Chapter 27, "BGP Overview," provides an overview of the Border Gateway Protocol (BGP), which is an exterior gateway protocol that is used to exchange routing information among routers in different ASs, and describes how to configure BGP.

Chapter 28, "BGP Configuration Guidelines," describes how to configure BGP.

Chapter 29, "Summary of BGP Configuration Statements," explains all the BGP configuration statements.

Part 7, "IP Multicast Protocols," describes how to configure and monitor the JUNOS software IP multicast routing protocols:

Chapter 30, "IP Multicast Overview," describes the IP multicast routing protocols supported by the JUNOS software.

Chapter 31, "IGMP Overview," provides an overview of the Internet Group Management Protocol (IGMP), which is used to learn whether group members are present.

Chapter 32, "IGMP Configuration Guidelines," describes how to configure IGMP.

Chapter 33, "Summary of IGMP Configuration Statements," explains all the IGMP configuration statements.

Chapter 34, "SAP and SDP," describes Session Announcement Protocol (SAP) and Session Description Protocol (SDP), which handle conference session announcements, and how to configure them.

Chapter 35, "Multicast Scoping," describes multicast scoping, which can be used to limit multicast traffic by configuring it to an administratively defined topological region.

Chapter 36, "DVMRP Overview," provides an overview of the Distance-Vector Multicast Routing Protocol (DVMRP), which is the distance-vector routing protocol that provides connectionless datagram delivery to a group of hosts across an internetwork.

Chapter 37, "DVMRP Configuration Guidelines," describes how to configure DVMRP.

Chapter 38, "Summary of DVMRP Configuration Statements," explains all the DVMRP configuration statements.

Chapter 39, “PIM Overview,” provides an overview of Protocol-Independent Multicast (PIM), which is a multicast routing protocol that routes to multicast groups.

Chapter 40, “PIM Configuration Guidelines,” describes how to configure PIM.

Chapter 41, “Summary of PIM Configuration Statements,” explains all the PIM configuration statements.

Chapter 42, “MSDP Overview,” provides an overview of Multicast Source Discovery Protocol (MSDP), a multicast routing protocol used to interconnect multicast routing domains.

Chapter 43, “MSDP Configuration Guidelines,” describes how to configure MSDP.

Chapter 44, “Summary of MSDP Configuration Statements,” explains all the MSDP configuration statements.

A glossary and an index are provided at the end of this manual.

## Related Documentation

The following additional documentation describes the JUNOS Internet software:

*JUNOS Internet Software Configuration Guide: Installation and System Management*—Provides an overview of the JUNOS Internet software and describes how to install and upgrade the software. This manual also describes how to configure system management functions, including user accounts, passwords, and SNMP.

*JUNOS Internet Software Configuration Guide: Interfaces and Chassis*—Provides an overview of the interface and chassis functions of the JUNOS Internet software and describes how to configure the interfaces and chassis on the router.

*JUNOS Internet Software Configuration Guide: MPLS Applications*—Provides an overview of traffic engineering concepts and describes how to configure traffic engineering protocols.

*JUNOS Internet Software Command Reference*—Describes the JUNOS Internet software commands you use to monitor and troubleshoot Juniper Networks routers.

## Manual Part Organization

The parts in this manual typically contain the following chapters:

**Overview**—Provides background information about and discusses concepts related to the software component described in the chapter. For example, in each routing protocol configuration chapter, the overview section provides a brief explanation of the design and functioning of the protocol.

**Configuration statements**—Lists all the configuration statements available to configure the software component. This list is designed to provide an overview of the configuration statement hierarchy for that software component.

Configuration guidelines—Describes how to configure all the features of the software component. The first section of the configuration guidelines describes the minimum configuration for that component, listing the configuration statements you must include to enable the software component on the router with only the bare minimum functionality. The remaining sections in the configuration guidelines are generally arranged so that the most common features are near the beginning.

Statement summary—A reference that lists all configuration statements alphabetically and explains each statement and all its options. The explanation of each configuration statement consists of the following parts:

Syntax—Describes the full syntax of the configuration statement. For an explanation of how to read the syntax statements, see “Documentation Conventions” on page xxxiii.

Hierarchy level—Tells where in the configuration statement hierarchy you include the statement.

Description—Describes the function of the configuration statement.

Options—Describes the configuration statement’s options, if there are any. For options with numeric values, the allowed range and default value, if any, are listed. For multiple options, if one option is the default, that fact is stated. If a configuration statement is at the top of a hierarchy of options that are other configuration statements, these options are generally explained separately in the statement summary section.

Usage guidelines—Points to the section or sections in the configuration guidelines section that describes how to use the configuration statement.

Required privilege level—Indicates the permissions that the user must have to view or modify the statement in the router configuration. For an explanation of the permissions, see the *JUNOS Internet Software Configuration Guide: Installation and System Management* .

See also—Indicates other configuration statements that might provide related or similar functionality.

## Using the Index

In the index, bold page numbers point to pages in the statement summary sections of configuration chapters or to commands in the monitoring and troubleshooting chapters. The index entry for each configuration statement always contains at least two entries. The first, with a bold page number on the same line as the statement name, references the statement summary section. The second entry, “usage guidelines,” references the section in the configuration guidelines section that describes how to use the statement.

## Documentation Conventions

### General Conventions

In general text, this manual uses the following conventions:

Statements, commands, filenames, directory names, IP addresses, and configuration hierarchy levels are shown in a sans serif font. In the following example, “stub” is a statement name and “[edit protocols ospf area *area-id*]” is a configuration hierarchy level:

To configure a stub area, include the stub statement at the [edit protocols ospf area *area-id*] hierarchy level:

In examples, text that you type literally is shown in a bold font. In the following example, you type the word “show”:

```
[edit protocols ospf area area-id
cli# show
stub <default-metric metric>
```

Examples of command output are generally shown in a fixed-width font to preserve the column alignment. For example:

```
> show interfaces terse
Interface      Admin Link Proto Local          Remote
at-1/3/0       up    up
at-1/3/0.0     up    up   inet  1.0.0.1        --> 1.0.0.2
               iso
fxp0           up    up
fxp0.0         up    up   inet  192.168.5.59/24
```

### Conventions for Software Commands and Statements

When describing the JUNOS software, this manual uses the following type and presentation conventions:

Statement or command names that you type literally are shown in a nonitalicized font. In the following example, the statement name is “area”:

You configure all these routers by including the following area statement at the [edit protocols ospf] hierarchy level:

Options, which are variable terms for which you substitute appropriate values, are shown in italics. In the following example, “area-id” is an option. When you type the area statement, you substitute a value for *area-id*.

```
area area-id;
```

Optional portions of a configuration statement are enclosed in angle brackets. In the following example, the “default-metric *metric*” portion of the statement is optional:

```
stub <default-metric metric>;
```

For text strings separated by a pipe ( | ), you must specify either *string1* or *string2*, but you cannot specify both or neither of them. Parentheses are sometimes used to group the strings.

```
string1 | string2
(string1 | string2)
```

In the following example, you must specify either broadcast or multicast, but you cannot specify both:

```
broadcast | multicast
```

For some statements, you can specify a set of values. The set must be enclosed in square brackets. For example:

```
community name members [community-id]
```

The configuration examples in this manual are generally formatted in the way that they appear when you issue a show command. This format includes braces ( { } ) and semicolons. When you type configuration statements in the CLI, you do not type the braces and semicolons. However, when you type configuration statements in an ASCII file, you must include the braces and semicolons. For example:

```
[edit]
cli# set routing-options static route default next-hop address retain
[edit]
cli# show
routing-options {
  static {
    route default {
      next-hop address;
      retain;
    }
  }
}
```

Comments in the configuration examples are shown either preceding the lines that the comments apply to, or more often, on the same line. When comments are shown on the same line, they are preceded by a pound sign (#) to indicate where the comment starts. In an actual configuration, comments can only precede a line; they cannot be on the same line as a configuration statement. For example:

```
protocols {
  mpls {
    interface (interface-name | all); # Required to enable MPLS on the interface
  }
  rsvp { # Required for dynamic MPLS only
    interface interface-name;
  }
}
```

The general syntax descriptions provide no indication of the number of times you can specify a statement, option, or keyword. This information is provided in the text of the statement summary.

## Documentation Feedback

We are always interested in hearing from our customers. Please let us know what you like and do not like about the Juniper Networks documentation, and let us know of any suggestions you have for improving the documentation. Also, let us know if you find any mistakes in the documentation. Send your feedback to [tech-doc@juniper.net](mailto:tech-doc@juniper.net).

## How to Request Support

For technical support, contact Juniper Networks at [support@juniper.net](mailto:support@juniper.net), or at 1-888-314-JTAC (within the United States) or 408-745-2121 (from outside the United States).

