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# OSPF Feature Guide for EX4600 Switches



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# About the Documentation

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- Supported Platforms on page xiii
- Using the Examples in This Manual on page xiii
- Documentation Conventions on page xv
- Documentation Feedback on page xvii
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## Documentation and Release Notes

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## Supported Platforms

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For the features described in this document, the following platforms are supported:

- EX Series

## Using the Examples in This Manual

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If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

## Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

## Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

## Documentation Conventions

Table 1 on page xv defines notice icons used in this guide.

Table 1: 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.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"><li>Introduces or emphasizes important new terms.</li><li>Identifies guide names.</li><li>Identifies RFC and Internet draft titles.</li></ul>	<ul style="list-style-type: none"><li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li><li><i>Junos OS CLI User Guide</i></li><li>RFC 1997, <i>BGP Communities Attribute</i></li></ul>
<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@# <b>set system domain-name</b> <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"><li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols ospf area area-id] hierarchy level.</li><li>The console port is labeled <b>CONSOLE</b>.</li></ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub &lt;default-metric metric&gt;;</b>
(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.	<b>broadcast   multicast</b>  <b>(string1   string2   string3)</b>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members [</b> <i>community-ids</i> <b>]</b>
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop address; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"><li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li><li>To cancel the configuration, click <b>Cancel</b>.</li></ul>



Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

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- E-mail—Send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net). Include the document or topic name, URL or page number, and software version (if applicable).

## 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 Partner Support Service 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/us/en/local/pdf/resource-guides/7100059-en.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

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- 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:  
<http://kb.juniper.net/InfoCenter/>
- 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: <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

# Overview

- [OSPF Overview on page 3](#)



## CHAPTER 1

# OSPF Overview

- [OSPF Overview on page 4](#)
- [OSPF Areas and Router Functionality Overview on page 9](#)
- [Packets Overview on page 11](#)
- [OSPF External Metrics Overview on page 14](#)

## OSPF Overview

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OSPF is an interior gateway protocol (IGP) that routes packets within a single autonomous system (AS). OSPF uses link-state information to make routing decisions, making route calculations using the shortest-path-first (SPF) algorithm (also referred to as the Dijkstra algorithm). Each router running OSPF floods link-state advertisements throughout the AS or area that contain information about that router's attached interfaces and routing metrics. Each router uses the information in these link-state advertisements to calculate the least cost path to each network and create a routing table for the protocol.

Junos OS supports OSPF version 2 (OSPFv2) and OSPF version 3 (OSPFv3), including virtual links, stub areas, and for OSPFv2, authentication. Junos OS does not support type-of-service (ToS) routing.

OSPF was designed for the Transmission Control Protocol/Internet Protocol (TCP/IP) environment and as a result explicitly supports IP subnetting and the tagging of externally derived routing information. OSPF also provides for the authentication of routing updates.

OSPF routes IP packets based solely on the destination IP address contained in the IP packet header. OSPF quickly detects topological changes, such as when router interfaces become unavailable, and calculates new loop-free routes quickly and with a minimum of routing overhead traffic.



**NOTE:** On SRX Series devices, when only one link-protection is configured under the OSPF interface, the device does not install an alternative route in the forwarding table. When the per-packet load-balancing is enabled as a workaround, the device does not observe both the OSPF metric and sending the traffic through both the interfaces.

An OSPF AS can consist of a single area, or it can be subdivided into multiple areas. In a single-area OSPF network topology, each router maintains a database that describes the topology of the AS. Link-state information for each router is flooded throughout the AS. In a multiarea OSPF topology, each router maintains a database that describes the topology of its area, and link-state information for each router is flooded throughout that area. All routers maintain summarized topologies of other areas within an AS. Within each area, OSPF routers have identical topological databases. When the AS or area topology changes, OSPF ensures that the contents of all routers' topological databases converge quickly.

All OSPFv2 protocol exchanges can be authenticated. OSPFv3 relies on IPsec to provide this functionality. This means that only trusted routers can participate in the AS's routing. A variety of authentication schemes can be used. A single authentication scheme is configured for each area, which enables some areas to use stricter authentication than others.

Externally derived routing data (for example, routes learned from BGP) is passed transparently throughout the AS. This externally derived data is kept separate from the OSPF link-state data. Each external route can be tagged by the advertising router, enabling the passing of additional information between routers on the boundaries of the AS.



**NOTE:** By default, Junos OS is compatible with RFC 1583, *OSPF Version 2*. In Junos OS Release 8.5 and later, you can disable compatibility with RFC 1583 by including the `no-rfc-1583` statement. For more information, see [“Example: Disabling OSPFv2 Compatibility with RFC 1583” on page 44](#).

This topic describes the following information:

- [OSPF Default Route Preference Values on page 6](#)
- [OSPF Routing Algorithm on page 6](#)
- [OSPF Three-Way Handshake on page 7](#)
- [OSPF Version 3 on page 8](#)

## OSPF Default Route Preference Values

The Junos OS routing protocol process assigns a default preference value to each route that the routing table receives. The default value depends on the source of the route. The preference value is from 0 through 4,294,967,295 ( $2^{32} - 1$ ), with a lower value indicating a more preferred route. [Table 3 on page 6](#) lists the default preference values for OSPF.

**Table 3: Default Route Preference Values for OSPF**

How Route Is Learned	Default Preference	Statement to Modify Default Preference
OSPF internal route	10	OSPF <a href="#">preference</a>
OSPF AS external routes	150	OSPF <a href="#">external-preference</a>

## OSPF Routing Algorithm

OSPF uses the shortest-path-first (SPF) algorithm, also referred to as the Dijkstra algorithm, to determine the route to each destination. All routing devices in an area run this algorithm in parallel, storing the results in their individual topological databases. Routing devices with interfaces to multiple areas run multiple copies of the algorithm. This section provides a brief summary of how the SPF algorithm works.

When a routing device starts, it initializes OSPF and waits for indications from lower-level protocols that the router interfaces are functional. The routing device then uses the OSPF hello protocol to acquire neighbors, by sending hello packets to its neighbors and receiving their hello packets.

On broadcast or nonbroadcast multiaccess networks (physical networks that support the attachment of more than two routing devices), the OSPF hello protocol elects a designated router for the network. This routing device is responsible for sending *link-state advertisements* (LSAs) that describe the network, which reduces the amount of network traffic and the size of the routing devices' topological databases.

The routing device then attempts to form *adjacencies* with some of its newly acquired neighbors. (On multiaccess networks, only the designated router and backup designated



router form adjacencies with other routing devices.) Adjacencies determine the distribution of routing protocol packets. Routing protocol packets are sent and received only on adjacencies, and topological database updates are sent only along adjacencies. When adjacencies have been established, pairs of adjacent routers synchronize their topological databases.

A routing device sends LSA packets to advertise its state periodically and when its state changes. These packets include information about the routing device's adjacencies, which allows detection of nonoperational routing devices.

Using a reliable algorithm, the routing device floods LSAs throughout the area, which ensures that all routing devices in an area have exactly the same topological database. Each routing device uses the information in its topological database to calculate a shortest-path tree, with itself as the root. The routing device then uses this tree to route network traffic.

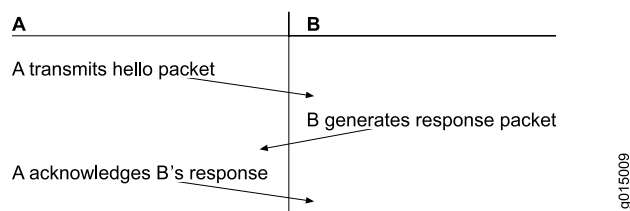
The description of the SPF algorithm up to this point has explained how the algorithm works within a single area (*intra-area routing*). For internal routers to be able to route to destinations outside the area (*interarea routing*), the area border routers must inject additional routing information into the area. Because the area border routers are connected to the backbone, they have access to complete topological data about the backbone. The area border routers use this information to calculate paths to all destinations outside its area and then advertise these paths to the area's internal routers.

Autonomous system (AS) boundary routers flood information about external autonomous systems throughout the AS, except to stub areas. Area border routers are responsible for advertising the paths to all AS boundary routers.

## OSPF Three-Way Handshake

OSPF creates a topology map by flooding LSAs across OSPF-enabled links. LSAs announce the presence of OSPF-enabled interfaces to adjacent OSPF interfaces. The exchange of LSAs establishes bidirectional connectivity between all adjacent OSPF interfaces (neighbors) using a three-way handshake, as shown in [Figure 1 on page 7](#).

**Figure 1: OSPF Three-Way Handshake**



In [Figure 1 on page 7](#), Router A sends hello packets out all its OSPF-enabled interfaces when it comes online. Router B receives the packet, which establishes that Router B can receive traffic from Router A. Router B generates a response to Router A to acknowledge receipt of the hello packet. When Router A receives the response, it establishes that Router B can receive traffic from Router A. Router A then generates a final response packet to inform Router B that Router A can receive traffic from Router B. This three-way handshake ensures bidirectional connectivity.

As new neighbors are added to the network or existing neighbors lose connectivity, the adjacencies in the topology map are modified accordingly through the exchange (or absence) of LSAs. These LSAs advertise only the incremental changes in the network, which helps minimize the amount of OSPF traffic on the network. The adjacencies are shared and used to create the network topology in the topological database.

## OSPF Version 3

OSPFv3 is a modified version of OSPF that supports IP version 6 (IPv6) addressing. OSPFv3 differs from OSPFv2 in the following ways:

- All neighbor ID information is based on a 32-bit router ID.
- The protocol runs per link rather than per subnet.
- Router and network link-state advertisements (LSAs) do not carry prefix information.
- Two new LSA types are included: link-LSA and intra-area-prefix-LSA.
- Flooding scopes are as follows:
  - Link-local
  - Area
  - AS
- Link-local addresses are used for all neighbor exchanges except virtual links.
- Authentication is removed. The IPv6 authentication header relies on the IP layer.
- The packet format has changed as follows:
  - Version number 2 is now version number 3.
  - The **db** option field has been expanded to 24 bits.
  - Authentication information has been removed.
  - Hello messages do not have address information.
  - Two new option bits are included: **R** and **V6**.
- Type 3 summary LSAs have been renamed *inter-area-prefix-LSAs*.
- Type 4 summary LSAs have been renamed *inter-area-router-LSAs*.

### Related Documentation

- [Understanding OSPF Areas and Backbone Areas on page 21](#)
- [OSPF Configuration Overview](#)
- [Example: Disabling OSPFv2 Compatibility with RFC 1583 on page 44](#)

## OSPF Areas and Router Functionality Overview

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In OSPF, a single autonomous system (AS) can be divided into smaller groups called *areas*. This reduces the number of link-state advertisements (LSAs) and other OSPF overhead traffic sent on the network, and it reduces the size of the topology database that each router must maintain. The routing devices that participate in OSPF routing perform one or more functions based on their location in the network.

This topic describes the following OSPF area types and routing device functions:

- [Areas on page 9](#)
- [Area Border Routers on page 9](#)
- [Backbone Areas on page 9](#)
- [AS Boundary Routers on page 10](#)
- [Backbone Router on page 10](#)
- [Internal Router on page 10](#)
- [Stub Areas on page 10](#)
- [Not-So-Stubby Areas on page 11](#)
- [Transit Areas on page 11](#)

### Areas

An *area* is a set of networks and hosts within an AS that have been administratively grouped together. We recommend that you configure an area as a collection of contiguous IP subnetted networks. Routing devices that are wholly within an area are called *internal routers*. All interfaces on internal routers are directly connected to networks within the area.

The topology of an area is hidden from the rest of the AS, thus significantly reducing routing traffic in the AS. Also, routing within the area is determined only by the area's topology, providing the area with some protection from bad routing data.

All routing devices within an area have identical topology databases.

### Area Border Routers

Routing devices that belong to more than one area and connect one or more OSPF areas to the backbone area are called *area border routers* (ABRs). At least one interface is within the backbone while another interface is in another area. ABRs also maintain a separate topological database for each area to which they are connected.

### Backbone Areas

An OSPF *backbone area* consists of all networks in area ID 0.0.0.0, their attached routing devices, and all ABRs. The backbone itself does not have any ABRs. The backbone distributes routing information between areas. The backbone is simply another area, so the terminology and rules of areas apply: a routing device that is directly connected to

the backbone is an internal router on the backbone, and the backbone's topology is hidden from the other areas in the AS.

The routing devices that make up the backbone must be physically contiguous. If they are not, you must configure *virtual links* to create the appearance of backbone connectivity. You can create virtual links between any two ABRs that have an interface to a common nonbackbone area. OSPF treats two routing devices joined by a virtual link as if they were connected to an unnumbered point-to-point network.

## AS Boundary Routers

Routing devices that exchange routing information with routing devices in non-OSPF networks are called *AS boundary routers*. They advertise externally learned routes throughout the OSPF AS. Depending on the location of the AS boundary router in the network, it can be an ABR, a backbone router, or an internal router (with the exception of stub areas). Internal routers within a stub area cannot be an AS boundary router because stub areas cannot contain any Type 5 LSAs.

Routing devices within the area where the AS boundary router resides know the path to that AS boundary router. Any routing device outside the area only knows the path to the nearest ABR that is in the same area where the AS boundary router resides.

## Backbone Router

*Backbone routers* are routing devices that have one or more interfaces connected to the OSPF backbone area (area ID 0.0.0.0).

## Internal Router

Routing devices that connect to only one OSPF area are called *internal routers*. All interfaces on internal routers are directly connected to networks within a single area.

## Stub Areas

*Stub areas* are areas through which or into which AS external advertisements are not flooded. You might want to create stub areas when much of the topological database consists of AS external advertisements. Doing so reduces the size of the topological databases and therefore the amount of memory required on the internal routers in the stub area.

Routing devices within a stub area rely on the default routes originated by the area's ABR to reach external AS destinations. You must configure the **default-metric** option on the ABR before it advertises a default route. Once configured, the ABR advertises a default route in place of the external routes that are not being advertised within the stub area, so that routing devices in the stub area can reach destinations outside the area.

The following restrictions apply to stub areas: you cannot create a virtual link through a stub area, a stub area cannot contain an AS boundary router, the backbone cannot be a stub area, and you cannot configure an area as both a stub area and a not-so-stubby area.

## Not-So-Stubby Areas

An OSPF stub area has no external routes in it, so you cannot redistribute from another protocol into a stub area. A *not-so-stubby area* (NSSA) allows external routes to be flooded within the area. These routes are then leaked into other areas. However, external routes from other areas still do not enter the NSSA.

The following restriction applies to NSSAs: you cannot configure an area as both a stub area and an NSSA.

## Transit Areas

*Transit areas* are used to pass traffic from one adjacent area to the backbone (or to another area if the backbone is more than two hops away from an area). The traffic does not originate in, nor is it destined for, the transit area.

### Related Documentation

- [OSPF Overview on page 4](#)
- [Packets Overview on page 11](#)
- [OSPF Configuration Overview](#)
- [Understanding OSPF Areas and Backbone Areas on page 21](#)
- [Understanding OSPF Stub Areas, Totally Stubby Areas, and Not-So-Stubby Areas on page 29](#)

## Packets Overview

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There are several types of link-state advertisement (LSA) packets.

This topic describes the following information:

- [OSPF Packet Header on page 11](#)
- [Hello Packets on page 12](#)
- [Database Description Packets on page 12](#)
- [Link-State Request Packets on page 12](#)
- [Link-State Update Packets on page 13](#)
- [Link-State Acknowledgment Packets on page 13](#)
- [Link-State Advertisement Packet Types on page 13](#)

## OSPF Packet Header

All OSPFv2 packets have a common 24-byte header, and OSPFv3 packets have a common 16-byte header, that contains all information necessary to determine whether OSPF should accept the packet. The header consists of the following fields:

- Version number—The current OSPF version number. This can be either 2 or 3.
- Type—Type of OSPF packet.

- Packet length—Length of the packet, in bytes, including the header.
- Router ID—IP address of the router from which the packet originated.
- Area ID—Identifier of the area in which the packet is traveling. Each OSPF packet is associated with a single area. Packets traveling over a virtual link are labeled with the backbone area ID, 0.0.0.0. .
- Checksum—Fletcher checksum.
- Authentication—(OSPFv2 only) Authentication scheme and authentication information.
- Instance ID—(OSPFv3 only) Identifier used when there are multiple OSPFv3 realms configured on a link.

## Hello Packets

Routers periodically send hello packets on all interfaces, including virtual links, to establish and maintain neighbor relationships. Hello packets are multicast on physical networks that have a multicast or broadcast capability, which enables dynamic discovery of neighboring routers. (On nonbroadcast networks, dynamic neighbor discovery is not possible, so you must configure all neighbors statically as described in [“Example: Configuring an OSPFv2 Interface on a Nonbroadcast Multiaccess Network” on page 51.](#))

Hello packets consist of the OSPF header plus the following fields:

- Network mask—(OSPFv2 only) Network mask associated with the interface.
- Hello interval—How often the router sends hello packets. All routers on a shared network must use the same hello interval.
- Options—Optional capabilities of the router.
- Router priority—The router’s priority to become the designated router.
- Router dead interval—How long the router waits without receiving any OSPF packets from a router before declaring that router to be down. All routers on a shared network must use the same router dead interval.
- Designated router—IP address of the designated router.
- Backup designated router—IP address of the backup designated router.
- Neighbor—IP addresses of the routers from which valid hello packets have been received within the time specified by the router dead interval.

## Database Description Packets

When initializing an adjacency, OSPF exchanges database description packets, which describe the contents of the topological database. These packets consist of the OSPF header, packet sequence number, and the link-state advertisement’s header.

## Link-State Request Packets

When a router detects that portions of its topological database are out of date, it sends a link-state request packet to a neighbor requesting a precise instance of the database.

These packets consist of the OSPF header plus fields that uniquely identify the database information that the router is seeking.

## Link-State Update Packets

Link-state update packets carry one or more link-state advertisements one hop farther from their origin. The router multicasts (floods) these packets on physical networks that support multicast or broadcast mode. The router acknowledges all link-state update packets and, if retransmission is necessary, sends the retransmitted advertisements unicast.

Link-state update packets consist of the OSPF header plus the following fields:

- Number of advertisements—Number of link-state advertisements included in this packet.
- Link-state advertisements—The link-state advertisements themselves.

## Link-State Acknowledgment Packets

The router sends link-state acknowledgment packets in response to link-state update packets to verify that the update packets have been received successfully. A single acknowledgment packet can include responses to multiple update packets.

Link-state acknowledgment packets consist of the OSPF header plus the link-state advertisement header.

## Link-State Advertisement Packet Types

Link-state request, link-state update, and link-state acknowledgment packets are used to reliably flood link-state advertisement packets. OSPF sends the following types of link-state advertisements:

- Router link advertisements—Are sent by all routers to describe the state and cost of the router's links to the area. These link-state advertisements are flooded throughout a single area only.
- Network link advertisements—Are sent by designated routers to describe all the routers attached to the network. These link-state advertisements are flooded throughout a single area only.
- Summary link advertisements—Are sent by area border routers to describe the routes that they know about in other areas. There are two types of summary link advertisements: those used when the destination is an IP network, and those used when the destination is an AS boundary router. Summary link advertisements describe interarea routes, that is, routes to destinations outside the area but within the AS. These link-state advertisements are flooded throughout the advertisement's associated areas.
- AS external link advertisement—Are sent by AS boundary routers to describe external routes that they know about. These link-state advertisements are flooded throughout the AS (except for stub areas).

Each link-state advertisement type describes a portion of the OSPF routing domain. All link-state advertisements are flooded throughout the AS.

Each link-state advertisement packet begins with a common 20-byte header.

**Related  
Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Areas and Router Functionality Overview on page 9](#)
- [OSPF Configuration Overview](#)
- [OSPF Designated Router Overview on page 17](#)
- [Understanding OSPFv2 Authentication](#)
- [OSPF Timers Overview on page 91](#)

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## OSPF External Metrics Overview

When OSPF exports route information from external autonomous systems (ASs), it includes a cost, or *external metric*, in the route. OSPF supports two types of external metrics: Type 1 and Type 2. The difference between the two metrics is how OSPF calculates the cost of the route.

- Type 1 external metrics are equivalent to the link-state metric, where the cost is equal to the sum of the internal costs plus the external cost. This means that Type 1 external metrics include the external cost to the destination as well as the cost (metric) to reach the AS boundary router.
- Type 2 external metrics are greater than the cost of any path internal to the AS. Type 2 external metrics use only the external cost to the destination and ignore the cost (metric) to reach the AS boundary router.

By default, OSPF uses the Type 2 external metric.

Both Type 1 and Type 2 external metrics can be present in the AS at the same time. In that event, Type 1 external metrics always takes the precedence.

Type 1 external paths are always preferred over Type 2 external paths. When all paths are Type 2 external paths, the paths with the smallest advertised Type 2 metric are always preferred.



## PART 2

# Configuring

- [Basic OSPF Area Configuration on page 17](#)
- [Advanced OSPF Area Configuration on page 29](#)
- [OSPF Interface on page 47](#)
- [OSPF Route Control on page 67](#)
- [OSPF Fault Detection on page 91](#)
- [OSPF Redundancy Features on page 109](#)
- [OSPF Traffic Engineering on page 125](#)
- [OSPF Database Protection on page 139](#)
- [OSPF Policy on page 143](#)



## CHAPTER 2

# Basic OSPF Area Configuration

- [Examples: Configuring OSPF Designated Routers on page 17](#)
- [Examples: Configuring OSPF Areas on page 21](#)

### Examples: Configuring OSPF Designated Routers

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- [OSPF Designated Router Overview on page 17](#)
- [Example: Configuring an OSPF Router Identifier on page 18](#)
- [Example: Controlling OSPF Designated Router Election on page 20](#)

### OSPF Designated Router Overview

Large LANs that have many routing devices and therefore many OSPF adjacencies can produce heavy control-packet traffic as link-state advertisements (LSAs) are flooded across the network. To alleviate the potential traffic problem, OSPF uses designated routers on all multiaccess networks (broadcast and nonbroadcast multiaccess [NBMA] networks types). Rather than broadcasting LSAs to all their OSPF neighbors, the routing devices send their LSAs to the designated router. Each multiaccess network has a designated router, which performs two main functions:

- Originate network link advertisements on behalf of the network.
- Establish adjacencies with all routing devices on the network, thus participating in the synchronizing of the link-state databases.

In LANs, the election of the designated router takes place when the OSPF network is initially established. When the first OSPF links are active, the routing device with the highest router identifier (defined by the **router-id** configuration value, which is typically the IP address of the routing device, or the loopback address) is elected the designated router. The routing device with the second highest router identifier is elected the backup designated router. If the designated router fails or loses connectivity, the backup designated router assumes its role and a new backup designated router election takes place between all the routers in the OSPF network.

OSPF uses the router identifier for two main purposes: to elect a designated router, unless you manually specify a priority value, and to identify the routing device from which a packet is originated. At designated router election, the router priorities are evaluated first, and the routing device with the highest priority is elected designated router. If router priorities tie, the routing device with the highest router identifier, which is typically the

routing device's IP address, is chosen as the designated router. If you do not configure a router identifier, the IP address of the first interface to come online is used. This is usually the loopback interface. Otherwise, the first hardware interface with an IP address is used.

At least one routing device on each logical IP network or subnet must be eligible to be the designated router for OSPFv2. At least one routing device on each logical link must be eligible to be the designated router for OSPFv3.

By default, routing devices have a priority of 128. A priority of 0 marks the routing device as ineligible to become the designated router. A priority of 1 means the routing device has the least chance of becoming a designated router. A priority of 255 means the routing device is always the designated router.

## Example: Configuring an OSPF Router Identifier

This example shows how to configure an OSPF router identifier.

- [Requirements on page 18](#)
- [Overview on page 18](#)
- [Configuration on page 19](#)
- [Verification on page 19](#)

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### Requirements

Before you begin:

- Identify the interfaces on the routing device that will participate in OSPF. You must enable OSPF on all interfaces within the network on which OSPF traffic is to travel.
- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.

---

### Overview

The router identifier is used by OSPF to identify the routing device from which a packet originated. Junos OS selects a router identifier according to the following set of rules:

1. By default, Junos OS selects the lowest configured physical IP address of an interface as the router identifier.
2. If a loopback interface is configured, the IP address of the loopback interface becomes the router identifier.
3. If multiple loopback interfaces are configured, the lowest loopback address becomes the router identifier.
4. If a router identifier is explicitly configured using the **router-id address** statement under the **[edit routing-options]** hierarchy level, the above three rules are ignored.



**NOTE:** If the router identifier is modified in a network, the link-state advertisements (LSAs) advertised by the previous router identifier are retained in the OSPF database until the LSA retransmit interval has timed out.

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If the router identifier is not configured explicitly and an interface IP address is used as the router identifier, the established OSPF adjacency flaps when the interface goes down, or when it is brought back into the network. When the interface is brought back into the network, or a new interface is introduced into the network, the router identifier is selected again based on the rules stated above. Hence, it is strongly recommended that you explicitly configure the router identifier under the **[edit routing-options]** hierarchy level to avoid unpredictable behavior if the interface address on a loopback interface changes.



**NOTE:** The router identifier behavior described here holds good even when configured under **[edit routing-instances *routing-instance-name* routing-options]** and **[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* routing-options]** hierarchy levels.

In this example, you configure the OSPF router identifier by setting its router ID value to the IP address of the device, which is 177.162.4.24.

### Configuration

#### CLI Quick Configuration

To quickly configure an OSPF router identifier, copy the following command and paste it into the CLI.

```
[edit]
set routing-options router-id 177.162.4.24
```

#### Step-by-Step Procedure

To configure an OSPF router identifier:

1. Configure the OSPF router identifier by entering the **[router-id]** configuration value.

```
[edit]
user@host# set routing-options router-id 177.162.4.24
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

### Results

Confirm your configuration by entering the **show routing-options router-id** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show routing-options router-id
router-id 177.162.4.24;
```

### Verification

After you configure the router ID and activate OSPF on the routing device, the router ID is referenced by multiple OSPF operational mode commands that you can use to monitor and troubleshoot the OSPF protocol. The router ID fields are clearly marked in the output.

## Example: Controlling OSPF Designated Router Election

This example shows how to control OSPF designated router election.

- [Requirements on page 20](#)
- [Overview on page 20](#)
- [Configuration on page 20](#)
- [Verification on page 21](#)

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### Requirements

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.

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### Overview

This example shows how to control OSPF designated router election. Within the example, you set the OSPF interface to **ge-0/0/1** and the device priority to 200. The higher the priority value, the greater likelihood the routing device will become the designated router.

By default, routing devices have a priority of 128. A priority of 0 marks the routing device as ineligible to become the designated router. A priority of 1 means the routing device has the least chance of becoming a designated router.

---

### Configuration

#### CLI Quick Configuration

To quickly configure an OSPF designated router election, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.3 interface ge-0/0/1 priority 200
```

#### Step-by-Step Procedure

To control OSPF designated router election:

1. Configure an OSPF interface and specify the device priority.



**NOTE:** To specify an OSPFv3 interface, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

---

```
[edit]
user@host# set protocols ospf area 0.0.0.3 interface ge-0/0/1 priority 200
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

### Results

Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.3 {
  interface ge-0/0/1.0 {
    priority 200;
  }
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

Confirm that the configuration is working properly.

- [Verifying the Designated Router Election on page 21](#)

#### Verifying the Designated Router Election

<b>Purpose</b>	Based on the priority you configured for a specific OSPF interface, you can confirm the address of the area's designated router. The DR ID, DR, or DR-ID field displays the address of the area's designated router. The BDR ID, BDR, or BDR-ID field displays the address of the backup designated router.
<b>Action</b>	From operational mode, enter the <b>show ospf interface</b> and the <b>show ospf neighbor</b> commands for OSPFv2, and enter the <b>show ospf3 interface</b> and the <b>show ospf3 neighbor</b> commands for OSPFv3.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">OSPF Areas and Router Functionality Overview on page 9</a></li> <li>• <a href="#">OSPF Configuration Overview</a></li> </ul>

## Examples: Configuring OSPF Areas

- [Understanding OSPF Areas and Backbone Areas on page 21](#)
- [Example: Configuring a Single-Area OSPF Network on page 23](#)
- [Example: Configuring a Multiarea OSPF Network on page 25](#)

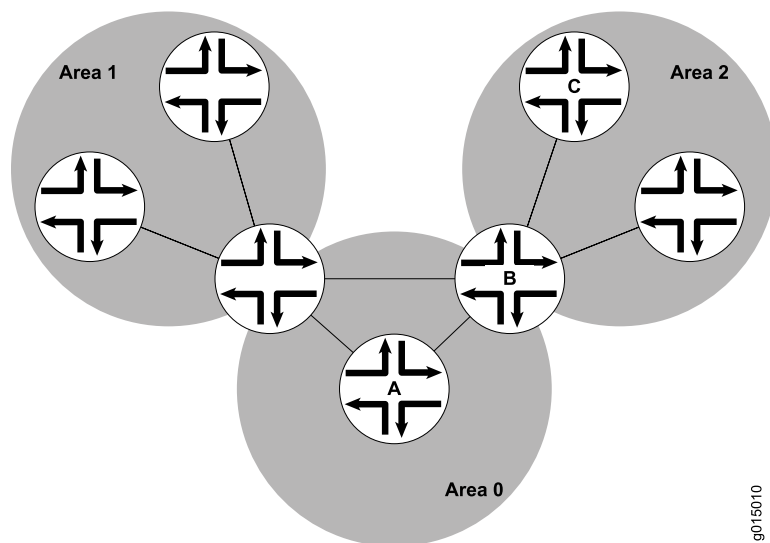
### Understanding OSPF Areas and Backbone Areas

OSPF networks in an autonomous system (AS) are administratively grouped into *areas*. Each area within an AS operates like an independent network and has a unique 32-bit area ID, which functions similar to a network address. Within an area, the topology database contains only information about the area, link-state advertisements (LSAs) are flooded only to nodes within the area, and routes are computed only within the area. The topology of an area is hidden from the rest of the AS, thus significantly reducing routing traffic in the AS. Subnetworks are divided into other areas, which are connected

to form the whole of the main network. Routing devices that are wholly within an area are called *internal routers*. All interfaces on internal routers are directly connected to networks within the area.

The central area of an AS, called the *backbone area*, has a special function and is always assigned the area ID 0.0.0.0. (Within a simple, single-area network, this is also the ID of the area.) Area IDs are unique numeric identifiers, in dotted decimal notation, but they are not IP addresses. Area IDs need only be unique within an AS. All other networks or areas in the AS must be directly connected to the backbone area by a routing device that has interfaces in more than one area. These connecting routing devices are called *area border routers* (ABRs). [Figure 2 on page 22](#) shows an OSPF topology of three areas connected by two ABRs.

**Figure 2: Multiarea OSPF Topology**



Because all areas are adjacent to the backbone area, OSPF routers send all traffic not destined for their own area through the backbone area. The ABRs in the backbone area are then responsible for transmitting the traffic through the appropriate ABR to the destination area. The ABRs summarize the link-state records of each area and advertise destination address summaries to neighboring areas. The advertisements contain the ID of the area in which each destination lies, so that packets are routed to the appropriate ABR. For example, in the OSPF areas shown in [Figure 2 on page 22](#), packets sent from Router A to Router C are automatically routed through ABR B.

Junos OS supports active backbone detection. Active backbone detection is implemented to verify that ABRs are connected to the backbone. If the connection to the backbone area is lost, then the routing device's default metric is not advertised, effectively rerouting traffic through another ABR with a valid connection to the backbone. Active backbone detection enables transit through an ABR with no active backbone connection. An ABR advertises to other routing devices that it is an ABR even if the connection to the backbone is down, so that the neighbors can consider it for interarea routes.

An OSPF restriction requires all areas to be directly connected to the backbone area so that packets can be properly routed. All packets are routed first to the backbone area by



default. Packets that are destined for an area other than the backbone area are then routed to the appropriate ABR and on to the remote host within the destination area.

## Example: Configuring a Single-Area OSPF Network

This example shows how to configure a single-area OSPF network.

- [Requirements on page 23](#)
- [Overview on page 23](#)
- [Configuration on page 24](#)
- [Verification on page 25](#)

### Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.
- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).

### Overview

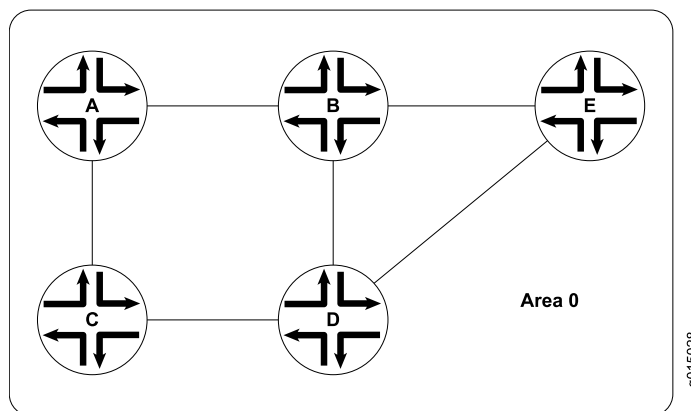
---

To activate OSPF on a network, you must enable the OSPF protocol on all interfaces within the network on which OSPF traffic is to travel. To enable OSPF, you must configure one or more interfaces on the device within an OSPF area. Once the interfaces are configured, OSPF LSAs are transmitted on all OSPF-enabled interfaces, and the network topology is shared throughout the network.

In an autonomous system (AS), the backbone area is always assigned area ID 0.0.0.0 (within a simple, single-area network, this is also the ID of the area). Area IDs are unique numeric identifiers, in dotted decimal notation. Area IDs need only be unique within an AS. All other networks or areas in the AS must be directly connected to the backbone area by area border routers that have interfaces in more than one area. You must also create a backbone area if your network consists of multiple areas. In this example, you create the backbone area and add interfaces, such as **ge-0/0/0**, as needed to the OSPF area.

To use OSPF on the device, you must configure at least one OSPF area, such as the one shown in [Figure 3 on page 24](#).

Figure 3: Typical Single-Area OSPF Network Topology



### Configuration

#### CLI Quick Configuration

To quickly configure a single-area OSPF network, copy the following command and paste it into the CLI. You repeat this configuration for all interfaces that are part of the OSPF area.

```
[edit]
set protocols ospf area 0.0.0.0 interface ge-0/0/0
```

#### Step-by-Step Procedure

To configure a single-area OSPF network:

1. Configure the single-area OSPF network by specifying the area ID and associated interface.



**NOTE:** For a single-area OSPFv3 network, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# set protocols ospf area 0.0.0.0 interface ge-0/0/0
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

### Results

Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.0 {
  interface ge-0/0/0.0;
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

---

Confirm that the configuration is working properly.

#### *Verifying the Interfaces in the Area*

- Purpose** Verify that the interface for OSPF or OSPFv3 has been configured for the appropriate area. Confirm that the Area field displays the value that you configured.
- Action** From operational mode, enter the **show ospf interface** command for OSPFv2, and enter the **show ospf3 interface** command for OSPFv3.

### Example: Configuring a Multiarea OSPF Network

This example shows how to configure a multiarea OSPF network. To reduce traffic and topology maintenance for the devices in an OSPF autonomous system (AS), you can group the OSPF-enabled routing devices into multiple areas.

- [Requirements on page 25](#)
- [Overview on page 25](#)
- [Configuration on page 26](#)
- [Verification on page 28](#)

### Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20.
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.

### Overview

---

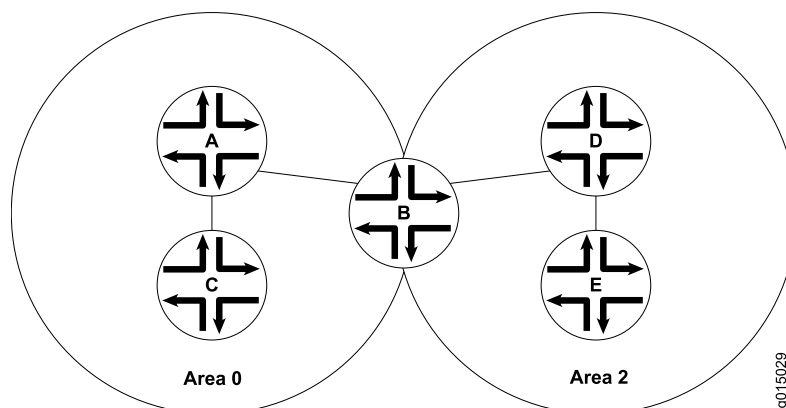
To activate OSPF on a network, you must enable the OSPF protocol on all interfaces within the network on which OSPF traffic is to travel. To enable OSPF, you must configure one or more interfaces on the device within an OSPF area. Once the interfaces are configured, OSPF LSAs are transmitted on all OSPF-enabled interfaces, and the network topology is shared throughout the network.

Each OSPF area consists of routing devices configured with the same area number. The backbone area is always assigned area ID 0.0.0.0. (All area identifiers (IDs) must be unique within an AS.) All other networks or areas in the AS must be directly connected to the backbone area by a router that has interfaces in more than one area. In [Figure 4 on page 26](#), Devices A and C are in the backbone area (area 0), and Devices D

and E are in area 2. Device B has a special role. This is the area border router that connects area 0 and area 2. The area border router maintains a separate topological database for each area to which it is connected.

To reduce traffic and topology maintenance for the devices in an OSPF AS, you can group them into multiple areas as shown in [Figure 4 on page 26](#). In this example, you create the backbone area, create an additional area (area 2) and assign it unique area ID 0.0.0.2, and you configure Device B as the area border router, where interface **ge-0/0/0** participates in OSPF area 0 and interface **ge-0/0/2** participates in OSPF area 2.

**Figure 4: Typical Multiarea OSPF Network Topology**



### Configuration

<b>CLI Quick Configuration</b>	To quickly configure a multiarea OSPF network, copy the following commands and paste them into the CLI. You repeat this configuration for all interfaces that are part of the OSPF area.
<b>Device A</b>	<pre>[edit] set protocols ospf area 0.0.0.0 interface ge-0/0/0 set protocols ospf area 0.0.0.0 interface ge-0/0/1</pre>
<b>Device C</b>	<pre>[edit] set protocols ospf area 0.0.0.0 interface ge-0/0/0</pre>
<b>Device B</b>	<pre>[edit] set protocols ospf area 0.0.0.0 interface ge-0/0/0 set protocols ospf area 0.0.0.2 interface ge-0/0/2</pre>
<b>Device D</b>	<pre>[edit] set protocols ospf area 0.0.0.2 interface ge-0/0/0 set protocols ospf area 0.0.0.2 interface ge-0/0/2</pre>
<b>Device E</b>	<pre>[edit] set protocols ospf area 0.0.0.2 interface ge-0/0/2</pre>
<b>Step-by-Step Procedure</b>	<p>To configure a multiarea OSPF network:</p> <ol style="list-style-type: none"> <li>1. Configure the backbone area.</li> </ol>



**NOTE:** For an OSPFv3 network, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@A# set protocols ospf area 0.0.0.0 interface ge-0/0/0
user@A# set protocols ospf area 0.0.0.0 interface ge-0/0/1
```

```
[edit]
user@C# set protocols ospf area 0.0.0.0 interface ge-0/0/0
```

```
[edit]
user@B# set protocols ospf area 0.0.0.0 interface ge-0/0/0
```

2. Configure an additional area for your OSPF network.

```
[edit]
user@B# set protocols ospf area 0.0.0.2 interface ge-0/0/2
```

```
[edit]
user@D# set protocols ospf area 0.0.0.2 interface ge-0/0/0
user@D# set protocols ospf area 0.0.0.2 interface ge-0/0/2
```

```
[edit]
user@E# set protocols ospf area 0.0.0.2 interface ge-0/0/2
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

### Results

Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@A# show protocols ospf
area 0.0.0.0 {
  interface ge-0/0/0.0;
  interface ge-0/0/1.0;
}
```

```
user@C# show protocols ospf
area 0.0.0.0 {
  interface ge-0/0/0.0;
}
```

```
user@B# show protocols ospf
area 0.0.0.0 {
  interface ge-0/0/0.0;
}
area 0.0.0.2 {
  interface ge-0/0/2.0;
}
```

```
user@D# show protocols ospf
area 0.0.0.2 {
```

```
interface ge-0/0/0.0;  
interface ge-0/0/2.0;  
}  
  
user@E# show protocols ospf  
area 0.0.0.2 {  
  interface ge-0/0/2.0;  
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

---

### Verification

Confirm that the configuration is working properly.

- [Verifying the Interfaces in the Area on page 28](#)

#### *Verifying the Interfaces in the Area*

<b>Purpose</b>	Verify that the interface for OSPF or OSPFv3 has been configured for the appropriate area. Confirm that the Area field displays the value that you configured.
<b>Action</b>	From operational mode, enter the <b>show ospf interface</b> command for OSPFv2, and enter the <b>show ospf3 interface</b> command for OSPFv3.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">OSPF Areas and Router Functionality Overview on page 9</a></li><li>• <a href="#">OSPF Configuration Overview</a></li></ul>

# Advanced OSPF Area Configuration

- Examples: Configuring OSPF Stub and Not-So-Stubby Areas on page 29
- Example: Configuring OSPF Multiarea Adjacency on page 39
- Example: Disabling OSPFv2 Compatibility with RFC 1583 on page 44

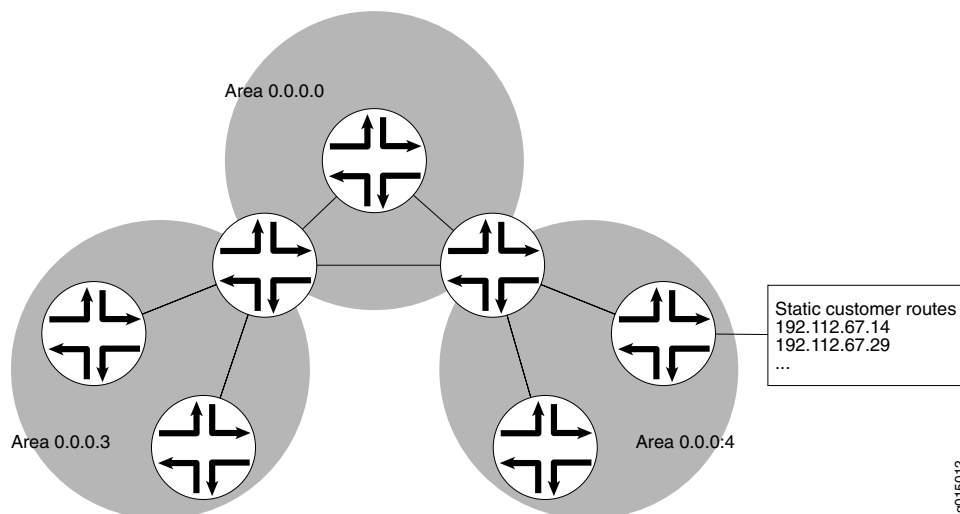
## Examples: Configuring OSPF Stub and Not-So-Stubby Areas

- Understanding OSPF Stub Areas, Totally Stubby Areas, and Not-So-Stubby Areas on page 29
- Example: Configuring OSPF Stub and Totally Stubby Areas on page 30
- Example: Configuring OSPF Not-So-Stubby Areas on page 34

## Understanding OSPF Stub Areas, Totally Stubby Areas, and Not-So-Stubby Areas

Figure 5 on page 29 shows an autonomous system (AS) across which many external routes are advertised. If external routes make up a significant portion of a topology database, you can suppress the advertisements in areas that do not have links outside the network. By doing so, you can reduce the amount of memory the nodes use to maintain the topology database and free it for other uses.

Figure 5: OSPF AS Network with Stub Areas and NSSAs



To control the advertisement of external routes into an area, OSPF uses stub areas. By designating an area border router (ABR) interface to the area as a stub interface, you suppress external route advertisements through the ABR. Instead, the ABR advertises a default route (through itself) in place of the external routes and generates network summary (Type 3) link-state advertisements (LSAs). Packets destined for external routes are automatically sent to the ABR, which acts as a gateway for outbound traffic and routes the traffic appropriately.



**NOTE:** You must explicitly configure the ABR to generate a default route when attached to a stub or not-so-stubby-area (NSSA). To inject a default route with a specified metric value into the area, you must configure the `default-metric` option and specify a metric value.

For example, area 0.0.0.3 in [Figure 5 on page 29](#) is not directly connected to the outside network. All outbound traffic is routed through the ABR to the backbone and then to the destination addresses. By designating area 0.0.0.3 as a stub area, you reduce the size of the topology database for that area by limiting the route entries to only those routes internal to the area.

A stub area that only allows routes internal to the area and restricts Type 3 LSAs from entering the stub area is often called a *totally stubby area*. You can convert area 0.0.0.3 to a totally stubby area by configuring the ABR to only advertise and allow the default route to enter into the area. External routes and destinations to other areas are no longer summarized or allowed into a totally stubby area.



**NOTE:** If you incorrectly configure a totally stubby area, you might encounter network connectivity issues. You should have advanced knowledge of OSPF and understand your network environment before configuring totally stubby areas.

Similar to area 0.0.0.3 in [Figure 5 on page 29](#), area 0.0.0.4 has no external connections. However, area 0.0.0.4 has static customer routes that are not internal OSPF routes. You can limit the external route advertisements to the area and advertise the static customer routes by designating the area an NSSA. In an NSSA, the AS boundary router generates NSSA external (Type 7) LSAs and floods them into the NSSA, where they are contained. Type 7 LSAs allow an NSSA to support the presence of AS boundary routers and their corresponding external routing information. The ABR converts Type 7 LSAs into AS external (Type 5) LSAs and leaks them to the other areas, but external routes from other areas are not advertised within the NSSA.

### Example: Configuring OSPF Stub and Totally Stubby Areas

This example shows how to configure an OSPF stub area and a totally stubby area to control the advertisement of external routes into an area.

- [Requirements on page 31](#)
- [Overview on page 31](#)



- [Configuration on page 32](#)
- [Verification on page 34](#)

## Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

## Overview

---

The backbone area, which is 0 in [Figure 6 on page 32](#), has a special function and is always assigned the area ID 0.0.0.0. Area IDs are unique numeric identifiers, in dotted decimal notation. Area IDs need only be unique within an autonomous system (AS). All other networks or areas (such as 3, 7, and 9) in the AS must be directly connected to the backbone area by area border routers (ABRs) that have interfaces in more than one area.

Stub areas are areas through which or into which OSPF does not flood AS external link-state advertisements (Type 5 LSAs). You might create stub areas when much of the topology database consists of AS external advertisements and you want to minimize the size of the topology databases on the internal routers in the stub area.

The following restrictions apply to stub areas:

- You cannot create a virtual link through a stub area.
- A stub area cannot contain an AS boundary router.
- You cannot configure the backbone as a stub area.
- You cannot configure an area as both a stub area and an not-so-stubby area (NSSA).

In this example, you configure each routing device in area 7 (area ID 0.0.0.7) as a stub router and some additional settings on the ABR:

- **stub**—Specifies that this area become a stub area and not be flooded with Type 5 LSAs. You must include the **stub** statement on all routing devices that are in area 7 because this area has no external connections.
- **default-metric**—Configures the ABR to generate a default route with a specified metric into the stub area. This default route enables packet forwarding from the stub area to external destinations. You configure this option only on the ABR. The ABR does not automatically generate a default route when attached to a stub. You must explicitly configure this option to generate a default route.

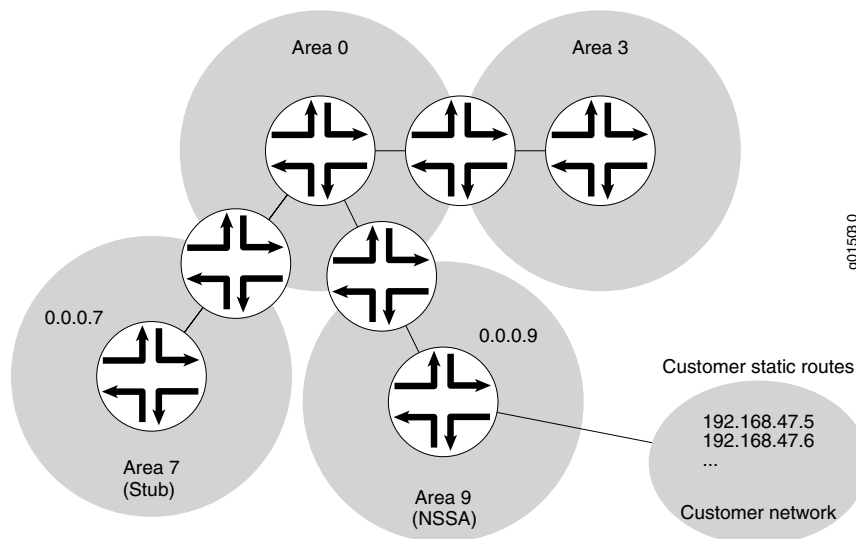
- **no-summaries**—(Optional) Prevents the ABR from advertising summary routes into the stub area by converting the stub area into a totally stubby area. If configured in combination with the **default-metric** statement, a totally stubby area only allows routes internal to the area and advertises the default route into the area. External routes and destinations to other areas are no longer summarized or allowed into a totally stubby area. Only the ABR requires this additional configuration because it is the only routing device within the totally stubby area that creates Type 3 LSAs used to receive and send traffic from outside of the area.

**NOTE:**

In Junos OS Release 8.5 and later, the following applies:

- A router-identifier interface that is not configured to run OSPF is no longer advertised as a stub network in OSPF LSAs.
- OSPF advertises a local route with a prefix length of 32 as a stub link if the loopback interface is configured with a prefix length other than 32. OSPF also advertises the direct route with the configured mask length, as in earlier releases.

Figure 6: OSPF Network Topology with Stub Areas and NSSAs



### Configuration

#### CLI Quick Configuration

- To quickly configure an OSPF stub area, copy the following command and paste it into the CLI. You must configure all routing devices that are part of the stub area.

```
[edit]
set protocols ospf area 0.0.0.7 stub
```

- To quickly configure the ABR to inject a default route into the area, copy the following command and paste it into the CLI. You apply this configuration only on the ABR.

```
[edit]
```

```
set protocols ospf area 0.0.0.7 stub default-metric 10
```

- (Optional) To quickly configure the ABR to restrict all summary advertisements and allow only internal routes and default route advertisements into the area, copy the following command and paste it into the CLI. You apply this configuration only on the ABR.

```
[edit]
set protocols ospf area 0.0.0.7 stub no-summaries
```

### Step-by-Step Procedure

To configure OSPF stub areas:

1. On all routing devices in the area, configure an OSPF stub area.



**NOTE:** To specify an OSPFv3 stub area, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

```
[edit]
user@host# set protocols ospf area 0.0.0.7 stub
```

2. On the ABR, inject a default route into the area.

```
[edit]
user@host# set protocols ospf area 0.0.0.7 stub default-metric 10
```

3. (Optional) On the ABR, restrict summary LSAs from entering the area. This step converts the stub area into a totally stubby area.

```
[edit]
user@host# set protocols ospf area 0.0.0.7 stub no-summaries
```

4. If you are done configuring the devices, commit the configuration.

```
[edit]
user@host# commit
```

### Results

Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Configuration on all routing devices:

```
user@host# show protocols ospf
area 0.0.0.7 {
  stub;
}
```

Configuration on the ABR (the output also includes the optional setting):

```
user@host# show protocols ospf
area 0.0.0.7 {
  stub default-metric 10 no-summaries;
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

---

Confirm that the configuration is working properly.

- [Verifying the Interfaces in the Area on page 34](#)
- [Verifying the Type of OSPF Area on page 34](#)

#### *Verifying the Interfaces in the Area*

**Purpose** Verify that the interface for OSPF has been configured for the appropriate area. Confirm that the output includes Stub as the type of OSPF area.

**Action** From operational mode, enter the **show ospf interface detail** command for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

#### *Verifying the Type of OSPF Area*

**Purpose** Verify that the OSPF area is a stub area. Confirm that the output displays Normal Stub as the Stub type.

**Action** From operational mode, enter the **show ospf overview** command for OSPFv2, and enter the **show ospf3 overview** command for OSPFv3.

## Example: Configuring OSPF Not-So-Stubby Areas

This example shows how to configure an OSPF not-so-stubby area (NSSA) to control the advertisement of external routes into an area.

- [Requirements on page 34](#)
- [Overview on page 35](#)
- [Configuration on page 36](#)
- [Verification on page 39](#)

### Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

## Overview

The backbone area, which is 0 in [Figure 7 on page 36](#), has a special function and is always assigned the area ID 0.0.0.0. Area IDs are unique numeric identifiers, in dotted decimal notation. Area IDs need only be unique within an AS. All other networks or areas (such as 3, 7, and 9) in the AS must be directly connected to the backbone area by ABRs that have interfaces in more than one area.

An OSPF stub area has no external routes, so you cannot redistribute routes from another protocol into a stub area. OSPF NSSAs allow external routes to be flooded within the area.

In addition, you might have a situation when exporting Type 7 LSAs into the NSSA is unnecessary. When an AS boundary router is also an ABR with an NSSA attached, Type 7 LSAs are exported into the NSSA by default. If the ABR is attached to multiple NSSAs, a separate Type 7 LSA is exported into each NSSA by default. During route redistribution, this routing device generates both Type 5 LSAs and Type 7 LSAs. You can disable exporting Type 7 LSAs into the NSSA.



**NOTE:** The following restriction applies to NSSAs: You cannot configure an area as both a stub area and an NSSA.

You configure each routing device in area 9 (area ID 0.0.0.9) with the following setting:

- **nssa**—Specifies an OSPF NSSA. You must include the **nssa** statement on all routing devices in area 9 because this area only has external connections to static routes.

You also configure the ABR in area 9 with the following additional settings:

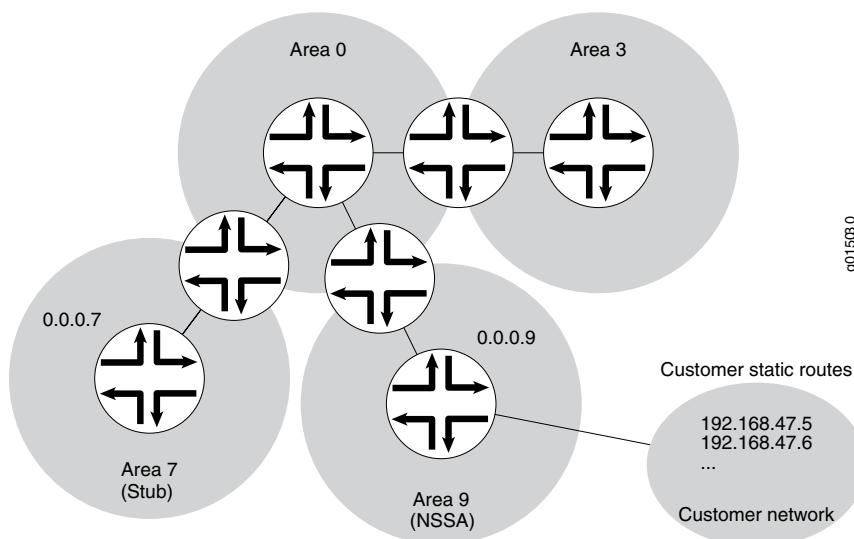
- **no-summaries**—Prevents the ABR from advertising summary routes into the NSSA. If configured in combination with the **default-metric** statement, the NSSA only allows routes internal to the area and advertises the default route into the area. External routes and destinations to other areas are no longer summarized or allowed into the NSSA. Only the ABR requires this additional configuration because it is the only routing device within the NSSA that creates Type 3 LSAs used to receive and send traffic from outside the area.
- **default-lsa**—Configures the ABR to generate a default route into the NSSA. In this example, you configure the following:
  - **default-metric**—Specifies that the ABR generate a default route with a specified metric into the NSSA. This default route enables packet forwarding from the NSSA to external destinations. You configure this option only on the ABR. The ABR does not automatically generate a default route when attached to an NSSA. You must explicitly configure this option for the ABR to generate a default route.
  - **metric-type**—(Optional) Specifies the external metric type for the default LSA, which can be either Type 1 or Type 2. When OSPF exports route information from external ASs, it includes a cost, or external metric, in the route. The difference between the two metrics is how OSPF calculates the cost of the route. Type 1 external metrics

are equivalent to the link-state metric, where the cost is equal to the sum of the internal costs plus the external cost. Type 2 external metrics use only the external cost assigned by the AS boundary router. By default, OSPF uses the Type 2 external metric.

- **type-7**—(Optional) Floods Type 7 default LSAs into the NSSA if the **no-summaries** statement is configured. By default, when the **no-summaries** statement is configured, a Type 3 LSA is injected into NSSAs for Junos OS release 5.0 and later. To support backward compatibility with earlier Junos OS releases, include the **type-7** statement.

The second example also shows the optional configuration required to disable exporting Type 7 LSAs into the NSSA by including the **no-nssa-abr** statement on the routing device that performs the functions of both an ABR and an AS boundary router.

Figure 7: OSPF Network Topology with Stub Areas and NSSAs



### Configuration

- [Configuring Routing Devices to Participate in a Not-So-Stubby-Area on page 36](#)
- [Disabling the Export of Type 7 Link State Advertisements into Not-So-Stubby Areas on page 38](#)

#### Configuring Routing Devices to Participate in a Not-So-Stubby-Area

##### CLI Quick Configuration

To quickly configure an OSPF NSSA, copy the following command and paste it into the CLI. You must configure all routing devices that are part of the NSSA.

```
[edit]
set protocols ospf area 0.0.0.9 nssa
```

To quickly configure an ABR that participates in an OSPF NSSA, copy the following commands and paste them into the CLI.

```
[edit]
set protocols ospf area 0.0.0.9 nssa default-lsa default-metric 10
set protocols ospf area 0.0.0.9 nssa default-lsa metric-type 1
```

```
set protocols ospf area 0.0.0.9 nssa default-lsa type-7
set protocols ospf area 0.0.0.9 nssa no-summaries
```

### Step-by-Step Procedure

To configure OSPF NSSAs:

1. On all routing devices in the area, configure an OSPF NSSA.



**NOTE:** To specify an OSPFv3 NSSA area, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

[edit]

```
user@host# set protocols ospf area 0.0.0.9 nssa
```

2. On the ABR, enter OSPF configuration mode and specify the NSSA area 0.0.0.9 that you already created.

[edit ]

```
user@host# edit protocols ospf area 0.0.0.9 nssa
```

3. On the ABR, inject a default route into the area.

[edit protocols ospf area 0.0.0.9 nssa]

```
user@host# set default-lsa default-metric 10
```

4. (Optional) On the ABR, specify the external metric type for the default route.

[edit protocols ospf area 0.0.0.9 nssa]

```
user@host# set default-lsa metric-type 1
```

5. (Optional) On the ABR, specify the flooding of Type 7 LSAs.

[edit protocols ospf area 0.0.0.9 nssa]

```
user@host# set default-lsa type-7
```

6. On the ABR, restrict summary LSAs from entering the area.

[edit protocols ospf area 0.0.0.9 nssa]

```
user@host# set no-summaries
```

7. If you are done configuring the devices, commit the configuration.

[edit protocols ospf area 0.0.0.9 nssa]

```
user@host# commit
```

### Results

Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Configuration on all routing devices in the area:

```
user@host# show protocols ospf
area 0.0.0.9 {
  nssa;
}
```

Configuration on the ABR. The output also includes the optional `metric-type` and `type-7` statements.

```

user@host# show protocols ospf
  area 0.0.0.9 {
    nssa {
      default-lsa {
        default-metric 10;
        metric-type 1;
        type-7;
      }
      no-summaries;
    }
  }
}

```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### *Disabling the Export of Type 7 Link State Advertisements into Not-So-Stubby Areas*

**CLI Quick Configuration** To quickly disable exporting Type 7 LSAs into the NSSA, copy the following command and paste it into the CLI. You configure this setting on an AS boundary router that is also an ABR with an NSSA area attached.

```

[edit]
set protocols ospf no-nssa-abr

```

**Step-by-Step Procedure** You can configure this setting if you have an AS boundary router that is also an ABR with an NSSA area attached.

1. Disable exporting Type 7 LSAs into the NSSA.



**NOTE:** To specify OSPFv3, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

```

[edit]
user@host# set protocols ospf no-nssa-abr

```

2. If you are done configuring the device, commit the configuration.

```

[edit]
user@host# commit

```

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```

user@host# show protocols ospf
no-nssa-abr;

```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.



### Verification

---

Confirm that the configuration is working properly.

- [Verifying the Interfaces in the Area on page 39](#)
- [Verifying the Type of OSPF Area on page 39](#)
- [Verifying the Type of LSAs on page 39](#)

#### *Verifying the Interfaces in the Area*

**Purpose** Verify that the interface for OSPF has been configured for the appropriate area. Confirm that the output includes Stub NSSA as the type of OSPF area.

**Action** From operational mode, enter the **show ospf interface detail** command for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

#### *Verifying the Type of OSPF Area*

**Purpose** Verify that the OSPF area is a stub area. Confirm that the output displays Not so Stubby Stub as the Stub type.

**Action** From operational mode, enter the **show ospf overview** command for OSPFv2, and enter the **show ospf3 overview** command for OSPFv3.

#### *Verifying the Type of LSAs*

**Purpose** Verify the type of LSAs that are in the area. If you disabled exporting Type 7 LSAs into an NSSA, confirm that the Type field does not include NSSA as a type of LSA.

**Action** From operational mode, enter the **show ospf database** command for OSPFv2, and enter the **show ospf3 database** command for OSPFv3.

**Related Documentation**

- *Example: Configuring OSPFv3 Stub and Totally Stubby Areas*
- [OSPF Areas and Router Functionality Overview on page 9](#)
- *OSPF Configuration Overview*

## Example: Configuring OSPF Multiarea Adjacency

---

- [Multiarea Adjacency for OSPF on page 39](#)
- [Example: Configuring Multiarea Adjacency for OSPF on page 40](#)

### Multiarea Adjacency for OSPF

An area is a set of networks and hosts within an autonomous system (AS) that have been administratively grouped together. By default, a single interface can belong to only one OSPF area. However, in some situations, you might want to configure an interface to belong to more than one area. Doing so allows the corresponding link to be considered

an intra-area link in multiple areas and to be preferred over other higher-cost intra-area paths. For example, you can configure an interface to belong to multiple areas with a high-speed backbone link between two area border routers (ABRs) so you can create multiarea adjacencies that belong to different areas.

In Junos OS Release 9.2 and later, you can configure a logical interface to belong to more than one OSPFv2 area. Support for OSPFv3 was introduced in Junos OS Release 9.4. As defined in RFC 5185, *OSPF Multi-Area Adjacency*, the ABRs establish multiple adjacencies belonging to different areas over the same logical interface. Each multiarea adjacency is announced as a point-to-point unnumbered link in the configured area by the routers connected to the link. For each area, one of the logical interfaces is treated as primary, and the remaining interfaces that are configured for the area are designated as secondary.

Any logical interface not configured as a secondary interface for an area is treated as the primary interface for that area. A logical interface can be configured as primary interface only for one area. For any other area for which you configure the interface, you must configure it as a secondary interface.

## Example: Configuring Multiarea Adjacency for OSPF

This example shows how to configure multiarea adjacency for OSPF.

- [Requirements on page 40](#)
- [Overview on page 40](#)
- [Configuration on page 41](#)
- [Verification on page 43](#)

---

### Requirements

Before you begin, plan your multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

---

### Overview

By default, a single interface can belong to only one OSPF area. You can configure a single interface to belong in multiple OSPF areas. Doing so allows the corresponding link to be considered an intra-area link in multiple areas and to be preferred over other higher-cost intra-area paths. When configuring a secondary interface, consider the following:

- For OSPFv2, you cannot configure point-to-multipoint and nonbroadcast multiaccess (NBMA) network interfaces as a secondary interface because secondary interfaces are treated as a point-to-point unnumbered link.
- Secondary interfaces are supported for LAN interfaces (the primary interface can be a LAN interface, but any secondary interfaces are treated as point-to-point unnumbered links over the LAN). In this scenario, you must ensure that there are only two routing devices on the LAN or that there are only two routing devices on the LAN that have secondary interfaces configured for a specific OSPF area.
- Since the purpose of a secondary interface is to advertise a topological path through an OSPF area, you cannot configure a secondary interface or a primary interface with

one or more secondary interfaces to be passive. Passive interfaces advertise their address, but do not run the OSPF protocol (adjacencies are not formed and hello packets are not generated).

- Any logical interface not configured as a secondary interface for an area is treated as a primary interface for that area. A logical interface can be configured as the primary interface only for one area. For any other area for which you configure the interface, you must configure it as a secondary interface.
- You cannot configure the **secondary** statement with the **interface all** statement.
- You cannot configure a secondary interface by its IP address.

In this example, you configure an interface to be in two areas, creating a multiarea adjacency with a link between two ABRs: ABR R1 and ABR R2. On each ABR, area 0.0.0.1 contains the primary interface and is the primary link between the ABRs, and area 0.0.0.2 contains the secondary logical interface, which you configure by including the **secondary** statement. You configure interface **so-0/0/0** on ABR R1 and interface **so-1/0/0** on ABR R2.

### Configuration

#### CLI Quick Configuration

To quickly configure a secondary logical interface for an OSPF area, copy the following commands and paste them into the CLI.

Configuration on ABR R1:

```
[edit]
set interfaces so-0/0/0 unit 0 family inet address 192.168.8.45/30
set routing-options router-id 10.255.0.1
set protocols ospf area 0.0.0.1 interface so-0/0/0
set protocols ospf area 0.0.0.2 interface so-0/0/0 secondary
```

Configuration on ABR R2:

```
[edit]
set interfaces so-1/0/0 unit 0 family inet address 192.168.8.37/30
set routing-options router-id 10.255.0.2
set protocols ospf area 0.0.0.1 interface so-1/0/0
set protocols ospf area 0.0.0.2 interface so-1/0/0 secondary
```

#### Step-by-Step Procedure

To configure a secondary logical interface:

1. Configure the device interfaces.



**NOTE:** For OSPFv3, on each interface specify the **inet6** address family and include the IPv6 address.

```
[edit]
user@R1# set interfaces so-0/0/0 unit 0 family inet address 192.168.8.45/30
```

```
[edit]
user@R2# set interfaces so-1/0/0 unit 0 family inet address 192.168.8.37/30
```

2. Configure the router identifier.

```
[edit]
user@R1# set routing-options router-id 10.255.0.1
```

```
[edit]
user@R2# set routing-options router-id 10.255.0.2
```

3. On each ABR, configure the primary interface for the OSPF area.



**NOTE:** For OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@R1# set protocols ospf 0.0.0.1 interface so-0/0/0
```

```
[edit ]
user@R2# set protocols ospf 0.0.0.2 interface so-1/0/0
```

4. On each ABR, configure the secondary interface for the OSPF area.

```
[edit ]
user@R1# set protocols ospf area 0.0.0.1 so-0/0/0 secondary
```

```
[edit ]
user@R2# set protocols ospf area 0.0.0.2 so-1/0/0 secondary
```

5. If you are done configuring the devices, commit the configuration.

```
[edit protocols ospf area 0.0.0.1 ]
user@host# commit
```

### Results

Confirm your configuration by entering the **show interfaces**, **show routing-options**, and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Configuration on ABR R1:

```
user@R1# show interfaces
so-0/0/0 {
  unit 0 {
    family inet {
      address 192.168.8.45/30;
    }
  }
}
```

```
user@R1# show routing-options
router-id 10.255.0.1;
```

```
user@R1# show protocols ospf
area 0.0.0.1 {
  interface so-0/0/0.0;
}
area 0.0.0.2 {
```

```

    interface so-0/0/0.0 {
      secondary;
    }
  }
}

```

Configuration on ABR R2:

```

user@R2# show interfaces
so-0/0/0 {
  unit 0 {
    family inet {
      address 192.168.8.37/30;
    }
  }
}

user@R2# show routing-options
router-id 10.255.0.2;

user@R2# show protocols ospf
area 0.0.0.1 {
  interface so-1/0/0.0;
}
area 0.0.0.2 {
  interface so-1/0/0.0 {
    secondary;
  }
}

```

## Verification

Confirm that the configuration is working properly.

- [Verifying the Secondary Interface on page 43](#)
- [Verifying the Interfaces in the Area on page 43](#)
- [Verifying Neighbor Adjacencies on page 44](#)

### *Verifying the Secondary Interface*

**Purpose** Verify that the secondary interface appears for the configured area. The Secondary field displays if the interface is configured as a secondary interface. The output might also show the same interface listed in multiple areas.

**Action** From operational mode, enter the **show ospf interface detail** command for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

### *Verifying the Interfaces in the Area*

**Purpose** Verify the interfaces configured for the specified area.

**Action** From operational mode, enter the **show ospf interface area *area-id*** command for OSPFv2, and enter the **show ospf3 interface area *area-id*** command for OSPFv3..

### ***Verifying Neighbor Adjacencies***

<b>Purpose</b>	Verify the primary and secondary neighbor adjacencies. The Secondary field displays if the neighbor is on a secondary interface.
<b>Action</b>	From operational mode, enter the <b>show ospf neighbor detail</b> command for OSPFv2, and enter the <b>show ospf3 neighbor detail</b> command for OSPFv3.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">OSPF Areas and Router Functionality Overview on page 9</a></li><li>• <a href="#">Understanding OSPF Areas and Backbone Areas on page 21</a></li><li>• <a href="#">OSPF Configuration Overview</a></li></ul>

---

## **Example: Disabling OSPFv2 Compatibility with RFC 1583**

- [OSPFv2 Compatibility with RFC 1583 Overview on page 44](#)
- [Example: Disabling OSPFv2 Compatibility with RFC 1583 on page 44](#)

### **OSPFv2 Compatibility with RFC 1583 Overview**

In the first implementation of OSPF (RFC1583, *OSPF Version 2*), the summary route assumes the cost of the granular route with the lowest cost. OSPF RFC 2328, *OSPF Version 2* changes the behavior so that the summary route assumes the cost of the granular route with the highest cost. OSPF readvertises the summary route whenever the cost of the summary changes. When using the default RFC 1583 behavior, this happens when the granular route with the lowest metric is changed or lost. When RFC 2328 is used, this happens when the granular route with the highest cost is changed or lost.

By default, the Junos OS implementation of OSPF is compatible with RFC 1583. This means that Junos OS maintains a single best route to an autonomous system (AS) boundary router in the OSPF routing table, rather than multiple intra-AS paths, if they are available. You can disable compatibility with RFC 1583. It is preferable to do so when the same external destination is advertised by AS boundary routers that belong to different OSPF areas. When you disable compatibility with RFC 1583, the OSPF routing table maintains the multiple intra-AS paths that are available, which the router uses to calculate AS external routes as defined in RFC 2328. Being able to use multiple available paths to calculate an AS external route can prevent routing loops.

### **Example: Disabling OSPFv2 Compatibility with RFC 1583**

This example shows how to disable OSPFv2 compatibility with RFC 1583 on the routing device.

- [Requirements on page 45](#)
- [Overview on page 45](#)
- [Configuration on page 45](#)
- [Verification on page 46](#)

## Requirements

No special configuration beyond device initialization is required before disabling OSPFv2 compatibility with RFC 1583.

## Overview

By default, the Junos OS implementation of OSPF is compatible with RFC 1583. This means that Junos OS maintains a single best route to an autonomous system (AS) boundary router in the OSPF routing table, rather than multiple intra-AS paths, if they are available. You can disable compatibility with RFC 1583. It is preferable to do so when the same external destination is advertised by AS boundary routers that belong to different OSPF areas. When you disable compatibility with RFC 1583, the OSPF routing table maintains the multiple intra-AS paths that are available, which the router uses to calculate AS external routes as defined in RFC 2328. Being able to use multiple available paths to calculate an AS external route can prevent routing loops. To minimize the potential for routing loops, configure the same RFC compatibility on all OSPF devices in an OSPF domain.

## Configuration

### CLI Quick Configuration

To quickly disable OSPFv2 compatibility with RFC 1583, copy the following command and paste it into the CLI. You configure this setting on all devices that are part of the OSPF domain.

```
[edit]
set protocols ospf no-rfc-1583
```

### Step-by-Step Procedure

To disable OSPFv2 compatibility with RFC 1583:

1. Disable RFC 1583.

```
[edit]
user@host# set protocols ospf no-rfc-1583
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```



**NOTE:** Repeat this configuration on each routing device that participates in an OSPF routing domain.

## Results

Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
no-rfc-1583;
```

## Verification

---

Confirm that the configuration is working properly.

### *Verifying the OSPF Routes*

**Purpose** Verify that the OSPF routing table maintains the intra-AS paths with the largest metric, which the router uses to calculate AS external routes.

**Action** From operational mode, enter the **show ospf route detail** command.

**Related Documentation**

- [OSPF Overview on page 4](#)
- *OSPF Configuration Overview*



## CHAPTER 4

# OSPF Interface

- [Examples: Configuring OSPF Interfaces on page 47](#)
- [Example: Configuring Multiple Address Families for OSPFv3 on page 62](#)

### Examples: Configuring OSPF Interfaces

---

- [About OSPF Interfaces on page 47](#)
- [Example: Configuring an Interface on a Broadcast or Point-to-Point Network on page 48](#)
- [Example: Configuring an OSPFv2 Interface on a Nonbroadcast Multiaccess Network on page 51](#)
- [Example: Configuring an OSPFv2 Interface on a Point-to-Multipoint Network on page 53](#)
- [Example: Configuring OSPF Demand Circuits on page 55](#)
- [Example: Configuring a Passive OSPF Interface on page 58](#)
- [Example: Configuring OSPFv2 Peer interfaces on page 60](#)

### About OSPF Interfaces

To activate OSPF on a network, you must enable the OSPF protocol on one or more interfaces on each device within the network on which traffic is to travel. How you configure the interface depends on whether the interface is connected to a broadcast or point-to-point network, a point-to-multipoint network, a nonbroadcast multiaccess (NBMA) network, or across a demand circuit.

- A broadcast interface behaves as if the routing device is connected to a LAN.
- A point-to-point interface provides a connection between a single source and a single destination (there is only one OSPF adjacency).
- A point-to-multipoint interface provides a connection between a single source and multiple destinations.
- An NBMA interface behaves in a similar fashion to a point-to-multipoint interface, but you might configure an NBMA interface to interoperate with other equipment.
- A demand circuit is a connection on which you can limit traffic based on user agreements. The demand circuit can limit bandwidth or access time based on agreements between the provider and user.

You can also configure an OSPF interface to be passive, to operate in passive traffic engineering mode, or to be a peer interface.

- A passive interface advertises its address, but does not run the OSPF protocol (adjacencies are not formed and hello packets are not generated).
- An interface operating in OSPF passive traffic engineering mode floods link address information within the autonomous system (AS) and makes it available for traffic engineering calculations.
- A peer interface can be configured for OSPFv2 routing devices. A peer interface is required for Generalized MPLS (GMPLS) to transport traffic engineering information through a link separate from the control channel. You establish this separate link by configuring a peer interface. The peer interface name must match the Link Management Protocol (LMP) peer name. A peer interface is optional for a hierarchy of RSVP label-switched paths (LSPs). After you configure the forwarding adjacency, you can configure OSPFv2 to advertise the traffic engineering properties of a forwarding adjacency to a specific peer.

Point-to-point interfaces differ from multipoint in that only one OSPF adjacency is possible. (A LAN, for instance, can have multiple addresses and can run OSPF on each subnet simultaneously.) As such, when you configure a numbered point-to-point interface to OSPF by name, multiple OSPF interfaces are created. One, which is unnumbered, is the interface on which the protocol is run. An additional OSPF interface is created for each address configured on the interface, if any, which is automatically marked as passive.

For OSPFv3, one OSPF-specific interface must be created per interface name configured under OSPFv3. OSPFv3 does not allow interfaces to be configured by IP address.

Enabling OSPF on an interface (by including the **interface** statement), disabling it (by including the **disable** statement), and not actually having OSPF run on an interface (by including the **passive** statement) are mutually exclusive states.



**NOTE:** When you configure OSPFv2 on an interface, you must also include the **family inet** statement at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level. When you configure OSPFv3 on an interface, you must also include the **family inet6** statement at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level. In Junos OS Release 9.2 and later, you can configure OSPFv3 to support address families other than unicast IPv6.

---

### Example: Configuring an Interface on a Broadcast or Point-to-Point Network

This example shows how to configure an OSPF interface on a broadcast or point-to-point network.

- [Requirements on page 49](#)
- [Overview on page 49](#)

- [Configuration on page 49](#)
- [Verification on page 50](#)

## Requirements

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#)
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

## Overview

If the interface on which you are configuring OSPF supports broadcast mode (such as a LAN), or if the interface supports point-to-point mode (such as a PPP interface or a point-to-point logical interface on Frame Relay), you specify the interface by including the IP address or the interface name for OSPFv2, or only the interface name for OSPFv3. In Junos OS Release 9.3 and later, an OSPF point-to-point interface can be an Ethernet interface without a subnet. If you configure an interface on a broadcast network, designated router and backup designated router election is performed.



### NOTE:

- Using both the interface name and the IP address of the same interface produces an invalid configuration.
- Including the IP address of loopback0 interface unit may implicitly enable OSPF on unnumbered interfaces with “unnumbered-address lo0.0” configured.

In this example, you configure interface **ge-0/2/0** as an OSPFv2 interface in OSPF area 0.0.0.1.

## Configuration

<b>CLI Quick Configuration</b>	To quickly configure an OSPF interface on a broadcast or point-to-point network, copy the following commands and paste them into the CLI.
<b>Step-by-Step Procedure</b>	<p>To configure an OSPF interface on a broadcast or point-to-point network:</p> <ol style="list-style-type: none"> <li>1. Configure the interface.</li> </ol> <pre> [edit] set interfaces ge-0/2/0 unit 0 family inet address 10.0.0.1 set protocols ospf area 0.0.0.1 interface ge-0/2/0           </pre>



**NOTE:** For an OSPFv3 interface, specify an IPv6 address.

```
[edit]
user@host# set interfaces ge-0/2/0 unit 0 family inet address 10.0.0.1
```

2. Create an OSPF area.



**NOTE:** For an OSPFv3 interface, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.1
```

3. Assign the interface to the area.

```
[edit protocols ospf area 0.0.0.1 ]
user@host# set interface ge-0/2/0
```

4. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.1 ]
user@host# commit
```

### Results

Confirm your configuration by entering the **show interfaces** and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
ge-0/2/0 {
  unit 0 {
    family inet {
      address 10.0.0.1/32;
    }
  }
}

user@host# show protocols ospf
area 0.0.0.1 {
  interface ge-0/2/0.0;
}
```

To confirm your OSPFv3 configuration, enter the **show interfaces** and the **show protocols ospf3** commands.

### Verification

Confirm that the configuration is working properly.

### *Verifying the OSPF Interface*

- Purpose** Verify the interface configuration. Depending on your deployment, the Type field might display LAN or P2P.
- Action** From operational mode, enter the **show ospf interface detail** command for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

## Example: Configuring an OSPFv2 Interface on a Nonbroadcast Multiaccess Network

This example shows how to configure an OSPFv2 interface on a nonbroadcast multiaccess (NBMA) network.

- [Requirements on page 51](#)
- [Overview on page 51](#)
- [Configuration on page 52](#)
- [Verification on page 53](#)

### Requirements

---

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#).
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

### Overview

---

When you configure OSPFv2 on an NBMA network, you can use nonbroadcast mode rather than point-to-multipoint mode. Using this mode offers no advantages over point-to-multipoint mode, but it has more disadvantages than point-to-multipoint mode. Nevertheless, you might occasionally find it necessary to configure nonbroadcast mode to interoperate with other equipment. Because there is no autodiscovery mechanism, you must configure each neighbor.

Nonbroadcast mode treats the NBMA network as a partially connected LAN, electing designated and backup designated routers. All routing devices must have a direct connection to both the designated and backup designated routers, or unpredictable results occur.

When you configure the interface, specify either the IP address or the interface name. Using both the IP address and the interface name produces an invalid configuration. For nonbroadcast interfaces, specify the IP address of the nonbroadcast interface as the interface name.

In this example, you configure the Asynchronous Transfer Mode (ATM) interface **at-0/1/0** as an OSPFv2 interface in OSPF area 0.0.0.1, and you specify the following settings:

- **interface-type nbma**—Sets the interface to run in NBMA mode. You must explicitly configure the interface to run in NBMA mode.
- **neighbor address <eligible>**—Specifies the IP address of the neighboring device. OSPF routing devices normally discover their neighbors dynamically by listening to the broadcast or multicast hello packets on the network. Because an NBMA network does not support broadcast (or multicast), the device cannot discover its neighbors dynamically, so you must configure all the neighbors statically. To configure multiple neighbors, include multiple **neighbor** statements. If you want the neighbor to be a designated router, include the **eligible** keyword.
- **poll-interval**—Specifies the length of time, in seconds, before the routing device sends hello packets out of the interface before it establishes adjacency with a neighbor. Routing devices send hello packets for a longer interval on nonbroadcast networks to minimize the bandwidth required on slow WAN links. The range is from 1 through 255 seconds. By default, the device sends hello packets out the interface every 120 seconds before it establishes adjacency with a neighbor.

Once the routing device detects an active neighbor, the hello packet interval changes from the time specified in the **poll-interval** statement to the time specified in the **hello-interval** statement.

---

### Configuration

#### CLI Quick Configuration

To quickly configure an OSPFv2 interface on an NBMA network, copy the following commands and paste them into the CLI.

```
[edit]
set interfaces at-0/1/0 unit 0 family inet address 192.0.2.1
set protocols ospf area 0.0.0.1 interface at-0/1/0.0 interface-type nbma
set protocols ospf area 0.0.0.1 interface at-0/1/0.0 neighbor 192.0.2.2 eligible
set protocols ospf area 0.0.0.1 interface at-0/1/0.0 poll-interval 130
```

#### Step-by-Step Procedure

To configure an OSPFv2 interface on an NBMA network:

1. Configure the interface.

```
[edit]
user@host# set interfaces at-0/1/0 unit 0 family inet address 192.0.2.1
```

2. Create an OSPF area.

```
[edit]
user@host# edit protocols ospf area 0.0.0.1
```

3. Assign the interface to the area.

In this example, include the **eligible** keyword to allow the neighbor to be a designated router.

```
[edit protocols ospf area 0.0.0.1 ]
user@host# set interface at-0/1/0 interface-type nbma neighbor 192.0.2.2 eligible
```

4. Configure the poll interval.

```
[edit protocols ospf area 0.0.0.1 ]
user@host# set interface at-0/1/0 poll-interval 130
```

5. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.1 ]
user@host# commit
```

### Results

Confirm your configuration by entering the **show interfaces** and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
at-0/1/0 {
  unit 0 {
    family inet {
      address 192.0.2.1/32;
    }
  }
}

user@host# show protocols ospf
area 0.0.0.1 {
  interface at-0/1/0.0 {
    interface-type nbma;
    neighbor 192.0.2.2 eligible;
    poll-interval 130;
  }
}
```

### Verification

Confirm that the configuration is working properly.

#### Verifying the OSPF Interface

**Purpose** Verify the interface configuration. Confirm that the Type field displays NBMA.

**Action** From operational mode, enter the **show ospf interface detail** command.

### Example: Configuring an OSPFv2 Interface on a Point-to-Multipoint Network

This example shows how to configure an OSPFv2 interface on a point-to-multipoint network.

- [Requirements on page 54](#)
- [Overview on page 54](#)
- [Configuration on page 54](#)
- [Verification on page 55](#)

## Requirements

---

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#)
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

## Overview

---

When you configure OSPFv2 on a nonbroadcast multiaccess (NBMA) network, such as a multipoint Asynchronous Transfer Mode (ATM) or Frame Relay, OSPFv2 operates by default in point-to-multipoint mode. In this mode, OSPFv2 treats the network as a set of point-to-point links. Because there is no autodiscovery mechanism, you must configure each neighbor.

When you configure the interface, specify either the IP address or the interface name. Using both the IP address and the interface name produces an invalid configuration.

In this example, you configure ATM interface **at-0/1/0** as an OSPFv2 interface in OSPF area 0.0.0.1, and you specify 192.0.2.1 as the neighbor's IP address.

## Configuration

---

### CLI Quick Configuration

To quickly configure an OSPFv2 interface on a point-to-multipoint network, copy the following commands and paste them into the CLI.

```
[edit]
set interfaces at-0/1/0 unit 0 family inet address 192.0.2.2
set protocols ospf area 0.0.0.1 interface at-0/1/0 neighbor 192.0.2.1
```

### Step-by-Step Procedure

To configure an OSPFv2 interface on a point-to-multipoint network:

1. Configure the interface.

```
[edit]
user@host# set interfaces at-0/1/0 unit 0 family inet address 192.0.2.2
```

2. Create an OSPF area.

```
[edit]
user@host# edit protocols ospf area 0.0.0.1
```

3. Assign the interface to the area and specify the neighbor.

```
[edit protocols ospf area 0.0.0.1]
user@host# set interface at-0/1/0 neighbor 192.0.2.1
```

To configure multiple neighbors, include a **neighbor** statement for each neighbor.

4. If you are done configuring the device, commit the configuration.



```
[edit protocols ospf area 0.0.0.1]
user@host# commit
```

### Results

Confirm your configuration by entering the **show interfaces** and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
at-0/1/0 {
  unit 0 {
    family inet {
      address 192.0.2.2/32;
    }
  }
}

user@host# show protocols ospf
area 0.0.0.1 {
  interface at-0/1/0.0 {
    neighbor 192.0.2.1;
  }
}
```

### Verification

Confirm that the configuration is working properly.

#### Verifying the OSPF Interface

**Purpose** Verify the interface configuration. Confirm that the Type field displays P2MP.

**Action** From operational mode, enter the **show ospf interface detail** command.

## Example: Configuring OSPF Demand Circuits

This example shows how to configure an OSPF demand circuit interface.

- [Requirements on page 55](#)
- [Overview on page 56](#)
- [Configuration on page 57](#)
- [Verification on page 58](#)

### Requirements

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.



**NOTE:** If you are using OSPF demand circuits over an ISDN link, you must configure an ISDN interface and enable dial-on-demand routing. See the *Junos OS Network Interfaces Library for Routing Devices*.

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Configure a single-area OSPF network. See [“Example: Configuring a Single-Area OSPF Network” on page 23](#).
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

---

## Overview

OSPF sends periodic hello packets to establish and maintain neighbor adjacencies and uses link-state advertisements (LSAs) to make routing calculations and decisions. OSPF support for demand circuits is defined in RFC 1793, *Extending OSPF to Support Demand Circuits*, and suppresses the periodic hello packets and LSAs. A demand circuit is a connection on which you can limit traffic based on user agreements. The demand circuit can limit bandwidth or access time based on agreements between the provider and user.

You configure demand circuits on an OSPF interface. When the interface becomes a demand circuit, all hello packets and LSAs are suppressed as soon as OSPF synchronization is achieved. LSAs have a DoNotAge bit that stops the LSA from aging and prevents periodic updates from being sent. Hello packets and LSAs are sent and received on a demand-circuit interface only when there is a change in the network topology. This reduces the amount of traffic through the OSPF interface.

Consider the following when configuring OSPF demand circuits:

- Periodic hellos are only suppressed on point-to-point and point-to-multipoint interfaces. If you configure demand circuits on an OSPF broadcast network or on an OSPF nonbroadcast multiaccess (NBMA) network, periodic hello packets are still sent.
- Demand circuit support on an OSPF point-to-multipoint interface resembles that for point-to-point interfaces. If you configure a point-to-multipoint interface as a demand circuit, the device negotiates hello suppression separately on each interface that is part of the point-to-multipoint network.

This example assumes that you have a point-to-point connection between two devices using SONET/SDH interfaces. A demand-circuit interface automatically negotiates the demand-circuit connection with its OSPF neighbor. If the neighbor does not support demand circuits, then no demand circuit connection is established.

In this example, you configure OSPF interface **so-0/1/0** in OSPF area 0.0.0.1 as a demand circuit.

## Configuration

**CLI Quick Configuration** To quickly configure an OSPF demand circuit interface, copy the following command and paste it into the CLI. You must configure both neighboring interfaces for OSPF demand circuits for the connection to be established.

```
[edit]
set protocols ospf area 0.0.0.1 interface so-0/1/0 demand-circuit
```

**Step-by-Step Procedure** To configure an OSPF demand circuit interface on one neighboring interface:

1. Create an OSPF area.



**NOTE:** For OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit ]
user@host# edit protocols ospf area 0.0.0.1
```

2. Configure the neighboring interface as a demand circuit.

```
[edit protocols ospf area 0.0.0.1]
user@host# set interface so-0/1/0 demand-circuit
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.1]
user@host# commit
```



**NOTE:** Repeat this entire configuration on the other neighboring interface.

## Results

Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols
ospf {
  area 0.0.0.1 {
    interface so-0/1/0.0 {
      demand-circuit;
    }
  }
}
```

To confirm your OSPFv3 configuration, enter the `show protocols ospf3` command.

### Verification

---

Confirm that the configuration is working properly.

#### *Verifying the Status of Neighboring Interfaces*

**Purpose** Verify information about the neighboring interface. When the neighbor is configured for demand circuits, a DC flag displays.

**Action** From operational mode, enter the **show ospf neighbor detail** command for OSPFv2, and enter the **show ospf3 neighbor detail** command for OSPFv3.

### Example: Configuring a Passive OSPF Interface

This example shows how to configure a passive OSPF interface. A passive OSPF interface advertises its address but does not run the OSPF protocol.

- [Requirements on page 58](#)
- [Overview on page 58](#)
- [Configuration on page 59](#)
- [Verification on page 60](#)

### Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

### Overview

---

By default, OSPF must be configured on an interface for direct interface addresses to be advertised as interior routes. To advertise the direct interface addresses without actually running OSPF on that interface (adjacencies are not formed and hello packets are not generated), you configure that interface as a passive interface.

Enabling OSPF on an interface (by including the **interface** statement), disabling it (by including the **disable** statement), and not actually having OSPF run on an interface (by including the **passive** statement) are mutually exclusive states.



**NOTE:** If you do not want to see notifications for state changes in a passive OSPF interface, you can disable the OSPF traps for the interface by including the `no-interface-state-traps` statement. The `no-interface-state-traps` statement is supported only for OSPFv2.

In this example, you configure interface `ge-0/2/0` as a passive OSPF interface in area 0.0.0.1 by including the `passive` statement.

### Configuration

**CLI Quick Configuration** To quickly configure a passive OSPF interface, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.1 interface ge-0/2/0 passive
```

**Step-by-Step Procedure** To configure a passive OSPF interface:

1. Create an OSPF area.



**NOTE:** For an OSPFv3 interface, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.1
```

2. Configure the passive interface.

```
[edit protocols ospf area 0.0.0.1 ]
user@host# set interface ge-0/2/0 passive
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.1]
user@host# commit
```

### Results

Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
  area 0.0.0.1 {
    interface ge-0/2/0.0 {
      passive;
    }
  }
```

To confirm your OSPFv3 configuration, enter the `show protocols ospf3` command.

### Verification

---

Confirm that the configuration is working properly.

#### *Verifying the Status of OSPF Interfaces*

- Purpose** Verify the status of the OSPF interface. If the interface is passive, the Adj count field is 0 because no adjacencies have been formed. Next to this field, you might also see the word Passive.
- Action** From operational mode, enter the **show ospf interface detail** command for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

### Example: Configuring OSPFv2 Peer interfaces

This example shows how to configure an OSPFv2 peer interface.

- [Requirements on page 60](#)
- [Overview on page 60](#)
- [Configuration on page 61](#)
- [Verification on page 61](#)

### Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.
- Configure Generalized MPLS per your network requirements. See *LMP Configuration Overview* in the *Junos OS MPLS Applications Library for Routing Devices*.

### Overview

---

You can configure an OSPFv2 peer interface for many reasons, including when you configure Generalized MPLS (GMPLS). This example configures a peer interface for GMPLS. GMPLS requires traffic engineering information to be transported through a link separate from the control channel. You establish this separate link by configuring a peer interface. The OSPFv2 peer interface name must match the Link Management Protocol (LMP) peer name. You configure GMPLS and the LMP settings separately from OSPF.

This example assumes that GMPLS and the LMP peer named **oxc1** are already configured, and you need to configure the OSPFv2 peer interface in area 0.0.0.0.

## Configuration

**CLI Quick Configuration** To quickly configure an OSPFv2 peer interface, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.0 peer-interface oxc1
```

**Step-by-Step Procedure** To configure a peer OSPFv2 interface used by the LMP:

1. Create an OSPF area.

```
[edit]
user@host# edit protocols ospf area 0.0.0.0
```

2. Configure the peer interface.

```
[edit protocols ospf area 0.0.0.0]
user@host# set peer-interface oxc1
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.0]
user@host# commit
```

## Results

Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
  area 0.0.0.0 {
    peer-interface oxc1;
  }
```

## Verification

Confirm that the configuration is working properly.

### Verifying the Configured OSPFv2 Peer

**Purpose** Verify the status of the OSPFv2 peer. When an OSPFv2 peer is configured for GMPLS, the Peer Name field displays the name of the LMP peer that you created for GMPLS, which is also the configured OSPFv2 peer.

**Action** From operational mode, enter the **show link-management** command.

**Related Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Configuration Overview](#)

## Example: Configuring Multiple Address Families for OSPFv3

---

- [Understanding Multiple Address Families for OSPFv3 on page 62](#)
- [Example: Configuring Multiple Address Families for OSPFv3 on page 62](#)

### Understanding Multiple Address Families for OSPFv3

By default, OSPFv3 supports only unicast IPv6 routes. In Junos OS Release 9.2 and later, you can configure OSPFv3 to support multiple address families, including IPv4 unicast, IPv4 multicast, and IPv6 multicast. This multiple address family support allows OSPFv3 to support both IPv6 and IPv4 nodes. Junos OS maps each address family to a separate realm as defined in Internet draft *draft-ietf-ospf-af-alt-06.txt, Support for Address Families in OSPFv3*. Each realm maintains a separate set of neighbors and link-state database.

When you configure multiple address families for OSPFv3, there is a new instance ID field that allows multiple OSPFv3 protocol instances per link. This allows a single link to belong to multiple areas.

You configure each realm independently. We recommend that you configure an area and at least one interface for each realm.

These are the default import and export routing tables for each of the four address families:

- IPv6 unicast: **inet6.0**
- IPv6 multicast: **inet6.2**
- IPv4 unicast: **inet.0**
- IPv4 multicast: **inet.2**

With the exception of virtual links, all configurations supported for the default IPv6 unicast family are supported for the address families that have to be configured as realms.

## Example: Configuring Multiple Address Families for OSPFv3

This example shows how to configure multiple address families for OSPFv3.

- [Requirements on page 62](#)
- [Overview on page 63](#)
- [Configuration on page 64](#)
- [Verification on page 65](#)

---

### Requirements

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).



- Configure a single-area OSPF network. See [“Example: Configuring a Single-Area OSPF Network” on page 23](#).
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

### Overview

By default, OSPFv3 supports unicast IPv6 routes, but you can configure OSPFv3 to support multiple address families. To support an address family other than unicast IPv6, you configure a realm that allows OSPFv3 to advertise IPv4 unicast, IPv4 multicast, or IPv6 multicast routes. Junos OS then maps each address family that you configure to a separate realm with its own set of neighbors and link-state database.



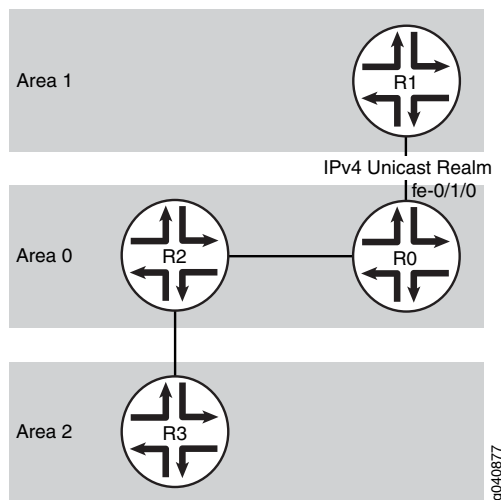
**NOTE:** By default, LDP synchronization is only supported for OSPFv2. If you configure an IPv4 unicast or IPv4 multicast realm, you can also configure LDP synchronization. Since LDP synchronization is only supported for IPv4, this support is only available for OSPFv3 if you configure an IPv4 realm.

When configuring OSPFv3 to support multiple address families, consider the following:

- You configure each realm independently. We recommend that you configure an area and at least one interface for each realm.
- OSPFv3 uses IPv6 link-local addresses as the source of hello packets and next hop calculations. As such, you must enable IPv6 on the link regardless of the additional realm you configure.

[Figure 8 on page 64](#) shows a connection between Routers R0 and R1. In this example, you configure interface **fe-0/1/0** on Router R0 in area 0 to advertise IPv4 unicast routes, in addition to the default unicast IPv6 routes in area 1, by including the **realm ipv4-unicast** statement. Depending on your network requirements, you can also advertise IPv4 multicast routes by including the **realm-ipv4-multicast** statement, and you can advertise IPv6 multicast routes by including the **realm-ipv6-multicast** statement.

Figure 8: IPv4 Unicast Realm



### Configuration

#### CLI Quick Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Modifying the Junos OS Configuration* in *CLI User Guide*.

To quickly configure multiple address families for OSPFv3, copy the following commands and paste them into the CLI.

```
[edit]
set interfaces fe-0/1/0 unit 0 family inet address 11.1.2.1/24
set interfaces fe-0/1/0 unit 0 family inet6
set protocols ospf3 area 0.0.0.0 interface fe-0/1/0
set protocols ospf3 realm ipv4-unicast area 0.0.0.0 interface fe-0/1/0
```

#### Step-by-Step Procedure

To configure multiple address families for OSPFv3:

1. Configure the device interface participating in OSPFv3.
 

```
[edit]
user@host# set interfaces fe-0/1/0 unit 0 family inet address 11.1.2.1/24
user@host# set interfaces fe-0/1/0 unit 0 family inet6
```
2. Enter OSPFv3 configuration mode.
 

```
[edit ]
user@host# edit protocols ospf3
```
3. Add the interface you configured to the OSPFv3 area.
 

```
[edit protocols ospf3 ]
user@host# set area 0.0.0.0 interface fe-0/1/0
```
4. Configure an IPv4 unicast realm. This allows OSPFv3 to support both IPv4 unicast and IPv6 unicast routes.
 

```
[edit protocols ospf3 ]
user@host# set realm ipv4-unicast area 0.0.0.0 interface fe-0/1/0
```

- If you are done configuring the device, commit the configuration.

```
[edit protocols ospf3 ]
user@host# commit
```



**NOTE:** Repeat this entire configuration on the neighboring device that is part of the realm.

### Results

Confirm your configuration by entering the **show interfaces** and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
fe-0/1/0 {
  unit 0 {
    family inet {
      address 11.1.2.1/24;
    }
    family inet6;
  }
}

user@host# show protocols ospf3
realm ipv4-unicast {
  area 0.0.0.0 {
    interface fe-0/1/0.0;
  }
}
area 0.0.0.0 {
  interface fe-0/1/0.0;
}
```

### Verification

Confirm that the configuration is working properly.

- [Verifying the Link-State Database on page 65](#)
- [Verifying the Status of OSPFv3 Interfaces with Multiple Address Families on page 65](#)

#### *Verifying the Link-State Database*

**Purpose** Verify the status of the link-state database for the configured realm, or address family.

**Action** From operational mode, enter the **show ospf3 database realm ipv4-unicast** command.

#### *Verifying the Status of OSPFv3 Interfaces with Multiple Address Families*

**Purpose** Verify the status of the interface for the specified OSPFv3 realm, or address family.

**Action** From operational mode, enter the **show ospf3 interface realm ipv4-unicast** command.

- Related Documentation**
- [OSPF Overview on page 4](#)
  - *OSPF Configuration Overview*

## CHAPTER 5

# OSPF Route Control

- [Examples: Configuring OSPF Route Summarization on page 67](#)
- [Examples: Configuring OSPF Traffic Control on page 76](#)
- [Example: Configuring OSPF Overload Mode on page 86](#)

### Examples: Configuring OSPF Route Summarization

---

- [Understanding OSPF Route Summarization on page 67](#)
- [Example: Summarizing Ranges of Routes in OSPF Link-State Advertisements on page 68](#)
- [Example: Limiting the Number of Prefixes Exported to OSPF on page 73](#)
- [Configuring OSPF Refresh and Flooding Reduction in Stable Topologies on page 75](#)

### Understanding OSPF Route Summarization

Area border routers (ABRs) send summary link advertisements to describe the routes to other areas. Depending on the number of destinations, an area can get flooded with a large number of link-state records, which can utilize routing device resources. To minimize the number of advertisements that are flooded into an area, you can configure the ABR to coalesce, or summarize, a range of IP addresses and send reachability information about these addresses in a single link-state advertisement (LSA). You can summarize one or more ranges of IP addresses, where all routes that match the specified area range are filtered at the area boundary, and the summary is advertised in their place.

For an OSPF area, you can summarize and filter intra-area prefixes. All routes that match the specified area range are filtered at the area boundary, and the summary is advertised in their place. For an OSPF not-so-stubby area (NSSA), you can only coalesce or filter NSSA external (Type 7) LSAs before they are translated into AS external (Type 5) LSAs and enter the backbone area. All external routes learned within the area that do not fall into the range of one of the prefixes are advertised individually to other areas.

In addition, you can also limit the number of prefixes (routes) that are exported into OSPF. By setting a user-defined maximum number of prefixes, you prevent the routing device from flooding an excessive number of routes into an area.

## Example: Summarizing Ranges of Routes in OSPF Link-State Advertisements

This example shows how to summarize routes sent into the backbone area.

- [Requirements on page 68](#)
- [Overview on page 68](#)
- [Configuration on page 69](#)
- [Verification on page 73](#)

---

### Requirements

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#)
- Configure a static route. See *Examples: Configuring Static Routes* in the *Junos OS Routing Protocols Library for Routing Devices*.

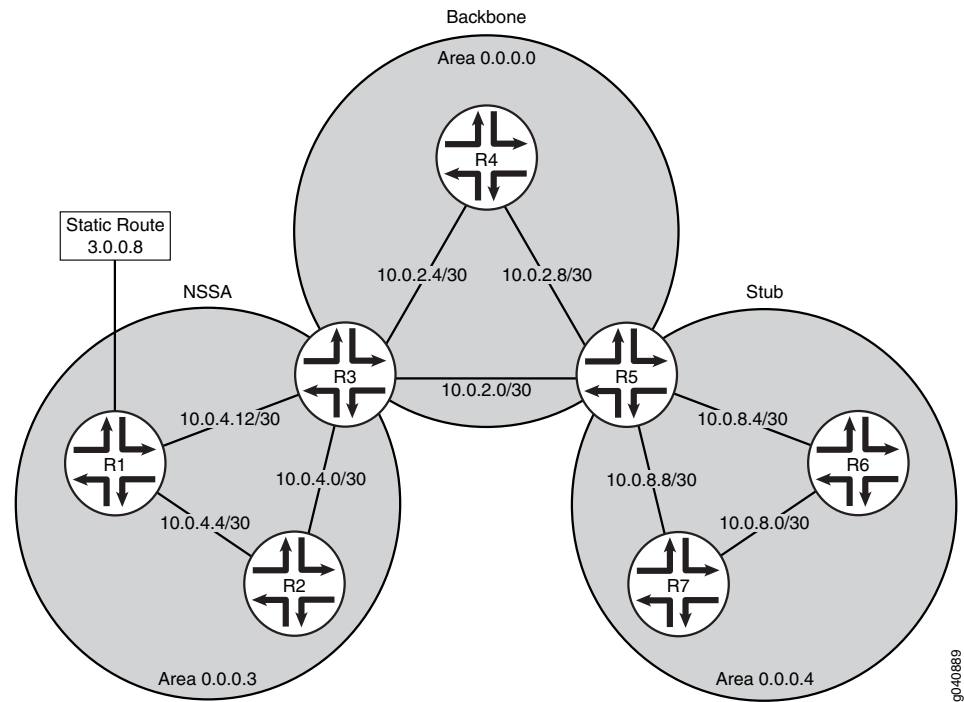
---

### Overview

You can summarize a range of IP addresses to minimize the size of the backbone router's link-state database. All routes that match the specified area range are filtered at the area boundary, and the summary is advertised in their place.

[Figure 9 on page 69](#) shows the topology used in this example. R5 is the ABR between area 0.0.0.4 and the backbone. The networks in area 0.0.0.4 are 10.0.8.4/30, 10.0.8.0/30, and 10.0.8.8/30, which can be summarized as 10.0.8.0/28. R3 is the ABR between NSSA area 0.0.0.3 and the backbone. The networks in area 0.0.0.3 are 10.0.4.4/30, 10.0.4.0/30, and 10.0.4.12/30, which can be summarized as 10.0.4.0/28. Area 0.0.0.3 also contains external static route 3.0.0.8 that you will prevent from flooding throughout the network.

Figure 9: Summarizing Ranges of Routes in OSPF



In this example, you configure the ABRs for route summarization by including the following settings:

- **area-range**—For an area, summarizes a range of IP addresses when sending summary intra-area link advertisements. For an NSSA, summarizes a range of IP addresses when sending NSSA link-state advertisements (Type 7 LSAs). The specified prefixes are used to aggregate external routes learned within the area when the routes are advertised to other areas.
- **network/mask-length**—Indicates the summarized IP address range and the number of significant bits in the network mask.
- **restrict**—On the NSSA ABR, prevents the configured summary from being advertised. In this example, we do not want to flood the external route outside of area 0.0.0.3.

### Configuration

#### CLI Quick Configuration

- To quickly configure route summarization for an OSPF area, copy the following commands and paste them into the CLI. The following is the configuration on ABR R5:

```
[edit]
set interfaces fe-0/0/1 unit 0 family inet address 10.0.8.3
set interfaces fe-0/0/2 unit 0 family inet address 10.0.8.4
set interfaces fe-0/0/0 unit 0 family inet address 10.0.2.3
set interfaces fe-0/0/4 unit 0 family inet address 10.0.2.5
set protocols ospf area 0.0.0.4 stub
set protocols ospf area 0.0.0.4 interface fe-0/0/1
set protocols ospf area 0.0.0.4 interface fe-0/0/2
set protocols ospf area 0.0.0.0 interface fe-0/0/0
```

```
set protocols ospf area 0.0.0.0 interface fe-0/0/4
set protocols ospf area 0.0.0.4 area-range 10.0.8.0/28
```

- To quickly configure route summarization for an OSPF NSSA, copy the following commands and paste them into the CLI. The following is the configuration on ABR R3:

```
[edit]
set interfaces fe-0/0/1 unit 0 family inet address 10.0.4.10
set interfaces fe-0/0/2 unit 0 family inet address 10.0.4.1
set interfaces fe-0/0/0 unit 0 family inet address 10.0.2.1
set interfaces fe-0/0/4 unit 0 family inet address 10.0.2.7
set protocols ospf area 0.0.0.3 interface fe-0/0/1
set protocols ospf area 0.0.0.3 interface fe-0/0/2
set protocols ospf area 0.0.0.0 interface fe-0/0/0
set protocols ospf area 0.0.0.0 interface fe-0/0/4
set protocols ospf area 0.0.0.3 area-range 10.0.4.0/28
set protocols ospf area 0.0.0.3 nssa
set protocols ospf area 0.0.0.3 nssa area-range 3.0.0.0/8 restrict
```

### Step-by-Step Procedure

To summarize routes sent to the backbone area:

1. Configure the interfaces.



**NOTE:** For OSPFv3, include IPv6 addresses.

```
[edit]
user@R5# set interfaces fe-0/0/1 unit 0 family inet address 10.0.8.3
user@R5# set interfaces fe-0/0/2 unit 0 family inet address 10.0.8.4
user@R5# set interfaces fe-0/0/0 unit 0 family inet address 10.0.2.3
user@R5# set interfaces fe-0/0/4 unit 0 family inet address 10.0.2.5

[edit]
user@R3# set interfaces fe-0/0/1 unit 0 family inet address 10.0.4.10
user@R3# set interfaces fe-0/0/2 unit 0 family inet address 10.0.4.1
user@R3# set interfaces fe-0/0/0 unit 0 family inet address 10.0.2.1
user@R3# set interfaces fe-0/0/4 unit 0 family inet address 10.0.2.7
```

2. Configure the type of OSPF area.



**NOTE:** For OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@R5# set protocols ospf area 0.0.0.4 stub

[edit]
user@R3# set protocols ospf area 0.0.0.3 nssa
```

3. Assign the interfaces to the OSPF areas.

```
user@R5# set protocols ospf area 0.0.0.4 interface fe-0/0/1
user@R5# set protocols ospf area 0.0.0.4 interface fe-0/0/2
```



```

user@R5# set protocols ospf area 0.0.0.0 interface fe-0/0/0
user@R5# set protocols ospf area 0.0.0.0 interface fe-0/0/4

user@R3# set protocols ospf area 0.0.0.3 interface fe-0/0/1
user@R3# set protocols ospf area 0.0.0.3 interface fe-0/0/2
user@R3# set protocols ospf area 0.0.0.0 interface fe-0/0/0
user@R3# set protocols ospf area 0.0.0.0 interface fe-0/0/4

```

4. Summarize the routes that are flooded into the backbone.

```

[edit]
user@R5# set protocols ospf area 0.0.0.4 area-range 10.0.8.0/28

[edit]
user@R3# set protocols ospf area 0.0.0.3 area-range 10.0.4.0/28

```

5. On ABR R3, restrict the external static route from leaving area 0.0.0.3.

```

[edit]
user@R3# set protocols ospf area 0.0.0.3 nssa area-range 3.0.0.0/8 restrict

```

6. If you are done configuring the devices, commit the configuration.

```

[edit]
user@host# commit

```

### Results

Confirm your configuration by entering the **show interfaces** and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Configuration on ABR R5:

```

user@R5# show interfaces
fe-0/0/0 {
  unit 0 {
    family inet {
      address 10.0.2.3/32;
    }
  }
}
fe-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.8.3/32;
    }
  }
}
fe-0/0/2 {
  unit 0 {
    family inet {
      address 10.0.8.4/32;
    }
  }
}
fe-0/0/4 {
  unit 0 {

```

```
        family inet {
            address 10.0.2.5/32;
        }
    }
}
```

```
user@R5# show protocols ospf
area 0.0.0.0 {
    interface fe-0/0/0.0;
    interface fe-0/0/4.0;
}
area 0.0.0.4 {
    stub;
    area-range 10.0.8.0/28;
    interface fe-0/0/1.0;
    interface fe-0/0/2.0;
}
```

Configuration on ABR R3:

```
user@R3# show interfaces
fe-0/0/0 {
    unit 0 {
        family inet {
            address 10.0.2.1/32;
        }
    }
}
fe-0/0/1 {
    unit 0 {
        family inet {
            address 10.0.4.10/32;
        }
    }
}
fe-0/0/2 {
    unit 0 {
        family inet {
            address 10.0.4.1/32;
        }
    }
}
fe-0/0/4 {
    unit 0 {
        family inet {
            address 10.0.2.7/32;
        }
    }
}
```

```
user@R3t# show protocols ospf
area 0.0.0.0 {
    interface fe-0/0/0.0;
    interface fe-0/0/4.0;
}
area 0.0.0.3 {
    nssa {
```

```

        area-range 3.0.0.0/8 restrict;
    }
    area-range 10.0.4.0/28;
    interface fe-0/0/1.0;
    interface fe-0/0/2.0;
}

```

To confirm your OSPFv3 configuration, enter the **show interfaces** and **show protocols ospf3** commands.

### Verification

Confirm that the configuration is working properly.

#### *Verifying the Summarized Route*

**Purpose** Verify that the routes you configured for route summarization are being aggregated by the ABRs before the routes enter the backbone area. Confirm route summarization by checking the entries of the OSPF link-state database for the routing devices in the backbone.

**Action** From operational mode, enter the **show ospf database** command for OSPFv2, and enter the **show ospf3 database** command for OSPFv3.

### Example: Limiting the Number of Prefixes Exported to OSPF

This example shows how to limit the number of prefixes exported to OSPF.

- [Requirements on page 73](#)
- [Overview on page 74](#)
- [Configuration on page 74](#)
- [Verification on page 75](#)

### Requirements

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

## Overview

By default, there is no limit to the number of prefixes (routes) that can be exported into OSPF. By allowing any number of routes to be exported into OSPF, the routing device can become overwhelmed and potentially flood an excessive number of routes into an area.

You can limit the number of routes exported into OSPF to minimize the load on the routing device and prevent this potential problem. If the routing device exceeds the configured prefix export value, the routing device purges the external prefixes and enters into an overload state. This state ensures that the routing device is not overwhelmed as it attempts to process routing information. The prefix export limit number can be a value from 0 through 4,294,967,295.

In this example, you configure a prefix export limit of 100,000 by including the **prefix-export-limit** statement.

## Configuration

### CLI Quick Configuration

To quickly limit the number of prefixes exported to OSPF, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf prefix-export-limit 100000
```

### Step-by-Step Procedure

To limit the number of prefixes exported to OSPF:

1. Configure the prefix export limit value.



**NOTE:** For OSPFv3, include the **ospf3** statement at the [edit protocols] hierarchy level.

```
[edit]
user@host# set protocols ospf prefix-export-limit 100000
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

## Results

Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
prefix-export-limit 100000;
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

Confirm that the configuration is working properly.

#### *Verifying the Prefix Export Limit*

- Purpose** Verify the prefix export counter that displays the number of routes exported into OSPF.
- Action** From operational mode, enter the **show ospf overview** command for OSPFv2, and enter the **show ospf3 overview** command for OSPFv3.

## Configuring OSPF Refresh and Flooding Reduction in Stable Topologies

The OSPF standard requires that every link-state advertisement (LSA) be refreshed every 30 minutes. The Juniper Networks implementation refreshes LSAs every 50 minutes. By default, any LSA that is not refreshed expires after 60 minutes. This requirement can result in traffic overhead that makes it difficult to scale OSPF networks. You can override the default behavior by specifying that the DoNotAge bit be set in self-originated LSAs when they are initially sent by the router or switch. Any LSA with the DoNotAge bit set is reflooded only when a change occurs in the LSA. This feature thus reduces protocol traffic overhead while permitting any changed LSAs to be flooded immediately. Routers or switches enabled for flood reduction continue to send hello packets to their neighbors and to age self-originated LSAs in their databases.

The Juniper implementation of OSPF refresh and flooding reduction is based on RFC 4136, *OSPF Refresh and Flooding Reduction in Stable Topologies*. However, the Juniper implementation does not include the forced-flooding interval defined in the RFC. Not implementing the forced-flooding interval ensures that LSAs with the DoNotAge bit set are reflooded only when a change occurs.

This feature is supported for the following:

- OSPFv2 and OSPFv3 interfaces
- OSPFv3 realms
- OSPFv2 and OSPFv3 virtual links
- OSPFv2 sham links
- OSPFv2 peer interfaces
- All routing instances supported by OSPF
- Logical systems

To configure flooding reduction for an OSPF interface, include the **flood-reduction** statement at the **[edit protocols (ospf | ospf3) area area-id interface interface-id]** hierarchy level.



**NOTE:** If you configure flooding reduction for an interface configured as a demand circuit, the LSAs are not initially flooded, but sent only when their content has changed. Hello packets and LSAs are sent and received on a demand-circuit interface only when a change occurs in the network topology.

In the following example, the OSPF interface `so-0/0/1.0` is configured for flooding reduction. As a result, all the LSAs generated by the routes that traverse the specified interface have the DoNotAge bit set when they are initially flooded, and LSAs are refreshed only when a change occurs.

```
[edit]
protocols ospf {
  area 0.0.0.0 {
    interface so-0/0/1.0 {
      flood-reduction;
    }
    interface lo0.0;
    interface so-0/0/0.0;
  }
}
```



**NOTE:** Beginning with Junos OS Release 12.2, you can configure a global default link-state advertisement (LSA) flooding interval in OSPF for self-generated LSAs by including the `lsa-refresh-interval minutes` statement at the `[edit protocols (ospf | ospf3)]` hierarchy level. The Juniper Networks implementation refreshes LSAs every 50 minutes. The range is 25 through 50 minutes. By default, any LSA that is not refreshed expires after 60 minutes.

If you have both the global LSA refresh interval configured for OSPF and OSPF flooding reduction configured for a specific interface in an OSPF area, the OSPF flood reduction configuration takes precedence for that specific interface.

- Related Documentation**
- [OSPF Overview on page 4](#)
  - [OSPF Configuration Overview](#)

---

## Examples: Configuring OSPF Traffic Control

- [Understanding OSPF Traffic Control on page 77](#)
- [Example: Controlling the Cost of Individual OSPF Network Segments on page 78](#)
- [Example: Dynamically Adjusting OSPF Interface Metrics Based on Bandwidth on page 82](#)
- [Example: Controlling OSPF Route Preferences on page 84](#)

## Understanding OSPF Traffic Control

Once a topology is shared across the network, OSPF uses the topology to route packets between network nodes. Each path between neighbors is assigned a cost based on the throughput, round-trip time, and reliability of the link. The sum of the costs across a particular path between hosts determines the overall cost of the path. Packets are then routed along the shortest path using the shortest-path-first (SPF) algorithm. Routes with lower total path metrics are preferred over those with higher path metrics.

You can use the following methods to control OSPF traffic:

- Control the cost of individual OSPF network segments
- Dynamically adjust OSPF interface metrics based on bandwidth
- Control OSPF route selection

### Controlling the Cost of Individual OSPF Network Segments

OSPF uses the following formula to determine the cost of a route:

$$\text{cost} = \text{reference-bandwidth} / \text{interface bandwidth}$$

You can modify the reference-bandwidth value, which is used to calculate the default interface cost. The interface bandwidth value is not user-configurable and refers to the actual bandwidth of the physical interface.

By default, OSPF assigns a default cost metric of 1 to any link faster than 100 Mbps, and a default cost metric of 0 to the loopback interface (**lo0**). No bandwidth is associated with the loopback interface.

To control the flow of packets across the network, OSPF allows you to manually assign a cost (or metric) to a particular path segment. When you specify a metric for a specific OSPF interface, that value is used to determine the cost of routes advertised from that interface. For example, if all routers in the OSPF network use default metric values, and you increase the metric on one interface to 5, all paths through that interface have a calculated metric higher than the default and are not preferred.



**NOTE:** Any value you configure for the metric overrides the default behavior of using the reference-bandwidth value to calculate the route cost for that interface.

When there are multiple equal-cost routes to the same destination in a routing table, an equal-cost multipath (ECMP) set is formed. If there is an ECMP set for the active route, the Junos OS software uses a hash algorithm to choose one of the next-hop addresses in the ECMP set to install in the forwarding table.

You can configure Junos OS so that multiple next-hop entries in an ECMP set are installed in the forwarding table. Define a load-balancing routing policy by including one or more **policy-statement** configuration statements at the **[edit policy-options]** hierarchy level,

with the action **load-balance per-packet**. Then apply the routing policy to routes exported from the routing table to the forwarding table.

### Dynamically Adjusting OSPF Interface Metrics Based on Bandwidth

You can specify a set of bandwidth threshold values and associated metric values for an OSPF interface or for a topology on an OSPF interface. When the bandwidth of an interface changes, the Junos OS automatically sets the interface metric to the value associated with the appropriate bandwidth threshold value. Junos OS uses the smallest configured bandwidth threshold value that is equal to or greater than the actual interface bandwidth to determine the metric value. If the interface bandwidth is greater than any of the configured bandwidth threshold values, the metric value configured for the interface is used instead of any of the bandwidth-based metric values configured. The ability to recalculate the metric for an interface when its bandwidth changes is especially useful for aggregate interfaces.



**NOTE:** You must also configure a metric for the interface when you enable bandwidth-based metrics.

### Controlling OSPF Route Preferences

You can control the flow of packets through the network using route preferences. Route preferences are used to select which route is installed in the forwarding table when several protocols calculate routes to the same destination. The route with the lowest preference value is selected.

By default, internal OSPF routes have a preference value of 10, and external OSPF routes have a preference value of 150. Although the default settings are appropriate for most environments, you might want to modify the default settings if all of the routing devices in your OSPF network use the default preference values, or if you are planning to migrate from OSPF to a different interior gateway protocol (IGP). If all of the devices use the default route preference values, you can change the route preferences to ensure that the path through a particular device is selected for the forwarding table any time multiple equal-cost paths to a destination exist. When migrating from OSPF to a different IGP, modifying the route preferences allows you to perform the migration in a controlled manner.

## **Example: Controlling the Cost of Individual OSPF Network Segments**

This example shows how to control the cost of individual OSPF network segments.

- [Requirements on page 78](#)
- [Overview on page 79](#)
- [Configuration on page 80](#)
- [Verification on page 82](#)

### Requirements

Before you begin:



- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.

## Overview

All OSPF interfaces have a cost, which is a routing metric that is used in the link-state calculation. Routes with lower total path metrics are preferred to those with higher path metrics. In this example, we explore how to control the cost of OSPF network segments.

By default, OSPF assigns a default cost metric of 1 to any link faster than 100 Mbps, and a default cost metric of 0 to the loopback interface (**lo0**). No bandwidth is associated with the loopback interface. This means that all interfaces faster than 100 Mbps have the same default cost metric of 1. If multiple equal-cost paths exist between a source and destination address, OSPF routes packets along each path alternately, in round-robin fashion.

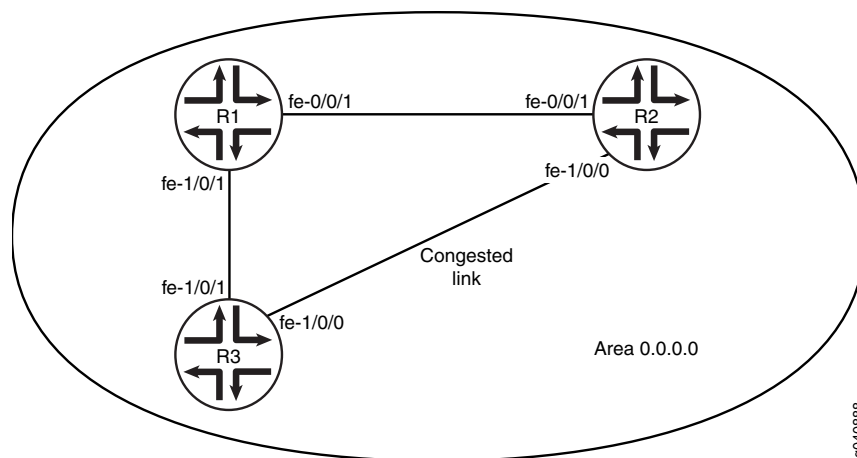
Having the same default metric might not be a problem if all of the interfaces are running at the same speed. If the interfaces operate at different speeds, you might notice that traffic is not routed over the fastest interface because OSPF equally routes packets across the different interfaces. For example, if your routing device has Fast Ethernet and Gigabit Ethernet interfaces running OSPF, each of these interfaces have a default cost metric of 1.

In the first example, you set the reference bandwidth to 10g (10 Gbps, as denoted by 10,000,000,000 bits) by including the **reference-bandwidth** statement. With this configuration, OSPF assigns the Fast Ethernet interface a default metric of 100, and the Gigabit Ethernet interface a metric of 10. Since the Gigabit Ethernet interface has the lowest metric, OSPF selects it when routing packets. The range is 9600 through 1,000,000,000,000 bits.

[Figure 10 on page 80](#) shows three routing devices in area 0.0.0.0 and assumes that the link between Device R2 and Device R3 is congested with other traffic. You can also control the flow of packets across the network by manually assigning a metric to a particular path segment. Any value you configure for the metric overrides the default behavior of using the reference-bandwidth value to calculate the route cost for that interface. To prevent the traffic from Device R3 going directly to Device R2, you adjust the metric on the interface on Device R3 that connects with Device R1 so that all traffic goes through Device R1.

In the second example, you set the metric to 5 on interface **fe-1/0/1** on Device R3 that connects with Device R1 by including the **metric** statement. The range is 1 through 65,535.

Figure 10: OSPF Metric Configuration



### Configuration

- [Configuring the Reference Bandwidth on page 80](#)
- [Configuring a Metric for a Specific OSPF Interface on page 81](#)

#### Configuring the Reference Bandwidth

##### CLI Quick Configuration

To quickly configure the reference bandwidth, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf reference-bandwidth 10g
```

##### Step-by-Step Procedure

To configure the reference bandwidth:

1. Configure the reference bandwidth to calculate the default interface cost.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# set protocols ospf reference-bandwidth 10g
```



**TIP:** As a shortcut in this example, you enter `10g` to specify 10 Gbps reference bandwidth. Whether you enter `10g` or `10000000000`, the output of `show protocols ospf` command displays 10 Gbps as `10g`, not `10000000000`.

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```



**NOTE:** Repeat this entire configuration on all routing devices in a shared network.

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
reference-bandwidth 10g;
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

#### *Configuring a Metric for a Specific OSPF Interface*

**CLI Quick Configuration** To quickly configure a metric for a specific OSPF interface, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.0 interface fe-1/0/1 metric 5
```

**Step-by-Step Procedure** To configure the metric for a specific OSPF interface:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.0
```

2. Configure the metric of the OSPF network segment.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface fe-1/0/1 metric 5
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# commit
```

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.0 {
  interface fe-1/0/1.0 {
    metric 5;
  }
}
```

```
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

---

Confirm that the configuration is working properly.

- [Verifying the Configured Metric on page 82](#)
- [Verifying the Route on page 82](#)

#### **Verifying the Configured Metric**

**Purpose** Verify the metric setting on the interface. Confirm that the Cost field displays the interface's configured metric (cost). When choosing paths to a destination, OSPF uses the path with the lowest cost.

**Action** From operational mode, enter the **show ospf interface detail** command for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

#### **Verifying the Route**

**Purpose** When choosing paths to a destination, OSPF uses the path with the lowest total cost. Confirm that OSPF is using the appropriate path.

**Action** From operational mode, enter the **show route** command.

## Example: Dynamically Adjusting OSPF Interface Metrics Based on Bandwidth

This example shows how to dynamically adjust OSPF interface metrics based on bandwidth.

- [Requirements on page 82](#)
- [Overview on page 83](#)
- [Configuration on page 83](#)
- [Verification on page 84](#)

### Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See "[Example: Configuring an OSPF Router Identifier](#)" on page 18.
- Control OSPF designated router election. See "[Example: Controlling OSPF Designated Router Election](#)" on page 20
- Configure a single-area OSPF network. See "[Example: Configuring a Single-Area OSPF Network](#)" on page 23.

## Overview

You can specify a set of bandwidth threshold values and associated metric values for an OSPF interface. When the bandwidth of an interface changes, the Junos OS automatically sets the interface metric to the value associated with the appropriate bandwidth threshold value. When you configure bandwidth-based metric values, you typically configure multiple bandwidth and metric values.

In this example, you configure OSPF interface **ae0** for bandwidth-based metrics by including the **bandwidth-based-metrics** statement and the following settings:

- **bandwidth**—Specifies the bandwidth threshold in bits per second. The range is 9600 through 1,000,000,000,000,000.
- **metric**—Specifies the metric value to associate with a specific bandwidth value. The range is 1 through 65,535.

## Configuration

### CLI Quick Configuration

To quickly configure bandwidth threshold values and associated metric values for an OSPF interface, copy the following commands, remove any line breaks, and then paste the commands into the CLI.

```
[edit]
set protocols ospf area 0.0.0.0 interface ae0.0 metric 5
set protocols ospf area 0.0.0.0 interface ae0.0 bandwidth-based-metrics bandwidth 1g metric 60
set protocols ospf area 0.0.0.0 interface ae0.0 bandwidth-based-metrics bandwidth 10g metric 50
```

To configure the metric for a specific OSPF interface:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.0
```

2. Configure the metric of the OSPF network segment.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface ae0 metric 5
```

3. Configure the bandwidth threshold values and associated metric values.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface ae0.0 bandwidth-based-metrics bandwidth 1g metric 60
user@host# set interface ae0.0 bandwidth-based-metrics bandwidth 10g metric 50
```

4. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# commit
```

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.0 {
  interface ae0.0 {
    bandwidth-based-metrics {
      bandwidth 1g metric 60;
      bandwidth 10g metric 50;
    }
    metric 5;
  }
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

---

### Verification

Confirm that the configuration is working properly.

#### *Verifying the Configured Metric*

- Purpose** Verify the metric setting on the interface. Confirm that the Cost field displays the interface's configured metric (cost). When choosing paths to a destination, OSPF uses the path with the lowest cost.
- Action** From operational mode, enter the **show ospf interface detail** command for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

## Example: Controlling OSPF Route Preferences

This example shows how to control OSPF route selection in the forwarding table. This example also shows how you might control route selection if you are migrating from OSPF to another IGP.

- [Requirements on page 84](#)
- [Overview on page 85](#)
- [Configuration on page 85](#)
- [Verification on page 86](#)

---

### Requirements

This example assumes that OSPF is properly configured and running in your network, and you want to control route selection because you are planning to migrate from OSPF to a different IGP.

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices* or the *Junos OS Interfaces Configuration Guide for Security Devices*.
- Configure the IGP that you want to migrate to. See the *Junos OS Routing Protocols Library for Routing Devices*.

## Overview

Route preferences are used to select which route is installed in the forwarding table when several protocols calculate routes to the same destination. The route with the lowest preference value is selected.

By default, internal OSPF routes have a preference value of 10, and external OSPF routes have a preference value of 150. You might want to modify this setting if you are planning to migrate from OSPF to a different IGP. Modifying the route preferences enables you to perform the migration in a controlled manner.

This example makes the following assumptions:

- OSPF is already running in your network.
- You want to migrate from OSPF to IS-IS.
- You configured IS-IS per your network requirements and confirmed it is working properly.

In this example, you increase the OSPF route preference values to make them less preferred than IS-IS routes by specifying 168 for internal OSPF routes and 169 for external OSPF routes. IS-IS internal routes have a preference of either 15 (for Level 1) or 18 (for Level 2), and external routes have a preference of 160 (for Level 1) or 165 (for Level 2). In general, it is preferred to leave the new protocol at its default settings to minimize complexities and simplify any future addition of routing devices to the network. To modify the OSPF route preference values, configure the following settings:

- **preference**—Specifies the route preference for internal OSPF routes. By default, internal OSPF routes have a value of 10. The range is from 0 through 4,294,967,295 ( $2^{32} - 1$ ).
- **external-preference**—Specifies the route preference for external OSPF routes. By default, external OSPF routes have a value of 150. The range is from 0 through 4,294,967,295 ( $2^{32} - 1$ ).

## Configuration

### CLI Quick Configuration

To quickly configure the OSPF route preference values, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf preference 168 external-preference 169
```

To configure route selection:

1. Enter OSPF configuration mode and set the external and internal routing preferences.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# set protocols ospf preference 168 external-preference 169
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
  preference 168;
  external-preference 169;
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

---

### Verification

Confirm that the configuration is working properly.

- [Verifying the Route on page 86](#)

#### *Verifying the Route*

**Purpose** Verify that the IGP is using the appropriate route. After the new IGP becomes the preferred protocol (in this example, IS-IS), you should monitor the network for any issues. After you confirm that the new IGP is working properly, you can remove the OSPF configuration from the routing device by entering the **delete ospf** command at the **[edit protocols]** hierarchy level.

**Action** From operational mode, enter the **show route** command.

**Related Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Configuration Overview](#)

---

## Example: Configuring OSPF Overload Mode

- [OSPF Overload Function Overview on page 86](#)
- [Example: Configuring OSPF to Make Routing Devices Appear Overloaded on page 88](#)

### OSPF Overload Function Overview

If the time elapsed after the OSPF instance is enabled is less than the specified timeout, overload mode is set.



You can configure the local routing device so that it appears to be overloaded. An overloaded routing device determines it is unable to handle any more OSPF transit traffic, which results in sending OSPF transit traffic to other routing devices. OSPF traffic to directly attached interfaces continues to reach the routing device. You might configure overload mode for many reasons, including:

- If you want the routing device to participate in OSPF routing, but do not want it to be used for transit traffic. This could include a routing device that is connected to the network for analysis purposes, but is not considered part of the production network, such as network management routing devices.
- If you are performing maintenance on a routing device in a production network. You can move traffic off that routing device so network services are not interrupted during your maintenance window.

You configure or disable overload mode in OSPF with or without a timeout. Without a timeout, overload mode is set until it is explicitly deleted from the configuration. With a timeout, overload mode is set if the time elapsed since the OSPF instance started is less than the specified timeout.

A timer is started for the difference between the timeout and the time elapsed since the instance started. When the timer expires, overload mode is cleared. In overload mode, the router link-state advertisement (LSA) is originated with all the transit router links (except stub) set to a metric of 0xFFFF. The stub router links are advertised with the actual cost of the interfaces corresponding to the stub. This causes the transit traffic to avoid the overloaded routing device and to take paths around the routing device. However, the overloaded routing device's own links are still accessible.

The routing device can also dynamically enter the overload state, regardless of configuring the device to appear overloaded. For example, if the routing device exceeds the configured OSPF prefix limit, the routing device purges the external prefixes and enters into an overload state.

In cases of incorrect configurations, the huge number of routes might enter OSPF, which can hamper the network performance. To prevent this, **prefix-export-limit** should be configured which will purge externals and prevent the network from the bad impact.

By allowing any number of routes to be exported into OSPF, the routing device can become overwhelmed and potentially flood an excessive number of routes into an area. You can limit the number of routes exported into OSPF to minimize the load on the routing device and prevent this potential problem.

By default, there is no limit to the number of prefixes (routes) that can be exported into OSPF. To prevent this, **prefix-export-limit** should be configured which will purge externals and prevent the network.

To limit the number of prefixes exported to OSPF:

```
[edit]
set protocols ospf prefix-export-limit number
```

The prefix export limit number can be a value from 0 through 4,294,967,295.

## Example: Configuring OSPF to Make Routing Devices Appear Overloaded

This example shows how to configure a routing device running OSPF to appear to be overloaded.

- [Requirements on page 88](#)
- [Overview on page 88](#)
- [Configuration on page 89](#)
- [Verification on page 90](#)

---

### Requirements

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#)
- Configure a single-area OSPF network. See [“Example: Configuring a Single-Area OSPF Network” on page 23](#).
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

---

### Overview

You can configure a local routing device running OSPF to appear to be overloaded, which allows the local routing device to participate in OSPF routing, but not for transit traffic. When configured, the transit interface metrics are set to the maximum value of 65535.

This example includes the following settings:

- **overload**—Configures the local routing device so it appears to be overloaded. You might configure this if you want the routing device to participate in OSPF routing, but do not want it to be used for transit traffic, or you are performing maintenance on a routing device in a production network.
- **timeout seconds**—(Optional) Specifies the number of seconds at which the overload is reset. If no timeout interval is specified, the routing device remains in the overload state until the overload statement is deleted or a timeout is set. In this example, you configure 60 seconds as the amount of time the routing device remains in the overload state. By default, the timeout interval is 0 seconds (this value is not configured). The range is from 60 through 1800 seconds.

### Configuration

**CLI Quick Configuration** To quickly configure a local routing device to appear as overloaded, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf overload timeout 60
```

**Step-by-Step Procedure** To configure a local routing device to appear overloaded:

1. Enter OSPF configuration mode.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# edit protocols ospf
```

2. Configure the local routing device to be overloaded.

```
[edit protocols ospf]
user@host# set overload
```

3. (Optional) Configure the number of seconds at which overload is reset.

```
[edit protocols ospf]
user@host# set overload timeout 60
```

4. (Optional) Configure the limit on the number prefixes exported to OSPF, to minimise the load on the routing device and prevent the device from entering the overload mode.

```
[edit protocols ospf]
user@host# set prefix-export-limit 50
```

5. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf]
user@host# commit
```

**Results** Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration. The output includes the optional `timeout` and `prefix-export-limit` statements.

```
user@host# show protocols ospf
```

```
prefix-export-limit 50;
overload timeout 60;
```

To confirm your OSPFv3 configuration, enter the `show protocols ospf3` command.

## Verification

---

Confirm that the configuration is working properly.

- [Verifying Traffic Has Moved Off Devices on page 90](#)
- [Verifying Transit Interface Metrics on page 90](#)
- [Verifying the Overload Configuration on page 90](#)
- [Verifying the Viable Next Hop on page 90](#)

### *Verifying Traffic Has Moved Off Devices*

**Purpose** Verify that the traffic has moved off the upstream devices.

**Action** From operational mode, enter the **show interfaces detail** command.

### *Verifying Transit Interface Metrics*

**Purpose** Verify that the transit interface metrics are set to the maximum value of 65535 on the downstream neighboring device.

**Action** From operational mode, enter the **show ospf database router detail advertising-router address** command for OSPFv2, and enter the **show ospf3 database router detail advertising-router address** command for OSPFv3.

### *Verifying the Overload Configuration*

**Purpose** Verify that overload is configured by reviewing the Configured overload field. If the overload timer is also configured, this field also displays the time that remains before it is set to expire.

**Action** From operational mode, enter the **show ospf overview** command for OSPFv2, and the **show ospf3 overview** command for OSPFv3.

### *Verifying the Viable Next Hop*

**Purpose** Verify the viable next hop configuration on the upstream neighboring device. If the neighboring device is overloaded, it is not used for transit traffic and is not displayed in the output.

**Action** From operational mode, enter the **show route address** command.

**Related Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Configuration Overview](#)

## CHAPTER 6

# OSPF Fault Detection

- [Example: Configuring OSPF Timers on page 91](#)
- [Example: Configuring BFD for OSPF on page 97](#)
- [Example: Configuring BFD Authentication for OSPF on page 103](#)

### Example: Configuring OSPF Timers

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- [OSPF Timers Overview on page 91](#)
- [Example: Configuring OSPF Timers on page 92](#)

### OSPF Timers Overview

OSPF routing devices constantly track the status of their neighbors, sending and receiving hello packets that indicate whether each neighbor still is functioning, and sending and receiving link-state advertisement (LSA) and acknowledgment packets. OSPF sends packets and expects to receive packets at specified intervals.

You configure OSPF timers on the interface of the routing device participating in OSPF. Depending on the timer, the configured interval must be the same on all routing devices on a shared network (area).

You can configure the following OSPF timers:

- **Hello interval**—Routing devices send hello packets at a fixed interval on all interfaces, including virtual links, to establish and maintain neighbor relationships. The hello interval specifies the length of time, in seconds, before the routing device sends a hello packet out of an interface. This interval must be the same on all routing devices on a shared network. By default, the routing device sends hello packets every 10 seconds (broadcast and point-to-point networks) and 30 seconds (nonbroadcast multiple access (NBMA) networks).
- **Poll interval**—(OSPFv2, Nonbroadcast networks only) Routing devices send hello packets for a longer interval on nonbroadcast networks to minimize the bandwidth required on slow WAN links. The poll interval specifies the length of time, in seconds, before the routing device sends hello packets out of the interface before establishing adjacency with a neighbor. By default, the routing device sends hello packets every 120 seconds until active neighbors are detected.

Once the routing device detects an active neighbor, the hello packet interval changes from the time specified in the poll interval to the time specified in the hello interval.

- **LSA retransmission interval**—When a routing device sends LSAs to its neighbors, the routing device expects to receive an acknowledgment packet from each neighbor within a certain amount of time. The LSA retransmission interval specifies the length of time, in seconds, that the routing device waits to receive an LSA packet before retransmitting the LSA to an interface's neighbors. By default, the routing device waits 5 seconds for an acknowledgment before retransmitting the LSA.
- **Dead interval**—If a routing device does not receive a hello packet from a neighbor within a fixed amount of time, the routing device modifies its topology database to indicate that the neighbor is nonoperational. The dead interval specifies the length of time, in seconds, that the routing device waits before declaring that a neighboring routing device is unavailable. This is an interval during which the routing device receives no hello packets from the neighbor. This interval must be the same on all routing devices on a shared network. By default, this interval is four times the default hello interval, which is 40 seconds (broadcast and point-to-point networks) and 120 seconds (NBMA networks).
- **Transit delay**—Before a link-state update packet is propagated out of an interface, the routing device must increase the age of the packet. The transit delay sets the estimated time required to transmit a link-state update on the interface. By default, the transit delay is 1 second. You should never have to modify the transit delay time.

### Example: Configuring OSPF Timers

This example shows how to configure the OSPF timers.

- [Requirements on page 92](#)
- [Overview on page 93](#)
- [Configuration on page 94](#)
- [Verification on page 97](#)

#### Requirements

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Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See "[Example: Configuring an OSPF Router Identifier](#)" on page 18.
- Control OSPF designated router election. See "[Example: Controlling OSPF Designated Router Election](#)" on page 20
- Configure a single-area OSPF network. See "[Example: Configuring a Single-Area OSPF Network](#)" on page 23.
- Configure a multiarea OSPF network. See "[Example: Configuring a Multiarea OSPF Network](#)" on page 25.

## Overview

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The default OSPF timer settings are optimal for most networks. However, depending on your network requirements, you might need to modify the timer settings. This example explains why you might need to modify the following timers:

- Hello interval
- Dead interval
- LSA retransmission interval
- Transit delay

### Hello Interval and Dead Interval

The hello interval and the dead interval optimize convergence times by efficiently tracking neighbor status. By lowering the values of the hello interval and the dead interval, you can increase the convergence of OSPF routes if a path fails. These intervals must be the same on all routing devices on a shared network. Otherwise, OSPF cannot establish the appropriate adjacencies.

In the first example, you lower the hello interval to 2 seconds and the dead interval to 8 seconds on point-to-point OSPF interfaces **fe-0/0/1** and **fe-1/0/1** in area 0.0.0.0 by configuring the following settings:

- **hello-interval**—Specifies the length of time, in seconds, before the routing device sends a hello packet out of an interface. By default, the routing device sends hello packets every 10 seconds. The range is from 1 through 255 seconds.
- **dead-interval**—Specifies the length of time, in seconds, that the routing device waits before declaring that a neighboring routing device is unavailable. This is an interval during which the routing device receives no hello packets from the neighbor. By default, the routing device waits 40 seconds (four times the hello interval). The range is 1 through 65,535 seconds.

### LSA Retransmission Interval

The link-state advertisement (LSA) retransmission interval optimizes the sending and receiving of LSA and acknowledgement packets. You must configure the LSA retransmission interval to be equal to or greater than 3 seconds to avoid triggering a retransmit trap because the Junos OS delays LSA acknowledgments by up to 2 seconds. If you have a virtual link, you might find increased performance by increasing the value of the LSA retransmission interval.

In the second example, you increase the LSA retransmission timer to 8 seconds on OSPF interface **fe-0/0/1** in area 0.0.0.1 by configuring the following setting:

- **retransmit-interval**—Specifies the length of time, in seconds, that the routing device waits to receive an LSA packet before retransmitting LSA to an interface's neighbors. By default, the routing device retransmits LSAs to its neighbors every 5 seconds. The range is from 1 through 65,535 seconds.

### Transit Delay

The transit delay sets the time the routing device uses to age a link-state update packet. If you have a slow link (for example, one with an average propagation delay of multiple seconds), you should increase the age of the packet by a similar amount. Doing this ensures that you do not receive a packet back that is younger than the original copy.

In the final example, you increase the transit delay to 2 seconds on OSPF interface **fe-1/0/1** in area 0.0.0.1. By configuring the following setting, this causes the routing device to age the link-state update packet by 2 seconds:

- **transit-delay**—Sets the estimated time required to transmit a link-state update on the interface. You should never have to modify the transit delay time. By default, the routing device ages the packet by 1 second. The range is from 1 through 65,535 seconds.

### Configuration

- [Configuring the Hello Interval and the Dead Interval on page 94](#)
- [Controlling the LSA Retransmission Interval on page 95](#)
- [Specifying the Transit Delay on page 96](#)

#### Configuring the Hello Interval and the Dead Interval

#### CLI Quick Configuration

To quickly configure the hello and dead intervals, copy the following commands and paste them into the CLI.

```
[edit]
set protocols ospf area 0.0.0.0 interface fe-0/0/1 hello-interval 2
set protocols ospf area 0.0.0.0 interface fe-0/0/1 dead-interval 8
set protocols ospf area 0.0.0.0 interface fe-1/0/1 hello-interval 2
set protocols ospf area 0.0.0.0 interface fe-1/0/1 dead-interval 8
```

#### Step-by-Step Procedure

To configure the hello and dead intervals:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.0
```

2. Specify the interfaces.



```
[edit protocols ospf area 0.0.0.0]
user@host# set interface fe-0/0/1
user@host# set interface fe-1/0/1
```

3. Configure the hello interval.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface fe-0/0/1 hello-interval 2
user@host# set interface fe-1/0/1 hello-interval 2
```

4. Configure the dead interval.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface fe-0/0/1 dead-interval 8
user@host# set interface fe-1/0/1 dead-interval 8
```

5. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# commit
```



**NOTE:** Repeat this entire configuration on all routing devices in a shared network.

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.0 {
  interface fe-0/0/1.0 {
    hello-interval 2;
    dead-interval 8;
  }
  interface fe-1/0/1.0 {
    hello-interval 2;
    dead-interval 8;
  }
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### *Controlling the LSA Retransmission Interval*

**CLI Quick Configuration** To quickly configure the LSA retransmission interval, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.1 interface fe-0/0/1 retransmit-interval 8
```

**Step-by-Step Procedure** To configure the LSA retransmission interval:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.1
```

2. Specify the interface.

```
[edit protocols ospf area 0.0.0.1]
user@host# set interface fe-0/0/1
```

3. Configure the LSA retransmission interval.

```
[edit protocols ospf area 0.0.0.1]
user@host# set interface fe-0/0/1 retransmit-interval 8
```

4. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.1]
user@host# commit
```

**Results** Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.1 {
  interface fe-0/0/1.0 {
    retransmit-interval 8;
  }
}
```

To confirm your OSPFv3 configuration, enter the `show protocols ospf3` command.

### *Specifying the Transit Delay*

**CLI Quick Configuration** To quickly configure the transit delay, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.1 interface fe-1/0/1 transit-delay 2
```

**Step-by-Step Procedure** To configure the transit delay:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.1
```

2. Specify the interface.  

```
[edit protocols ospf area 0.0.0.1]
user@host# set interface fe-1/0/1
```
3. Configure the transit delay.  

```
[edit protocols ospf area 0.0.0.1 ]
user@host# set interface fe-1/0/1 transit-delay 2
```
4. If you are done configuring the device, commit the configuration.  

```
[edit protocols ospf area 0.0.0.1 ]
user@host# commit
```

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.1 {
  interface fe-1/0/1.0 {
    transit-delay 2;
  }
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

Confirm that the configuration is working properly.

#### *Verifying the Timer Configuration*

**Purpose** Verify that the interface for OSPF or OSPFv3 has been configured with the applicable timer values. Confirm that the Hello field, the Dead field, and the ReXmit field display the values that you configured.

**Action** From operational mode, enter the **show ospf interface detail** for OSPFv2, and enter the **show ospf3 interface detail** command for OSPFv3.

**Related Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Configuration Overview](#)

## Example: Configuring BFD for OSPF

- [Understanding BFD for OSPF on page 97](#)
- [Example: Configuring BFD for OSPF on page 100](#)

### Understanding BFD for OSPF

The Bidirectional Forwarding Detection (BFD) protocol is a simple hello mechanism that detects failures in a network. BFD works with a wide variety of network environments

and topologies. A pair of routing devices exchange BFD packets. Hello packets are sent at a specified, regular interval. A neighbor failure is detected when the routing device stops receiving a reply after a specified interval. The BFD failure detection timers have shorter time limits than the OSPF failure detection mechanisms, so they provide faster detection.

The BFD failure detection timers are adaptive and can be adjusted to be faster or slower. The lower the BFD failure detection timer value, the faster the failure detection and vice versa. For example, the timers can adapt to a higher value if the adjacency fails (that is, the timer detects failures more slowly). Or a neighbor can negotiate a higher value for a timer than the configured value. The timers adapt to a higher value when a BFD session flap occurs more than three times in a span of 15 seconds. A back-off algorithm increases the receive (Rx) interval by two if the local BFD instance is the reason for the session flap. The transmission (Tx) interval is increased by two if the remote BFD instance is the reason for the session flap. You can use the **clear bfd adaptation** command to return BFD interval timers to their configured values. The **clear bfd adaptation** command is hitless, meaning that the command does not affect traffic flow on the routing device.



**NOTE:** BFD is supported for OSPFv3 in Junos OS Release 9.3 and later.

---

You can configure the following BFD protocol settings:

- **detection-time threshold**—Threshold for the adaptation of the detection time. When the BFD session detection time adapts to a value equal to or greater than the configured threshold, a single trap and a single system log message are sent.
- **full-neighbors-only**—Ability to establish BFD sessions only for OSPF neighbors with full neighbor adjacency. The default behavior is to establish BFD sessions for all OSPF neighbors. This setting is available in Junos OS Release 9.5 and later.
- **minimum-interval**—Minimum transmit and receive interval for failure detection. This setting configures both the minimum interval after which the local routing device transmits hello packets and the minimum interval after which the routing device expects to receive a reply from the neighbor with which it has established a BFD session. Both intervals are in milliseconds. You can also specify the minimum transmit and receive intervals separately using the **transmit-interval** **minimum-interval** and **minimum-receive-interval** statements.



**NOTE:** BFD is an intensive protocol that consumes system resources. Specifying a minimum interval for BFD of less than 100 ms for Routing Engine-based sessions and 10 ms for distributed BFD sessions can cause undesired BFD flapping.

Depending on your network environment, these additional recommendations might apply:

- For large-scale network deployments with a large number of BFD sessions, specify a minimum interval of 300 ms for Routing Engine-based sessions and 100 ms for distributed BFD sessions.
- For very large-scale network deployments with a large number of BFD sessions, contact Juniper Networks customer support for more information.
- For BFD sessions to remain up during a Routing Engine switchover event when nonstop active routing (NSR) is configured, specify a minimum interval of 2500 ms for Routing Engine-based sessions. Without NSR, Routing Engine-based sessions can have a minimum interval of 100 ms. In OSPFv3, BFD is always based in the Routing Engine, meaning that BFD is not distributed. For distributed BFD sessions with NSR configured, the minimum interval recommendations are unchanged and depend only on your network deployment.

- **minimum-receive-interval**—Minimum receive interval for failure detection. This setting configures the minimum receive interval, in milliseconds, after which the routing device expects to receive a hello packet from a neighbor with which it has established a BFD session. You can also specify the minimum receive interval using the **minimum-interval** statement.
- **multiplier**—Multiplier for hello packets. This setting configures the number of hello packets that are not received by a neighbor, which causes the originating interface to be declared down. By default, three missed hello packets cause the originating interface to be declared down.
- **no-adaptation**—Disables BFD adaptation. This setting disables BFD sessions from adapting to changing network conditions. This setting is available in Junos OS Release 9.0 and later.



**NOTE:** We recommend that you do not disable BFD adaptation unless it is preferable not to have BFD adaptation in your network.

- **transmit-interval minimum-interval**—Minimum transmit interval for failure detection. This setting configures the minimum transmit interval, in milliseconds, at which the local routing device transmits hello packets to the neighbor with which it has established a BFD session. You can also specify the minimum transmit interval using the **minimum-interval** statement.

- **transmit-interval threshold**—Threshold for the adaptation of the BFD session transmit interval. When the transmit interval adapts to a value greater than the threshold, a single trap and a single system log message are sent. The threshold value must be greater than the minimum transmit interval. If you attempt to commit a configuration with a threshold value less than the minimum transmit interval, the routing device displays an error and does not accept the configuration.
- **version**—BFD version. This setting configures the BFD version used for detection. You can explicitly configure BFD version 1, or the routing device can automatically detect the BFD version. By default, the routing device automatically detects the BFD version automatically, which is either 0 or 1.

You can also trace BFD operations for troubleshooting purposes.

### Example: Configuring BFD for OSPF

This example shows how to configure the Bidirectional Forwarding Detection (BFD) protocol for OSPF.

- [Requirements on page 100](#)
- [Overview on page 100](#)
- [Configuration on page 102](#)
- [Verification on page 103](#)

---

#### Requirements

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20.
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

---

#### Overview

An alternative to adjusting the OSPF hello interval and dead interval settings to increase route convergence is to configure BFD. The BFD protocol is a simple hello mechanism that detects failures in a network. The BFD failure detection timers have shorter timer limits than the OSPF failure detection mechanisms, thereby providing faster detection.

BFD is useful on interfaces that are unable to detect failure quickly, such as Ethernet interfaces. Other interfaces, such as SONET interfaces, already have built-in failure detection. Configuring BFD on those interfaces is unnecessary.

You configure BFD on a pair of neighboring OSPF interfaces. Unlike the OSPF hello interval and dead interval settings, you do not have to enable BFD on all interfaces in an OSPF area.

In this example, you enable failure detection by including the **bfd-liveness-detection** statement on the neighbor OSPF interface **fe-0/1/0** in area 0.0.0.0 and configure the BFD packet exchange interval to 300 milliseconds, configure 4 as the number of missed hello packets that causes the originating interface to be declared down, and configure BFD sessions only for OSPF neighbors with full neighbor adjacency by including the following settings:

- **full-neighbors-only**—In Junos OS Release 9.5 and later, configures the BFD protocol to establish BFD sessions only for OSPF neighbors with full neighbor adjacency. The default behavior is to establish BFD sessions for all OSPF neighbors.
- **minimum-interval**—Configures the minimum interval, in milliseconds, after which the local routing device transmits hello packets as well as the minimum interval after which the routing device expects to receive a reply from the neighbor with which it has established a BFD session. You can configure a number in the range from 1 through 255,000 milliseconds. You can also specify the minimum transmit and receive intervals separately using the **transmit-interval** **minimum-interval** and **minimum-receive-interval** statements.



**NOTE:** BFD is an intensive protocol that consumes system resources. Specifying a minimum interval for BFD of less than 100 ms for Routing Engine-based sessions and 10 ms for distributed BFD sessions can cause undesired BFD flapping.

Depending on your network environment, these additional recommendations might apply:

- For large-scale network deployments with a large number of BFD sessions, specify a minimum interval of 300 ms for Routing Engine-based sessions and 100 ms for distributed BFD sessions.
- For very large-scale network deployments with a large number of BFD sessions, contact Juniper Networks customer support for more information.
- For BFD sessions to remain up during a Routing Engine switchover event when nonstop active routing (NSR) is configured, specify a minimum interval of 2500 ms for Routing Engine-based sessions. For distributed BFD sessions with NSR configured, the minimum interval recommendations are unchanged and depend only on your network deployment.

- **multiplier**—Configures the number of hello packets not received by a neighbor that causes the originating interface to be declared down. By default, three missed hello packets cause the originating interface to be declared down. You can configure a value in the range from 1 through 255.

### Configuration

**CLI Quick Configuration** To quickly configure the BFD protocol for OSPF, copy the following commands, remove any line breaks, and then paste the commands into the CLI.

```
[edit]
set protocols ospf area 0.0.0.0 interface fe-0/0/1 bfd-liveness-detection minimum-interval 300
set protocols ospf area 0.0.0.0 interface fe-0/0/1 bfd-liveness-detection multiplier 4
set protocols ospf area 0.0.0.0 interface fe-0/0/1 bfd-liveness-detection full-neighbors-only
```

**Step-by-Step Procedure** To configure the BFD protocol for OSPF on one neighboring interface:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

- ```
[edit]
user@host# edit protocols ospf area 0.0.0.0
```
2. Specify the interface.

```
[edit protocols ospf area 0.0.0.0]
user@host# set interface fe-0/0/1
```
  3. Specify the minimum transmit and receive intervals.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface fe-0/0/1 bfd-liveness-detection minimum-interval 300
```
  4. Configure the number of missed hello packets that cause the originating interface to be declared down.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface fe-0/0/1 bfd-liveness-detection multiplier 4
```
  5. Configure BFD sessions only for OSPF neighbors with full neighbor adjacency.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# set interface fe-0/0/1 bfd-liveness-detection full-neighbors-only
```
  6. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.0 ]
user@host# commit
```



**NOTE:** Repeat this entire configuration on the other neighboring interface.



**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.0 {
  interface fe-0/0/1.0 {
    bfd-liveness-detection {
      minimum-interval 300;
      multiplier 4;
      full-neighbors-only;
    }
  }
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

Confirm that the configuration is working properly.

#### Verifying the BFD Sessions

**Purpose** Verify that the OSPF interfaces have active BFD sessions, and that session components have been configured correctly.

**Action** From operational mode, enter the **show bfd session detail** command.

**Meaning** The output displays information about the BFD sessions.

- The Address field displays the IP address of the neighbor.
- The Interface field displays the interface you configured for BFD.
- The State field displays the state of the neighbor and should show Full to reflect the full neighbor adjacency that you configured.
- The Transmit Interval field displays the time interval you configured to send BFD packets.
- The Multiplier field displays the multiplier you configured.

**Related Documentation**

- [OSPF Configuration Overview](#)
- [BFD Authentication for OSPF Overview on page 104](#)

### Example: Configuring BFD Authentication for OSPF

- [BFD Authentication for OSPF Overview on page 104](#)
- [Configuring BFD Authentication for OSPF on page 105](#)

## BFD Authentication for OSPF Overview

Bidirectional Forwarding Detection (BFD) enables rapid detection of communication failures between adjacent systems. By default, authentication for BFD sessions is disabled. However, when you run BFD over Network Layer protocols, the risk of service attacks can be significant. We strongly recommend using authentication if you are running BFD over multiple hops or through insecure tunnels. Beginning with Junos OS Release 9.6, Junos OS supports authentication for BFD sessions running over OSPFv2. BFD authentication is not supported on MPLS OAM sessions. BFD authentication is only supported in the Canada and United States version of the Junos OS image and is not available in the export version.

You authenticate BFD sessions by specifying an authentication algorithm and keychain, and then associating that configuration information with a security authentication keychain using the keychain name.

The following sections describe the supported authentication algorithms, security keychains, and level of authentication that can be configured:

- [BFD Authentication Algorithms on page 104](#)
- [Security Authentication Keychains on page 105](#)
- [Strict Versus Loose Authentication on page 105](#)

---

### BFD Authentication Algorithms

Junos OS supports the following algorithms for BFD authentication:

- **simple-password**—Plain-text password. One to 16 bytes of plain text are used to authenticate the BFD session. One or more passwords can be configured. This method is the least secure and should be used only when BFD sessions are not subject to packet interception.
- **keyed-md5**—Keyed Message Digest 5 hash algorithm for sessions with transmit and receive intervals greater than 100 ms. To authenticate the BFD session, keyed MD5 uses one or more secret keys (generated by the algorithm) and a sequence number that is updated periodically. With this method, packets are accepted at the receiving end of the session if one of the keys matches and the sequence number is greater than or equal to the last sequence number received. Although more secure than a simple password, this method is vulnerable to replay attacks. Increasing the rate at which the sequence number is updated can reduce this risk.
- **meticulous-keyed-md5**—Meticulous keyed Message Digest 5 hash algorithm. This method works in the same manner as keyed MD5, but the sequence number is updated with every packet. Although more secure than keyed MD5 and simple passwords, this method might take additional time to authenticate the session.
- **keyed-sha-1**—Keyed Secure Hash Algorithm I for sessions with transmit and receive intervals greater than 100 ms. To authenticate the BFD session, keyed SHA uses one or more secret keys (generated by the algorithm) and a sequence number that is updated periodically. The key is not carried within the packets. With this method,

packets are accepted at the receiving end of the session if one of the keys matches and the sequence number is greater than the last sequence number received.

- **meticulous-keyed-sha-1**—Meticulous keyed Secure Hash Algorithm I. This method works in the same manner as keyed SHA, but the sequence number is updated with every packet. Although more secure than keyed SHA and simple passwords, this method might take additional time to authenticate the session.



**NOTE:** Nonstop active routing (NSR) is not supported with the meticulous-keyed-md5 and meticulous-keyed-sha-1 authentication algorithms. BFD sessions using these algorithms might go down after a switchover.

---

### Security Authentication Keychains

The security authentication keychain defines the authentication attributes used for authentication key updates. When the security authentication keychain is configured and associated with a protocol through the keychain name, authentication key updates can occur without interrupting routing and signaling protocols.

The authentication keychain contains one or more keychains. Each keychain contains one or more keys. Each key holds the secret data and the time at which the key becomes valid. The algorithm and keychain must be configured on both ends of the BFD session, and they must match. Any mismatch in configuration prevents the BFD session from being created.

BFD allows multiple clients per session, and each client can have its own keychain and algorithm defined. To avoid confusion, we recommend specifying only one security authentication keychain.

---

### Strict Versus Loose Authentication

By default, strict authentication is enabled and authentication is checked at both ends of each BFD session. Optionally, to smooth migration from nonauthenticated sessions to authenticated sessions, you can configure *loose checking*. When loose checking is configured, packets are accepted without authentication being checked at each end of the session. This feature is intended for transitional periods only.

## Configuring BFD Authentication for OSPF

Beginning with Junos OS Release 9.6, you can configure authentication for BFD sessions running over OSPFv2. Routing instances are also supported.

The following sections provide instructions for configuring and viewing BFD authentication on OSPF:

- [Configuring BFD Authentication Parameters on page 106](#)
- [Viewing Authentication Information for BFD Sessions on page 107](#)

## Configuring BFD Authentication Parameters

Only three steps are needed to configure authentication on a BFD session:

1. Specify the BFD authentication algorithm for the OSPFv2 protocol.
2. Associate the authentication keychain with the OSPFv2 protocol.
3. Configure the related security authentication keychain.

To configure BFD authentication:

1. Specify the algorithm (**keyed-md5**, **keyed-sha-1**, **meticulous-keyed-md5**, **meticulous-keyed-sha-1**, or **simple-password**) to use for BFD authentication on an OSPF route or routing instance.

[edit]

```
user@host# set protocols ospf area 0.0.0.1 interface if2-ospf bfd-liveness-detection
authentication algorithm keyed-sha-1
```



**NOTE:** Nonstop active routing (NSR) is not supported with meticulous-keyed-md5 and meticulous-keyed-sha-1 authentication algorithms. BFD sessions using these algorithms might go down after a switchover.

2. Specify the keychain to be used to associate BFD sessions on the specified OSPF route or routing instance with the unique security authentication keychain attributes.

This keychain should match the keychain name configured at the **[edit security authentication key-chains]** hierarchy level.

[edit]

```
user@host# set protocols ospf area 0.0.0.1 interface if2-ospf bfd-liveness-detection
authentication keychain bfd-ospf
```



**NOTE:** The algorithm and keychain must be configured on both ends of the BFD session, and they must match. Any mismatch in configuration prevents the BFD session from being created.

3. Specify the unique security authentication information for BFD sessions:
  - The matching keychain name as specified in Step 2.
  - At least one key, a unique integer between 0 and 63. Creating multiple keys enables multiple clients to use the BFD session.
  - The secret data used to allow access to the session.
  - The time at which the authentication key becomes active, in the format *yyyy-mm-dd.hh:mm:ss*.

[edit security]

```
user@host# authentication-key-chains key-chain bfd-ospf key 53 secret
$9$ggaJDmPQ6/tJgF/AtREVsyPsnCtUHM start-time 2009-06-14.10:00:00
```

4. (Optional) Specify loose authentication checking if you are transitioning from nonauthenticated sessions to authenticated sessions.

```
[edit]
user@host> set protocols ospf interface if2-ospf bfd-liveness-detection authentication
loose-check
```

5. (Optional) View your configuration using the **show bfd session detail** or **show bfd session extensive** command.

6. Repeat the steps in this procedure to configure the other end of the BFD session.



**NOTE:** BFD authentication is only supported in the Canada and United States version of the Junos OS image and is not available in the export version.

### Viewing Authentication Information for BFD Sessions

You can view the existing BFD authentication configuration using the **show bfd session detail** and **show bfd session extensive** commands.

The following example shows BFD authentication configured for the **if2-ospf** BGP group. It specifies the keyed SHA-1 authentication algorithm and a keychain name of **bfd-ospf**. The authentication keychain is configured with two keys. Key 1 contains the secret data “\$9\$ggaJDmPQ6/tJgF/AtREVsyPsnCtUHM” and a start time of June 1, 2009, at 9:46:02 AM PST. Key 2 contains the secret data “\$9\$a5jiKW9L.reP38ny.TszF2/9” and a start time of June 1, 2009, at 3:29:20 PM PST.

```
[edit protocols ospf]
area 0.0.0.1 {
  interface if2-ospf {
    bfd-liveness-detection {
      authentication {
        algorithm keyed-sha-1;
        key-chain bfd-ospf;
      }
    }
  }
}
[edit security]
authentication key-chains {
  key-chain bfd-ospf {
    key 1 {
      secret "$9$ggaJDmPQ6/tJgF/AtREVsyPsnCtUHM";
      start-time "2009-6-1.09:46:02 -0700";
    }
    key 2 {
      secret "$9$a5jiKW9L.reP38ny.TszF2/9";
      start-time "2009-6-1.15:29:20 -0700";
    }
  }
}
```

If you commit these updates to your configuration, you see output similar to the following. In the output for the **show bfd session detail** command, **Authenticate** is displayed to indicate that BFD authentication is configured.

#### show bfd session detail

```
user@host# show bfd session detail
```

| Address   | State | Interface  | Detect Time | Transmit Interval | Multiplier |
|-----------|-------|------------|-------------|-------------------|------------|
| 10.9.1.33 | Up    | so-7/1/0.0 | 0.600       | 0.200             | 3          |

Client OSPF, TX interval 0.200, RX interval 0.200, multiplier 3, **Authenticate**  
 Session up time 3d 00:34  
 Local diagnostic None, remote diagnostic None  
 Remote state Up, version 1  
 Replicated

1 sessions, 1 clients

Cumulative transmit rate 10.0 pps, cumulative receive rate 10.0 pps

For more information about the configuration, use the **show bfd session extensive** command. The output for this command provides the keychain name, the authentication algorithm and mode for each client in the session, and the overall BFD authentication configuration status, keychain name, and authentication algorithm and mode.

#### show bfd session extensive

```
user@host# show bfd session extensive
```

| Address   | State | Interface  | Detect Time | Transmit Interval | Multiplier |
|-----------|-------|------------|-------------|-------------------|------------|
| 10.9.1.33 | Up    | so-7/1/0.0 | 0.600       | 0.200             | 3          |

Client OSPF, TX interval 0.200, RX interval 0.200, multiplier 3, **Authenticate**  
**keychain bfd-ospf, algo keyed-md5, mode loose**

Session up time 3d 00:34  
 Local diagnostic None, remote diagnostic None  
 Remote state Up, version 1  
 Replicated  
 Min async interval 0.200, min slow interval 1.000  
 Adaptive async tx interval 0.200, rx interval 0.200  
 Local min tx interval 0.200, min rx interval 0.200, multiplier 3  
 Remote min tx interval 0.100, min rx interval 0.100, multiplier 3  
 Threshold transmission interval 0.000, Threshold for detection time 0.000  
 Local discriminator 11, remote discriminator 80  
 Echo mode disabled/inactive  
**Authentication enabled/active, keychain bfd-ospf, algo keyed-sha-1, mode strict**  
 1 sessions, 1 clients  
 Cumulative transmit rate 10.0 pps, cumulative receive rate 10.0 pps

- Related Documentation**
- [OSPF Configuration Overview](#)
  - [Understanding BFD for OSPF on page 97](#)

## CHAPTER 7

# OSPF Redundancy Features

- [Examples: Configuring Graceful Restart for OSPF on page 109](#)

### Examples: Configuring Graceful Restart for OSPF

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- [Graceful Restart for OSPF Overview on page 109](#)
- [Example: Configuring Graceful Restart for OSPF on page 111](#)
- [Example: Configuring the Helper Capability Mode for OSPFv2 Graceful Restart on page 115](#)
- [Example: Configuring the Helper Capability Mode for OSPFv3 Graceful Restart on page 118](#)
- [Example: Disabling Strict LSA Checking for OSPF Graceful Restart on page 122](#)

### Graceful Restart for OSPF Overview

Graceful restart allows a routing device undergoing a restart to inform its adjacent neighbors and peers of its condition. During a graceful restart, the restarting device and its neighbors continue forwarding packets without disrupting network performance. Because neighboring devices assist in the restart (these neighbors are called *helper routers*), the restarting device can quickly resume full operation without recalculating algorithms.



**NOTE:** On a broadcast link with a single neighbor, when the neighbor initiates an OSPFv3 graceful restart operation, the restart might be terminated at the point when the local routing device assumes the role of a helper. A change in the LSA is considered a topology change, which terminates the neighbor's restart operation.

Graceful restart is disabled by default. You can globally enable graceful restart for all routing protocols by including the **graceful-restart** statement at the [edit routing-options] hierarchy level. To enable graceful restart specifically for OSPF, first you need to globally enable graceful restart for all routing protocols.

This topic describes the following information:

- [Helper Mode for Graceful Restart on page 110](#)
- [Planned and Unplanned Graceful Restart on page 111](#)

### Helper Mode for Graceful Restart

---

When a device enabled for OSPF graceful restart restarts, it retains routes learned before the restart in its forwarding table. The device does not allow new OSPF link-state advertisements (LSAs) to update the routing table. This device continues to forward traffic to other OSPF neighbors (or helper routers), and sends only a limited number of LSAs during the restart period. To reestablish OSPF adjacencies with neighbors, the restarting device must send a grace LSA to all neighbors. In response, the helper routers enter helper mode (the ability to assist a neighboring device attempting a graceful restart) and send an acknowledgment back to the restarting device. If there are no topology changes, the helper routers continue to advertise LSAs as if the restarting device had remained in continuous OSPF operation.



**NOTE:** Helper mode is enabled by default when you start the routing platform, even if graceful restart is not enabled. You can disable helper mode specifically for OSPF.

When the restarting device receives replies from all the helper routers, the restarting device selects routes, updates the forwarding table, and discards the old routes. At this point, full OSPF adjacencies are reestablished and the restarting device receives and processes OSPF LSAs as usual. When the helper routers no longer receive grace LSAs from the restarting device or when the topology of the network changes, the helper routers also resume normal operation.

Beginning with Junos OS Release 11.4, you can configure restart signaling-based helper mode for OSPFv2 graceful restart configurations. The Junos OS implementation is based on RFC 4811, *OSPF Out-of-Band Link State Database (LSDB) Resynchronization*, RFC 4812, *OSPF Restart Signaling*, and RFC 4813, *OSPF Link-Local Signaling*. In restart signaling-based helper mode implementations, the restarting device informs its restart status to its neighbors only after the restart is complete. When the restart is complete, the restarting device sends hello messages to its helper routers with the restart signal (RS) bit set in the hello packet header. When a helper router receives a hello packet with the RS bit set in the header, the helper router returns a hello message to the restarting device. The reply hello message from the helper router contains the ResyncState flag and the ResyncTimeout timer that enable the restarting device to keep track of the helper routers that are syncing up with it. When all helpers complete the synchronization, the restarting device exits the restart mode.



**NOTE:** Restart signaling-based graceful restart helper mode is not supported for OSPFv3 configurations.



## Planned and Unplanned Graceful Restart

OSPF supports two types of graceful restart: planned and unplanned. During a planned restart, the restarting routing device informs the neighbors before restarting. The neighbors act as if the routing device is still within the network topology, and continue forwarding traffic to the restarting routing device. A grace period is set to specify when the neighbors should consider the restarting routing device as part of the topology. During an unplanned restart, the routing device restarts without warning.

### Example: Configuring Graceful Restart for OSPF

This example shows how to configure graceful restart specifically for OSPF.

- [Requirements on page 111](#)
- [Overview on page 111](#)
- [Configuration on page 112](#)
- [Verification on page 114](#)

#### Requirements

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20.
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

#### Overview

Graceful restart enables a routing device undergoing a restart to inform its adjacent neighbors and peers of its condition. During a graceful restart, the restarting routing device and its neighbors continue forwarding packets without disrupting network performance. By default, graceful restart is disabled. You can globally enable graceful restart for all routing protocols by including the **graceful-restart** statement at the **[edit routing-options]** hierarchy level, or you can enable graceful restart specifically for OSPF by including the **graceful-restart** statement at the **[edit protocols (ospf|ospf3)]** hierarchy level.

The first example shows how to enable graceful restart and configure the optional settings for the grace period interval. In this example, interfaces **fe-1/1/1** and **fe-1/1/2** are in OSPF area 0.0.0.0, and you configure those interfaces for graceful restart. The grace period interval for OSPF graceful restart is determined as equal to or less than the sum of the **notify-duration** time interval and the **restart-duration** time interval. The grace period is the number of seconds that the routing device's neighbors continue to advertise the routing device as fully adjacent, regardless of the connection state between the routing device and its neighbors.

The **notify-duration** statement configures how long (in seconds) the routing device notifies helper routers that it has completed graceful restart by sending purged grace link-state advertisements (LSAs) over all interfaces. By default, the routing device sends grace LSAs for 30 seconds. The range is from 1 through 3600 seconds.

The **restart-duration** statement configures the amount of time the routing device waits (in seconds) to complete reacquisition of OSPF neighbors from each area. By default, the routing device allows 180 seconds. The range is from 1 through 3600 seconds.

The second example shows how to disable graceful restart for OSPF by including the **disable** statement.

### Configuration

- [Enabling Graceful Restart for OSPF on page 112](#)
- [Disabling Graceful Restart for OSPF on page 114](#)

#### *Enabling Graceful Restart for OSPF*

**CLI Quick Configuration** To quickly enable graceful restart for OSPF, copy the following commands and paste them into the CLI.

```
[edit]
set interfaces fe-1/1/1 unit 0 family inet address 10.0.0.4
set interfaces fe-1/1/2 unit 0 family inet address 10.0.0.5
set protocols ospf area 0.0.0.0 interface fe-1/1/1
set protocols ospf area 0.0.0.0 interface fe-1/1/2
set routing-options graceful-restart
set protocols ospf graceful-restart restart-duration 190
set protocols ospf graceful-restart notify-duration 40
```

**Step-by-Step Procedure** To enable graceful restart for OSPF:

1. Configure the interfaces.



**NOTE:** For OSPFv3, use IPv6 addresses.

```
[edit]
user@host# set interfaces fe-1/1/1 unit 0 family inet address 10.0.0.4
user@host# set interfaces fe-1/1/2 unit 0 family inet address 10.0.0.5
```

2. Configure OSPF on the interfaces.



**NOTE:** To specify OSPFv3, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

```
[edit]
user@host# set protocols ospf area 0.0.0.0 interface fe-1/1/1
user@host# set protocols ospf area 0.0.0.0 interface fe-1/1/2
```

3. Configure graceful restart globally
 

```
[edit]
user@host#edit routing-options graceful-restart
```
4. Configure OSPF graceful restart.
 

```
[edit]
user@host# edit protocols ospf graceful-restart
```
5. (Optional) Configure the restart duration time.
 

```
[edit protocols ospf graceful-restart]
user@host# set restart-duration 190
```
6. (Optional) Configure the notify duration time.
 

```
[edit protocols ospf graceful-restart]
user@host# set notify-duration 40
```
7. If you are done configuring the device, commit the configuration.
 

```
[edit protocols ospf graceful-restart]
user@host# commit
```

**Results** Confirm your configuration by entering the **show interfaces** and **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
fe-1/1/1 {
  unit 0 {
    family inet {
      address 10.0.0.4/32;
    }
  }
}
fe-1/1/2 {
  unit 0 {
    family inet {
      address 10.0.0.5/32;
    }
  }
}
user@host# show protocols ospf
graceful-restart {
  restart-duration 190;
  notify-duration 40;
}
area 0.0.0.0 {
  interface fe-1/1/1.0;
  interface fe-1/1/2.0;
}
```

To confirm an OSPFv3 configuration, enter the **show interfaces** and the **show protocols ospf3** commands.

### *Disabling Graceful Restart for OSPF*

**CLI Quick Configuration** To quickly disable graceful restart for OSPF, copy the following command and paste it into the CLI.

```
[edit]
user@host# set protocols ospf graceful-restart disable
```

**Step-by-Step Procedure** To disable graceful restart for OSPF:

1. Disable graceful restart for the OSPF protocol only.

This command does not affect the global graceful restart configuration setting.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

---

```
[edit]
user@host# set protocols ospf graceful-restart disable
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
graceful-restart disable;
```

To confirm an OSPFv3 configuration, enter the `show protocols ospf3` command.

---

### Verification

Confirm that the configuration is working properly.

- [Verifying the OSPF Graceful Restart Configuration on page 114](#)
- [Verifying Graceful Restart Status on page 115](#)

### *Verifying the OSPF Graceful Restart Configuration*

**Purpose** Verify information about your OSPF graceful restart configuration.

**Action** From operational mode, enter the `show ospf overview` command for OSPFv2. Enter the `show ospf3 overview` command for OSPFv3.

**Meaning** The Restart field displays the status of graceful restart as either enabled or disabled. The Restart duration field displays how much time the restarted routing device requires to complete reacquisition of OSPF neighbors. The Restart grace period field displays how

much time the neighbors should consider the restarted routing device as part of the topology.

#### ***Verifying Graceful Restart Status***

**Purpose** Verify the status of graceful restart.

**Action** From operational mode, enter the **show route instance detail** command.

**Meaning** The Restart State field displays Pending if the restart has not been completed or Complete if the restart has finished. The Path selection timeout field indicates the amount of time remaining until graceful restart is declared complete. There is a more detailed Restart State field that displays a list of protocols that have or have not yet completed graceful restart for the specified routing table.

### **Example: Configuring the Helper Capability Mode for OSPFv2 Graceful Restart**

This example shows how to disable and reenabling the helper mode capability for OSPFv2 graceful restart.

- [Requirements on page 115](#)
- [Overview on page 115](#)
- [Configuration on page 116](#)
- [Verification on page 118](#)

#### **Requirements**

---

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

#### **Overview**

---

The OSPF graceful restart helper capability assists a neighboring routing device attempting a graceful restart. By default, the helper capability is globally enabled when you start the routing platform. This means that the helper capability is enabled when you start OSPF, even if graceful restart is not globally enabled or specifically enabled for OSPF. You can further modify your graceful restart configuration to disable the helper capability.

Beginning with Junos OS Release 11.4, you can configure restart signaling-based helper mode for OSPFv2 graceful restart configurations. Both the standard and restart signaling-based helper modes are enabled by default.

In the first example, interfaces **fe-1/1/1** and **fe-1/1/2** are in OSPFv2 area 0.0.0.0, and you configure those interfaces for graceful restart. You then disable the standard OSPFv2 graceful restart helper capability by including the **helper-disable standard** statement. This configuration is useful if you have an environment that contains other vendor equipment that is configured for restart signaling-based graceful restart.



**NOTE:** The **helper-disable** statement and the **no-strict-lsa-checking** statement cannot be configured at the same time. If you attempt to configure both statements at the same time, the routing device displays a warning message when you enter the **show protocols ospf** command.

The second example shows how to reenable the standard OSPFv2 restart helper capability that you disabled in the first example.

---

### Configuration

---

- [Disabling Helper Mode for OSPFv2 on page 116](#)
- [Reenabling Helper Mode for OSPFv2 on page 117](#)

#### *Disabling Helper Mode for OSPFv2*

#### CLI Quick Configuration

To quickly enable graceful restart for OSPFv2 with helper mode disabled, copy the following commands and paste them into the CLI.

```
[edit]
set interfaces fe-1/1/1 unit 0 family inet address 10.0.0.4
set interfaces fe-1/1/2 unit 0 family inet address 10.0.0.5
set protocols ospf area 0.0.0.0 interface fe-1/1/1
set protocols ospf area 0.0.0.0 interface fe-1/1/2
set protocols ospf graceful-restart helper-disable standard
```

#### Step-by-Step Procedure

To enable graceful restart for OSPFv2 with helper mode disabled:

1. Configure the interfaces.

```
[edit]
user@host# set interfaces fe-1/1/1 unit 0 family inet address 10.0.0.4
user@host# set interfaces fe-1/1/2 unit 0 family inet address 10.0.0.5
```

2. Configure OSPFv2 on the interfaces

```
[edit]
user@host# set protocols ospf area 0.0.0.0 interface fe-1/1/1
user@host# set protocols ospf area 0.0.0.0 interface fe-1/1/2
```

3. Disable the OSPFv2 graceful restart helper capability.  
If you disable the OSPFv2 graceful restart helper capability, you cannot disable strict LSA checking.

```
[edit]
```

```
user@host# set protocols ospf graceful-restart helper-disable standard
```

4. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the **show interfaces** and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
fe-1/1/1 {
  unit 0 {
    family inet {
      address 10.0.0.4/32;
    }
  }
}
fe-1/1/2 {
  unit 0 {
    family inet {
      address 10.0.0.5/32;
    }
  }
}
user@host# show protocols ospf
graceful-restart {
  helper-disable {
    standard;
  }
}
area 0.0.0.0 {
  interface fe-1/1/1.0;
  interface fe-1/1/2.0;
}
```

#### *Reenabling Helper Mode for OSPFv2*

**CLI Quick Configuration** To quickly reenabling standard helper-mode for OSPFv2, copy the following command and paste it into the CLI.

```
[edit]
delete protocols ospf graceful-restart helper-disable standard
```



**NOTE:** To reenabling restart signaling-based helper mode, include the **restart-signaling** statement. To reenabling both standard and restart signaling-based helper mode, include the **both** statement.

**Step-by-Step Procedure** To reenabling standard helper mode for OSPFv2:

1. Delete the standard helper-mode statement from the OSPFv2 configuration.

```
[edit]  
user@host# delete protocols ospf graceful-restart helper-disable standard
```

2. If you are done configuring the device, commit the configuration.

```
[edit]  
user@host# commit
```

**Results** After you reenable standard helper mode, the **show protocols ospf** command no longer displays the graceful restart configuration.

---

### Verification

Confirm that the configuration is working properly.

- [Verifying the OSPFv2 Graceful Restart Configuration on page 118](#)
- [Verifying Graceful Restart Status on page 118](#)

#### *Verifying the OSPFv2 Graceful Restart Configuration*

**Purpose** Verify information about your OSPFv2 graceful restart configuration. The Restart field displays the status of graceful restart as either enabled or disabled, the Graceful restart helper mode field displays the status of the standard helper mode capability as enabled or disabled, and the Restart-signaling helper mode field displays the status of the restart signaling-based helper mode as enabled or disabled. By default, both standard and restart signaling-based helper modes are enabled.

**Action** From operational mode, enter the **show ospf overview** command.

#### *Verifying Graceful Restart Status*

**Purpose** Verify the status of graceful restart. The Restart State field displays Pending if the restart has not completed, or Complete if the restart has finished. The Path selection timeout field indicates the amount of time remaining until graceful restart is declared complete. There is a more detailed Restart State field that displays a list of protocols that have completed graceful restart or have not yet completed graceful restart for the specified routing table.

**Action** From operational mode, enter the **show route instance detail** command.

### Example: Configuring the Helper Capability Mode for OSPFv3 Graceful Restart

This example shows how to disable and reenable the helper mode capability for OSPFv3 graceful restart.

- [Requirements on page 119](#)
- [Overview on page 119](#)
- [Configuration on page 119](#)
- [Verification on page 121](#)



## Requirements

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See “[Example: Configuring an OSPF Router Identifier](#)” on page 18.
- Control OSPF designated router election. See “[Example: Controlling OSPF Designated Router Election](#)” on page 20
- Configure a single-area OSPF network. See “[Example: Configuring a Single-Area OSPF Network](#)” on page 23.
- Configure a multiarea OSPF network. See “[Example: Configuring a Multiarea OSPF Network](#)” on page 25.

## Overview

The OSPF graceful restart helper capability assists a neighboring routing device attempting a graceful restart. By default, the helper capability is globally enabled when you start the routing platform. This means that the helper capability is enabled when you start OSPF, even if graceful restart is not globally enabled or specifically enabled for OSPF. You can further modify your graceful restart configuration to disable the helper capability.

In the first example, interfaces **fe-1/1/1** and **fe-1/1/2** are in OSPFv3 area 0.0.0.0, and you configure those interfaces for graceful restart. You then disable the OSPFv3 graceful restart helper capability by including the **helper-disable** statement.



**NOTE:** The **helper-disable** statement and the **no-strict-lsa-checking** statement cannot be configured at the same time. If you attempt to configure both statements at the same time, the routing device displays a warning message when you enter the **show protocols ospf** command.

The second example shows how to reenable the OSPFv3 restart helper capability that you disabled in the first example.

## Configuration

- [Disabling Helper Mode for OSPFv3](#) on page 119
- [Reenabling Helper Mode for OSPFv3](#) on page 121

### *Disabling Helper Mode for OSPFv3*

#### CLI Quick Configuration

To quickly enable graceful restart for OSPFv3 with helper mode disabled, copy the following commands and paste them into the CLI.

```
[edit]
set interfaces fe-1/1/1 unit 0 family inet6 address 2002:0a00:0004::
set interfaces fe-1/1/2 unit 0 family inet6 address 2002:0a00:0005::
set protocols ospf3 area 0.0.0.0 interface fe-1/1/1
set protocols ospf3 area 0.0.0.0 interface fe-1/1/2
set protocols ospf3 graceful-restart helper-disable
```

**Step-by-Step Procedure**

To enable graceful restart for OSPFv3 with helper mode disabled:

1. Configure the interfaces.  

```
[edit]
user@host# set interfaces fe-1/1/1 unit 0 family inet6 address 2002:0a00:0004::
user@host# set interfaces fe-1/1/1 unit 0 family inet address 2002:0a00:0005::
```
2. Configure OSPFv3 on the interfaces  

```
[edit]
user@host# set protocols ospf3 area 0.0.0.0 interface fe-1/1/1
user@host# set protocols ospf3 area 0.0.0.0 interface fe-1/1/2
```
3. Disable the OSPFv3 graceful restart helper capability.  
If you disable the OSPFv3 graceful restart helper capability, you cannot disable strict LSA checking.  

```
[edit]
user@host# set protocols ospf3 graceful-restart helper-disable
```
4. If you are done configuring the device, commit the configuration.  

```
[edit]
user@host# commit
```

**Results**

Confirm your configuration by entering the **show interfaces** and the **show protocols ospf3** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
fe-1/1/1 {
  unit 0 {
    family inet6 {
      address 2002:0a00:0004::/128;
    }
  }
}
fe-1/1/2 {
  unit 0 {
    family inet6 {
      address 2002:0a00:0005::/128;
    }
  }
}
user@host# show protocols ospf3
graceful-restart {
  helper-disable;
}
area 0.0.0.0 {
  interface fe-1/1/1.0;
  interface fe-1/1/2.0;
}
```

**Reenabling Helper Mode for OSPFv3**

**CLI Quick Configuration** To quickly reenable helper-mode for OSPFv3, copy the following command and paste it into the CLI.

```
[edit]
delete protocols ospf3 graceful-restart helper-disable
```

**Step-by-Step Procedure** To reenable helper mode for OSPFv3:

1. Delete the standard helper-mode statement from the OSPFv3 configuration.

```
[edit]
user@host# delete protocols ospf3 graceful-restart helper-disable
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

**Results** After you reenable standard helper mode, the **show protocols ospfs** command no longer displays the graceful restart configuration.

**Verification**

Confirm that the configuration is working properly.

- [Verifying the OSPFv3 Graceful Restart Configuration on page 121](#)
- [Verifying Graceful Restart Status on page 121](#)

**Verifying the OSPFv3 Graceful Restart Configuration**

**Purpose** Verify information about your OSPFv3 graceful restart configuration. The Restart field displays the status of graceful restart as either enabled or disabled, and the Helper mode field displays the status of the helper mode capability as either enabled or disabled.

**Action** From operational mode, enter the **show ospf3 overview** command.

**Verifying Graceful Restart Status**

**Purpose** Verify the status of graceful restart. The Restart State field displays Pending if the restart has not completed, or Complete if the restart has finished. The Path selection timeout field indicates the amount of time remaining until graceful restart is declared complete. There is a more detailed Restart State field that displays a list of protocols that have completed graceful restart or have not yet completed graceful restart for the specified routing table.

**Action** From operational mode, enter the **show route instance detail** command.

## Example: Disabling Strict LSA Checking for OSPF Graceful Restart

This example shows how to disable strict link-state advertisement (LSA) checking for OSPF graceful restart.

- [Requirements on page 122](#)
- [Overview on page 122](#)
- [Configuration on page 122](#)
- [Verification on page 124](#)

---

### Requirements

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#)
- Configure a single-area OSPF network. See [“Example: Configuring a Single-Area OSPF Network” on page 23](#).
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

---

### Overview

You can disable strict LSA checking to prevent the termination of graceful restart by a helping router. You might configure this option for interoperability with other vendor devices. The OSPF graceful restart helper capability must be enabled if you disable strict LSA checking. By default, LSA checking is enabled.

In this example, interfaces **fe-1/1/1** and **fe-1/1/2** are in OSPF area 0.0.0.0, and you configure those interfaces for graceful restart. You then disable strict LSA checking by including the **no-strict-lsa-checking** statement.



**NOTE:** The **helper-disable** statement and the **no-strict-lsa-checking** statement cannot be configured at the same time. If you attempt to configure both statements at the same time, the routing device displays a warning message when you enter the **show protocols ospf** command.

---

---

### Configuration

#### CLI Quick Configuration

To quickly enable graceful restart for OSPF with strict LSA checking disabled, copy the following commands and paste them into the CLI.

```
[edit]
set interfaces fe-1/1/1 unit 0 family inet address 10.0.0.4
set interfaces fe-1/1/2 unit 0 family inet address 10.0.0.5
```

```
set protocols ospf area 0.0.0.0 interface fe-1/1/1
set protocols ospf area 0.0.0.0 interface fe-1/1/2
set protocols ospf graceful-restart no-strict-lsa-checking
```

**Step-by-Step Procedure** To enable graceful restart for OSPF with strict LSA checking disabled:

1. Configure the interfaces.



**NOTE:** For OSPFv3, use IPv6 addresses.

[edit]

```
user@host# set interfaces fe-1/1/1 unit 0 family inet address 10.0.0.4
```

```
user@host# set interfaces fe-1/1/1 unit 0 family inet address 10.0.0.5
```

2. Configure OSPF on the interfaces



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the [edit protocols] hierarchy level.

[edit]

```
user@host# set protocols ospf area 0.0.0.0 interface fe-1/1/1
```

```
user@host# set protocols ospf area 0.0.0.0 interface fe-1/1/2
```

3. Disable strict LSA checking.  
If you disable the strict LSA checking, OSPF graceful restart helper capability must be enabled (which is the default behavior).

[edit]

```
user@host# set protocols ospf graceful-restart no-strict-lsa-checking
```

4. If you are done configuring the device, commit the configuration.

[edit]

```
user@host# commit
```

**Results** Confirm your configuration by entering the `show interfaces` and the `show protocols ospf` commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
fe-1/1/1 {
  unit 0 {
    family inet {
      address 10.0.0.4/32;
    }
  }
}
fe-1/1/2 {
  unit 0 {
    family inet {
      address 10.0.0.5/32;
    }
  }
}
```

```
    }  
  }  
}  
user@host# show protocols ospf  
graceful-restart {  
  no-strict-lsa-checking;  
}  
area 0.0.0.0 {  
  interface fe-1/1/1.0;  
  interface fe-1/1/2.0;  
}
```

To confirm your OSPFv3 configuration, enter the **show interfaces** and the **show protocols ospf3** commands.

---

### Verification

Confirm that the configuration is working properly.

- [Verifying the OSPF Graceful Restart Configuration on page 124](#)
- [Verifying Graceful Restart Status on page 124](#)

#### *Verifying the OSPF Graceful Restart Configuration*

**Purpose** Verify information about your OSPF graceful restart configuration. The Restart field displays the status of graceful restart as either enabled or disabled.

**Action** From operational mode, enter the **show ospf overview** command for OSPFv2, and enter the **show ospf3 overview** command for OSPFv3.

#### *Verifying Graceful Restart Status*

**Purpose** Verify the status of graceful restart. The Restart State field displays Pending if the restart has not completed, or Complete if the restart has finished. The Path selection timeout field indicates the amount of time remaining until graceful restart is declared complete. There is a more detailed Restart State field that displays a list of protocols that have completed graceful restart or have not yet completed graceful restart for the specified routing table.

**Action** From operational mode, enter the **show route instance detail** command.

**Related Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Configuration Overview](#)
- [Graceful Restart Concepts in the Junos OS High Availability Library for Routing Devices](#)

## CHAPTER 8

# OSPF Traffic Engineering

- [Examples: Configuring OSPF Traffic Engineering on page 125](#)
- [Example: Configuring OSPF Passive Traffic Engineering Mode on page 134](#)

### Examples: Configuring OSPF Traffic Engineering

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- [OSPF Support for Traffic Engineering on page 125](#)
- [Example: Enabling OSPF Traffic Engineering Support on page 128](#)
- [Example: Configuring the Traffic Engineering Metric for a Specific OSPF Interface on page 132](#)

### OSPF Support for Traffic Engineering

Traffic engineering allows you to control the path that data packets follow, bypassing the standard routing model, which uses routing tables. Traffic engineering moves flows from congested links to alternate links that would not be selected by the automatically computed destination-based shortest path.

To help provide traffic engineering and MPLS with information about network topology and loading, extensions have been added to the Junos OS implementation of OSPF. When traffic engineering is enabled on the routing device, you can enable OSPF traffic engineering support. When you enable traffic engineering for OSPF, the shortest-path-first (SPF) algorithm takes into account the various label-switched paths (LSPs) configured under MPLS and configures OSPF to generate opaque link-state advertisements (LSAs) that carry traffic engineering parameters. The parameters are used to populate the traffic engineering database. The traffic engineering database is used exclusively for calculating explicit paths for the placement of LSPs across the physical topology. The Constrained Shortest Path First (CSPF) algorithm uses the traffic engineering database to compute the paths that MPLS LSPs take. RSVP uses this path information to set up LSPs and to reserve bandwidth for them.

By default, traffic engineering support is disabled. To enable traffic engineering, include the **traffic-engineering** statement. You can also configure the following OSPF traffic engineering extensions:

- **advertise-unnumbered-interfaces**—(OSPFv2 only) Advertises the link-local identifier in the link-local traffic engineering LSA packet. This statement must be included on both ends of an unnumbered link to allow an ingress LER to update the link in its traffic engineering database and use it for CSPF calculations. The link-local identifier is then used by RSVP to signal unnumbered interfaces as defined in RFC 3477, *Signalling Unnumbered Links in Resource Reservation Protocol - Traffic Engineering (RSVP-TE)*.
- **credibility-protocol-preference**—(OSPFv2 only) Assigns a credibility value to OSPF routes in the traffic engineering database. By default, Junos OS prefers IS-IS routes in the traffic engineering database over other interior gateway protocol (IGP) routes even if the routes of another IGP are configured with a lower, that is, more preferred, preference value. The traffic engineering database assigns a credibility value to each IGP and prefers the routes of the IGP with the highest credibility value. In Junos OS Release 9.4 and later, you can configure OSPF to take protocol preference into account to determine the traffic engineering database credibility value. When protocol preference is used to determine the credibility value, IS-IS routes are not automatically preferred by the traffic engineering database, depending on your configuration.
- **ignore-lsp-metrics**—Ignores RSVP LSP metrics in OSPF traffic engineering shortcut calculations or when you configure LDP over RSVP LSPs. This option avoids mutual dependency between OSPF and RSVP, eliminating the time period when the RSVP metric used for tunneling traffic is not up to date. In addition, If you are using RSVP for traffic engineering, you can run LDP simultaneously to eliminate the distribution of external routes in the core. The LSPs established by LDP are tunneled through the LSPs established by RSVP. LDP effectively treats the traffic-engineered LSPs as single hops.
- **multicast-rpf-routes**—(OSPFv2 only) Installs unicast IPv4 routes (not LSPs) in the multicast routing table (**inet.2**) for multicast reverse-path forwarding (RPF) checks. The **inet.2** routing table consists of unicast routes used for multicast RPF lookup. RPF is an antispoofing mechanism used to check if the packet is coming in on an interface that is also sending data back to the packet source.
- **no-topology**—(OSPFv2 only) To disable the dissemination of link-state topology information. If disabled, traffic engineering topology information is no longer distributed within the OSPF area.
- **shortcuts**—Configures OSPF to use MPLS LSPs as shortcut next hops. By default, shortcut routes calculated through OSPFv2 are installed in the **inet.3** routing table, and shortcut routes calculated through OSPFv3 are installed in the **inet6.3** routing table.





**NOTE:** Whenever possible, use OSPF IGP shortcuts configured at the `[edit protocols mpls traffic-engineering bgp-igp]` hierarchy level instead of traffic engineering shortcuts configured at the `[edit protocols (ospf | ospf3) traffic-engineering shortcuts]` hierarchy level.

If you configure OSPF IGP shortcuts, `inet.3` routes are moved into the `inet.0` routing table. In addition, you can verify the data path using `ping` or `traceroute` commands since the ping and traceroute packets get tunneled into the LSP. In case of a VPN enabled device, we recommend using `[edit protocols mpls traffic-engineering bgp-igp-both-ribs]` because BGP next-hop resolution for VPN prefixes relies on entries in the `inet.3` table.

If you configure traffic engineering shortcuts, OSPF treats the MPLS LSP as a candidate next hop and installs the routes in the `inet.3` (for OSPFv2) and `inet6.3` (for OSPFv3) routing tables. The only use for these tables is to allow BGP to perform next-hop resolution. In addition, you cannot verify the data path of these routes using `ping` or `traceroute` commands because the ping and traceroute packets get tunneled into the LSP.

- **`lsp-metric-info-summary`**—Advertises the LSP metric in summary LSAs to treat the LSP as a link. This configuration allows other routing devices in the network to use this LSP. To accomplish this, you need to configure MPLS and OSPF traffic engineering to advertise the LSP metric in summary LSAs.

When you enable traffic engineering on the routing device, you can also configure an OSPF metric that is used exclusively for traffic engineering. The traffic engineering metric is used for information injected into the traffic engineering database. Its value does not affect normal OSPF forwarding.



**CAUTION:** When the OSPF traffic engineering configuration is considerably modified, the routing table entries are deleted and the routing table is recreated. Changes to configuration that can cause this behavior include enabling or disabling:

- Traffic engineering shortcuts
- IGP shortcuts
- LDP tunneling
- Multiprotocol LSP
- Advertise summary metrics
- Multicast RPF routes

## Example: Enabling OSPF Traffic Engineering Support

This example shows how to enable OSPF traffic engineering support to advertise the label-switched path (LSP) metric in summary link-state advertisements (LSAs).

- [Requirements on page 128](#)
- [Overview on page 128](#)
- [Configuration on page 129](#)
- [Verification on page 132](#)

---

### Requirements

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure BGP per your network requirements. See the *Junos OS Routing Protocols Library for Routing Devices*
- Configure MPLS per your network requirements. See the *Junos OS MPLS Applications Library for Routing Devices*.

---

### Overview

You can configure OSPF to treat an LSP as a link and have other routing devices in the network use this LSP. To accomplish this, you configure MPLS and OSPF traffic engineering to advertise the LSP metric in summary LSAs.

In this example, there are four routing devices in area 0.0.0.0, and you want OSPF to treat the LSP named R1-to-R4 that goes from the ingress Device R1 to the egress Device R4 as a link.

For OSPF, you enable traffic engineering on all four routing devices in the area by including the **traffic-engineering** statement. This configuration ensures that the shortest-path-first (SPF) algorithm takes into account the LSPs configured under MPLS and configures OSPF to generate LSAs that carry traffic engineering parameters. You further ensure that OSPF uses the MPLS LSP as the next hop and advertises the LSP metric in summary LSAs, by including the optional **shortcuts lsp-metric-into-summary** statement on the ingress Device R1.

For MPLS, you enable traffic engineering so that MPLS performs traffic engineering on both BGP and IGP destinations by including the **traffic-engineering bgp-igp** statement, and you include the LSP named R1-to-R4 by including the **label-switched-path lsp-path-name to address** statement on the ingress Device R1. The address specified in the **to** statement on the ingress Device R1 must match the router ID of the egress Device R4 for the LSP to function as a direct link to the egress routing device and to be used as input to the OSPF SPF calculations. In this example, the router ID of the egress Device R4 is 10.0.0.4.

## Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Modifying the Junos OS Configuration* in *CLI User Guide*.

**CLI Quick Configuration** To quickly enable OSPF traffic engineering support to advertise the LSP metric in summary LSAs, copy the following commands and paste them into the CLI.

Configuration on R1:

```
[edit]
set routing-options router-id 10.0.0.1
set protocols ospf area 0.0.0.0 interface all
set protocols ospf area 0.0.0.0 interface fxp0.0 disable
set protocols ospf traffic-engineering shortcuts lsp-metric-into-summary
set protocols mpls traffic-engineering bgp-igp
set protocols mpls label-switched-path R1-to-R4 to 10.0.0.4
```

Configuration on R2:

```
[edit]
set routing-options router-id 10.0.0.2
set protocols ospf area 0.0.0.0 interface all
set protocols ospf area 0.0.0.0 interface fxp0.0 disable
set protocols ospf traffic-engineering
```

Configuration on R3:

```
[edit]
set routing-options router-id 10.0.0.3
set protocols ospf area 0.0.0.0 interface all
set protocols ospf area 0.0.0.0 interface fxp0.0 disable
set protocols ospf traffic-engineering
```

Configuration on R4:

```
[edit]
set routing-options router-id 10.0.0.4
set protocols ospf area 0.0.0.0 interface all
set protocols ospf area 0.0.0.0 interface fxp0.0 disable
set protocols ospf traffic-engineering
```

**Step-by-Step Procedure** To enable OSPF traffic engineering support to advertise LSP metrics in summary LSAs:

1. Configure the router ID.

```
[edit]
user@R1# set routing-options router-id 10.0.0.1
```

```
[edit]
user@R2# set routing-options router-id 10.0.0.2
```

```
[edit]
user@R3# set routing-options router-id 10.0.0.3
```

```
[edit]
user@R4# set routing-options router-id 10.0.0.4
```

2. Configure the OSPF area and add the interfaces.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@R1# set protocols ospf area 0.0.0.0 interface all
user@R1# set protocols ospf area 0.0.0.0 interface fxp0.0 disable
```

```
[edit]
user@R2# set protocols ospf area 0.0.0.0 interface all
user@R2# set protocols ospf area 0.0.0.0 interface fxp0.0 disable
```

```
[edit]
user@R3# set protocols ospf area 0.0.0.0 interface all
user@R3# set protocols ospf area 0.0.0.0 interface fxp0.0 disable
```

```
[edit]
user@R4# set protocols ospf area 0.0.0.0 interface all
user@R4# set protocols ospf area 0.0.0.0 interface fxp0.0 disable
```

3. Enable OSPF traffic engineering.

```
[edit]
user@R1 set protocols ospf traffic-engineering shortcuts lsp-metric-into-summary
```

```
[edit]
user@R2 set protocols ospf traffic-engineering
```

```
[edit]
user@R3 set protocols ospf traffic-engineering
```

```
[edit]
user@R4 set protocols ospf traffic-engineering
```

4. On Device R1, configure MPLS traffic engineering.

```
[edit ]
user@R1 set protocol mpls traffic-engineering bgp-igp
user@R1 set protocols mpls label-switched-path R1-to-R4 to 10.0.0.4
```

5. If you are done configuring the devices, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the `show routing-options`, `show protocols ospf`, and `show protocols mpls` commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Output for R1:

```
user@host# show routing-options
router-id 10.0.0.1;

user@host# show protocols ospf
traffic-engineering {
  shortcuts lsp-metric-into-summary;
```

```

}
area 0.0.0.0 {
  interface all;
  interface fxp0.0 {
    disable;
  }
}

user@host# show protocols mpls
traffic-engineering bgp-igp;
label-switched-path R1-to-R4 {
  to 10.0.0.4;
}

```

Output for R2:

```

user@host# show routing-options
router-id 10.0.0.2;

user@host# show protocols ospf
traffic-engineering;
area 0.0.0.0 {
  interface all;
  interface fxp0.0 {
    disable;
  }
}

```

Output for R3:

```

user@host# show routing-options
router-id 10.0.0.3;

user@host# show protocols ospf
traffic-engineering;
area 0.0.0.0 {
  interface all;
  interface fxp0.0 {
    disable;
  }
}

```

Output for R4:

```

user@host# show routing-options
router-id 10.0.0.4;

user@host# show protocols ospf
traffic-engineering;
area 0.0.0.0 {
  interface all;
  interface fxp0.0 {
    disable;
  }
}

```

To confirm your OSPFv3 configuration, enter the **show routing-options**, **show protocols ospf3**, and **show protocols mpls** commands.

### Verification

---

Confirm that the configuration is working properly.

- [Verifying the Traffic Engineering Capability for OSPF on page 132](#)
- [Verifying OSPF Entries in the Traffic Engineering Database on page 132](#)
- [Verifying That the Traffic Engineering Database Is Learning Node Information from OSPF on page 132](#)

#### *Verifying the Traffic Engineering Capability for OSPF*

**Purpose** Verify that traffic engineering has been enabled for OSPF. By default, traffic engineering is disabled.

**Action** From operational mode, enter the **show ospf overview** command for OSPFv2, and enter the **show ospf3 overview** for OSPFv3.

#### *Verifying OSPF Entries in the Traffic Engineering Database*

**Purpose** Verify the OSPF information in the traffic engineering database. The Protocol field displays OSPF and the area from which the information was learned.

**Action** From operational mode, enter the **show ted database** command.

#### *Verifying That the Traffic Engineering Database Is Learning Node Information from OSPF*

**Purpose** Verify that OSPF is reporting node information. The Protocol name field displays OSPF and the area from which the information was learned.

**Action** From operational mode, enter the **show ted protocol** command.

### Example: Configuring the Traffic Engineering Metric for a Specific OSPF Interface

This example shows how to configure the OSPF metric value used for traffic engineering.

- [Requirements on page 132](#)
- [Overview on page 133](#)
- [Configuration on page 133](#)
- [Verification on page 134](#)

### Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure OSPF for traffic engineering. See “[Example: Enabling OSPF Traffic Engineering Support](#)” on page 128

## Overview

You can configure an OSPF metric that is used exclusively for traffic engineering. To modify the default value of the traffic engineering metric, include the **te-metric** statement. The OSPF traffic engineering metric does not affect normal OSPF forwarding. By default, the traffic engineering metric is the same value as the OSPF metric. The range is 1 through 65,535.

In this example, you configure the OSPF traffic engineering metric on OSPF interface **fe-0/1/1** in area **0.0.0.0**.

## Configuration

**CLI Quick Configuration** To quickly configure the OSPF traffic engineering metric for a specific interface, copy the following command and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.0 interface fe-0/1/1 te-metric 10
```

**Step-by-Step Procedure** To configure an OSPF traffic engineering metric for a specific interface used only for traffic engineering:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the **ospf3** statement at the **[edit protocols]** hierarchy level.

```
[edit]
user@host# edit protocols ospf area 0.0.0.0
```

2. Configure the traffic engineering metric of the OSPF network segments.

```
[edit protocols ospf area 0.0.0.0]
user@host# set interface fe-0/1/1 te-metric 10
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf area 0.0.0.0]
user@host# commit
```

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.0 {
  interface fe-0/1/1.0 {
    te-metric 10;
  }
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

---

Confirm that the configuration is working properly.

#### ***Verifying the Configured Traffic Engineering Metric***

**Purpose** Verify the traffic engineering metric value. Confirm that Metric field displays the configured traffic engineering metric.

**Action** From operational mode, enter the **show ted database extensive** command.

**Related Documentation**

- *OSPF Configuration Overview*
- *Junos OS MPLS Applications Library for Routing Devices*

## Example: Configuring OSPF Passive Traffic Engineering Mode

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- [OSPF Passive Traffic Engineering Mode on page 134](#)
- [Example: Configuring OSPF Passive Traffic Engineering Mode on page 134](#)

### OSPF Passive Traffic Engineering Mode

Ordinarily, interior routing protocols such as OSPF are not run on links between autonomous systems. However, for inter-AS traffic engineering to function properly, information about the inter-AS link—in particular, the address on the remote interface—must be made available inside the autonomous system (AS). This information is not normally included either in the external BGP (EBGP) reachability messages or in the OSPF routing advertisements.

To flood this link address information within the AS and make it available for traffic engineering calculations, you must configure OSPF passive mode for traffic engineering on each inter-AS interface. You must also supply the remote address for OSPF to distribute and include it in the traffic engineering database. OSPF traffic engineering mode allows MPLS label-switched paths (LSPs) to dynamically discover OSPF AS boundary routers and to allow routers to establish a traffic engineering LSP across multiple autonomous systems.

## Example: Configuring OSPF Passive Traffic Engineering Mode

This example shows how to configure OSPF passive mode for traffic engineering on an inter-AS interface. The AS boundary router link between the EBGP peers must be a directly connected link and must be configured as a passive traffic engineering link.

- [Requirements on page 135](#)
- [Overview on page 135](#)
- [Configuration on page 135](#)
- [Verification on page 136](#)



## Requirements

---

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure BGP per your network requirements. See the *Junos OS Routing Protocols Library for Routing Devices*.
- Configure the LSP per your network requirements. See the *Junos OS MPLS Applications Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#).
- Configure a single-area OSPF network. See [“Example: Configuring a Single-Area OSPF Network” on page 23](#).
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

## Overview

---

You can configure OSPF passive mode for traffic engineering on an inter-AS interface. The address used for the remote node of the OSPF passive traffic engineering link must be the same as the address used for the EBGP link. In this example, you configure interface **so-1/1/0** in area 0.0.0.1 as the inter-AS link to distribute traffic engineering information with OSPF within the AS and include the following settings:

- **passive**—Advertises the direct interface addresses on an interface without actually running OSPF on that interface. A passive interface is one for which the address information is advertised as an internal route in OSPF, but on which the protocol does not run.
- **traffic-engineering**—Configures an interface in OSPF passive traffic-engineering mode to enable dynamic discovery of OSPF AS boundary routers. By default, OSPF passive traffic-engineering mode is disabled.
- **remote-node-id**—Specifies the IP address at the far end of the inter-AS link. In this example, the remote IP address is 192.168.207.2.

## Configuration

---

To quickly configure OSPF passive mode for traffic engineering, copy the following command, remove any line breaks, and paste it into the CLI.

```
[edit]
set protocols ospf area 0.0.0.1 interface so-1/1/0 passive traffic-engineering remote-node-id
192.168.207.2
```

**Step-by-Step Procedure** To configure OSPF passive traffic engineering mode:

1. Create an OSPF area.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# set protocols ospf area 0.0.0.1
```

2. Configure interface `so-1/1/0` as a passive interface configured for traffic engineering, and specify the IP address at the far end of the inter-AS link.

```
[edit protocols ospf area 0.0.0.1]
user@host# set interface so-1/1/0 passive traffic-engineering remote-node-id
192.168.207.2
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf]
user@host# commit
```

**Results** Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
area 0.0.0.1 {
  interface so-1/1/0.0 {
    passive {
      traffic-engineering {
        remote-node-id 192.168.207.2;
      }
    }
  }
}
```

To confirm your OSPFv3 configuration, enter the `show protocols ospf3` command.

### Verification

Confirm that the configuration is working properly.

#### *Verifying the Status of OSPF Interfaces*

**Purpose** Verify the status of OSPF interfaces. If the interface is passive, the Adj count field is 0 because no adjacencies have been formed. Next to this field, you might also see the word Passive.

**Action** From operational mode, enter the `show ospf interface detail` command for OSPFv2, and enter the `show ospf3 interface detail` command for OSPFv3.

- Related Documentation**
- *OSPF Configuration Overview*
  - [About OSPF Interfaces on page 47](#)
  - *Junos OS MPLS Applications Library for Routing Devices*



## CHAPTER 9

# OSPF Database Protection

- [Example: Configuring OSPF Database Protection on page 139](#)

### Example: Configuring OSPF Database Protection

---

- [OSPF Database Protection Overview on page 139](#)
- [Configuring OSPF Database Protection on page 140](#)

### OSPF Database Protection Overview

OSPF database protection allows you to limit the number of link-state advertisements (LSAs) not generated by the local router in a given OSPF routing instance, helping to protect the link-state database from being flooded with excessive LSAs. This feature is particularly useful if VPN routing and forwarding is configured on your provider edge and customer edge routers using OSPF as the routing protocol. An overrun link-state database on the customer edge router can exhaust resources on the provider edge router and impact the rest of the service provider network.

When you enable OSPF database protection, the maximum number of LSAs you specify includes all LSAs whose advertising router ID is not equal to the local router ID (nonself-generated LSAs). These might include external LSAs as well as LSAs with any scope such as the link, area, and autonomous system (AS).

Once the specified maximum LSA count is exceeded, the database typically enters into the ignore state. In this state, all neighbors are brought down, and nonself-generated LSAs are destroyed. In addition, the database sends out hellos but ignores all received packets. As a result, the database does not form any full neighbors, and therefore does not learn about new LSAs. However, if you have configured the **warning-only** option, only a warning is issued and the database does not enter the ignore state but continues to operate as before.

You can also configure one or more of the following options:

- A warning threshold for issuing a warning message before the LSA limit is reached.
- An ignore state time during which the database must remain in the ignore state and after which normal operations can be resumed.
- An ignore state count that limits the number of times the database can enter the ignore state, after which it must enter the isolate state. The isolate state is very similar to the

ignore state, but has one important difference: once the database enters the isolate state, it must remain there until you issue a command to clear database protection before it can return to normal operations.

- A reset time during which the database must stay out of the ignore or isolate state before it is returned to a normal operating state.

## Configuring OSPF Database Protection

By configuring OSPF database protection, you can help prevent your OSPF link-state database from being overrun with excessive LSAs that are not generated by the local router. You specify the maximum number of LSAs whose advertising router ID is not the same as the local router ID in an OSPF instance. This feature is particularly useful if your provider edge and customer edge routers are configured with VPN routing and forwarding using OSPF.

OSPF database protection is supported on:

- Logical systems
- All routing instances supported by OSPFv2 and OSPFv3
- OSPFv2 and OSPFv3 topologies
- OSPFv3 realms

To configure OSPF database protection:

1. Include the **database-protection** statement at one of the following hierarchy levels:
  - [edit protocols ospf | ospf3]
  - [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols (ospf |ospf3)]
  - [edit routing-instances *routing-instance-name* protocols (ospf |ospf3)]
  - [edit routing-instances *routing-instance-name* protocols ospf3 realm (ipv4-unicast | ipv4-multicast | ipv6-unicast | ipv6-multicast)]
2. Include the **maximum-lsa *number*** statement.



**NOTE:** The **maximum-lsa** statement is mandatory, and there is no default value for it. If you omit this statement, you cannot configure OSPF database protection.

---

3. (Optional) Include the following statements:
  - **ignore-count *number***—Specify the number of times the database can enter the ignore state before it goes into the isolate state.
  - **ignore-time *seconds***—Specify the time limit the database must remain in the ignore state before it resumes regular operations.

- **reset-time *seconds***—Specify the time during which the database must operate without being in either the ignore or isolate state before it is reset to a normal operating state.
  - **warning-threshold *percent***—Specify the percent of the maximum LSA number that must be exceeded before a warning message is issued.
4. (Optional) Include the **warning-only** statement to prevent the database from entering the ignore state or isolate state when the maximum LSA count is exceeded.



**NOTE:** If you include the **warning-only** statement, values for the other optional statements at the same hierarchy level are not used when the maximum LSA number is exceeded.

5. Verify your configuration by checking the database protection fields in the output of the **show ospf overview** command.

**Related  
Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Configuration Overview](#)





## CHAPTER 10

# OSPF Policy

- [Examples: Configuring OSPF Routing Policy on page 143](#)
- [Examples: Configuring Routing Policy for Network Summaries on page 159](#)

### Examples: Configuring OSPF Routing Policy

---

- [Understanding OSPF Routing Policy on page 143](#)
- [Example: Injecting OSPF Routes into the BGP Routing Table on page 145](#)
- [Example: Redistributing Static Routes into OSPF on page 148](#)
- [Example: Configuring an OSPF Import Policy on page 151](#)
- [Example: Configuring a Route Filter Policy to Specify Priority for Prefixes Learned Through OSPF on page 155](#)

### Understanding OSPF Routing Policy

Each routing policy is identified by a policy name. The name can contain letters, numbers, and hyphens (-) and can be up to 255 characters long. To include spaces in the name, enclose the entire name in double quotation marks. Each routing policy name must be unique within a configuration. Once a policy is created and named, it must be applied before it is active.

In the **import** statement, you list the name of the routing policy used to filter OSPF external routes from being installed into the routing tables of OSPF neighbors. You can filter the routes, but not link-state address (LSA) flooding. An external route is a route that is outside the OSPF Autonomous System (AS). The import policy does not impact the OSPF database. This means that the import policy has no impact on the link-state advertisements.

In the **export** statement, you list the name of the routing policy to be evaluated when routes are being exported from the routing table into OSPF.

By default, if a routing device has multiple OSPF areas, learned routes from other areas are automatically installed into area 0 of the routing table.

To specify more than one policy and create a policy chain, you list the policies using a space as a separator. If multiple policies are specified, the policies are evaluated in the order in which they are specified. As soon as an accept or reject action is executed, the policy chain evaluation ends.

This topic describes the following information:

- [Routing Policy Terms on page 144](#)
- [Routing Policy Match Conditions on page 144](#)
- [Routing Policy Actions on page 145](#)

---

### Routing Policy Terms

Routing policies are made up of one or more terms. A term is a named structure in which match conditions and actions are defined. You can define one or more terms. The name can contain letters, numbers, and hyphens ( - ) and can be up to 255 characters long. To include spaces in the name, enclose the entire name in double quotation marks.

Each term contains a set of match conditions and a set of actions:

- Match conditions are criteria that a route must match before the actions can be applied. If a route matches all criteria, one or more actions are applied to the route.
- Actions specify whether to accept or reject the route, control how a series of policies are evaluated, and manipulate the characteristics associated with a route.

---

### Routing Policy Match Conditions

A match condition defines the criteria that a route must match for an action to take place. You can define one or more match conditions for each term. If a route matches all of the match conditions for a particular term, the actions defined for that term are processed.

Each term can include two statements, **from** and **to**, that define the match conditions:

- In the **from** statement, you define the criteria that an incoming route must match. You can specify one or more match conditions. If you specify more than one, they all must match the route for a match to occur.

The **from** statement is optional. If you omit the **from** and the **to** statements, all routes are considered to match.



**NOTE:** In export policies, omitting the **from** statement from a routing policy term might lead to unexpected results. For more information, see the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices*.

---

- In the **to** statement, you define the criteria that an outgoing route must match. You can specify one or more match conditions. If you specify more than one, they all must match the route for a match to occur.

The order of the match conditions in a term is not important because a route must match all match conditions in a term for an action to be taken.

For a complete list of match conditions, see *Routing Policy Match Conditions* in the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices*.

### Routing Policy Actions

---

An action defines what the routing device does with the route when the route matches all the match conditions in the **from** and **to** statements for a particular term. If a term does not have **from** and **to** statements, all routes are considered to match and the actions apply to all routes.

Each term can have one or more of the following types of actions. The actions are configured under the **then** statement.

- Flow control actions, which affect whether to accept or reject the route and whether to evaluate the next term or routing policy.
- Actions that manipulate route characteristics.
- Trace action, which logs route matches.

The **then** statement is optional. If you omit it, one of the following occurs:

- The next term in the routing policy, if one exists, is evaluated.
- If the routing policy has no more terms, the next routing policy, if one exists, is evaluated.
- If there are no more terms or routing policies, the **accept** or **reject** action specified by the default policy is executed.

For a complete list of routing policy actions, see *Actions in Routing Policy Terms*, *Routing Policies*, *Firewall Filters*, and *Traffic Policers Feature Guide for Routing Devices*.

### Example: Injecting OSPF Routes into the BGP Routing Table

This example shows how to create a policy that injects OSPF routes into the BGP routing table.

- [Requirements on page 145](#)
- [Overview on page 146](#)
- [Configuration on page 146](#)
- [Verification on page 148](#)
- [Troubleshooting on page 148](#)

#### Requirements

---

Before you begin:

- Configure network interfaces.
- Configure external peer sessions. See *Example: Configuring External BGP Point-to-Point Peer Sessions*.
- Configure interior gateway protocol (IGP) sessions between peers.

## Overview

---

In this example, you create a routing policy called **injectpolicy1** and a routing term called **injectterm1**. The policy injects OSPF routes into the BGP routing table.

## Configuration

---

- [Configuring the Routing Policy on page 146](#)
- [Configuring Tracing for the Routing Policy on page 147](#)

### Configuring the Routing Policy

#### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set policy-options policy-statement injectpolicy1 term injectterm1 from protocol ospf
set policy-options policy-statement injectpolicy1 term injectterm1 from area 0.0.0.1
set policy-options policy-statement injectpolicy1 term injectterm1 then accept
set protocols bgp export injectpolicy1
```

#### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To inject OSPF routes into a BGP routing table:

1. Create the policy term.

```
[edit policy-options policy-statement injectpolicy1]
user@host# set term injectterm1
```

2. Specify OSPF as a match condition.

```
[edit policy-options policy-statement injectpolicy1 term injectterm1]
user@host# set from protocol ospf
```

3. Specify the routes from an OSPF area as a match condition.

```
[edit policy-options policy-statement injectpolicy1 term injectterm1]
user@host# set from area 0.0.0.1
```

4. Specify that the route is to be accepted if the previous conditions are matched.

```
[edit policy-options policy-statement injectpolicy1 term injectterm1]
user@host# set then accept
```

5. Apply the routing policy to BGP.

```
[edit]
user@host# set protocols bgp export injectpolicy1
```

#### Results

Confirm your configuration by entering the **show policy-options** and **show protocols bgp** commands from configuration mode. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```

user@host# show policy-options
policy-statement injectpolicy1 {
  term injectterm1 {
    from {
      protocol ospf;
      area 0.0.0.1;
    }
    then accept;
  }
}

```

```

user@host# show protocols bgp
export injectpolicy1;

```

If you are done configuring the device, enter **commit** from configuration mode.

### *Configuring Tracing for the Routing Policy*

**CLI Quick Configuration** To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```

set policy-options policy-statement injectpolicy1 term injectterm1 then trace
set routing-options traceoptions file ospf-bgp-policy-log
set routing-options traceoptions file size 5m
set routing-options traceoptions file files 5
set routing-options traceoptions flag policy

```

**Step-by-Step Procedure** The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

1. Include a trace action in the policy.

```

[edit policy-options policy-statement injectpolicy1 term injectterm1]
user@host# then trace

```

2. Configure the tracing file for the output.

```

[edit routing-options traceoptions]
user@host# set file ospf-bgp-policy-log
user@host# set file size 5m
user@host# set file files 5
user@host# set flag policy

```

**Results** Confirm your configuration by entering the **show policy-options** and **show routing-options** commands from configuration mode. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```

user@host# show policy-options
policy-statement injectpolicy1 {
  term injectterm1 {
    then {
      trace;
    }
  }
}

```

```
    }  
  }  
  
  user@host# show routing-options  
  traceoptions {  
    file ospf-bgp-policy-log size 5m files 5;  
    flag policy;  
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

---

### Verification

Confirm that the configuration is working properly.

#### *Verifying That the Expected BGP Routes Are Present*

**Purpose** Verify the effect of the export policy.

**Action** From operational mode, enter the **show route** command.

---

### Troubleshooting

- [Using the show log Command to Examine the Actions of the Routing Policy on page 148](#)

#### *Using the show log Command to Examine the Actions of the Routing Policy*

**Problem** The routing table contains unexpected routes, or routes are missing from the routing table.

**Solution** If you configure policy tracing as shown in this example, you can run the **show log ospf-bgp-policy-log** command to diagnose problems with the routing policy. The **show log ospf-bgp-policy-log** command displays information about the routes that the **injectpolicy1** policy term analyzes and acts upon.

## Example: Redistributing Static Routes into OSPF

This example shows how to create a policy that redistributes static routes into OSPF.

- [Requirements on page 148](#)
- [Overview on page 149](#)
- [Configuration on page 149](#)
- [Verification on page 150](#)

---

### Requirements

Before you begin:

- Configure the device interfaces. See the *Junos OS Network Interfaces Library for Routing Devices*.
- Configure static routes. See *Examples: Configuring Static Routes* in the *Junos OS Routing Protocols Library for Routing Devices*.

## Overview

In this example, you create a routing policy called `exportstatic1` and a routing term called `exportstatic1`. The policy injects static routes into OSPF. This example includes the following settings:

- **policy-statement**—Defines the routing policy. You specify the name of the policy and further define the elements of the policy. The policy name must be unique and can contain letters, numbers, and hyphens ( - ) and be up to 255 characters long.
- **term**—Defines the match condition and applicable actions for the routing policy. The term name can contain letters, numbers, and hyphens ( - ) and be up to 255 characters long. You specify the name of the term and define the criteria that an incoming route must match by including the **from** statement and the action to take if the route matches the conditions by including the **then** statement. In this example you specify the static protocol match condition and the accept action.
- **export**—Applies the export policy you created to be evaluated when routes are being exported from the routing table into OSPF.

## Configuration

### CLI Quick Configuration

To quickly create a policy that injects static routes into OSPF, copy the following commands and paste them into the CLI.

```
[edit]
set policy-options policy-statement exportstatic1 term exportstatic1 from protocol static
set policy-options policy-statement exportstatic1 term exportstatic1 then accept
set protocols ospf export exportstatic1
```

### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Modifying the Junos OS Configuration* in *CLI User Guide*.

To inject static routes into OSPF:

1. Create the routing policy.
 

```
[edit]
user@host# edit policy-options policy-statement exportstatic1
```
2. Create the policy term.
 

```
[edit policy-options policy-statement exportstatic1]
user@host# set term exportstatic1
```
3. Specify static as a match condition.
 

```
[edit policy-options policy-statement exportstatic1 term exportstatic1]
user@host# set from protocol static
```
4. Specify that the route is to be accepted if the previous condition is matched.
 

```
[edit policy-options policy-statement exportstatic1 term exportstatic1]
user@host# set then accept
```
5. Apply the routing policy to OSPF.



**NOTE:** For OSPFv3, include the `ospf3` statement at the [edit protocols] hierarchy level.

```
[edit]
user@host# set protocols ospf export exportstatic1
```

6. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the `show policy-options` and `show protocols ospf` commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show policy-options
policy-statement exportstatic1 {
  term exportstatic1 {
    from protocol static;
    then accept;
  }
}

user@host# show protocols ospf
export exportstatic1;
```

To confirm your OSPFv3 configuration, enter the `show policy-options` and the `show protocols ospf3` commands.

---

### Verification

Confirm that the configuration is working properly.

- [Verifying That the Expected Static Routes Are Present on page 150](#)
- [Verifying That AS External LSAs Are Added to the Routing Table on page 150](#)

#### *Verifying That the Expected Static Routes Are Present*

**Purpose** Verify the effect of the export policy.

**Action** From operational mode, enter the `show route` command.

#### *Verifying That AS External LSAs Are Added to the Routing Table*

**Purpose** On the routing device where you configured the export policy, verify that the routing device originates an AS external LSA for the static routes that are added to the routing table.

**Action** From operational mode, enter the `show ospf database` command for OSPFv2, and enter the `show ospf3 database` command for OSPFv3.



## Example: Configuring an OSPF Import Policy

This example shows how to create an OSPF import policy. OSPF import policies apply to external routes only. An external route is a route that is outside the OSPF autonomous system (AS).

- [Requirements on page 151](#)
- [Overview on page 151](#)
- [Configuration on page 152](#)
- [Verification on page 154](#)

---

### Requirements

Before you begin:

- Configure static routes. See *Examples: Configuring Static Routes* in the *Junos OS Routing Protocols Library for Routing Devices*.
- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#).
- Configure a single-area OSPF network. See [“Example: Configuring a Single-Area OSPF Network” on page 23](#).

---

### Overview

External routes are learned by AS boundary routers. External routes can be advertised throughout the OSPF domain if you configure the AS boundary router to redistribute the route into OSPF. An external route might be learned by the AS boundary router from a routing protocol other than OSPF, or the external route might be a static route that you configure on the AS boundary router.

For OSPFv3, the link-state advertisement (LSA) is referred to as the interarea prefix LSA and performs the same function as a network-summary LSA performs for OSPFv2. An area border router (ABR) originates an interarea prefix LSA for each IPv6 prefix that must be advertised into an area.

OSPF import policy allows you to prevent external routes from being added to the routing tables of OSPF neighbors. The import policy does not impact the OSPF database. This means that the import policy has no impact on the link-state advertisements. The filtering is done only on external routes in OSPF. The intra-area and interarea routes are not considered for filtering. The default action is to accept the route when the route does not match the policy.

This example includes the following OSPF policy settings:

- **policy-statement**—Defines the routing policy. You specify the name of the policy and further define the elements of the policy. The policy name must be unique and can contain letters, numbers, and hyphens ( - ) and be up to 255 characters long.

- **export**—Applies the export policy you created to be evaluated when network summary LSAs are flooded into an area. In this example, the export policy is named `export_static`.
- **import**—Applies the import policy you created to prevent external routes from being added to the routing table. In this example, the import policy is named `filter_routes`.

The devices you configure in this example represent the following functions:

- **R1**—Device R1 is in area 0.0.0.0 and has a direct connection to device R2. R1 has an OSPF export policy configured. The export policy redistributes static routes from R1's routing table into R1's OSPF database. Because the static route is in R1's OSPF database, the route is advertised in an LSA to R1's OSPF neighbor. R1's OSPF neighbor is device R2.
- **R2**—Device R2 is in area 0.0.0.0 and has a direct connection to device R1. R2 has an OSPF import policy configured that matches the static route to the 10.0.16.0/30 network and prevents the static route from being installed in R2's routing table. R2's OSPF neighbor is device R1.

---

### Configuration

#### CLI Quick Configuration

To quickly configure an OSPF import policy, copy the following commands, removing any line breaks, and then paste the commands into the CLI.

Configuration on Device R1:

```
[edit]
set interfaces so-0/2/0 unit 0 family inet address 10.0.2.1/30
set protocols ospf export export_static
set protocols ospf area 0.0.0.0 interface so-0/2/0
set policy-options policy-statement export_static from protocol static
set policy-options policy-statement export_static then accept
```

Configuration on Device R2:

```
[edit]
set interfaces so-0/2/0 unit 0 family inet address 10.0.2.2/30
set protocols ospf import filter_routes
set protocols ospf area 0.0.0.0 interface so-0/2/0
set policy-options policy-statement filter_routes from route-filter 10.0.16.0/30 exact
set policy-options policy-statement filter_routes then reject
```

#### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Modifying the Junos OS Configuration* in *CLI User Guide*.

To configure an OSPF import policy:

1. Configure the interfaces.

```
[edit]
user@R1# set interfaces so-0/2/0 unit 0 family inet address 10.0.2.1/30
```

```
[edit]
user@R2# set interfaces so-0/2/0 unit 0 family inet address 10.0.2.2/30
```

2. Enable OSPF on the interfaces.



**NOTE:** For OSPFv3, include the `ospf3` statement at the [edit protocols] hierarchy level.

```
[edit]
user@R1# set protocols ospf area 0.0.0.0 interface so-0/2/0
```

```
[edit]
user@R2# set protocols ospf area 0.0.0.0 interface so-0/2/0
```

3. On R1, redistribute the static route into OSPF.

```
[edit]
user@R1# set protocols ospf export export_static
user@R1# set policy-options policy-statement export_static from protocol static
user@R1# set policy-options policy-statement export_static then accept
```

4. On R2, configure the OSPF import policy.

```
[edit]
user@R2# set protocols ospf import filter_routes
user@R2# set policy-options policy-statement filter_routes from route-filter
10.0.16.0/30 exact
user@R2# set policy-options policy-statement filter_routes then reject
```

5. If you are done configuring the devices, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the `show interfaces`, `show policy-options`, and `show protocols ospf` commands on the appropriate device. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Output for R1:

```
user@R1# show interfaces
so-0/2/0 {
  unit 0 {
    family inet {
      address 10.0.2.1/30;
    }
  }
}

user@R1# show policy-options
policy-statement export_static {
  from protocol static;
  then accept;
}

user@R1# show protocols ospf
export export_static;
area 0.0.0.0 {
```

```
interface so-0/2/0.0;  
}
```

Output for R2:

```
user@R2# show interfaces  
so-0/2/0 {  
  unit 0 {  
    family inet {  
      address 10.0.2.2/30;  
    }  
  }  
}  
  
user@R2# show policy-options  
policy-statement filter_routes {  
  from {  
    route-filter 10.0.16.0/30 exact;  
  }  
  then reject;  
}  
  
user@R2# show protocols ospf  
import filter_routes;  
area 0.0.0.0 {  
  interface so-0/2/0.0;  
}
```

To confirm your OSPFv3 configuration, enter the **show interfaces**, **show policy-options**, **show routing-options**, and **show protocols ospf3** commands on the appropriate device.

---

### Verification

Confirm that the configuration is working properly.

- [Verifying the OSPF Database on page 154](#)
- [Verifying the Routing Table on page 154](#)

#### *Verifying the OSPF Database*

**Purpose** Verify that OSPF is advertising the static route in the OSPF database.

**Action** From operational mode, enter the **show ospf database** for OSPFv2, and enter the **show ospf3 database** command for OSPFv3.

#### *Verifying the Routing Table*

**Purpose** Verify the entries in the routing table.

**Action** From operational mode, enter the **show route** command.

## Example: Configuring a Route Filter Policy to Specify Priority for Prefixes Learned Through OSPF

This example shows how to create an OSPF import policy that prioritizes specific prefixes learned through OSPF.

- [Requirements on page 155](#)
- [Overview on page 155](#)
- [Configuration on page 156](#)
- [Verification on page 158](#)

---

### Requirements

Before you begin:

- Configure the device interfaces.
- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#).
- Configure a single-area OSPF network. See [“Example: Configuring a Single-Area OSPF Network” on page 23](#).
- Configure a multiarea OSPF network. See [“Example: Configuring a Multiarea OSPF Network” on page 25](#).

---

### Overview

In a network with a large number of OSPF routes, it can be useful to control the order in which routes are updated in response to a network topology change. In Junos OS Release 9.3 and later, you can specify a priority of high, medium, or low for prefixes included in an OSPF import policy. In the event of an OSPF topology change, high priority prefixes are updated in the routing table first, followed by medium and then low priority prefixes.

OSPF import policy can only be used to set priority or to filter OSPF external routes. If an OSPF import policy is applied that results in a **reject** terminating action for a nonexternal route, then the **reject** action is ignored and the route is accepted anyway. By default, such a route is now installed in the routing table with a priority of low. This behavior prevents traffic black holes, that is, silently discarded traffic, by ensuring consistent routing within the OSPF domain.

In general, OSPF routes that are not explicitly assigned a priority are treated as priority medium, except for the following:

- Summary discard routes have a default priority of low.
- Local routes that are not added to the routing table are assigned a priority of low.

- External routes that are rejected by import policy and thus not added to the routing table are assigned a priority of low.

Any available match criteria applicable to OSPF routes can be used to determine the priority. Two of the most commonly used match criteria for OSPF are the **route-filter** and **tag** statements.

In this example, the routing device is in area 0.0.0.0, with interfaces fe-0/1/0 and fe-1/1/0 connecting to neighboring devices. You configure an import routing policy named ospf-import to specify a priority for prefixes learned through OSPF. Routes associated with these prefixes are installed in the routing table in the order of the prefixes' specified priority. Routes matching **200.3.0.0/16 orlonger** are installed first because they have a priority of **high**. Routes matching **200.2.0.0/16 orlonger** are installed next because they have a priority of **medium**. Routes matching **200.1.0.0/16 orlonger** are installed last because they have a priority of **low**. You then apply the import policy to OSPF.



**NOTE:** The priority value takes effect when a new route is installed, or when there is a change to an existing route.

### Configuration

#### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces fe-0/1/0 unit 0 family inet address 192.168.8.4/30
set interfaces fe-0/2/0 unit 0 family inet address 192.168.8.5/30
set policy-options policy-statement ospf-import term t1 from route-filter 200.1.0.0/16
  orlonger
set policy-options policy-statement ospf-import term t1 then priority low
set policy-options policy-statement ospf-import term t1 then accept
set policy-options policy-statement ospf-import term t2 from route-filter 200.2.0.0/16
  orlonger
set policy-options policy-statement ospf-import term t2 then priority medium
set policy-options policy-statement ospf-import term t2 then accept
set policy-options policy-statement ospf-import term t3 from route-filter 200.3.0.0/16
  orlonger
set policy-options policy-statement ospf-import term t3 then priority high
set policy-options policy-statement ospf-import term t3 then accept
set protocols ospf import ospf-import
set protocols ospf area 0.0.0.0 interface fe-0/1/0.0
set protocols ospf area 0.0.0.0 interface fe-0/2/0.0
```

#### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure an OSPF import policy that prioritizes specific prefixes:

1. Configure the device interfaces.

```
[edit interfaces]
user@host# set fe-0/1/0 unit 0 family inet address 192.168.8.4/30
```

```
user@host# set fe-0/2/0 unit 0 family inet address 192.168.8.5/30
```

2. Enable OSPF on the interfaces.



**NOTE:** For OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit protocols ospf area 0.0.0.0]
user@host# set interface fe-0/1/0.0
user@host# set interface fe-0/2/0.0
```

3. Configure the policy to specify the priority for prefixes learned through OSPF.

```
[edit policy-options policy-statement ospf-import]
user@host# set term t1 from route-filter 200.1.0.0/16 orlonger
user@host# set term t1 then priority low
user@host# set term t1 then accept
```

```
user@host# set term t2 from route-filter 200.2.0.0/16 orlonger
user@host# set term t2 then priority medium
user@host# set term t2 then accept
```

```
user@host# set term t3 from route-filter 200.3.0.0/16 orlonger
user@host# set term t3 then priority high
user@host# set term t3 then accept
```

4. Apply the policy to OSPF.

```
[edit protocols ospf]
user@host# set import ospf-import
```

5. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

**Results** From configuration mode, confirm your configuration by entering the **show interfaces**, **show protocols ospf**, and **show policy-options** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show interfaces
fe-0/1/0 {
  unit 0 {
    family inet {
      address 192.168.8.4/30;
    }
  }
}
fe-0/2/0 {
  unit 0 {
```

```
        family inet {
            address 192.168.8.5/30;
        }
    }
}

user@host# show protocols ospf
import ospf-import;
area 0.0.0.0 {
    interface fe-0/1/0.0;
    interface fe-0/2/0.0;
}

user@host# show policy-options
policy-statement ospf-import {
    term t1 {
        from {
            route-filter 200.1.0.0/16 orlonger;
        }
        then {
            priority low;
            accept;
        }
    }
    term t2 {
        from {
            route-filter 200.2.0.0/16 orlonger;
        }
        then {
            priority medium;
            accept;
        }
    }
    term t3 {
        from {
            route-filter 200.3.0.0/16 orlonger;
        }
        then {
            priority high;
            accept;
        }
    }
}
```

To confirm your OSPFv3 configuration, enter the **show interfaces**, **show protocols ospf3**, and **show policy-options** commands.

---

### Verification

Confirm that the configuration is working properly.

#### *Verifying the Prefix Priority in the OSPF Routing Table*

**Purpose** Verify the priority assigned to the prefix in the OSPF routing table.



**Action** From operational mode, enter the **show ospf route detail** for OSPFv2, and enter the **show ospf3 route detail** command for OSPFv3.

**Related Documentation**

- [OSPF Overview on page 4](#)
- [OSPF Configuration Overview](#)
- *Routing Policy Match Conditions* in the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices*
- *Actions in Routing Policy Terms* in the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices*

## Examples: Configuring Routing Policy for Network Summaries

- [Import and Export Policies for Network Summaries Overview on page 159](#)
- [Example: Configuring an OSPF Export Policy for Network Summaries on page 159](#)
- [Example: Configuring an OSPF Import Policy for Network Summaries on page 169](#)

### Import and Export Policies for Network Summaries Overview

By default, OSPF uses network-summary link-state advertisements (LSAs) to transmit route information across area boundaries. Each area border router (ABR) floods network-summary LSAs to other routing devices in the same area. The ABR also controls which routes from the area are used to generate network-summary LSAs into other areas. Each ABR maintains a separate topological database for each area to which they are connected. In Junos OS Release 9.1 and later, you can configure export and import policies for OSPFv2 and OSPFv3 that enable you to control how network-summary LSAs, which contain information about interarea OSPF prefixes, are distributed and generated. For OSPFv3, the LSA is referred to as the interarea prefix LSA and performs the same function as a network-summary LSA performs for OSPFv2. An ABR originates an interarea prefix LSA for each IPv6 prefix that must be advertised into an area.

The export policy enables you to specify which summary LSAs are flooded into an area. The import policy enables you to control which routes learned from an area are used to generate summary LSAs into other areas. You define a routing policy at the **[edit policy-options policy-statement *policy-name*]** hierarchy level. As with all OSPF export policies, the default for network-summary LSA export policies is to reject everything. Similarly, as with all OSPF import policies, the default for network-summary LSA import policies is to accept all OSPF routes.

### Example: Configuring an OSPF Export Policy for Network Summaries

This example shows how to create an OSPF export policy to control the network-summary (Type 3) LSAs that the ABR floods into an OSPF area.

- [Requirements on page 160](#)
- [Overview on page 160](#)

- [Configuration on page 162](#)
- [Verification on page 167](#)

## Requirements

---

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#)

## Overview

---

OSPF uses network-summary LSAs to transmit route information across area boundaries. Depending on your network environment, you might want to further filter the network-summary LSAs between OSPF areas. For example, if you create OSPF areas to define administrative boundaries, you might not want to advertise internal route information between those areas. To further improve the control of route distribution between multiple OSPF areas, you can configure network summary policies on the ABR for the area that you want to filter the advertisement of network-summary LSAs.



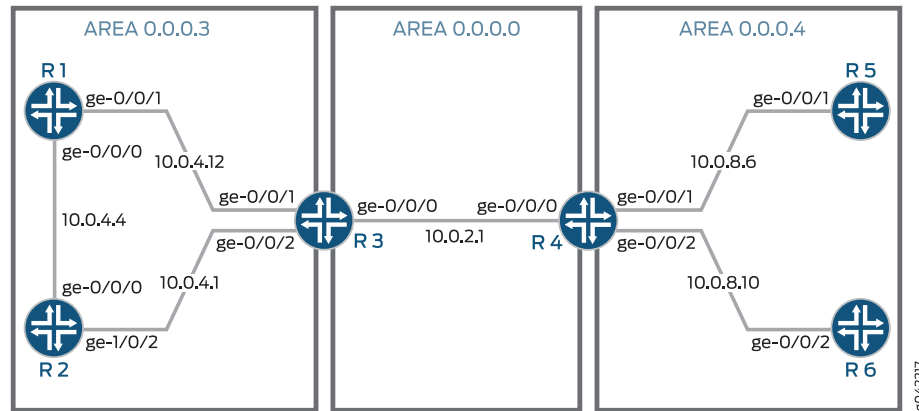
**NOTE:** For OSPFv3, the LSA is referred to as the interarea prefix LSA and performs the same function as a network-summary LSA performs for OSPFv2. An ABR originates an interarea prefix LSA for each IPv6 prefix that must be advertised into an area. In this topic, the terms network summary policy and network-summary policy are used to describe both OSPFv2 and OSPFv3 functionality.

The following guidelines apply to export network summary policies:

- You should have a thorough understanding of your network before configuring these policies. Incorrect network summary policy configuration might result in an unintended result such as suboptimal routing or dropped traffic.
- We recommend that you use the **route-filter** policy match condition for these types of policies.
- We recommend that you use the **accept** and **reject** routing policy terms for these types of policies.

[Figure 11 on page 161](#) shows a sample topology with three OSPF areas. R4 generates network summaries for the routes in area 4 and sends them out of area 4 to area 0. R3 generates network summaries for the routes in area 3 and sends them out of area 3 to area 0.

Figure 11: Sample Topology Used for an OSPF Export Network Summary Policy



In this example, you configure R4 with an export network summary policy named `export-policy` that only allows routes that match the 10.0.4.4 prefix from area 3 into area 4. The export policy controls the network-summary LSAs that R4 floods into area 4. This results in only the allowed interarea route to enter area 4, and all other interarea routes to be purged from the OSPF database and the routing table of the devices in area 4. You first define the policy and then apply it to the ABR by including the `network-summary-export` statement for OSPFv2 or the `inter-area-prefix-export` statement for OSPFv3.

The devices operate as follows:

- R1—Device R1 is an internal router in area 3. Interface `ge-0/0/1` has an IP address of 10.0.4.13/30 and connects to R3. Interface `ge-0/0/0` has an IP address of 10.0.4.5/30 and connects to R2.
- R2—Device R2 is an internal router in area 3. Interface `ge-0/0/0` has an IP address of 10.0.4.6/30 and connects to R1. Interface `ge-0/0/2` has an IP address of 10.0.4.1 and connects to R3.
- R3—Device R3 participates in area 3 and area 0. R3 is the ABR between area 3 and area 0, and passes network-summary LSAs between the areas. Interface `ge-0/0/2` has an IP address of 10.0.4.2/30 and connects to R2. Interface `ge-0/0/1` has an IP address of 10.0.4.14/30 and connects to R1. Interface `ge-0/0/0` has an IP address of 10.0.2.1/30 and connects to R4.
- R4—Device R4 participates in area 0 and area 4. R4 is the ABR between area 0 and area 4, and passes network-summary LSAs between the areas. Interface `ge-0/0/0` has an IP address of 10.0.2.4/30 and connects to R3. Interface `ge-0/0/1` has an IP address of 10.0.8.6/30 and connects to R5. Interface `ge-0/0/2` has an IP address of 10.0.8.9/30 and connects to R6.

- R5—Device R5 is an internal router in area 4. Interface **ge-0/0/1** has an IP address of 10.0.8.5/30 and connects to R4.
- R6—Device R6 is an internal router in area 4. Interface **ge-0/0/2** has an IP address of 10.0.8.10/30 and connects to R4.

### Configuration

---

#### CLI Quick Configuration

To quickly configure an OSPF export policy for network summaries, copy the following commands, removing any line breaks, and then paste the commands into the CLI.

Configuration on Device R1:

```
[edit]
set interfaces ge-0/0/0 unit 0 family inet address 10.0.4.5/30
set interfaces ge-0/0/1 unit 0 family inet address 10.0.4.13/30
set protocols ospf area 0.0.0.3 interface ge-0/0/1
set protocols ospf area 0.0.0.3 interface ge-0/0/0
```

Configuration on Device R2:

```
[edit]
set interfaces ge-0/0/0 unit 0 family inet address 10.0.4.6/30
set interfaces ge-0/0/2 unit 0 family inet address 10.0.4.1/30
set protocols ospf area 0.0.0.3 interface ge-0/0/2
set protocols ospf area 0.0.0.3 interface ge-0/0/1
```

Configuration on Device R3:

```
[edit]
set interfaces ge-0/0/0 unit 0 family inet address 10.0.4.2/30
set interfaces ge-0/0/1 unit 0 family inet address 10.0.4.14/30
set interfaces ge-0/0/2 unit 0 family inet address 10.0.2.1/30
set protocols ospf area 0.0.0.0 interface ge-0/0/0
set protocols ospf area 0.0.0.3 interface ge-0/0/1
set protocols ospf area 0.0.0.3 interface ge-0/0/2
```

Configuration on Device R4:

```
[edit]
set interfaces ge-0/0/0 unit 0 family inet address 10.0.2.1/30
set interfaces ge-0/0/1 unit 0 family inet address 10.0.8.6/30
set interfaces ge-0/0/2 unit 0 family inet address 10.0.8.9/30
set protocols ospf area 0.0.0.0 interface ge-0/0/0
set protocols ospf area 0.0.0.4 network-summary-export export-policy
set protocols ospf area 0.0.0.4 interface ge-0/0/1
set protocols ospf area 0.0.0.4 interface ge-0/0/2
set policy-options policy-statement export-policy term term1 from route-filter 10.0.4.4/30
  prefix-length-range /30-/30
set policy-options policy-statement export-policy term term1 then accept
```

Configuration on Device R5:

```
[edit]
set interfaces ge-0/0/1 unit 0 family inet address 10.0.8.5/30
set protocols ospf area 0.0.0.4 interface ge-0/0/1
```

Configuration on Device R6:

```
[edit]
set interfaces ge-0/0/2 unit 0 family inet address 10.0.8.10/30
set protocols ospf area 0.0.0.4 interface ge-0/0/2
```

### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Modifying the Junos OS Configuration in CLI User Guide*.

To configure an OSPF export policy for network summaries:

1. Configure the interfaces.



**NOTE:** For OSPFv3, use IPv6 addresses.

```
[edit]
user@R1# set interfaces ge-0/0/0 unit 0 family inet address 10.0.4.5/30
user@R1# set interfaces ge-0/0/1 unit 0 family inet address 10.0.4.13/30

[edit]
user@R2# set interfaces ge-0/0/0 unit 0 family inet address 10.0.4.6/30
user@R2# set interfaces ge-0/0/2 unit 0 family inet address 10.0.4.1/30

[edit]
user@R3# set interfaces fe-1/0/0 unit 0 family inet address 10.0.4.2/30
user@R3# set interfaces fe-1/1/0 unit 0 family inet address 10.0.4.14/30
user@R3# set interfaces fe-0/0/1 unit 0 family inet address 10.0.2.1/30

[edit]
user@R4# set interfaces ge-0/0/0 unit 0 family inet address 10.0.4.2/30
user@R4# set interfaces ge-0/0/1 unit 0 family inet address 10.0.4.14/30
user@R4# set interfaces ge-0/0/2 unit 0 family inet address 10.0.2.1/30

[edit]
user@R5# set interfaces ge-0/0/1 unit 0 family inet address 10.0.8.5/30

[edit]
user@R6# set interfaces ge-0/0/2 unit 0 family inet address 10.0.8.10/30
```

2. Enable OSPF on the interfaces.



**NOTE:** For OSPFv3, include the `ospf3` statement at the [edit protocols] hierarchy level.

```
[edit]
user@R1# set protocols ospf area 0.0.0.3 interface ge-0/0/1
user@R1# set protocols ospf area 0.0.0.3 interface ge-0/0/0

[edit]
user@R2# set protocols ospf area 0.0.0.3 interface ge-0/0/2
user@R2# set protocols ospf area 0.0.0.3 interface ge-0/0/1

[edit]
user@R3# set protocols ospf area 0.0.0.3 interface ge-0/0/1
```

```
user@R3# set protocols ospf area 0.0.0.3 interface ge-0/0/2
user@R3# set protocols ospf area 0.0.0.0 interface ge-0/0/0
```

```
[edit]
user@R4# set protocols ospf area 0.0.0.0 interface ge-0/0/0
user@R4# set protocols ospf area 0.0.0.4 interface ge-0/0/1
user@R4# set protocols ospf area 0.0.0.4 interface ge-0/0/2
```

```
[edit]
user@R5# set protocols ospf area 0.0.0.4 interface fe-0/0/1
```

```
[edit]
user@R6# set protocols ospf area 0.0.0.4 interface fe-0/0/2
```

3. On R4, configure the export network summary policy.

```
[edit ]
user@R4# set policy-options policy-statement export-policy term term1 from
route-filter 10.0.4.4/30 prefix-length-range /30-/30
user@R4# set policy-options policy-statement export-policy term term1 then accept
```

4. On R4, apply the export network summary policy to OSPF.



**NOTE:** For OSPFv3, include the `inter-area-prefix-export` statement at the `[edit protocols ospf3 area area-id]` hierarchy level.

```
[edit]
user@R4# set protocols ospf area 0.0.0.4 network-summary-export export-policy
```

5. If you are done configuring the devices, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the `show interfaces`, `show policy-options`, and `show protocols ospf` commands on the appropriate device. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Output for R1:

```
user@R1# show interfaces
ge-0/0/0 {
  unit 0 {
    family inet {
      address 10.0.4.5/30;
    }
  }
}
ge-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.4.13/30;
    }
  }
}
```

```

}

user@R1# show protocols ospf
area 0.0.0.3 {
  interface ge-0/0/1.0;
  interface ge-0/0/0.0;
}

```

Output for R2:

```

user@R2# show interfaces
ge-0/0/0 {
  unit 0 {
    family inet {
      address 10.0.4.6/30;
    }
  }
}
ge-0/0/2 {
  unit 0 {
    family inet {
      address 10.0.4.1/30;
    }
  }
}

user@R2# show protocols ospf
area 0.0.0.3 {
  interface ge-0/0/2.0;
  interface ge-0/0/1.0;
}

```

Output for R3:

```

user@R3# show interfaces
ge-0/0/0 {
  unit 0 {
    family inet {
      address 10.0.2.1/30;
      address 10.0.4.2/30;
    }
  }
}
ge-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.4.14/30;
    }
  }
}
ge-0/0/2 {
  unit 0 {
    family inet {
      address 10.0.4.2/30;
      address 10.0.2.1/30;
    }
  }
}

```

```
user@R3# show protocols ospf
area 0.0.0.0 {
  interface ge-0/0/0.0;
}
area 0.0.0.3 {
  interface ge-0/0/1.0;
  interface ge-0/0/2.0;
}
```

Output for R4:

```
user@R4# show interfaces
ge-0/0/0 {
  unit 0 {
    family inet {
      address 10.0.2.1/30;
    }
  }
}
ge-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.8.6/30;
    }
  }
}
ge-0/0/2 {
  unit 0 {
    family inet {
      address 10.0.8.9/30;
    }
  }
}

user@R4# show protocols ospf
ospf {
  area 0.0.0.0 {
    interface ge-0/0/0.0;
  }
  area 0.0.0.4 {
    network-summary-export export-policy;
    interface ge-0/0/1.0;
    interface ge-0/0/2.0;
  }
}

user@R4# show policy-options
policy-statement export-policy {
  term term1 {
    from {
      route-filter 10.0.4.4/30 prefix-length-range /30-/30;
    }
    then accept;
  }
}
```

Output for R5:



```

user@R5# show interfaces
ge-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.8.5/30;
    }
  }
}

user@R5# show protocols ospf
ospf {
  area 0.0.0.4 {
    interface ge-0/0/1.0;
  }
}

```

Output for R6:

```

user@R6# show interfaces
ge-0/0/2 {
  unit 0 {
    family inet {
      address 10.0.8.10/30;
    }
  }
}

user@R6# show protocols ospf
area 0.0.0.4 {
  interface ge-0/0/2.0;
}

```

To confirm your OSPFv3 configuration, enter the **show interfaces**, **show policy-options**, and **show protocols ospf3** commands on the appropriate device.

## Verification

Confirm that the configuration is working properly.

- [Verifying the OSPF Database on page 167](#)
- [Verifying the Routing Table on page 168](#)

### Verifying the OSPF Database

**Purpose** Verify that the OSPF database for the devices in area 4 includes the interarea route that we permitted on the ABR R4. The other interarea routes that are not specified should age out or no longer be present in the OSPF database.

**Action** From operational mode, enter the **show ospf database** command.

## Sample Output

```

user@R4>show ospf database
OSPF database, Area 0.0.0.0

```

| Type   | ID        | Adv Rtr  | Seq        | Age  | Opt  | Cksum  | Len |
|--------|-----------|----------|------------|------|------|--------|-----|
| Router | 10.0.2.1  | 10.0.2.1 | 0x80000004 | 911  | 0x22 | 0xda1f | 36  |
| Router | *10.0.2.2 | 10.0.2.2 | 0x80000003 | 1505 | 0x22 | 0xda1d | 36  |

```

Network *10.0.2.2      10.0.2.2      0x80000002    213    0x22 0x6d97    32
Summary 10.0.4.0        10.0.2.1      0x80000003   1495    0x22 0x60c1    28
Summary 10.0.4.4        10.0.2.1      0x80000002   1490    0x22 0x44d9    28
Summary 10.0.4.12       10.0.2.1      0x80000003   1490    0x22 0xe72e    28
Summary *10.0.8.4       10.0.2.2      0x80000004    644    0x22 0x414     28
Summary *10.0.8.8       10.0.2.2      0x80000003   1503    0x22 0xdd37    28

```

```

      OSPF database, Area 0.0.0.4
Type      ID          Adv Rtr      Seq      Age    Opt  Cksum  Len
Router *10.0.2.2      10.0.2.2      0x80000004   1508    0x22 0x597   48
Router 10.0.8.5       10.0.8.5      0x80000003   1517    0x22 0x8cc   36
Router 10.0.8.10      10.0.8.10     0x80000003   1514    0x22 0x3090  36
Network 10.0.8.5      10.0.8.5      0x80000001   1517    0x22 0x35b4  32
Network 10.0.8.10     10.0.8.10     0x80000001   1514    0x22 0x17c3  32
Summary *10.0.4.4     10.0.2.2      0x80000001   1492    0x22 0x4ad2  28

```

```
user@R5>show ospf database
```

```
OSPF database, Area 0.0.0.4
```

```

Type      ID          Adv Rtr      Seq      Age    Opt  Cksum  Len
Router 10.0.2.2      10.0.2.2      0x80000004   1479    0x22 0x597   48
Router *10.0.8.5     10.0.8.5      0x80000003   1486    0x22 0x8cc   36
Router 10.0.8.10     10.0.8.10     0x80000003   1485    0x22 0x3090  36
Network *10.0.8.5    10.0.8.5      0x80000001   1486    0x22 0x35b4  32
Network 10.0.8.10    10.0.8.10     0x80000001   1485    0x22 0x17c3  32
Summary 10.0.4.4     10.0.2.2      0x80000001   1463    0x22 0x4ad2  28

```

```
user@R6>show ospf database
```

```
OSPF database, Area 0.0.0.4
```

```

Type      ID          Adv Rtr      Seq      Age    Opt  Cksum  Len
Router 10.0.2.2      10.0.2.2      0x80000004   2162    0x22 0x597   48
Router 10.0.8.5       10.0.8.5      0x80000003   2171    0x22 0x8cc   36
Router *10.0.8.10     10.0.8.10     0x80000003   2166    0x22 0x3090  36
Network 10.0.8.5      10.0.8.5      0x80000001   2171    0x22 0x35b4  32
Network *10.0.8.10    10.0.8.10     0x80000001   2166    0x22 0x17c3  32
Summary 10.0.4.4     10.0.2.2      0x80000001   2146    0x22 0x4ad2  28

```

### Verifying the Routing Table

**Purpose** Verify that the routes corresponding to the rejected network summaries are no longer present in R4's, R5's, or R6's routing table.

**Action** From operational mode, enter the **show route protocol ospf** command for both OSPFv2 and OSPFv3.

### Sample Output

```
user@R4> show route protocol ospf
```

```
inet.0: 10 destinations, 10 routes (10 active, 0 holddown, 0 hidden)
```

```
+ = Active Route, - = Last Active, * = Both
```

```

10.0.4.0/30      *[OSPF/10] 00:37:05, metric 2
                  > to 10.0.2.1 via ge-3/0/2.4
10.0.4.4/30      *[OSPF/10] 00:36:59, metric 3
                  > to 10.0.2.1 via ge-3/0/2.4
10.0.4.12/30     *[OSPF/10] 00:37:05, metric 2
                  > to 10.0.2.1 via ge-3/0/2.4
224.0.0.5/32     *[OSPF/10] 00:38:05, metric 1
                  MultiRecv

```

```
user@R5> show route protocol ospf
```

```
inet.0: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
10.0.4.4/30      *[OSPF/10] 00:37:09, metric 4
                  > to 10.0.8.6 via ge-3/0/2.5
10.0.8.8/30      *[OSPF/10] 00:37:30, metric 2
                  > to 10.0.8.6 via ge-3/0/2.5
224.0.0.5/32     *[OSPF/10] 00:38:20, metric 1
                  MultiRecv
```

```
user@6> show route protocol ospf
```

```
inet.0: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
10.0.4.4/30      *[OSPF/10] 00:38:19, metric 4
                  > to 10.0.8.9 via ge-3/0/2.6
10.0.8.4/30      *[OSPF/10] 00:38:34, metric 2
                  > to 10.0.8.9 via ge-3/0/2.6
224.0.0.5/32     *[OSPF/10] 00:39:34, metric 1
                  MultiRecv
```

## Example: Configuring an OSPF Import Policy for Network Summaries

This example shows how to create an OSPF import policy to control the network-summary (Type 3) LSAs that the ABR advertises out of an OSPF area.

- [Requirements on page 169](#)
- [Overview on page 169](#)
- [Configuration on page 171](#)
- [Verification on page 177](#)

### Requirements

Before you begin:

- Configure the router identifiers for the devices in your OSPF network. See [“Example: Configuring an OSPF Router Identifier” on page 18](#).
- Control OSPF designated router election. See [“Example: Controlling OSPF Designated Router Election” on page 20](#).

### Overview

OSPF uses network-summary LSAs to transmit route information across area boundaries. Depending on your network environment, you might want to further filter the network-summary LSAs between OSPF areas. For example, if you create OSPF areas to define administrative boundaries, you might not want to advertise internal route information between those areas. To further improve the control of route distribution between multiple OSPF areas, you can configure network summary policies on the ABR for the area that you want to filter the advertisement of network-summary LSAs.



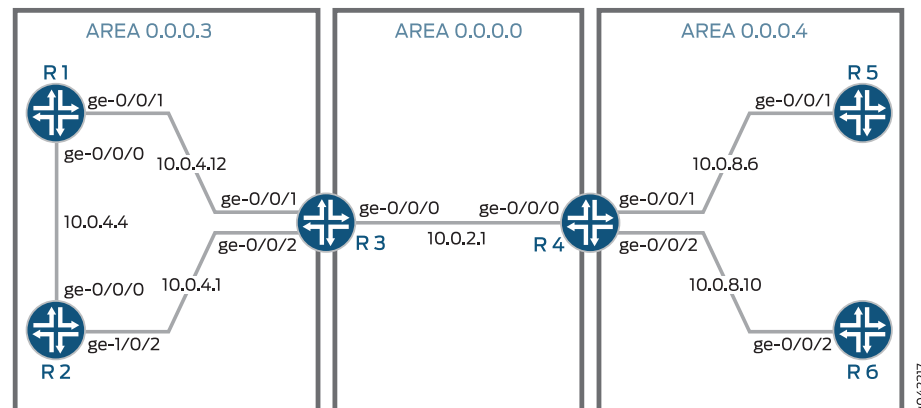
**NOTE:** For OSPFv3, the LSA is referred to as the interarea prefix LSA and performs the same function as a network-summary LSA performs for OSPFv2. An ABR originates an interarea prefix LSA for each IPv6 prefix that must be advertised into an area. In this topic, the terms network summary policy and network-summary policy are used to describe both OSPFv2 and OSPFv3 functionality.

The following guidelines apply to import network summary policies:

- You should have a thorough understanding of your network before configuring these policies. Incorrect network summary policy configuration might result in an unintended result such as suboptimal routing or dropped traffic.
- We recommend that you use the **route-filter** policy match condition for these types of policies.
- We recommend that you use the **accept** and **reject** routing policy terms for these types of policies.

Figure 12 on page 170 shows a sample topology with three OSPF areas. R4 generates network summaries for the routes in area 4 and sends them out of area 4 to area 0. R3 generates network summaries for the routes in area 3 and sends them out of area 3 to area 0.

**Figure 12: Sample Topology Used for an OSPF Import Network Summary Policy**



In this example, you configure R3 with an import network summary policy named `import-policy` so R3 only generates network summaries for the route 10.0.4.12/30. The import policy controls the routes and therefore the network summaries that R3 advertises out of area 3, so applying this policy means that R3 only advertises route 10.0.4.12/30 out of area 3. This results in existing network summaries from other interarea routes getting purged from the OSPF database in area 0 and area 4, as well as the routing tables of the devices in areas 0 and area 4. You first define the policy and then apply it to the

ABR by including the **network-summary-import** statement for OSPFv2 or the **inter-area-prefix-import** statement for OSPFv3.

The devices operate as follows:

- R1—Device R1 is an internal router in area 3. Interface **fe-0/1/0** has an IP address of 10.0.4.13/30 and connects to R3. Interface **fe-0/0/1** has an IP address of 10.0.4.5/30 and connects to R2.
- R2—Device R2 is an internal router in area 3. Interface **fe-0/0/1** has an IP address of 10.0.4.6/30 and connects to R1. Interface **fe-1/0/0** has an IP address of 10.0.4.1/30 and connects to R3.
- R3—Device R3 participates in area 3 and area 0. R3 is the ABR between area 3 and area 0, and passes network-summary LSAs between the areas. Interface **fe-1/0/0** has an IP address of 10.0.4.2/30 and connects to R2. Interface **fe-1/1/0** has an IP address of 10.0.4.14/30 and connects to R1. Interface **fe-0/0/1** has an IP address of 10.0.2.1/30 and connects to R4.
- R4—Device R4 participates in area 0 and area 4. R4 is the ABR between area 0 and area 4, and passes network-summary LSAs between the areas. Interface **fe-0/0/1** has an IP address of 10.0.2.1/30 and connects to R3. Interface **fe-1/1/0** has an IP address of 10.0.8.6/30 and connects to R5. Interface **fe-1/0/0** has an IP address of 10.0.8.9/30 and connects to R6.
- R5—Device R5 is an internal router in area 4. Interface **fe-1/1/0** has an IP address of 10.0.8.5/30 and connects to R4.
- R6—Device R6 is an internal router in area 4. Interface **fe-1/0/0** has an IP address of 10.0.8.10/30 and connects to R4.

### Configuration

#### CLI Quick Configuration

To quickly configure an OSPF import policy for network summaries, copy the following commands, removing any line breaks, and then paste the commands into CLI.

Configuration on Device R1:

```
[edit]
set interfaces fe-0/1/0 unit 0 family inet address 10.0.4.13/30
set interfaces fe-0/0/1 unit 0 family inet address 10.0.4.5/30
set protocols ospf area 0.0.0.3 interface fe-0/1/0
set protocols ospf area 0.0.0.3 interface fe-0/0/1
```

Configuration on Device R2:

```
[edit]
set interfaces fe-0/1/0 unit 0 family inet address 10.0.4.6/30
set interfaces fe-1/0/0 unit 0 family inet address 10.0.4.1/30
set protocols ospf area 0.0.0.3 interface fe-0/1/0
set protocols ospf area 0.0.0.3 interface fe-1/0/0
```

Configuration on Device R3:

```
[edit]
set interfaces fe-1/0/0 unit 0 family inet address 10.0.4.2/30
```

```

set interfaces fe-1/1/0 unit 0 family inet address 10.0.4.14/30
set interfaces fe-0/0/1 unit 0 family inet address 10.0.2.1/30
set policy-options policy-statement import-policy term term1 from route-filter 10.0.4.12/30
  prefix-length-range /30-/30
set policy-options policy-statement import-policy term term1 then accept
set protocols ospf area 0.0.0.3 interface fe-1/0/0
set protocols ospf area 0.0.0.3 interface fe-1/1/0
set protocols ospf area 0.0.0.0 interface fe-0/0/1
set protocols ospf area 0.0.0.3 network-summary-import import-policy

```

Configuration on Device R4:

```

[edit]
set interfaces fe-0/0/1 unit 0 family inet address 10.0.2.1/30
set interfaces fe-1/1/0 unit 0 family inet address 10.0.8.6/30
set interfaces fe-1/0/0 unit 0 family inet address 10.0.8.9/30
set protocols ospf area 0.0.0.0 interface fe-0/0/1
set protocols ospf area 0.0.0.4 interface fe-1/1/0
set protocols ospf area 0.0.0.4 interface fe-1/0/0

```

Configuration on Device R5:

```

[edit]
set interfaces fe-1/1/0 unit 0 family inet address 10.0.8.5/30
set protocols ospf area 0.0.0.4 interface fe-1/1/0

```

Configuration on Device R6:

```

[edit]
set interfaces fe-1/0/0 unit 0 family inet address 10.0.8.10/30
set protocols ospf area 0.0.0.4 interface fe-1/0/0

```

#### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Modifying the Junos OS Configuration* in *CLI User Guide*.

To configure an OSPF import policy for network summaries:

1. Configure the interfaces.



**NOTE:** For OSPFv3, use IPv6 addresses.

```

[edit]
user@R1# set interfaces fe-0/1/0 unit 0 family inet address 10.0.4.13/30
user@R1# set interfaces fe-0/0/1 unit 0 family inet address 10.0.4.5/30

[edit]
user@R2# set interfaces fe-0/1/0 unit 0 family inet address 10.0.4.6/30
user@R2# set interfaces fe-1/0/0 unit 0 family inet address 10.0.4.1/30

[edit]
user@R3# set interfaces fe-1/0/0 unit 0 family inet address 10.0.4.2/30
user@R3# set interfaces fe-1/1/0 unit 0 family inet address 10.0.4.14/30
user@R3# set interfaces fe-0/0/1 unit 0 family inet address 10.0.2.1/30

```

```
[edit]
user@R4# set interfaces fe-0/0/1 unit 0 family inet address 10.0.2.1/30
user@R4# set interfaces fe-1/1/0 unit 0 family inet address 10.0.8.6/30
user@R4# set interfaces fe-1/0/0 unit 0 family inet address 10.0.8.9/30

[edit]
user@R5# set interfaces fe-1/1/0 unit 0 family inet address 10.0.8.5/30

[edit]
user@R6# set interfaces fe-1/0/0 unit 0 family inet address 10.0.8.10/30
```

2. Enable OSPF on the interfaces.



**NOTE:** For OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@R1# set protocols ospf area 0.0.0.3 interface fe-0/1/0
user@R1# set protocols ospf area 0.0.0.3 interface fe-0/0/1

[edit]
user@R2# set protocols ospf area 0.0.0.3 interface fe-0/1/0
user@R2# set protocols ospf area 0.0.0.3 interface fe-1/0/0

[edit]
user@R3# set protocols ospf area 0.0.0.3 interface fe-1/0/0
user@R3# set protocols ospf area 0.0.0.3 interface fe-1/1/0
user@R3# set protocols ospf area 0.0.0.0 interface fe-0/0/1

[edit]
user@R4# set protocols ospf area 0.0.0.0 interface fe-0/0/1
user@R4# set protocols ospf area 0.0.0.4 interface fe-1/1/0
user@R4# set protocols ospf area 0.0.0.4 interface fe-1/0/0

[edit]
user@R5# set protocols ospf area 0.0.0.4 interface fe-1/1/0

[edit]
user@R6# set protocols ospf area 0.0.0.4 interface fe-1/0/0
```

3. On R3, configure the import network summary policy.

```
[edit ]
user@R3# set policy-options policy-statement import-policy term term1 from
route-filter 10.0.4.12/30 prefix-length-range /30-/30
user@R3# set policy-options policy-statement import-policy term term1 then accept
```

4. On R3, apply the import network summary policy to OSPF.



**NOTE:** For OSPFv3, include the `inter-area-prefix-export` statement at the `[edit protocols ospf3 area area-id]` hierarchy level.

```
[edit]
user@R3# set protocols ospf area 0.0.0.3 network-summary-import import-policy
```

5. If you are done configuring the devices, commit the configuration.

```
[edit]
user@host# commit
```

**Results** Confirm your configuration by entering the **show interfaces**, **show policy-options**, and **show protocols ospf** commands on the appropriate device. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

Output for R1:

```
user@R1# show interfaces
fe-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.4.5/30;
    }
  }
}
fe-0/1/0 {
  unit 0 {
    family inet {
      address 10.0.4.13/30;
    }
  }
}

user@R1# show protocols ospf
area 0.0.0.3 {
  interface fe-0/1/0.0;
  interface fe-0/0/1.0;
}
```

Output for R2:

```
user@R2# show interfaces
fe-0/1/0 {
  unit 0 {
    family inet {
      address 10.0.4.6/30;
    }
  }
}
fe-1/0/0 {
  unit 0 {
    family inet {
      address 10.0.4.1/30;
    }
  }
}

user@R2# show protocols ospf
area 0.0.0.3 {
  interface fe-0/1/0.0;
  interface fe-1/0/0.0;
}
```



Output for R3:

```

user@R3# show interfaces
fe-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.2.1/30;
    }
  }
}
fe-1/0/0 {
  unit 0 {
    family inet {
      address 10.0.4.2/30;
    }
  }
}
fe-1/1/0 {
  unit 0 {
    family inet {
      address 10.0.4.14/30;
    }
  }
}

user@R3# show protocols ospf
area 0.0.0.0 {
  interface fe-0/0/1.0;
}
area 0.0.0.3 {
  network-summary-import import-policy;
  interface fe-1/0/0.0;
  interface fe-1/1/0.0;
}

user@R3# show policy-options
policy-statement import-policy {
  term term1 {
    from {
      route-filter 10.0.4.12/30 prefix-length-range /30-/30;
    }
    then accept;
  }
}

```

Output for R4:

```

user@R4# show interfaces
fe-0/0/1 {
  unit 0 {
    family inet {
      address 10.0.2.1/30;
    }
  }
}
fe-1/0/0 {
  unit 0 {

```

```
        family inet {
            address 10.0.8.9/30;
        }
    }
}
fe-1/1/0 {
    unit 0 {
        family inet {
            address 10.0.8.6/30;
        }
    }
}

user@R4# show protocols ospf
area 0.0.0.0 {
    interface fe-0/0/1.0;
}
area 0.0.0.4 {
    interface fe-0/1/0.0;
    interface fe-1/0/0.0;
}
```

Output for R5:

```
user@R5# show interfaces
fe-1/1/0 {
    unit 0 {
        family inet {
            address 10.0.8.5/30;
        }
    }
}

user@R5# show protocols ospf
area 0.0.0.4 {
    interface fe-1/1/0.0;
}
```

Output for R6:

```
user@R6# show interfaces
fe-1/0/0 {
    unit 0 {
        family inet {
            address 10.0.8.10/30;
        }
    }
}

user@R6# show protocols ospf
area 0.0.0.4 {
    interface fe-1/0/0.0;
}
```

To confirm your OSPFv3 configuration, enter the **show interfaces**, **show policy-options**, and **show protocols ospf3** commands on the appropriate device.

### Verification

---

Confirm that the configuration is working properly.

- [Verifying the OSPF Database on page 177](#)
- [Verifying the Routing Table on page 177](#)

#### ***Verifying the OSPF Database***

**Purpose** Verify that the OSPF database for the devices in area 4 includes the interarea route that we are advertising from R3. Any other routes from area 3 should not be advertised into area 4, so those entries should age out or no longer be present in the OSPF database.

**Action** From operational mode, enter the **show ospf database netsummary area 0.0.0.4** command for OSPFv2, and enter the **show ospf3 database inter-area-prefix area 0.0.0.4** command for OSPFv3.

#### ***Verifying the Routing Table***

**Purpose** Verify that the specified route is included in R4's, R5's, or R6's routing table. Any other routes from area 3 should not be advertised into area 4.

**Action** From operational mode, enter the **show route protocol ospf** command for both OSPFv2 and OSPFv3.

**Related Documentation**

- [OSPF Overview on page 4](#)
- *OSPF Configuration Overview*
- *Routing Policy Match Conditions in the Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices*
- *Actions in Routing Policy Terms in the Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices*



## PART 3

# Monitoring and Troubleshooting

- [OSPF Monitoring on page 181](#)
- [Routine Monitoring on page 189](#)



## CHAPTER 11

# OSPF Monitoring

- [Example: Configuring OSPF Trace Options on page 181](#)

### Example: Configuring OSPF Trace Options

---

- [Tracing OSPF Protocol Traffic on page 181](#)
- [Example: Tracing OSPF Protocol Traffic on page 182](#)

### Tracing OSPF Protocol Traffic

Tracing operations record detailed messages about the operation of OSPF. You can trace OSPF protocol traffic to help debug OSPF protocol issues. When you trace OSPF protocol traffic, you specify the name of the file and the type of information you want to trace.

You can specify the following OSPF protocol-specific trace options:

- **database-description**—All database description packets, which are used in synchronizing the OSPF topological database
- **error**—OSPF error packets
- **event**—OSPF state transitions
- **flooding**—Link-state flooding packets
- **graceful-restart**—Graceful-restart events
- **hello**—Hello packets, which are used to establish neighbor adjacencies and to determine whether neighbors are reachable
- **ldp-synchronization**—Synchronization events between OSPF and LDP
- **lsa-ack**—Link-state acknowledgment packets, which are used in synchronizing the OSPF topological database
- **lsa-analysis**—Link-state analysis. Specific to the Juniper Networks implementation of OSPF, Junos OS performs LSA analysis before running the shortest-path-first (SPF) algorithm. LSA analysis helps to speed the calculations performed by the SPF algorithm.
- **lsa-request**—Link-state request packets, which are used in synchronizing the OSPF topological database
- **lsa-update**—Link-state updates packets, which are used in synchronizing the OSPF topological database

- **nsr-synchronization**—Nonstop routing synchronization events
- **on-demand**—Trace demand circuit extensions
- **packet-dump**—Dump the contents of selected packet types
- **packets**—All OSPF packets
- **restart-signaling**—(OSPFv2 only) Restart-signaling graceful restart events
- **spf**—Shortest path first (SPF) calculations

You can optionally specify one or more of the following flag modifiers:

- **detail**—Detailed trace information
- **receive**—Packets being received
- **send**—Packets being transmitted



**NOTE:** Use the **detail** flag modifier with caution as it might cause the CPU to become very busy.

---

Global tracing options are inherited from the configuration set by the **traceoptions** statement at the **[edit routing-options]** hierarchy level. You can override the following global trace options for the OSPF protocol using the **traceoptions flag** statement included at the **[edit protocols ospf]** hierarchy level:

- **all**—All tracing operations
- **general**—All normal operations and routing table changes (a combination of the normal and route trace operations)
- **normal**—Normal events
- **policy**—Policy processing
- **route**—Routing information
- **state**—State transitions
- **task**—Routing protocol task processing
- **timer**—Routing protocol timer processing



**NOTE:** Use the trace flag **all** with caution as it might cause the CPU to become very busy.

---

### Example: Tracing OSPF Protocol Traffic

This example shows how to trace OSPF protocol traffic.

- [Requirements on page 183](#)
- [Overview on page 183](#)



- [Configuration on page 184](#)
- [Verification on page 187](#)

## Requirements

This example assumes that OSPF is properly configured and running in your network, and you want to trace OSPF protocol traffic for debugging purposes.

## Overview

You can trace OSPF protocol traffic to help debug OSPF protocol issues. When you trace OSPF protocol traffic, you specify the name of the file and the type of information you want to trace. All files are placed in a directory on the routing device's hard disk. On M Series and T Series routers, trace files are stored in the /var/log directory.

This example shows a few configurations that might be useful when debugging OSPF protocol issues. The verification output displayed is specific to each configuration.



**TIP:** To keep track of your log files, create a meaningful and descriptive name so it is easy to remember the content of the trace file. We recommend that you place global routing protocol tracing output in the file `routing-log`, and OSPF tracing output in the file `ospf-log`.

In the first example, you globally enable tracing operations for all routing protocols that are actively running on your routing device to the file `routing-log`. With this configuration, you keep the default settings for the trace file size and the number of trace files. After enabling global tracing operations, you enable tracing operations to provide detailed information about OSPF packets, including link-state advertisements, requests, and updates, database description packets, and hello packets to the file `ospf-log`, and you configure the following options:

- **size**—Specifies the maximum size of each trace file, in KB, MB, or GB. In this example, you configure 10 KB as the maximum size. When the file reaches its maximum size, it is renamed with a .0 extension. When the file again reaches its maximum size, it is renamed with a .1 extension, and the newly created file is renamed with a .0 extension. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten. If you specify a maximum file size, you must also specify a maximum number of trace files with the **files** option. You specify **k** for KB, **m** for MB, and **g** for GB. By default, the trace file size is 128 KB. The file size range is 10 KB through the maximum file size supported on your system.
- **files**—Specifies the maximum number of trace files. In this example, you configure a maximum of 5 trace files. When a trace file reaches its maximum size, it is renamed with a .0 extension, then a .1 extension, and so on until the maximum number of trace files is reached. When the maximum number of files is reached, the oldest trace file is overwritten. If you specify a maximum number of files, you must also specify a maximum file size with the **size** option. By default, there are 10 files. The range is 2 through 1000 files.

In the second example, you trace all SPF calculations to the file `ospf-log` by including the `spf` flag. You keep the default settings for the trace file size and the number of trace files.

In the third example, you trace the creation, receipt, and retransmission of all LSAs to the file `ospf-log` by including the `lsa-request`, `lsa-update`, and `lsa-ack` flags. You keep the default settings for the trace file size and the number of trace files.

### Configuration

- [Configuring Global Tracing Operations and Tracing OSPF Packet Information on page 184](#)
- [Tracing SPF Calculations on page 185](#)
- [Tracing Link-State Advertisements on page 186](#)

#### Configuring Global Tracing Operations and Tracing OSPF Packet Information

##### CLI Quick Configuration

To quickly enable global tracing operations for all routing protocols actively running on your routing device and to trace detailed information about OSPF packets, copy the following commands and paste them into the CLI.

```
[edit]
set routing-options traceoptions file routing-log
set protocols ospf traceoptions file ospf-log
set protocols ospf traceoptions file files 5 size 10k
set protocols ospf traceoptions flag lsa-ack
set protocols ospf traceoptions flag database-description
set protocols ospf traceoptions flag hello
set protocols ospf traceoptions flag lsa-update
set protocols ospf traceoptions flag lsa-request
```

##### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Modifying the Junos OS Configuration* in *CLI User Guide*.

To configure global routing tracing operations and tracing operations for OSPF packets:

1. Configure tracing at the routing options level to collect information about the active routing protocols on your routing device.

```
[edit]
user@host# edit routing-options traceoptions
```

2. Configure the filename for the global trace file.

```
[edit routing-options traceoptions]
user@host# set file routing-log
```

3. Configure the filename for the OSPF trace file.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
```

- ```

user@host# edit protocols ospf traceoptions
user@host# set file ospf-log

```
4. Configure the maximum number of trace files.

```

[edit protocols ospf traceoptions]
user@host# set file files 5

```
  5. Configure the maximum size of each trace file.

```

[edit protocols ospf traceoptions]
user@host# set file size 10k

```
  6. Configure tracing flags.

```

[edit protocols ospf traceoptions]
user@host# set flag lsa-ack
user@host# set flag database-description
user@host# set flag hello
user@host# set flag lsa-update
user@host# set flag lsa-request

```
  7. If you are done configuring the device, commit the configuration.

```

[edit protocols ospf traceoptions]
user@host# commit

```

**Results** Confirm your configuration by entering the **show routing-options** and the **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```

user@host# show routing-options
traceoptions {
  file routing-log;
}

user@host# show protocols ospf
traceoptions {
  file ospf-log size 10k files 5;
  flag lsa-ack;
  flag database-description;
  flag hello;
  flag lsa-update;
  flag lsa-request;
}

```

To confirm your OSPFv3 configuration, enter the **show routing-options** and the **show protocols ospf3** commands.

### *Tracing SPF Calculations*

**CLI Quick Configuration** To quickly trace SPF calculations, copy the following commands and paste them into the CLI.

```

[edit]
set protocols ospf traceoptions file ospf-log
set protocols ospf traceoptions flag spf

```

**Step-by-Step Procedure** To configure SPF tracing operations for OSPF:

1. Configure the filename for the OSPF trace file.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# edit protocols ospf traceoptions
user@host# set file ospf-log
```

2. Configure the SPF tracing flag.

```
[edit protocols ospf traceoptions]
user@host# set flag spf
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf traceoptions]
user@host# commit
```

**Results** Confirm your configuration by entering the `show protocols ospf` command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
traceoptions {
  file ospf-log ;
  flag spf;
}
```

To confirm your OSPFv3 configuration, enter the `show protocols ospf3` command.

### *Tracing Link-State Advertisements*

**CLI Quick Configuration** To quickly trace the creation, receipt, and retransmission of all LSAs, copy the following commands and paste them into the CLI.

```
[edit]
set protocols ospf traceoptions file ospf-log
set protocols ospf traceoptions flag lsa-request
set protocols ospf traceoptions flag lsa-update
set protocols ospf traceoptions flag lsa-ack
```

**Step-by-Step Procedure** To configure link-state advertisement tracing operations for OSPF:

1. Configure the filename for the OSPF trace file.



**NOTE:** To specify OSPFv3, include the `ospf3` statement at the `[edit protocols]` hierarchy level.

```
[edit]
user@host# edit protocols ospf traceoptions
user@host# set file ospf-log
```

2. Configure the link-state advertisement tracing flags.

```
[edit protocols ospf traceoptions]
user@host# set flag lsa-request
user@host# set flag lsa-update
user@host# set flag lsa-ack
```

3. If you are done configuring the device, commit the configuration.

```
[edit protocols ospf traceoptions]
user@host# commit
```

**Results** Confirm your configuration by entering the **show protocols ospf** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show protocols ospf
traceoptions {
  file ospf-log;
  flag lsa-request;
  flag lsa-update;
  flag lsa-ack;
}
```

To confirm your OSPFv3 configuration, enter the **show protocols ospf3** command.

### Verification

Confirm that the configuration is working properly.

#### Verifying Trace Operations

**Purpose** Verify that the Trace options field displays the configured trace operations, and verify that the Trace file field displays the location on the routing device where the file is saved, the name of the file to receive the output of the tracing operation, and the size of the file.

**Action** From operational mode, enter the **show ospf overview extensive** command for OSPFv2, and enter the **show ospf3 overview extensive** command for OSPFv3.

**Related Documentation**

- [OSPF Overview on page 4](#)
- *OSPF Configuration Overview*
- *Tracing and Logging Junos OS Operations* in the *Junos OS Administration Library for Routing Devices*
- *Example: Tracing Global Routing Protocol Operations* in the *Junos OS Routing Protocols Library for Routing Devices*



## CHAPTER 12

# Routine Monitoring

- [Monitoring OSPF Routing Information on page 189](#)

### Monitoring OSPF Routing Information

---

<b>Purpose</b>	Use the monitoring functionality to monitor OSPF routing information on routing devices.
<b>Action</b>	To view OSPF routing information in the CLI, enter the following CLI commands: <ul style="list-style-type: none"><li>• <code>show ospf neighbor</code></li><li>• <code>show ospf interface</code></li><li>• <code>show ospf statistics</code></li></ul>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">show (ospf   ospf3) interface on page 258</a></li><li>• <a href="#">clear (ospf   ospf3) neighbor on page 237</a></li><li>• <a href="#">show (ospf   ospf3) statistics on page 286</a></li></ul>





## PART 4

# Configuration Statements and Operational Commands

- Configuration Statements on page 193
- Operational Commands on page 231



## CHAPTER 13

# Configuration Statements

- [area](#) on page 194
- [area-range](#) on page 196
- [authentication \(Protocols OSPF\)](#) on page 198
- [context-identifier \(Protocols OSPF\)](#) on page 199
- [bfd-liveness-detection \(Protocols OSPF\)](#) on page 200
- [database-protection](#) on page 204
- [disable \(OSPF\)](#) on page 206
- [export \(Protocols OSPF\)](#) on page 208
- [external-preference \(Protocols OSPF\)](#) on page 209
- [graceful-restart \(Protocols OSPF\)](#) on page 210
- [import \(Protocols OSPF\)](#) on page 212
- [interface \(Protocols OSPF\)](#) on page 213
- [no-nssa-abr](#) on page 215
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- [reference-bandwidth \(Protocols OSPF\)](#) on page 222
- [rib-group \(Protocols OSPF\)](#) on page 223
- [topology \(OSPF\)](#) on page 224
- [traceoptions \(Protocols OSPF\)](#) on page 225
- [traffic-engineering \(OSPF\)](#) on page 228

## area

<b>Syntax</b>	<pre> area <i>area-id</i> {     interface <i>interface-name</i> {         passive;         topology (ipv4-multicast   <i>name</i>) {             disable;         }     }     virtual-link neighbor-id <i>router-id</i> transit-area <i>area-id</i> {         topology (ipv4-multicast   <i>name</i>) {             disable;         }     } } </pre>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<b>ospf</b>   ospf3)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	<p>Specify the area identifier for this routing device to use when participating in OSPF routing. All routing devices in an area must use the same area identifier to establish adjacencies.</p> <p>Specify multiple <b>area</b> statements to configure the routing device as an area border router. An area border router does not automatically summarize routes between areas. Use the <b>area-range</b> statement to configure route summarization. By definition, an area border router must be connected to the backbone area either through a physical link or through a virtual link. To create a virtual link, include the <b>virtual-link</b> statement.</p> <p>To specify that the routing device is directly connected to the OSPF backbone, include the <b>area 0.0.0.0</b> statement.</p> <p>All routing devices on the backbone must be contiguous. If they are not, use the <b>virtual-link</b> statement to create the appearance of connectivity to the backbone.</p>

You can also configure any interface that belongs to one or more topologies to advertise the direct interface addresses without actually running OSPF on that interface. By default, OSPF must be configured on an interface in order for direct interface addresses to be advertised as interior routes.



**NOTE:** If you configure an interface with the **passive** statement, it applies to all the topologies to which the interface belongs. You cannot configure an interface as passive for only one specific topology and have it remain active for any other topologies to which it belongs.

<b>Options</b>	<b>area-id</b> —Area identifier. The identifier can be up to 32 bits. It is common to specify the area number as a simple integer or an IP address. Area number <b>0.0.0.0</b> is reserved for the OSPF backbone area.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">OSPF Areas and Router Functionality Overview on page 9</a></li> <li>• <a href="#">Understanding Multiple Address Families for OSPFv3 on page 62</a></li> <li>• <a href="#">virtual-link</a></li> </ul>

## area-range

<b>Syntax</b>	<b>area-range</b> <i>network/mask-length</i> <exact> <override-metric <i>metric</i> > <restrict>;
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (ospf   ospf3) <b>area</b> <i>area-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols (ospf   ospf3) area <i>area-id</i> nssa],</p> <p>[edit logical-systems <i>logical-system-name</i> realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) area <i>area-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) <b>area</b> <i>area-id</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) area <i>area-id</i> nssa],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) <b>area</b> <i>area-id</i>],</p> <p>[edit protocols (ospf   ospf3) <b>area</b> <i>area-id</i>],</p> <p>[edit protocols (ospf   ospf3) area <i>area-id</i> nssa],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) <b>area</b> <i>area-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) <b>area</b> <i>area-id</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) area <i>area-id</i> nssa],</p> <p>[edit routing-instances <i>routing-instance-name</i> realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) <b>area</b> <i>area-id</i>]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	<p>(Area border routers only) For an area, summarize a range of IP addresses when sending summary link advertisements (within an area). To summarize multiple ranges, include multiple <b>area-range</b> statements.</p> <p>For a not-so-stubby area (NSSA), summarize a range of IP addresses when sending NSSA link-state advertisements. The specified prefixes are used to aggregate external routes learned within the area when the routes are advertised to other areas. To specify multiple prefixes, include multiple <b>area-range</b> statements. All external routes learned within the area that do not fall into one of the prefixes are advertised individually to other areas.</p>
<b>Default</b>	By default, area border routing devices do not summarize routes being sent from one area to other areas, but rather send all routes explicitly.
<b>Options</b>	<p><b>exact</b>—(Optional) Summarization of a route is advertised only when an exact match is made with the configured summary range.</p> <p><b>mask-length</b>—Number of significant bits in the network mask.</p> <p><b>network</b>—IP address. You can specify one or more IP addresses.</p>

**override-metric *metric***—(Optional) Override the metric for the IP address range and configure a specific metric value.

**restrict**—(Optional) Do not advertise the configured summary. This hides all routes that are contained within the summary, effectively creating a route filter.

**Range:** 1 through 16,777,215

<b>Required Privilege</b>	routing—To view this statement in the configuration.
<b>Level</b>	routing-control—To add this statement to the configuration.

<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Example: Summarizing Ranges of Routes in OSPF Link-State Advertisements on page 68</a></li></ul>
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## authentication (Protocols OSPF)

<b>Syntax</b>	<pre> authentication {     md5 key-identifier {         key key-value;         start-time YYYY-MM-DD.hh:mm;     }     simple-password key; } </pre>
<b>Hierarchy Level</b>	<pre> [edit logical-systems <i>logical-system-name</i> protocols ospf area <i>area-id</i> <b>interface</b> <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> protocols ospf area <i>area-id</i> virtual-link], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf area <i>area-id</i> <b>interface</b> <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf area <i>area-id</i> virtual-link], [edit protocols ospf area <i>area-id</i> <b>interface</b> <i>interface-name</i>], [edit protocols ospf area <i>area-id</i> virtual-link], [edit routing-instances <i>routing-instance-name</i> protocols ospf area <i>area-id</i> <b>interface</b> <i>interface-name</i>], [edit routing-instances <i>routing-instance-name</i> protocols ospf area <i>area-id</i> virtual-link] </pre>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	<p>Configure an authentication key (password). Neighboring routers use the password to verify the authenticity of packets sent from this interface.</p> <p>All routers that are connected to the same IP subnet must use the same authentication scheme and password.</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <i>Understanding OSPFv2 Authentication</i></li> <li>• <i>Example: Configuring MD5 Authentication for OSPFv2 Exchanges</i></li> <li>• <i>Example: Configuring a Transition of MD5 Keys on an OSPFv2 Interface</i></li> <li>• <i>Example: Configuring Simple Authentication for OSPFv2 Exchanges</i></li> </ul>



## context-identifier (Protocols OSPF)

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<b>Syntax</b>	context-identifier <i>identifier</i>
<b>Hierarchy Level</b>	[edit logical-systems <i>logical-system-name</i> protocols (ospf   ospf3) <b>area</b> <i>area-id</i> ], [edit protocols (ospf   ospf3) <b>area</b> <i>area-id</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 10.4. Statement introduced in Junos OS Release 11.3 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Configure OSPF context-identifier information.
<b>Options</b>	<i>identifier</i> —IPv4 address that defines a protection pair. The context identifier is manually configured on both the primary and protector provider edge (PE) devices.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">show ospf context-identifier on page 247</a></li> </ul>

## bfd-liveness-detection (Protocols OSPF)

**Syntax**    `bfd-liveness-detection {`  
                   `authentication {`  
                     `algorithm algorithm-name;`  
                     `key-chain key-chain-name;`  
                     `loose-check;`  
                   `}`  
                   `detection-time {`  
                     `threshold milliseconds;`  
                   `}`  
                   `full-neighbors-only`  
                   `minimum-interval milliseconds;`  
                   `minimum-receive-interval milliseconds;`  
                   `multiplier number;`  
                   `no-adaptation;`  
                   `transmit-interval {`  
                     `minimum-interval milliseconds;`  
                     `threshold milliseconds;`  
                   `}`  
                   `version (1 | automatic);`  
                   `}`

**Hierarchy Level**    `[edit logical-systems logical-system-name protocols (ospf | ospf3) area area-id interface interface-name],`  
                           `[edit logical-systems logical-system-name protocols ospf3 realm (ipv4-unicast |`  
                             `ipv4-multicast | ipv6-multicast) area area-id interface interface-name],`  
                           `[edit logical-systems logical-system-name routing-instances routing-instance-name protocols`  
                             `(ospf | ospf3) area area-id interface interface-name],`  
                           `[edit logical-systems logical-system-name routing-instances routing-instance-name protocols`  
                             `ospf3 realm (ipv4-unicast | ipv4-multicast | ipv6-multicast) area area-id interface`  
                             `interface-name],`  
                           `[edit protocols (ospf | ospf3) area area-id interface interface-name],`  
                           `[edit protocols ospf3 realm (ipv4-unicast | ipv4-multicast | ipv6-multicast) area area-id`  
                             `interface interface-name],`  
                           `[edit routing-instances routing-instance-name protocols (ospf | ospf3) area area-id interface`  
                             `interface-name],`  
                           `[edit routing-instances routing-instance-name protocols ospf3 realm (ipv4-unicast |`  
                             `ipv4-multicast | ipv6-multicast) area area-id interface interface-name]`

**Release Information**    Statement introduced before Junos OS Release 7.4.  
                               Statement introduced in Junos OS Release 9.0 for EX Series switches.  
                               **detection-time threshold** and **transmit-interval threshold** options added in Junos OS Release 8.2.  
                               Support for logical systems introduced in Junos OS Release 8.3.  
                               **no-adaptation** option introduced in Junos OS Release 9.0.  
                               **no-adaptation** option introduced in Junos OS Release 9.0 for EX Series switches.  
                               Support for OSPFv3 introduced in Junos OS Release 9.3.  
                               Support for OSPFv3 introduced in Junos OS Release 9.3 for EX Series switches.  
                               **full-neighbors-only** option introduced in Junos OS Release 9.5.  
                               **full-neighbors-only** option introduced in Junos OS Release 9.5 for EX Series switches.

**authentication algorithm**, **authentication key-chain**, and **authentication loose-check** options introduced in Junos OS Release 9.6.

Statement introduced in Junos OS Release 12.1 for the QFX Series.

Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

**Description** Configure bidirectional failure detection timers and authentication for OSPF.

The remaining statements are explained separately.

**Options**    **authentication algorithm** *algorithm-name* —Configure the algorithm used to authenticate the specified BFD session: **simple-password**, **keyed-md5**, **keyed-sha-1**, **meticulous-keyed-md5**, or **meticulous-keyed-sha-1**.

**authentication key-chain** *key-chain-name* —Associate a security key with the specified BFD session using the name of the security keychain. The name you specify must match one of the keychains configured in the **authentication-key-chains key-chain** statement at the **[edit security]** hierarchy level.

**authentication loose-check**—(Optional) Configure loose authentication checking on the BFD session. Use only for transitional periods when authentication may not be configured at both ends of the BFD session.

**detection-time threshold** *milliseconds*—Configure a threshold for the adaptation of the BFD session detection time. When the detection time adapts to a value equal to or greater than the threshold, a single trap and a single system log message are sent.

**full-neighbors-only**—Establish BFD sessions only for OSPF neighbors in the full state. The default behavior is to establish BFD sessions for all OSPF neighbors.

**minimum-interval** *milliseconds*—Configure the minimum interval after which the local routing device transmits a hello packet and then expects to receive a reply from the neighbor with which it has established a BFD session. Optionally, instead of using this statement, you can configure the minimum transmit and receive intervals separately using the **transmit-interval minimum-interval** and **minimum-receive-interval** statements.

**Range:** 1 through 255,000 milliseconds

**minimum-receive-interval** *milliseconds*—Configure the minimum interval after which the routing device expects to receive a reply from a neighbor with which it has established a BFD session. Optionally, instead of using this statement, you can configure the minimum receive interval using the **minimum-interval** statement.

**Range:** 1 through 255,000 milliseconds

**multiplier** *number*—Configure the number of hello packets not received by a neighbor that causes the originating interface to be declared down.

**Range:** 1 through 255

**Default:** 3

**no-adaptation**—Specify that BFD sessions should not adapt to changing network conditions. We recommend that you not disable BFD adaptation unless it is preferable not to have BFD adaptation enabled in your network.

**transmit-interval threshold** *milliseconds*—Configure the threshold for the adaptation of the BFD session transmit interval. When the transmit interval adapts to a value greater than the threshold, a single trap and a single system message are sent. The interval threshold must be greater than the minimum transmit interval.

**Range:** 0 through 4,294,967,295 ( $2^{32} - 1$ )

**transmit-interval minimum-interval** *milliseconds*—Configure the minimum interval at which the routing device transmits hello packets to a neighbor with which it has established

a BFD session. Optionally, instead of using this statement, you can configure the minimum transmit interval using the **minimum-interval** statement.

**Range:** 1 through 255,000

**version**—Configure the BFD version to detect: **1** (BFD version 1) or **automatic** (autodetect the BFD version).

**Default:** **automatic**

<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
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<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Example: Configuring BFD for OSPF on page 100</a></li><li>• <a href="#">Example: Configuring BFD Authentication for OSPF on page 103</a></li></ul>
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## database-protection

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<b>Syntax</b>	<pre>database-protection {     ignore-count <i>number</i>;     ignore-time <i>seconds</i>;     maximum-lsa <i>number</i>;     reset-time <i>seconds</i>;     warning-only;     warning-threshold <i>percent</i>; }</pre>
<b>Hierarchy Level</b>	<pre>[edit protocols (<i>ospf</i>   <i>ospf3</i>)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols   (<i>ospf</i>   <i>ospf3</i>)], [edit routing-instances <i>routing-instance-name</i> protocols (<i>ospf</i>   <i>ospf3</i>)], [edit routing-instances <i>routing-instance-name</i> protocols <i>ospf3</i> realm (<i>ipv4-unicast</i>     <i>ipv4-multicast</i>   <i>ipv6-unicast</i>   <i>ipv6-multicast</i>)]</pre>
<b>Release Information</b>	<p>Statement introduced in Junos OS Release 10.2.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Configure the maximum number of link-state advertisements (LSAs) that are not generated by the router or switch in a given OSPF instance.
<b>Default</b>	By default, OSPF database protection is not enabled.
<b>Options</b>	<p><b>ignore-count <i>number</i></b>—Configure the number of times the database can enter the ignore state. When the ignore count is exceeded, the database enters the isolate state.</p> <p><b>Range:</b> 1 through 32</p> <p><b>Default:</b> 5</p> <p><b>ignore-time <i>seconds</i></b>—Configure the time the database must remain in the ignore state before it resumes regular operations (enters retry state).</p> <p><b>Range:</b> 30 through 3,600 seconds</p> <p><b>Default:</b> 300 seconds</p> <p><b>maximum-lsa <i>number</i></b>—Configure the maximum number of LSAs whose advertising router ID is different from the local router ID in a given OSPF instance. This includes external LSAs as well as LSAs with any scope, such as the link, area, and autonomous system (AS). This value is mandatory.</p> <p><b>Range:</b> 1 through 1,000,000</p> <p><b>Default:</b> None</p> <p><b>reset-time <i>seconds</i></b>—Configure the time period during which the database must operate without being in the ignore or isolate state before it is reset to a normal operating state.</p> <p><b>Range:</b> 60 through 86,400 seconds</p> <p><b>Default:</b> 600 seconds</p>

**warning-only**—Specify that only a warning should be issued when the maximum LSA number is exceeded. If configured, no other action is taken against the database.

**warning-threshold *percent***—Configure the percentage of the maximum number of LSAs to be exceeded before a warning message is logged.

**Range:** 30 through 100 percent

**Default:** 75 percent

<b>Required Privilege</b>	routing—To view this statement in the configuration.
<b>Level</b>	routing-control—To add this statement to the configuration.

<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">OSPF Database Protection Overview on page 139</a></li><li>• <a href="#">Configuring OSPF Database Protection on page 140</a></li></ul>
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## disable (OSPF)

<b>Syntax</b>	disable;
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols (ospf   ospf3) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf <b>area</b> <i>area-id</i> <b>peer-interface</b> <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols (ospf   ospf3) virtual-link],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) virtual-link],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instances</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>],</p> <p>[edit protocols (<b>ospf</b>   ospf3)],</p> <p>[edit protocols (ospf   ospf3) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>],</p> <p>[edit protocols (ospf   ospf3) virtual-link],</p> <p>[edit protocols ospf <b>area</b> <i>area-id</i> <b>peer-interface</b> <i>interface-name</i>],</p> <p>[edit protocols ospf <i>area</i> <i>area-id</i> virtual-link neighbor-id <i>router-id</i> transit-area <i>area-id</i>],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (ospf   ospf3) virtual-link],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast) <b>area</b> <i>area-id</i> <b>interface</b> <i>interface-name</i>]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Disable OSPF, an OSPF interface, or an OSPF virtual link.



By default, control packets sent to the remote end of a virtual link must be forwarded using the default topology. In addition, the transit area path consists only of links that are in the default topology. You can disable a virtual link for a configured topology, but not for a default topology. Include the **disable** statement at the **[edit protocols ospf area *area-id* virtual-link neighbor-id router-id transit-area *area-id* topology *name*]** hierarchy level.



**NOTE:** If you disable the virtual link by including the **disable** statement at the **[edit protocols ospf area *area-id* virtual-link neighbor-id router-id transit-area *area-id*]** hierarchy level, you disable the virtual link for all topologies, including the default topology. You cannot disable the virtual link only in the default topology.

<b>Default</b>	The configured object is enabled (operational) unless explicitly disabled.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <i>OSPF Configuration Overview</i></li> <li>• <i>Configuring RSVP and OSPF for LMP Peer Interfaces</i></li> </ul>

## export (Protocols OSPF)

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<b>Syntax</b>	<code>export [ <i>policy-names</i> ];</code>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Apply one or more policies to routes being exported from the routing table into OSPF.
<b>Options</b>	<i>policy-names</i> —Name of one or more policies.
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Understanding OSPF Routing Policy on page 143</a></li><li>• <a href="#">Import and Export Policies for Network Summaries Overview on page 159</a></li><li>• <a href="#">import on page 212</a></li><li>• <i>Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices</i></li></ul>

## external-preference (Protocols OSPF)

<b>Syntax</b>	<code>external-preference <i>preference</i>;</code>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Set the route preference for OSPF external routes.
<b>Options</b>	<p><b><i>preference</i></b>—Preference value.</p> <p><b>Range:</b> 0 through 4,294,967,295 (<math>2^{32} - 1</math>)</p> <p><b>Default:</b> 150</p>
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Example: Controlling OSPF Route Preferences on page 84</a></li> <li>• <a href="#">preference on page 220</a></li> </ul>

## graceful-restart (Protocols OSPF)

<b>Syntax</b>	<pre> graceful-restart {   disable;   helper-disable (standard   restart-signaling   both);   no-strict-lsa-checking;   notify-duration <i>seconds</i>;   restart-duration <i>seconds</i>; } </pre>
<b>Hierarchy Level</b>	<pre> [edit logical-systems <i>logical-system-name</i> protocols (<b>ospf</b>   ospf3)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)], [edit protocols (<b>ospf</b>   ospf3)], [edit routing-instances <i>routing-instance-name</i> protocols ospf] </pre>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Support for the <b>no-strict-lsa-checking</b> statement introduced in Junos OS Release 8.5.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the helper mode <b>standard</b>, <b>restart-signaling</b>, and <b>both</b> options introduced in Junos OS Release 11.4.</p> <p>Statement introduced in Junos OS Release 12.1 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	<p>Configure graceful restart for OSPF.</p> <p>Graceful restart allows a routing device to restart with minimal effects to the network, and is enabled for all routing protocols at the <b>[edit routing-options]</b> hierarchy level.</p>
<b>Options</b>	<p><b>disable</b>—Disable graceful restart for OSPF.</p> <p><b>helper-disable (standard   restart-signaling   both)</b>—Disable helper mode for graceful restart. When helper mode is disabled, a device cannot help a neighboring device that is attempting to restart. Beginning with Junos OS Release 11.4, you can configure restart signaling-based helper mode for OSPFv2 graceful restart configurations. The <b>standard</b>, <b>restart-signaling</b>, and <b>both</b> options are only supported for OSPFv2. Specify <b>standard</b> to disable helper mode for standard graceful restart (based on RFC 3623). Specify <b>restart-signaling</b> to disable helper mode for restart signaling-based graceful restart (based on RFC 4811, RFC 4812, and RFC 4813). Specify <b>both</b> to disable helper mode for both standard and restart signaling-based graceful restart. The last committed statement takes precedence over the previously configured statement.</p> <p><b>Default:</b> Helper mode is enabled by default. For OSPFv2, both standard and restart-signaling based helper modes are enabled by default.</p> <p><b>no-strict-lsa-checking</b>—Disable strict OSPF link-state advertisement (LSA) checking to prevent the termination of graceful restart by a helping router. LSA checking is enabled by default.</p>



**NOTE:** The `helper-disable` statement and the `no-strict-lsa-checking` statement cannot be configured at the same time. If you attempt to configure both statements at the same time, the routing device displays a warning message when you enter the `show protocols (ospf | ospf3)` command.

**notify-duration seconds**—Estimated time needed to send out purged grace LSAs over all the interfaces.

**Range:** 1 through 3600 seconds

**Default:** 30 seconds

**restart-duration seconds**—Estimated time needed to reacquire a full OSPF neighbor from each area.

**Range:** 1 through 3600 seconds

**Default:** 180 seconds

**Required Privilege Level** routing—To view this statement in the configuration.  
routing-control—To add this statement to the configuration.

**Related Documentation**

- [Example: Configuring Graceful Restart for OSPF on page 111](#)
- [Example: Configuring the Helper Capability Mode for OSPFv2 Graceful Restart on page 115](#)
- [Example: Configuring the Helper Capability Mode for OSPFv3 Graceful Restart on page 118](#)
- [Example: Disabling Strict LSA Checking for OSPF Graceful Restart on page 122](#)
- *Junos OS High Availability Library for Routing Devices*

## import (Protocols OSPF)

---

<b>Syntax</b>	<code>import [ <i>policy-names</i> ];</code>
<b>Hierarchy Level</b>	<code>[edit logical-systems <i>logical-system-name</i> protocols (<a href="#">ospf</a>   ospf3)],</code> <code>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast  </code> <code>  ipv4-multicast   ipv6-multicast)],</code> <code>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols</code> <code>  (<a href="#">ospf</a>   ospf3)],</code> <code>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols</code> <code>  ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</code> <code>[edit protocols (<a href="#">ospf</a>   ospf3)],</code> <code>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</code> <code>[edit routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</code> <code>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast  </code> <code>  ipv4-multicast   ipv6-multicast)]</code>
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches. Support for the <b>realm</b> statement introduced in Junos OS Release 9.2. Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches. Statement introduced in Junos OS Release 11.3 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Filter OSPF routes from being added to the routing table.
<b>Options</b>	<i>policy-names</i> —Name of one or more policies.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Understanding OSPF Routing Policy on page 143</a></li><li>• <a href="#">Import and Export Policies for Network Summaries Overview on page 159</a></li><li>• <a href="#">export on page 208</a></li><li>• <i>Routing Policies, Firewall Filters, and Traffic Policers Feature Guide for Routing Devices</i></li></ul>

## interface (Protocols OSPF)

**Syntax** interface *interface-name* {  
 disable;  
 authentication key <key-id identifier>;  
 bfd-liveness-detection {  
 authentication {  
 algorithm *algorithm-name*;  
 key-chain *key-chain-name*;  
 loose-check;  
 }  
 detection-time {  
 threshold *milliseconds*;  
 }  
 minimum-interval *milliseconds*;  
 minimum-receive-interval *milliseconds*;  
 transmit-interval {  
 threshold *milliseconds*;  
 minimum-interval *milliseconds*;  
 }  
 multiplier *number*;  
 }  
 dead-interval *seconds*;  
 demand-circuit;  
 hello-interval *seconds*;  
 ipsec-sa *name*;  
 interface-type *type*;  
 ldp-synchronization {  
 disable;  
 hold-time *seconds*;  
 }  
 metric *metric*;  
 neighbor *address* <eligible>;  
 no-interface-state-traps;  
 passive;  
 poll-interval *seconds*;  
 priority *number*;  
 retransmit-interval *seconds*;  
 te-metric *metric*;  
 topology (ipv4-multicast | *name*) {  
 metric *metric*;  
 }  
 transit-delay *seconds*;  
}

**Hierarchy Level** [edit logical-systems *logical-system-name* protocols (ospf | ospf3) *area area-id*],  
 [edit logical-systems *logical-system-name* protocols ospf3 realm (ipv4-unicast |  
 ipv4-multicast | ipv6-multicast) *area area-id*],  
 [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols  
 (ospf | ospf3) *area area-id*],  
 [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols  
 ospf3 realm (ipv4-unicast | ipv4-multicast | ipv6-multicast) *area area-id*],  
 [edit protocols (ospf | ospf3) *area area-id*],  
 [edit protocols ospf3 realm (ipv4-unicast | ipv4-multicast | ipv6-multicast) *area area-id*],

```
[edit routing-instances routing-instance-name protocols (ospf | ospf3) area area-id],
[edit routing-instances routing-instance-name protocols ospf3 realm (ipv4-unicast |
  ipv4-multicast | ipv6-multicast) area area-id]
```

**Release Information** Statement introduced before Junos OS Release 7.4.  
 Statement introduced in Junos OS Release 9.0 for EX Series switches.  
 Support for the **topology** statement introduced in Junos OS Release 9.0.  
 Support for the **topology** statement introduced in Junos OS Release 9.0 for EX Series switches.  
 Support for the **realm** statement introduced in Junos OS Release 9.2.  
 Support for the **realm** statement introduced in Junos OS Release 9.2 for EX Series switches.  
 Support for the **no-interface-state-traps** statement introduced in Junos OS Release 10.3.  
 This statement is supported only for OSPFv2.  
 Statement introduced in Junos OS Release 11.3 for the QFX Series.  
 Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

**Description** Enable OSPF routing on a routing device interface.

You must include at least one **interface** statement in the configuration to enable OSPF on the routing device.

**Options** *interface-name*—Name of the interface. Specify the interface by IP address or interface name for OSPFv2, or only the interface name for OSPFv3. Using both the interface name and IP address of the same interface produces an invalid configuration. To configure all interfaces, you can specify **all**. Specifying a particular interface and **all** produces an invalid configuration.



**NOTE:** For nonbroadcast interfaces, specify the IP address of the nonbroadcast interface as *interface-name*.

The remaining statements are explained separately.



**NOTE:** You cannot run both OSPF and **ethernet-tcc** encapsulation between two Juniper Networks routing devices.

**Required Privilege Level** routing—To view this statement in the configuration.  
 routing-control—To add this statement to the configuration.



- Related Documentation**
- [OSPF Configuration Overview](#)
  - [Example: Configuring Multitopology Routing Based on Applications](#)
  - [Example: Configuring Multitopology Routing Based on a Multicast Source](#)
  - [Example: Configuring Multiple Address Families for OSPFv3 on page 62](#)
  - [neighbor](#)

## no-nssa-abr

<b>Syntax</b>	no-nssa-abr;
<b>Hierarchy Level</b>	[edit logical-systems <i>logical-system-name</i> protocols ( <a href="#">ospf</a>   ospf3)], [edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ( <a href="#">ospf</a>   ospf3)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)], [edit protocols ( <a href="#">ospf</a>   ospf3)], [edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)], [edit routing-instances <i>routing-instance-name</i> protocols ( <a href="#">ospf</a>   ospf3)], [edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]
<b>Release Information</b>	Statement introduced in Junos OS Release 7.6. Statement introduced in Junos OS Release 9.0 for EX Series switches. Support for the <b>realm</b> statement introduced in Junos OS Release 9.2. Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches. Statement introduced in Junos OS Release 11.3 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Disable exporting Type 7 link-state advertisements into not-so-stubby-areas (NSSAs) for an autonomous system boundary router (ASBR) or an area border router (ABR).
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	• <a href="#">Example: Configuring OSPF Not-So-Stubby Areas on page 34</a>

## no-rfc-1583

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<b>Syntax</b>	no-rfc-1583;
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced in Junos OS Release 8.5.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Disable compatibility with RFC 1583, <i>OSPF Version 2</i> . If the same external destination is advertised by AS boundary routers that belong to different OSPF areas, disabling compatibility with RFC 1583 can prevent routing loops.
<b>Default</b>	Compatibility with RFC 1583 is enabled by default.
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control-level—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Example: Disabling OSPFv2 Compatibility with RFC 1583 on page 44</a></li></ul>


## ospf

<b>Syntax</b>	<code>ospf { ... }</code>
<b>Hierarchy Level</b>	[edit logical-systems <i>logical-system-name</i> protocols], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols], [edit protocols], [edit routing-instances <i>routing-instance-name</i> protocols]
<b>Release Information</b>	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 9.0 for EX Series switches. Statement introduced in Junos OS Release 11.3 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Enable OSPF routing on the routing device.  You must include the <b>ospf</b> statement to enable OSPF on the routing device.
<b>Default</b>	OSPF is disabled on the routing device.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <i>OSPF Configuration Overview</i></li> <li>• <i>[edit protocols ospf] Hierarchy Level</i></li> </ul>

## ospf3

<b>Syntax</b>	<code>ospf3 { ... }</code>
<b>Hierarchy Level</b>	[edit protocols], [edit routing-instances <i>routing-instance-name</i> protocols]
<b>Release Information</b>	Statement introduced in Junos OS Release 11.3 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Enable OSPFv3 routing on the routing device.  You must include the <b>ospf3</b> statement to enable OSPFv3.
<b>Default</b>	OSPFv3 is disabled on the routing device.
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <i>OSPF Configuration Overview</i></li> <li>• <i>[edit protocols ospf3] Hierarchy Level</i></li> </ul>

## overload (Protocols OSPF)

<b>Syntax</b>	<pre>overload {     timeout <i>seconds</i>; }</pre>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf <b>topology</b> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf <b>topology</b> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<b>ospf</b>   ospf3)],</p> <p>[edit protocols ospf <b>topology</b> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf <b>topology</b> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for Multitopology Routing introduced in Junos OS Release 9.0.</p> <p>Support for Multitopology Routing introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	<p>Configure the local routing device so that it appears to be overloaded. You might do this when you want the routing device to participate in OSPF routing, but do not want it to be used for transit traffic.</p>
<div>  <p><b>NOTE:</b> Traffic destined to directly attached interfaces continues to reach the routing device.</p> </div>	
<b>Options</b>	<p><b>timeout <i>seconds</i></b>—(Optional) Number of seconds at which the overloading is reset. If no timeout interval is specified, the routing device remains in overload state until the <b>overload</b> statement is deleted or a timeout is set.</p> <p><b>Range:</b> 60 through 1800 seconds</p>

**Default:** 0 seconds



**NOTE:** Multitopology Routing does not support the timeout option.

**Required Privilege Level** routing—To view this statement in the configuration.  
routing-control—To add this statement to the configuration.

**Related Documentation**

- [Example: Configuring OSPF to Make Routing Devices Appear Overloaded on page 88](#)
- *Example: Configuring Multitopology Routing Based on Applications*
- *Example: Configuring Multitopology Routing Based on a Multicast Source*


## preference (Protocols OSPF)

<b>Syntax</b>	<code>preference <i>preference</i>;</code>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Set the route preference for OSPF internal routes.
<b>Options</b>	<p><b><i>preference</i></b>—Preference value.</p> <p><b>Range:</b> 0 through 4,294,967,295 (<math>2^{32} - 1</math>)</p> <p><b>Default:</b> 10</p>
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Example: Controlling OSPF Route Preferences on page 84</a></li> <li>• <a href="#">external-preference on page 209</a></li> </ul>

## prefix-export-limit (Protocols OSPF)

<b>Syntax</b>	<code>prefix-export-limit <i>number</i>;</code>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf <a href="#">topology</a> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf <a href="#">topology</a> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit protocols ospf <a href="#">topology</a> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<a href="#">ospf</a>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf <a href="#">topology</a> (default   ipv4-multicast   <i>name</i>)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for Multitopology Routing introduced in Junos OS Release 9.0.</p> <p>Support for Multitopology Routing introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Configure a limit to the number of prefixes exported into OSPF.
<b>Options</b>	<p><b><i>number</i></b>—Prefix limit.</p> <p><b>Range:</b> 0 through 4,294,967,295 (<math>2^{32} - 1</math>)</p> <p><b>Default:</b> None</p>
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Example: Limiting the Number of Prefixes Exported to OSPF on page 73</a></li> <li>• <a href="#">Example: Configuring Multitopology Routing Based on Applications</a></li> <li>• <a href="#">Example: Configuring Multitopology Routing Based on a Multicast Source</a></li> </ul>

## reference-bandwidth (Protocols OSPF)

<b>Syntax</b>	<code>reference-bandwidth <i>reference-bandwidth</i>;</code>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<b>ospf</b>   ospf3)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	<p>Set the reference bandwidth used in calculating the default interface cost. The cost is calculated using the following formula:</p> $\text{cost} = \text{ref-bandwidth} / \text{bandwidth}$
<b>Options</b>	<p><b><i>reference-bandwidth</i></b>—Reference bandwidth, in bits per second.</p> <p><b>Range:</b> 9600 through 1,000,000,000,000 bits</p> <p><b>Default:</b> 100 Mbps (100,000,000 bits)</p>
<div>  <p><b>NOTE:</b> The default behavior is to use the reference-bandwidth value to calculate the cost of OSPF interfaces. You can override this behavior for any OSPF interface by configuring a specific cost with the <b>metric</b> statement.</p> </div>	
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Example: Controlling the Cost of Individual OSPF Network Segments on page 78</a></li> <li>• <i>metric</i></li> </ul>



## rib-group (Protocols OSPF)

<b>Syntax</b>	<code>rib-group group-name;</code>
<b>Hierarchy Level</b>	<p>[edit logical-systems <i>logical-system-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit protocols (<b>ospf</b>   ospf3)],</p> <p>[edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)],</p> <p>[edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)]</p>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Install routes learned from OSPF routing instances into routing tables in the OSPF routing table group.
<b>Options</b>	<b>group-name</b> —Name of the routing table group.
<b>Required Privilege Level</b>	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <i>Example: Exporting Specific Routes from One Routing Table Into Another Routing Table</i></li> <li>• <i>Example: Importing Direct and Static Routes Into a Routing Instance</i></li> <li>• <i>Understanding Multiprotocol BGP</i></li> <li>• <i>interface-routes</i></li> <li>• <i>rib-group</i></li> </ul>

## topology (OSPF)

---

<b>Syntax</b>	<pre>topology (default   ipv4-multicast   <i>name</i>) {     spf-options {         delay <i>milliseconds</i>;         holddown <i>milliseconds</i>;         rapid-runs <i>number</i>;     }     topology-id <i>number</i>; }</pre>
<b>Hierarchy Level</b>	[edit logical-systems <i>logical-system-name</i> protocols <b>ospf</b> ], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols <b>ospf</b> ], [edit protocols <b>ospf</b> ], [edit routing-instances <i>routing-instance-name</i> protocols <b>ospf</b> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 9.0. Statement introduced in Junos OS Release 11.3 for the QFX Series. Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Enable a topology for OSPF multitopology routing. You must first configure one or more topologies under the <b>[edit routing-options]</b> hierarchy level.
<b>Options</b>	<p><b>default</b>—Name of the default topology. This topology is automatically created, and all routes that correspond to it are automatically added to the <b>inet.0</b> routing table. You can modify certain default parameters, such as for the SPF algorithm.</p> <p><b>ipv4-multicast</b>—Name of the topology for IPv4 multicast traffic.</p> <p><b>name</b>—Name of a topology you configured at the <b>[edit routing-options]</b> hierarchy level to create a topology for a specific type of traffic, such as voice or video.</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <i>Example: Configuring Multitopology Routing Based on Applications</i></li><li>• <i>Example: Configuring Multitopology Routing Based on a Multicast Source</i></li></ul>

## traceoptions (Protocols OSPF)

<b>Syntax</b>	<pre>traceoptions {     file <i>filename</i> &lt;files <i>number</i>&gt; &lt;size <i>size</i>&gt; &lt;world-readable   no-world-readable&gt;;     flag <i>flag</i> &lt;flag-modifier&gt; &lt;disable&gt;; }</pre>
<b>Hierarchy Level</b>	<pre>[edit logical-systems <i>logical-system-name</i> protocols (<b>ospf</b>   ospf3)], [edit logical-systems <i>logical-system-name</i> protocols ospf3 realm (ipv4-unicast     ipv4-multicast   ipv6-multicast)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols   (<b>ospf</b>   ospf3)], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> protocols   ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)], [edit protocols (<b>ospf</b>   ospf3)], [edit protocols ospf3 realm (ipv4-unicast   ipv4-multicast   ipv6-multicast)], [edit routing-instances <i>routing-instance-name</i> protocols (<b>ospf</b>   ospf3)], [edit routing-instances <i>routing-instance-name</i> protocols ospf3 realm (ipv4-unicast     ipv4-multicast   ipv6-multicast)]</pre>
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2.</p> <p>Support for the <b>realm</b> statement introduced in Junos OS Release 9.2 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	<p>Configure OSPF protocol-level tracing options.</p> <p>To specify more than one tracing operation, include multiple <b>flag</b> statements.</p>



**NOTE:** The **traceoptions** statement is not supported on QFabric systems.

<b>Default</b>	The default OSPF protocol-level tracing options are those inherited from the routing protocols <b>traceoptions</b> statement included at the <b>[edit routing-options]</b> hierarchy level.
<b>Options</b>	<p><b>disable</b>—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as <b>all</b>.</p> <p><b>file <i>filename</i></b>—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory <b>/var/log</b>. We recommend that you place OSPF tracing output in the file <b>ospf-log</b>.</p> <p><b>files <i>number</i></b>—(Optional) Maximum number of trace files. When a trace file named <b>trace-file</b> reaches its maximum size, it is renamed <b>trace-file.0</b>, then <b>trace-file.1</b>, and</p>

so on, until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.

If you specify a maximum number of files, you also must specify a maximum file size with the **size** option.

**Range:** 2 through 1000 files

**Default:** 10 files

**flag flag**—Tracing operation to perform. To specify more than one tracing operation, include multiple **flag** statements.

#### OSPF Tracing Flags

- **database-description**—Database description packets, which are used in synchronizing the OSPF and OSPFv3 topological database.
- **error**—OSPF and OSPFv3 error packets.
- **event**—OSPF and OSPFv3 state transitions.
- **flooding**—Link-state flooding packets.
- **graceful-restart**—Graceful-restart events.
- **hello**—Hello packets, which are used to establish neighbor adjacencies and to determine whether neighbors are reachable.
- **ldp-synchronization**—Synchronization events between OSPF and LDP.
- **lsa-ack**—Link-state acknowledgment packets, which are used in synchronizing the OSPF topological database.
- **lsa-analysis**—Link-state analysis. Specific to the Juniper Networks implementation of OSPF, Junos OS performs LSA analysis before running the shortest-path-first (SPF) algorithm. LSA analysis helps to speed the calculations performed by the SPF algorithm.
- **lsa-request**—Link-state request packets, which are used in synchronizing the OSPF topological database.
- **lsa-update**—Link-state updates packets, which are used in synchronizing the OSPF topological database.
- **nsr-synchronization**—Nonstop routing synchronization events.
- **on-demand**—Trace demand circuit extensions.
- **packet-dump**—Content of selected packet types.
- **packets**—All OSPF packets.
- **restart-signaling**—(OSPFv2 only) Restart-signaling graceful restart events.
- **spf**—Shortest-path-first (SPF) calculations.

#### Global Tracing Flags

- **all**—All tracing operations.
- **general**—A combination of the **normal** and **route** trace operations.
- **normal**—All normal operations. If you do not specify this option, only unusual or abnormal operations are traced.
- **policy**—Policy operations and actions.
- **route**—Routing table changes.
- **state**—State transitions.
- **task**—Routing protocol task processing.
- **timer**—Routing protocol timer processing.

**flag-modifier**—(Optional) Modifier for the tracing flag. You can specify one or more of these modifiers:

- **detail**—Detailed trace information.
- **receive**—Packets being received.
- **send**—Packets being transmitted.

**no-world-readable**—(Optional) Prevent any user from reading the log file.

**size size**—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named **trace-file** reaches this size, it is renamed **trace-file.0**. When the **trace-file** again reaches its maximum size, **trace-file.0** is renamed **trace-file.1** and **trace-file** is renamed **trace-file.0**. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.

If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option.

**Syntax:** **xk** to specify KB, **xm** to specify MB, or **xg** to specify GB

**Range:** 10 KB through the maximum file size supported on your system

**Default:** 128 KB

**world-readable**—(Optional) Allow any user to read the log file.

<b>Required Privilege Level</b>	routing and trace—To view this statement in the configuration. routing-control and trace-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Example: Tracing OSPF Protocol Traffic on page 182</a></li> </ul>

## traffic-engineering (OSPF)

<b>Syntax</b>	<pre> traffic-engineering {   &lt;advertise-unnumbered-interfaces&gt;;   &lt;credibility-protocol-preference&gt;;   ignore-lsp-metrics;   multicast-rpf-routes;   no-topology;   shortcuts {     lsp-metric-into-summary;   } } </pre>
<b>Hierarchy Level</b>	[edit logical-systems <i>logical-system-name</i> protocols ( <a href="#">ospf</a>   ospf3)], [edit protocols ( <a href="#">ospf</a>   ospf3)]
<b>Release Information</b>	<p>Statement introduced before Junos OS Release 7.4.</p> <p><b>multicast-rpf-routes</b> option introduced in Junos OS Release 7.5.</p> <p><b>advertise-unnumbered-interfaces</b> option introduced in Junos OS Release 8.5.</p> <p>Statement introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Support for OSPFv3 (<b>ospf3</b>) introduced in Junos OS Release 9.4.</p> <p>Support for OSPFv3 (<b>ospf3</b>) introduced in Junos OS Release 9.4 for EX Series switches.</p> <p><b>credibility-protocol-preference</b> statement introduced in Junos OS Release 9.4.</p> <p><b>credibility-protocol-preference</b> statement introduced in Junos OS Release 9.4 for EX Series switches.</p> <p>Statement introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Enable the OSPF traffic engineering features.
<b>Default</b>	Traffic engineering support is disabled.
<b>Options</b>	<p><b>advertise-unnumbered-interfaces</b>—(Optional) (OSPFv2 only) Include the link-local identifier in the link-local traffic-engineering link-state advertisement. This statement must be included on both ends of an unnumbered link to allow an ingress LER to update the link in its traffic engineering database and use it for CSPF calculations. The link-local identifier is then used by RSVP to signal unnumbered interfaces as defined in RFC 3477.</p> <p><b>credibility-protocol-preference</b>—(Optional) (OSPFv2 only) Use the configured preference value for OSPF routes to calculate the traffic engineering database credibility value used to select IGP routes. Use this statement to override the default behavior, in which the traffic engineering database prefers IS-IS routes even if OSPF routes are configured with a lower, that is, preferred, preference value. For example, OSPF routes have a default preference value of 10, whereas IS-IS Level 1 routes have a default preference value of 15. When protocol preference is enabled, the credibility value is determined by deducting the protocol preference value from a base value of 512. Using default protocol preference values, OSPF has a credibility value of 502, whereas IS-IS has a credibility value of 497. Because the traffic engineering database prefers IGP routes with the highest credibility value, OSPF routes are now preferred.</p>

**multicast-rpf-routes**—(Optional) (OSPFv2 only) Install routes for multicast RPF checks into the **inet.2** routing table. The **inet.2** routing table consists of unicast routes used for multicast RPF lookup. RPF is an antispoofing mechanism used to check whether the packet is coming in on an interface that is also sending data back to the packet source.



**NOTE:** You must enable OSPF traffic engineering shortcuts to use the **multicast-rpf-routes** statement. You must not allow LSP advertisements into OSPF when configuring the **multicast-rpf-routes** statement.

**no-topology**—(Optional) (OSPFv2 only) Disable the dissemination of the link-state topology information.

The remaining statements are explained separately.



**CAUTION:** When the OSPF traffic engineering configuration is considerably modified, the routing table entries are deleted and the routing table is recreated. Changes to configuration that can cause this behavior include enabling or disabling:

- Traffic engineering shortcuts
- IGP shortcuts
- LDP tunneling
- Multiprotocol LSP
- Advertise summary metrics
- Multicast RPF routes

**Required Privilege Level** routing—To view this statement in the configuration.  
routing-control—To add this statement to the configuration.

**Related Documentation** [• Example: Enabling OSPF Traffic Engineering Support on page 128](#)





## CHAPTER 14

# Operational Commands

- `clear (ospf | ospf3) database`
- `clear (ospf | ospf3) database-protection`
- `clear (ospf | ospf3) io-statistics`
- `clear (ospf | ospf3) neighbor`
- `clear (ospf | ospf3) statistics`
- `clear (ospf | ospf3) overload`
- `show (ospf | ospf3) backup coverage`
- `show (ospf | ospf3) backup neighbor`
- `show ospf context-identifier`
- `show ospf database`
- `show (ospf | ospf3) interface`
- `show (ospf | ospf3) io-statistics`
- `show (ospf | ospf3) log`
- `show (ospf | ospf3) neighbor`
- `show (ospf | ospf3) overview`
- `show (ospf | ospf3) route`
- `show (ospf | ospf3) statistics`

```
clear (ospf | ospf3) database
```

- |  |   |
|--|---|
| List of Syntax                           | <a href="#">Syntax on page 232</a><br><a href="#">Syntax (EX Series Switch and QFX Series) on page 232</a>  |
| Syntax                                   | <pre>clear (ospf   ospf3) database &lt;advertising-router (<i>router-id</i>   self)&gt; &lt;area <i>area-id</i>&gt; &lt;asbrsummary&gt; &lt;external&gt; &lt;instance <i>instance-name</i>&gt; &lt;inter-area-prefix&gt; &lt;inter-area-router&gt; &lt;intra-area-prefix&gt; &lt;link-local&gt; &lt;logical-system (all   <i>logical-system-name</i>)&gt; &lt;lsa-id <i>lsa-id</i>&gt; &lt;netsummary&gt; &lt;network&gt; &lt;nssa&gt; &lt;opaque-area&gt; &lt;purge&gt; &lt;realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)&gt; &lt;router&gt;</pre>  |
| Syntax (EX Series Switch and QFX Series) | <pre>clear (ospf   ospf3) database &lt;advertising-router (<i>router-id</i>   self)&gt; &lt;area <i>area-id</i>&gt; &lt;asbrsummary&gt; &lt;external&gt; &lt;instance <i>instance-name</i>&gt; &lt;inter-area-prefix&gt; &lt;inter-area-router&gt; &lt;intra-area-prefix&gt; &lt;link-local&gt; &lt;lsa-id <i>lsa-id</i>&gt; &lt;netsummary&gt; &lt;network&gt; &lt;nssa&gt; &lt;opaque-area&gt; &lt;purge&gt; &lt;router&gt;</pre>   |
| Release Information                      | <p>Command introduced before Junos OS Release 7.4.</p> <p><b>advertising-router</b> <i>router-id</i>, <b>netsummary</b>, <b>network</b>, <b>nssa</b>, <b>opaque-area</b>, and <b>router</b> options added in Junos OS Release 8.3. You must use the <b>purge</b> command with these options.</p> <p><b>area</b> <i>area-id</i> option added in Junos OS Release 8.3.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p><b>realm</b> option added in Junos OS Release 9.2.</p> <p><b>advertising-router</b> (<i>router-id</i>   <b>self</b>) option added in Junos OS Release 9.5.</p> <p><b>advertising-router</b> (<i>router-id</i>   <b>self</b>) option introduced in Junos OS Release 9.5 for EX Series switches.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> |

Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

**purge** option (and all options that are dependent on the **purge** option) hidden in Junos OS Release 13.3.

**Description** With the master Routing Engine, delete entries in the Open Shortest Path First (OSPF) link-state advertisement (LSA) database. With the backup Routing Engine, delete the OSPF LSA database and sync the new database with the master Routing Engine.



**CAUTION:** You can also use the **purge** command with any of the options to discard rather than delete the specified LSA entries. This command is useful only for testing. Use it with care, because it causes significant network disruption.

**Options** **none**—Delete all LSAs other than the system's own LSAs, which are regenerated. To resynchronize the database, the system destroys all adjacent neighbors that are in the state **EXSTART** or higher. The neighbors are then reacquired and the databases are synchronized.

**advertising-router** (*router-id* | **self**)—(Hidden) Discard entries for the LSA entries advertised by the specified routing device or by this routing device.

**area** *area-id*—(Optional) Discard entries for the LSAs in the specified area.

**asbrsummary**—(Optional) Discard summary AS boundary router LSA entries.

**external**—(Optional) Discard external LSAs.

**instance** *instance-name*—(Optional) Delete or discard entries for the specified routing instance only.

**inter-area-prefix**—(OSPFv3 only) (Optional) Discard interarea prefix LSAs.

**inter-area-router**—(OSPFv3 only) (Optional) Discard interarea router LSAs.

**intra-area-prefix**—(OSPFv3 only) (Optional) Discard intra-area prefix LSAs.

**logical-system** (**all** | *logical-system-name*)—(Optional) Perform this operation on all logical systems or on a particular logical system.

**link-local**—(Optional) Delete link-local LSAs.

**lsa-id** *lsa-id*—(Optional) Discard the LSA entries with the specified LSA identifier.

**netsummary**—(Hidden) Discard summary network LSAs.

**network**—(Hidden) Discard network LSAs.

**nssa**—(Hidden) Discard not-so-stubby area (NSSA) LSAs.

**opaque-area**—(Hidden) Discard opaque area-scope LSAs.

**purge**—(Hidden) Discard all entries in the link-state advertisement database. All link-state advertisements are set to **MAXAGE** and are flooded. The database is repopulated when the originators of the link-state advertisements receive the **MAXAGE** link-state advertisements and reissue them.

**realm (ipv4-multicast | ipv4-unicast | ipv6-multicast)**—(OSPFv3 only) (Optional) Delete the entries for the specified OSPFv3 realm, or address family. Use the **realm** option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.

**router**—(Hidden) Discard router LSAs.

**Required Privilege Level**

clear

**Related Documentation**

- [show ospf database on page 249](#)
- *show ospf3 database*

**List of Sample Output** [clear ospf database on page 234](#)

**Output Fields** When you enter this command, you are provided feedback on the status of your request.

## Sample Output

### [clear ospf database](#)

```
user@host> clear ospf database
```

## clear (ospf | ospf3) database-protection

---

<b>Syntax</b>	clear (ospf   ospf3) database-protection <instance <i>instance-name</i> >
<b>Release Information</b>	Command introduced in Junos OS Release 10.2. Command introduced in Junos OS Release 11.3 for the QFX Series. Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Clear the Open Shortest Path First (OSPF) link-state database from its isolated state. Reset the ignore count, ignore timer, and reset timer, and resume normal operations.
<b>Options</b>	<b>instance <i>instance-name</i></b> —(Optional) Clear the OSPF link-state database for the specified routing instance only.
<b>Required Privilege Level</b>	clear
<b>Output Fields</b>	This command produces no output.

### Sample Output

#### clear ospf database-protection

```
user@host> clear ospf database-protection
```

## clear (ospf | ospf3) io-statistics

---

<b>List of Syntax</b>	<a href="#">Syntax on page 236</a> <a href="#">Syntax (EX Series Switch and QFX Series) on page 236</a>
<b>Syntax</b>	clear (ospf   ospf3) io-statistics <logical-system (all   <i>logical-system-name</i> )>
<b>Syntax (EX Series Switch and QFX Series)</b>	clear (ospf   ospf3) io-statistics
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.3 for the QFX Series. Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Clear Open Shortest Path First (OSPF) input and output statistics.
<b>Options</b>	<b>none</b> —Clear OSPF input and output statistics.  <b>logical-system (all   <i>logical-system-name</i>)</b> —(Optional) Perform this operation on all logical systems or on a particular logical system.
<b>Required Privilege Level</b>	clear
<b>List of Sample Output</b>	<a href="#">clear ospf io-statistics on page 236</a>
<b>Output Fields</b>	When you enter this command, you are provided feedback on the status of your request.

### Sample Output

#### clear ospf io-statistics

```
user@host> clear ospf io-statistics
```

## clear (ospf | ospf3) neighbor

<b>List of Syntax</b>	<a href="#">Syntax on page 237</a> <a href="#">Syntax (EX Series Switch and QFX Series) on page 237</a>
<b>Syntax</b>	<pre>clear (ospf   ospf3) neighbor &lt;area <i>area-id</i>&gt; &lt;instance <i>instance-name</i>&gt; &lt;interface <i>interface-name</i>&gt; &lt;logical-system (all   <i>logical-system-name</i>)&gt; &lt;neighbor&gt; &lt;realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)&gt;</pre>
<b>Syntax (EX Series Switch and QFX Series)</b>	<pre>clear (ospf   ospf3) neighbor &lt;area <i>area-id</i>&gt; &lt;instance <i>instance-name</i>&gt; &lt;interface <i>interface-name</i>&gt; &lt;neighbor&gt;</pre>
<b>Release Information</b>	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p><b>realm</b> option introduced in Junos OS Release 9.2.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Tear down Open Shortest Path First (OSPF) neighbor connections.
<b>Options</b>	<p><b>none</b>—Tear down OSPF connections with all neighbors for all routing instances.</p> <p><b>area <i>area-id</i></b>—(Optional) Tear down neighbor connections for the specified area only.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Tear down neighbor connections for the specified routing instance only.</p> <p><b>interface <i>interface-name</i></b>—(Optional) Tear down neighbor connections for the specified interface only.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p> <p><b>neighbor</b>—(Optional) Clear the state of the specified neighbor only.</p> <p><b>realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)</b>—(Optional) (OSPFv3 only) Clear the state of the specified OSPFv3 realm, or address family. Use the <b>realm</b> option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.</p>
<b>Required Privilege Level</b>	clear
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">show (ospf   ospf3) neighbor on page 269</a></li> </ul>

**List of Sample Output** [clear ospf neighbor on page 238](#)

**Output Fields** When you enter this command, you are provided feedback on the status of your request.

## Sample Output

[clear ospf neighbor](#)

```
user@host> clear ospf neighbor
```



## clear (ospf | ospf3) statistics

<b>List of Syntax</b>	<a href="#">Syntax on page 239</a> <a href="#">Syntax (EX Series Switch and QFX Series) on page 239</a>
<b>Syntax</b>	clear (ospf   ospf3) statistics <instance <i>instance-name</i> > <logical-system (all   <i>logical-system-name</i> )> <realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)>
<b>Syntax (EX Series Switch and QFX Series)</b>	clear (ospf   ospf3) statistics <instance <i>instance-name</i> >
<b>Release Information</b>	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p><b>realm</b> option introduced in Junos OS Release 9.2.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Clear Open Shortest Path First (OSPF) statistics.
<b>Options</b>	<p><b>none</b>—Clear OSPF statistics.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Clear statistics for the specified routing instance only.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p> <p><b>realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)</b>—(Optional) (OSPFv3 only) Clear statistics for the specified OSPFv3 realm, or address family. Use the <b>realm</b> option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.</p>
<b>Required Privilege Level</b>	clear
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">show (ospf   ospf3) statistics on page 286</a></li> </ul>
<b>List of Sample Output</b>	<a href="#">clear ospf statistics on page 239</a>
<b>Output Fields</b>	See <a href="#">show (ospf   ospf3) statistics</a> for an explanation of output fields.

## Sample Output

### clear ospf statistics

The following sample output displays OSPF statistics before and after the **clear ospf statistics** command is entered:

```
user@host> show ospf statistics
```

Packet type	Total		Last 5 seconds	
	Sent	Received	Sent	Received
Hello	3254	2268	3	1
DbD	41	46	0	0
LSReq	8	7	0	0
LSUpdate	212	154	0	0
LSAck	65	98	0	0

DBDs retransmitted	:	3, last 5 seconds	:	0
LSAs flooded	:	12, last 5 seconds	:	0
LSAs flooded high-prio	:	0, last 5 seconds	:	0
LSAs retransmitted	:	0, last 5 seconds	:	0
LSAs transmitted to nbr:	:	3, last 5 seconds	:	0
LSAs requested	:	5, last 5 seconds	:	0
LSAs acknowledged	:	19, last 5 seconds	:	0

Flood queue depth	:	0
Total rexmit entries	:	0
db summaries	:	0
lsreq entries	:	0

Receive errors:  
626 subnet mismatches

user@host> clear ospf statistics

user@host> show ospf statistics

Packet type	Total		Last 5 seconds	
	Sent	Received	Sent	Received
Hello	3	1	3	1
DbD	0	0	0	0
LSReq	0	0	0	0
LSUpdate	0	0	0	0
LSAck	0	0	0	0

DBDs retransmitted	:	0, last 5 seconds	:	0
LSAs flooded	:	0, last 5 seconds	:	0
LSAs flooded high-prio	:	0, last 5 seconds	:	0
LSAs retransmitted	:	0, last 5 seconds	:	0
LSAs transmitted to nbr:	:	0, last 5 seconds	:	0
LSAs requested	:	0, last 5 seconds	:	0
LSAs acknowledged	:	0, last 5 seconds	:	0

Flood queue depth	:	0
Total rexmit entries	:	0
db summaries	:	0
lsreq entries	:	0

Receive errors:  
None

## clear (ospf | ospf3) overload

<b>List of Syntax</b>	<a href="#">Syntax on page 241</a> <a href="#">Syntax (EX Series Switches) on page 241</a>
<b>Syntax</b>	clear (ospf   ospf3) overload <instance <i>instance-name</i> > <logical-system (all   <i>logical-system-name</i> )>
<b>Syntax (EX Series Switches)</b>	clear (ospf   ospf3) overload <instance <i>instance-name</i> >
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.3 for the QFX Series. Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
<b>Description</b>	Clear the Open Shortest Path First (OSPF) overload bit and rebuild link-state advertisements (LSAs).
<b>Options</b>	<p><b>none</b>—Clear the overload bit and rebuild LSAs for all routing instances.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Clear the overload bit and rebuild LSAs for the specified routing instance only.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p>
<b>Required Privilege Level</b>	clear
<b>List of Sample Output</b>	<a href="#">clear ospf overload on page 241</a>
<b>Output Fields</b>	When you enter this command, you are provided feedback on the status of your request.

## Sample Output

### clear ospf overload

```
user@host> clear ospf overload
```

## show (ospf | ospf3) backup coverage

<b>Syntax</b>	<pre>show (ospf   ospf3) backup coverage &lt;instance <i>instance-name</i>&gt; &lt; logical-system (all   <i>logical-system-name</i>)&gt; &lt;realm (ipv4-unicast   ipv6-unicast)&gt; &lt;topology <i>topology-name</i>&gt;</pre>
<b>Syntax (QFX Series)</b>	<pre>show (ospf   ospf3) backup coverage &lt;instance <i>instance-name</i>&gt; &lt;topology <i>topology-name</i>&gt;</pre>
<b>Release Information</b>	<p>Command introduced in Junos OS Release 10.0.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Display information about the level of backup coverage available for all the nodes and prefixes in the network.
<b>Options</b>	<p><b>none</b>—Display information about the level backup coverage for all OSPF routing instances in all logical systems.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Display information about the level of backup coverage for all logical systems or for a specific logical system.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Display information about the level of backup coverage for a specific OSPF routing instance.</p> <p><b>realm (ipv4-unicast   ipv6-unicast)</b>—(Optional) (OSPFv3 only) Display information about the level of backup coverage for the specific OSPFv3 realm, or address family.</p> <p><b>topology (default   <i>topology-name</i>)</b>—(Optional) (OSPFv2 only) Display information about the level of backup coverage for the specific OSPF topology.</p>
<b>Required Privilege Level</b>	view
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">show (ospf   ospf3) backup lsp</a></li> </ul>
<b>List of Sample Output</b>	<a href="#">show ospf backup coverage on page 243</a> <a href="#">show ospf3 backup coverage on page 243</a>
<b>Output Fields</b>	<p><a href="#">Table 4 on page 242</a> lists the output fields for the <b>show (ospf   ospf3) backup coverage</b> command. Output fields are listed in the approximate order in which they appear.</p>

**Table 4: show (ospf | ospf3) backup coverage Output Fields**

Field Name	Field Description
Node Coverage	Information about backup coverage for each OSPF node.

Table 4: show (ospf | ospf3) backup coverage Output Fields (*continued*)

Field Name	Field Description
<b>Area</b>	Area number. Area <b>0.0.0.0</b> is the backbone.
<b>Covered Nodes</b>	Number of nodes for which backup coverage is available.
<b>Total Nodes</b>	Total number of OSPF nodes.
<b>Route Coverage</b>	Information about backup coverage for each type of OSPF route.
<b>Path Type</b>	Type of OSPF path: <b>Intra</b> , <b>Inter</b> , <b>Ext1</b> , <b>Ext2</b> , and <b>All</b> .
<b>Covered Routes</b>	For each path type, the number of routes for which backup coverage is available.
<b>Total Routes</b>	For each path type, the total number of configured routes.
<b>Percent Covered</b>	For all nodes and for each path type, the percentage for which backup coverage is available.

## Sample Output

### show ospf backup coverage

```

user@host> show ospf backup coverage
Topology default coverage:

Node Coverage:

Area              Covered  Total  Percent
                  Nodes   Nodes  Covered
0.0.0.0           4        5    80.00%

Route Coverage:

Path Type  Covered  Total  Percent
          Routes Routes  Covered
Intra      8        14    57.14%
Inter      0         0   100.00%
Ext1       0         0   100.00%
Ext2       1         1   100.00%
All        9        15    60.00%

```

### show ospf3 backup coverage

```

user @host > show ospf3 backup coverage
show ospf3 backup coverage
Node Coverage:

Area              Covered  Total  Percent
                  Nodes   Nodes  Covered
0.0.0.0           4        5    80.00%

Route Coverage:

```

Path Type	Covered Routes	Total Routes	Percent Covered
Intra	4	6	66.67%
Inter	0	0	100.00%
Ext1	0	0	100.00%
Ext2	1	1	100.00%
All	5	7	71.43%

## show (ospf | ospf3) backup neighbor

<b>Syntax</b>	<pre>show (ospf   ospf3) backup neighbor &lt;area <i>area-id</i>&gt; &lt;instance (default   <i>instance-name</i>)&gt; &lt;logical-system (default   ipv4-multicast   <i>logical-system-name</i>)&gt; &lt;topology (default   ipv4-multicast   <i>topology-name</i>)&gt;</pre>	
<b>Syntax (QFX Series)</b>	<pre>show (ospf   ospf3) backup neighbor &lt;area <i>area-id</i>&gt; &lt;instance <i>instance-name</i>&gt; &lt;topology (default   ipv4-multicast   <i>topology-name</i>)&gt;</pre>	
<b>Release Information</b>	<p>Command introduced in Junos OS Release 10.0.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>	
<b>Description</b>	Display the neighbors through which direct next hops for the backup paths are available.	
<b>Options</b>	<p><b>none</b>—Display all neighbors that have direct next hops for backup paths.</p> <p><b>area <i>area-id</i></b>—(Optional) Display the area information.</p> <p><b>instance (default   <i>instance-name</i>)</b>—(Optional) Display information about the default routing instance or a particular routing instance.</p> <p><b>logical-system (default   ipv4-multicast   <i>logical-system-name</i>)</b>—(Optional) Display information about the default logical system, IPv4 multicast logical system, or a particular logical system.</p> <p><b>topology (default   ipv4-multicast   <i>topology-name</i>)</b>—(OSPFv2 only) (Optional) Display information about the default topology, IPv4 multicast topology, or a particular topology.</p>	
<b>Required Privilege Level</b>	view	
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">show (ospf   ospf3) backup spf</a></li> </ul>	
<b>List of Sample Output</b>	<a href="#">show ospf backup neighbor on page 246</a>	
<b>Output Fields</b>	Table 5 on page 245 lists the output fields for the <b>show (ospf   ospf3) backup neighbor</b> command. Output fields are listed in the approximate order in which they appear.	

Table 5: show (ospf | ospf3) backup neighbor Output Fields

Field Name	Field Description	Level of Output
Neighbor to Self Metric	Metric from the backup neighbor to the OSPF node.	All levels

Table 5: show (ospf |ospf3) backup neighbor Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Self to Neighbor Metric</b>	Metric from the OSPF node to the backup neighbor.	All levels
<b>Direct next-hop</b>	Interface and address of the direct next hop.	All levels

## Sample Output

### show ospf backup neighbor

```
user@host> show ospf backup neighbor
Topology default backup neighbors:

Area 0.0.0.5 backup neighbors:

10.0.0.5
  Neighbor to Self Metric: 5
  Self to Neighbor Metric: 5
  Direct next-hop: ge-4/0/0.111 via 10.0.175.5

10.0.0.6
  Neighbor to Self Metric: 5
  Self to Neighbor Metric: 5
  Direct next-hop: ge-4/1/0.110 via 10.0.176.6
```



## show ospf context-identifier

<b>List of Syntax</b>	<a href="#">Syntax on page 247</a> <a href="#">Syntax (EX Series Switches and QFX Series) on page 247</a>
<b>Syntax</b>	<pre>show ospf context-identifier &lt;brief   detail&gt; &lt;area <i>area-id</i>&gt; &lt;context-id&gt; &lt;instance <i>instance-name</i>&gt; &lt;logical-system (all   <i>logical-system-name</i>)&gt;</pre>
<b>Syntax (EX Series Switches and QFX Series)</b>	<pre>show ospf context-identifier &lt;brief   detail&gt; &lt;area <i>area-id</i>&gt; &lt;context-id&gt; &lt;instance <i>instance-name</i>&gt;</pre>
<b>Release Information</b>	<p>Command introduced in Junos OS Release 10.4.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Display the context identifier information processed and advertised by Open Shortest Path First (OSPF) for egress protection.
<b>Options</b>	<p><b>none</b>—Display information about all context identifiers.</p> <p><b>brief   detail</b>—(Optional) Display the specified level of output.</p> <p><b>area <i>area-id</i></b>—(Optional) Display information about the context identifier for the specified area.</p> <p><b>context-id</b>—(Optional) Display information about the specified context identifier.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Display information about the context identifier for the specified routing instance.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p>
<b>Required Privilege Level</b>	view
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><i>egress-protection (Layer 2 circuit)</i> in the <i>Junos OS VPNs Library for Routing Devices</i></li> <li><i>egress-protection (MPLS)</i> in the <i>Junos OS VPNs Library for Routing Devices</i></li> </ul>
<b>List of Sample Output</b>	<a href="#">show ospf context-identifier on page 248</a> <a href="#">show ospf context-identifier detail on page 248</a>
<b>Output Fields</b>	<p><a href="#">Table 6 on page 248</a> lists the output fields for the <b>show ospf context-identifier</b> command. Output fields are listed in the approximate order in which they appear.</p>

Table 6: show ospf context-identifier Output Fields

Field Name	Field Description	Level of Output
<b>Context</b>	IPv4 address that defines a protection pair. The context is manually configured on both primary and protector provider edge (PE) devices.	All levels
<b>Status</b>	State of the path: <b>active</b> or <b>inactive</b> .	All levels
<b>Metric</b>	Advertised OSPF metric.	All levels
<b>Area</b>	OSPF area number.	All levels
<b>Other Advertisements</b>	Other advertisements received by the OSPF node: <ul style="list-style-type: none"> <li>• <b>Advertising router</b>—Address of the device that sent the advertisement.</li> <li>• <b>Type</b>—Type of OSPF path: <b>inter-area</b> and <b>stub</b>.</li> <li>• <b>Metric</b>—Advertised OSPF metric.</li> <li>• <b>None</b>—No additional advertisements were received by the OSPF node.</li> </ul>	<b>detail</b>

## Sample Output

### show ospf context-identifier

```
user@host> show ospf context-identifier
Context-id: 2.2.4.3
Status: active, Metric: 65534, PE role: protector, Area: 0.0.0.0
```

### show ospf context-identifier detail

```
user@host> show ospf context-identifier detail
Context-id: 88.24.13.1
Status: inactive, Metric: 0, PE role: protector, Area: 0.0.0.13
Other Advertisements:
Advertising router: 8.8.8.103
Type: stub link
Metric: 65534
```

## show ospf database

**List of Syntax**    [Syntax on page 249](#)  
                           [Syntax \(EX Series Switches and QFX Series\) on page 249](#)

**Syntax**    show ospf database  
                   <brief | detail | extensive | summary>  
                   <advertising-router (*address* | self)>  
                   <area *area-id*>  
                   <asbrsummary>  
                   <external>  
                   <instance *instance-name*>  
                   <link-local>  
                   <logical-system (all | *logical-system-name*)>  
                   <lsa-id *lsa-id*>  
                   <netsummary>  
                   <network>  
                   <nssa>  
                   <opaque-area>  
                   <router>

**Syntax (EX Series Switches and QFX Series)**    show ospf database  
   <brief | detail | extensive | summary>  
   <advertising-router (*address* | self)>  
   <area *area-id*>  
   <asbrsummary>  
   <external>  
   <instance *instance-name*>  
   <link-local>  
   <lsa-id *lsa-id*>  
   <netsummary>  
   <network>  
   <nssa>  
   <opaque-area>  
   <router>

**Release Information**    Command introduced before Junos OS Release 7.4.  
                                   Command introduced in Junos OS Release 9.0 for EX Series switches.  
                                   **advertising-router self (*address* | self)** option introduced in Junos OS Release 9.5.  
                                   **advertising-router self (*address* | self)** option introduced in Junos OS Release 9.5 for EX Series switches.  
                                   Command introduced in Junos OS Release 11.3 for the QFX Series.  
                                   Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

**Description**    Display the entries in the OSPF version 2 (OSPFv2) link-state database, which contains data about link-state advertisement (LSA) packets.

**Options**    **none**—Display standard information about entries in the OSPFv2 link-state database for all routing instances.

**brief | detail | extensive | summary**—(Optional) Display the specified level of output.

**advertising-router** (*address* | *self*)—(Optional) Display the LSAs advertised either by a particular routing device or by this routing device.

**area** *area-id*—(Optional) Display the LSAs in a particular area.

**asbrsummary**—(Optional) Display summary AS boundary router LSA entries.

**external**—(Optional) Display external LSAs.

**instance** *instance-name*—(Optional) Display all OSPF database information under the named routing instance.

**link-local**—(Optional) Display information about link-local LSAs.

**logical-system** (*all* | *logical-system-name*)—(Optional) Perform this operation on all logical systems or on a particular logical system.

**lsa-id** *lsa-id*—(Optional) Display the LSA with the specified LSA identifier.

**netsummary**—(Optional) Display summary network LSAs.

**network**—(Optional) Display information about network LSAs.

**nssa**—(Optional) Display information about not-so-stubby area (NSSA) LSAs.

**opaque-area**—(Optional) Display opaque area-scope LSAs.

**router**—(Optional) Display information about router LSAs.

**Required Privilege Level**

view

**Related Documentation**

- [clear \(ospf | ospf3\) database on page 232](#)

**List of Sample Output**

[show ospf database on page 252](#)  
[show ospf database brief on page 253](#)  
[show ospf database detail on page 253](#)  
[show ospf database extensive on page 254](#)  
[show ospf database summary on page 256](#)

**Output Fields**

[Table 7 on page 250](#) describes the output fields for the **show ospf database** command. Output fields are listed in the approximate order in which they appear.

**Table 7: show ospf database Output Fields**

Field Name	Field Description	Level of Output
<b>area</b>	Area number. Area 0.0.0.0 is the backbone area.	All levels
<b>Type</b>	Type of link advertisement: <b>ASBRSum</b> , <b>Extern</b> , <b>Network</b> , <b>NSSA</b> , <b>OpaqArea</b> , <b>Router</b> , or <b>Summary</b> .	All levels

Table 7: show ospf database Output Fields (*continued*)

Field Name	Field Description	Level of Output
ID	LSA identifier included in the advertisement. An asterisk preceding the identifier marks database entries that originated from the local routing device.	All levels
Adv Rtr	Address of the routing device that sent the advertisement.	All levels
Seq	Link sequence number of the advertisement.	All levels
Age	Time elapsed since the LSA was originated, in seconds.	All levels
Opt	Optional OSPF capabilities associated with the LSA.	All levels
Cksum	Checksum value of the LSA.	All levels
Len	Length of the advertisement, in bytes.	All levels
Router	Router link-state advertisement information: <ul style="list-style-type: none"> <li>• <b>bits</b>—Flags describing the routing device that generated the LSP.</li> <li>• <b>link count</b>—Number of links in the advertisement.</li> <li>• <b>id</b>—ID of a routing device or subnet on the link.</li> <li>• <b>data</b>—For stub networks, the subnet mask. Otherwise, the IP address of the routing device that generated the LSP.</li> <li>• <b>type</b>—Type of link. It can be <b>PointToPoint</b>, <b>Transit</b>, <b>Stub</b>, or <b>Virtual</b>.</li> <li>• <b>TOS count</b>—Number of type-of-service (ToS) entries in the advertisement.</li> <li>• <b>TOS 0 metric</b>—Metric for ToS 0.</li> <li>• <b>TOS</b>—Type-of-service (ToS) value.</li> <li>• <b>metric</b>—Metric for the ToS.</li> </ul>	detail extensive
Network	Network link-state advertisement information: <ul style="list-style-type: none"> <li>• <b>mask</b>—Network mask.</li> <li>• <b>attached router</b>—ID of the attached neighbor.</li> </ul>	detail extensive
Summary	Summary link-state advertisement information: <ul style="list-style-type: none"> <li>• <b>mask</b>—Network mask.</li> <li>• <b>TOS</b>—Type-of-service (ToS) value.</li> <li>• <b>metric</b>—Metric for the ToS.</li> </ul>	detail extensive
Gen timer	How long until the LSA is regenerated.	extensive
Aging timer	How long until the LSA expires.	extensive
Installed <i>hh:mm:ss</i> ago	How long ago the route was installed.	extensive
expires in <i>hh:mm:ss</i>	How long until the route expires.	extensive

Table 7: show ospf database Output Fields (*continued*)

Field Name	Field Description	Level of Output
sent <i>hh:mm:ss ago</i>	How long ago the LSA was sent.	extensive
Last changed <i>hh:mm:ss ago</i>	How long ago the route was changed.	extensive
Change count	Number of times the route has changed.	extensive
Ours	Indicates that this is a local advertisement.	extensive
Router LSAs	Number of router link-state advertisements in the link-state database.	summary
Network LSAs	Number of network link-state advertisements in the link-state database.	summary
Summary LSAs	Number of summary link-state advertisements in the link-state database.	summary
NSSA LSAs	Number of not-so-stubby area link-state advertisements in the link-state database.	summary

## Sample Output

### show ospf database

```

user@host> show ospf database
OSPF link state database, Area 0.0.0.1
  Type      ID                Adv Rtr          Seq      Age  Opt  Cksum  Len
Router     10.255.70.103      10.255.70.103    0x80000002  215  0x20 0x4112  48
Router     *10.255.71.242     10.255.71.242    0x80000002  214  0x20 0x11b1  48
Summary    *23.1.1.0          10.255.71.242    0x80000002  172  0x20 0x6d72  28
Summary    *24.1.1.0          10.255.71.242    0x80000002  177  0x20 0x607e  28
NSSA       *33.1.1.1          10.255.71.242    0x80000002  217  0x28 0x73bd  36

      OSPF link state database, Area 0.0.0.2
  Type      ID                Adv Rtr          Seq      Age  Opt  Cksum  Len
Router     10.255.71.52       10.255.71.52     0x80000004  174  0x20 0xd021  36
Router     *10.255.71.242     10.255.71.242    0x80000003  173  0x20 0xe191  36
Network    *23.1.1.1          10.255.71.242    0x80000002  173  0x20 0x9c76  32
Summary    *12.1.1.0          10.255.71.242    0x80000001  217  0x20 0xfeec  28
Summary    *24.1.1.0          10.255.71.242    0x80000002  177  0x20 0x607e  28
NSSA       *33.1.1.1          10.255.71.242    0x80000001  222  0x28 0xe047  36

      OSPF link state database, Area 0.0.0.3
  Type      ID                Adv Rtr          Seq      Age  Opt  Cksum  Len
Router     10.255.71.238      10.255.71.238    0x80000003  179  0x20 0x3942  36
Router     *10.255.71.242     10.255.71.242    0x80000003  177  0x20 0xf37d  36
Network    *24.1.1.1          10.255.71.242    0x80000002  177  0x20 0xc591  32
Summary    *12.1.1.0          10.255.71.242    0x80000001  217  0x20 0xfeec  28
Summary    *23.1.1.0          10.255.71.242    0x80000002  172  0x20 0x6d72  28
NSSA       *33.1.1.1          10.255.71.242    0x80000001  222  0x28 0xeb3b  36

```

**show ospf database brief**

The output for the **show ospf database brief** command is identical to that for the **show ospf database** command. For sample output, see [show ospf database on page 252](#).

**show ospf database detail**

```

user@host> show ospf database detail
    OSPF link state database, Area 0.0.0.1
  Type      ID          Adv Rtr      Seq      Age  Opt  Cksum  Len
Router  10.255.70.103    10.255.70.103  0x80000002  261  0x20 0x4112  48
  bits 0x0, link count 2
  id 10.255.71.242, data 12.1.1.1, Type PointToPoint (1)
  TOS count 0, TOS 0 metric 1
  id 12.1.1.0, data 255.255.255.0, Type Stub (3)
  TOS count 0, TOS 0 metric 1
Router  *10.255.71.242  10.255.71.242  0x80000002  260  0x20 0x11b1  48
  bits 0x3, link count 2
  id 10.255.70.103, data 12.1.1.2, Type PointToPoint (1)
  TOS count 0, TOS 0 metric 1
  id 12.1.1.0, data 255.255.255.0, Type Stub (3)
  TOS count 0, TOS 0 metric 1
Summary *23.1.1.0      10.255.71.242  0x80000002  218  0x20 0x6d72  28
  mask 255.255.255.0
  TOS 0x0, metric 1
Summary *24.1.1.0      10.255.71.242  0x80000002  223  0x20 0x607e  28
  mask 255.255.255.0
  TOS 0x0, metric 1
NSSA   *33.1.1.1       10.255.71.242  0x80000002  263  0x28 0x73bd  36
  mask 255.255.255.255
  Type 2, TOS 0x0, metric 0, fwd addr 12.1.1.2, tag 0.0.0.0

    OSPF link state database, Area 0.0.0.2
  Type      ID          Adv Rtr      Seq      Age  Opt  Cksum  Len
Router  10.255.71.52    10.255.71.52  0x80000004  220  0x20 0xd021  36
  bits 0x0, link count 1
  id 23.1.1.1, data 23.1.1.2, Type Transit (2)
  TOS count 0, TOS 0 metric 1
Router  *10.255.71.242  10.255.71.242  0x80000003  219  0x20 0xe191  36
  bits 0x3, link count 1
  id 23.1.1.1, data 23.1.1.1, Type Transit (2)
  TOS count 0, TOS 0 metric 1
Network *23.1.1.1      10.255.71.242  0x80000002  219  0x20 0x9c76  32
  mask 255.255.255.0
  attached router 10.255.71.242
  attached router 10.255.71.52
Summary *12.1.1.0      10.255.71.242  0x80000001  263  0x20 0xfeec  28
  mask 255.255.255.0
  TOS 0x0, metric 1
Summary *24.1.1.0      10.255.71.242  0x80000002  223  0x20 0x607e  28
  mask 255.255.255.0
  TOS 0x0, metric 1
NSSA   *33.1.1.1       10.255.71.242  0x80000001  268  0x28 0xe047  36
  mask 255.255.255.255
  Type 2, TOS 0x0, metric 0, fwd addr 23.1.1.1, tag 0.0.0.0

    OSPF link state database, Area 0.0.0.3
  Type      ID          Adv Rtr      Seq      Age  Opt  Cksum  Len
Router  10.255.71.238    10.255.71.238  0x80000003  225  0x20 0x3942  36
  bits 0x0, link count 1

```

```

    id 24.1.1.1, data 24.1.1.2, Type Transit (2)
    TOS count 0, TOS 0 metric 1
Router *10.255.71.242    10.255.71.242    0x80000003    223    0x20 0xf37d    36
    bits 0x3, link count 1
    id 24.1.1.1, data 24.1.1.1, Type Transit (2)
    TOS count 0, TOS 0 metric 1
Network *24.1.1.1        10.255.71.242    0x80000002    223    0x20 0xc591    32
    mask 255.255.255.0
    attached router 10.255.71.242
    attached router 10.255.71.238
Summary *12.1.1.0        10.255.71.242    0x80000001    263    0x20 0xfeec    28
    mask 255.255.255.0
    TOS 0x0, metric 1
Summary *23.1.1.0        10.255.71.242    0x80000002    218    0x20 0x6d72    28
    mask 255.255.255.0
    TOS 0x0, metric 1
NSSA *33.1.1.1          10.255.71.242    0x80000001    268    0x28 0xeb3b    36
    mask 255.255.255.255
    Type 2, TOS 0x0, metric 0, fwd addr 24.1.1.1, tag 0.0.0.0

```

### show ospf database extensive

```

user@host> show ospf database extensive
    OSPF link state database, Area 0.0.0.1
    Type      ID          Adv Rtr      Seq      Age  Opt  Cksum  Len
Router 10.255.70.103  10.255.70.103  0x80000002  286  0x20 0x4112  48
    bits 0x0, link count 2
    id 10.255.71.242, data 12.1.1.1, Type PointToPoint (1)
    TOS count 0, TOS 0 metric 1
    id 12.1.1.0, data 255.255.255.0, Type Stub (3)
    TOS count 0, TOS 0 metric 1
    Aging timer 00:55:14
    Installed 00:04:43 ago, expires in 00:55:14
    Last changed 00:04:43 ago, Change count: 2
Router *10.255.71.242  10.255.71.242  0x80000002  285  0x20 0x11b1  48
    bits 0x3, link count 2
    id 10.255.70.103, data 12.1.1.2, Type PointToPoint (1)
    TOS count 0, TOS 0 metric 1
    id 12.1.1.0, data 255.255.255.0, Type Stub (3)
    TOS count 0, TOS 0 metric 1
    Gen timer 00:45:15
    Aging timer 00:55:15
    Installed 00:04:45 ago, expires in 00:55:15, sent 00:04:43 ago
    Last changed 00:04:45 ago, Change count: 2, Ours
Summary *23.1.1.0        10.255.71.242    0x80000002    243    0x20 0x6d72    28
    mask 255.255.255.0
    TOS 0x0, metric 1
    Gen timer 00:45:57
    Aging timer 00:55:57
    Installed 00:04:03 ago, expires in 00:55:57, sent 00:04:01 ago
    Last changed 00:04:48 ago, Change count: 1, Ours
Summary *24.1.1.0        10.255.71.242    0x80000002    248    0x20 0x607e    28
    mask 255.255.255.0
    TOS 0x0, metric 1
    Gen timer 00:45:52
    Aging timer 00:55:52
    Installed 00:04:08 ago, expires in 00:55:52, sent 00:04:06 ago
    Last changed 00:04:48 ago, Change count: 1, Ours
NSSA *33.1.1.1          10.255.71.242    0x80000002    288    0x28 0x73bd    36
    mask 255.255.255.255
    Type 2, TOS 0x0, metric 0, fwd addr 12.1.1.2, tag 0.0.0.0

```



Gen timer 00:45:12  
 Aging timer 00:55:12  
 Installed 00:04:48 ago, expires in 00:55:12, sent 00:04:48 ago  
 Last changed 00:04:48 ago, Change count: 2, Ours

#### OSPF link state database, Area 0.0.0.2

Type	ID	Adv Rtr	Seq	Age	Opt	Cksum	Len
Router	10.255.71.52	10.255.71.52	0x80000004	245	0x20	0xd021	36
bits 0x0, link count 1							
id 23.1.1.1, data 23.1.1.2, Type Transit (2)							
TOS count 0, TOS 0 metric 1							
Aging timer 00:55:55							
Installed 00:04:02 ago, expires in 00:55:55							
Last changed 00:04:02 ago, Change count: 2							
Router	*10.255.71.242	10.255.71.242	0x80000003	244	0x20	0xe191	36
bits 0x3, link count 1							
id 23.1.1.1, data 23.1.1.1, Type Transit (2)							
TOS count 0, TOS 0 metric 1							
Gen timer 00:45:56							
Aging timer 00:55:56							
Installed 00:04:04 ago, expires in 00:55:56, sent 00:04:02 ago							
Last changed 00:04:04 ago, Change count: 2, Ours							
Network	*23.1.1.1	10.255.71.242	0x80000002	244	0x20	0x9c76	32
mask 255.255.255.0							
attached router 10.255.71.242							
attached router 10.255.71.52							
Gen timer 00:45:56							
Aging timer 00:55:56							
Installed 00:04:04 ago, expires in 00:55:56, sent 00:04:02 ago							
Last changed 00:04:04 ago, Change count: 1, Ours							
Summary	*12.1.1.0	10.255.71.242	0x80000001	288	0x20	0xfeec	28
mask 255.255.255.0							
TOS 0x0, metric 1							
Gen timer 00:45:12							
Aging timer 00:55:12							
Installed 00:04:48 ago, expires in 00:55:12, sent 00:04:04 ago							
Last changed 00:04:48 ago, Change count: 1, Ours							
Summary	*24.1.1.0	10.255.71.242	0x80000002	248	0x20	0x607e	28
mask 255.255.255.0							
TOS 0x0, metric 1							
Gen timer 00:45:52							
Aging timer 00:55:52							
Installed 00:04:08 ago, expires in 00:55:52, sent 00:04:04 ago							
Last changed 00:04:48 ago, Change count: 1, Ours							
NSSA	*33.1.1.1	10.255.71.242	0x80000001	293	0x28	0xe047	36
mask 255.255.255.255							
Type 2, TOS 0x0, metric 0, fwd addr 23.1.1.1, tag 0.0.0.0							
Gen timer 00:45:07							
Aging timer 00:55:07							
Installed 00:04:53 ago, expires in 00:55:07, sent 00:04:04 ago							
Last changed 00:04:53 ago, Change count: 1, Ours							

#### OSPF link state database, Area 0.0.0.3

Type	ID	Adv Rtr	Seq	Age	Opt	Cksum	Len
Router	10.255.71.238	10.255.71.238	0x80000003	250	0x20	0x3942	36
bits 0x0, link count 1							
id 24.1.1.1, data 24.1.1.2, Type Transit (2)							
TOS count 0, TOS 0 metric 1							
Aging timer 00:55:50							
Installed 00:04:07 ago, expires in 00:55:50							
Last changed 00:04:07 ago, Change count: 2							

```

Router *10.255.71.242    10.255.71.242    0x80000003    248    0x20 0xf37d    36
  bits 0x3, link count 1
  id 24.1.1.1, data 24.1.1.1, Type Transit (2)
  TOS count 0, TOS 0 metric 1
  Gen timer 00:45:52
  Aging timer 00:55:52
  Installed 00:04:08 ago, expires in 00:55:52, sent 00:04:06 ago
  Last changed 00:04:08 ago, Change count: 2, Ours
Network *24.1.1.1        10.255.71.242    0x80000002    248    0x20 0xc591    32
  mask 255.255.255.0
  attached router 10.255.71.242
  attached router 10.255.71.238
  Gen timer 00:45:52
  Aging timer 00:55:52
  Installed 00:04:08 ago, expires in 00:55:52, sent 00:04:06 ago
  Last changed 00:04:08 ago, Change count: 1, Ours
Summary *12.1.1.0        10.255.71.242    0x80000001    288    0x20 0xfeec    28
  mask 255.255.255.0
  TOS 0x0, metric 1
  Gen timer 00:45:12
  Aging timer 00:55:12
  Installed 00:04:48 ago, expires in 00:55:12, sent 00:04:13 ago
  Last changed 00:04:48 ago, Change count: 1, Ours
Summary *23.1.1.0        10.255.71.242    0x80000002    243    0x20 0x6d72    28
  mask 255.255.255.0
  TOS 0x0, metric 1
  Gen timer 00:45:57
  Aging timer 00:55:57
  Installed 00:04:03 ago, expires in 00:55:57, sent 00:04:01 ago
  Last changed 00:04:48 ago, Change count: 1, Ours
NSSA *33.1.1.1          10.255.71.242    0x80000001    293    0x28 0xeb3b    36
  mask 255.255.255.255
  Type 2, TOS 0x0, metric 0, fwd addr 24.1.1.1, tag 0.0.0.0
  Gen timer 00:45:07
  Aging timer 00:55:07
  Installed 00:04:53 ago, expires in 00:55:07, sent 00:04:13 ago
  Last changed 00:04:53 ago, Change count: 1, Ours

```

### show ospf database summary

```

user@host> show ospf database summary
Area 0.0.0.1:
  2 Router LSAs
  2 Summary LSAs
  1 NSSA LSAs
Area 0.0.0.2:
  2 Router LSAs
  1 Network LSAs
  2 Summary LSAs
  1 NSSA LSAs
Area 0.0.0.3:
  2 Router LSAs
  1 Network LSAs
  2 Summary LSAs
  1 NSSA LSAs
Externals:
Interface fe-2/2/1.0:
Interface ge-0/3/2.0:
Interface so-0/1/2.0:
Interface so-0/1/2.0:

```



## show (ospf | ospf3) interface

**List of Syntax**    [Syntax on page 258](#)  
                          [Syntax \(EX Series Switches and QFX Series\) on page 258](#)

**Syntax**    show (ospf | ospf3) interface  
                  <brief | detail | extensive>  
                  <area *area-id*>  
                  <interface-name>  
                  <instance *instance-name*>  
                  <logical-system (all | *logical-system-name*)>  
                  <realm (ipv4-multicast | ipv4-unicast | ipv6-multicast)>

**Syntax (EX Series Switches and QFX Series)**    show (ospf | ospf3) interface  
                  <brief | detail | extensive>  
                  <area *area-id*>  
                  <interface-name>  
                  <instance *instance-name*>

**Release Information**    Command introduced before Junos OS Release 7.4.  
                                  Command introduced in Junos OS Release 9.0 for EX Series switches.  
                                  **area** option introduced in Junos OS Release 9.2.  
                                  **area** option introduced in Junos OS Release 9.2 for EX Series switches.  
                                  **realm** option introduced in Junos OS Release 9.2.  
                                  Command introduced in Junos OS Release 11.3 for the QFX Series.  
                                  Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

**Description**    Display the status of OSPF interfaces.

**Options**    **none**—Display standard information about the status of all OSPF interfaces for all routing instances

**brief | detail | extensive**—(Optional) Display the specified level of output.

**area *area-id***—(Optional) Display information about the interfaces that belong to the specified area.

**interface-name**—(Optional) Display information for the specified interface.

**instance *instance-name***—(Optional) Display all OSPF interfaces under the named routing instance.

**logical-system (all | *logical-system-name*)**—(Optional) Perform this operation on all logical systems or on a particular logical system.

**realm (ipv4-multicast | ipv4-unicast | ipv6-multicast)**—(OSPFv3 only) (Optional) Display information about the interfaces for the specified OSPFv3 realm, or address family. Use the **realm** option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.

**Required Privilege Level**    view

**List of Sample Output** [show ospf interface brief on page 261](#)  
[show ospf interface detail on page 261](#)  
[show ospf3 interface detail on page 261](#)  
[show ospf interface detail\(When Multiarea Adjacency Is Configured\) on page 261](#)  
[show ospf interface area area-id on page 263](#)  
[show ospf interface extensive \(When Flooding Reduction Is Enabled\) on page 263](#)  
[show ospf interface extensive \(When LDP Synchronization Is Configured\) on page 263](#)

**Output Fields** [Table 8 on page 259](#) lists the output fields for the **show (ospf | ospf3) interface** command. Output fields are listed in the approximate order in which they appear.

**Table 8: show (ospf | ospf3) interface Output Fields**

Field Name	Field Description	Level of Output
<b>Interface</b>	Name of the interface running OSPF version 2 or OSPF version 3.	All levels
<b>State</b>	State of the interface: <b>BDR</b> , <b>Down</b> , <b>DR</b> , <b>DRother</b> , <b>Loop</b> , <b>PtToPt</b> , or <b>Waiting</b> .	All levels
<b>Area</b>	Number of the area that the interface is in.	All levels
<b>DR ID</b>	Address of the area's designated router.	All levels
<b>BDR ID</b>	Backup designated router for a particular subnet.	All levels
<b>Nbrs</b>	Number of neighbors on this interface.	All levels
<b>Type</b>	Type of interface: <b>LAN</b> , <b>NBMA</b> , <b>P2MP</b> , <b>P2P</b> , or <b>Virtual</b> .	<b>detail extensive</b>
<b>Address</b>	IP address of the neighbor.	<b>detail extensive</b>
<b>Mask</b>	Netmask of the neighbor.	<b>detail extensive</b>
<b>Prefix-length</b>	(OSPFv3) IPv6 prefix length, in bits.	<b>detail extensive</b>
<b>OSPF3-Intf-Index</b>	(OSPFv3) OSPF version 3 interface index.	<b>detail extensive</b>
<b>MTU</b>	Interface maximum transmission unit (MTU).	<b>detail extensive</b>
<b>Cost</b>	Interface cost (metric).	<b>detail extensive</b>
<b>DR addr</b>	Address of the designated router.	<b>detail extensive</b>
<b>BDR addr</b>	Address of the backup designated router.	<b>detail extensive</b>
<b>Adj count</b>	Number of adjacent neighbors.	<b>detail extensive</b>
<b>Secondary</b>	Indicates that this interface is configured as a secondary interface for this area. This interface can belong to more than one area, but can be designated as a primary interface for only one area.	<b>detail extensive</b>

Table 8: show (ospf | ospf3) interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Flood Reduction</b>	Indicates that this interface is configured with flooding reduction. All self-originated LSAs from this interface are initially sent with the <b>DoNotAge</b> bit set. As a result, LSAs are refreshed only when a change occurs.	<b>extensive</b>
<b>Priority</b>	Router priority used in designated router (DR) election on this interface.	<b>detail extensive</b>
<b>Flood list</b>	List of link-state advertisements (LSAs) that might be about to flood this interface.	<b>extensive</b>
<b>Ack list</b>	Acknowledgment list. List of pending acknowledgments on this interface.	<b>extensive</b>
<b>Descriptor list</b>	List of packet descriptors.	<b>extensive</b>
<b>Hello</b>	Configured value for the hello timer.	<b>detail extensive</b>
<b>Dead</b>	Configured value for the dead timer.	<b>detail extensive</b>
<b>Auth type</b>	(OSPFv2) Authentication mechanism for sending and receiving OSPF protocol packets: <ul style="list-style-type: none"> <li>• <b>MD5</b>—The MD5 mechanism is configured in accordance with RFC 2328.</li> <li>• <b>None</b>—No authentication method is configured.</li> <li>• <b>Password</b>—A simple password (RFC 2328) is configured.</li> </ul>	<b>detail extensive</b>
<b>Topology</b>	(Multiarea adjacency) Name of topology: <b>default</b> or <b>name</b> .	
<b>LDP sync state</b>	(OSPFv2 and LDP synchronization) Current state of LDP synchronization: <b>in sync</b> , <b>in holddown</b> , and <b>not supported</b> .	<b>extensive</b>
<b>reason</b>	(OSPFv2 and LDP synchronization) Reason for the current state of LDP synchronization. The LDP session might be up or down, or adjacency might be up or down.	<b>extensive</b>
<b>config holdtime</b>	(OSPFv2 and LDP synchronization) Configured value of the hold timer.  If the state is not synchronized, and the hold time is not infinity, the <b>remaining</b> field displays the number of seconds that remain until the configured hold timer expires.	<b>extensive</b>
<b>IPSec SA name</b>	(OSPFv2) Name of the IPSec security association name.	<b>detail extensive</b>
<b>Active key ID</b>	(OSPFv2 and MD5) Number from <b>0</b> to <b>255</b> that uniquely identifies an MD5 key.	<b>detail extensive</b>
<b>Start time</b>	(OSPFv2 and MD5) Time at which the routing device starts using an MD5 key to authenticate OSPF packets transmitted on the interface on which this key is configured. To authenticate received OSPF protocol packets, the key becomes effective immediately after the configuration is committed. If the start time option is not configured, the key is effective immediately for send and receive and is displayed as <b>Start time 1970 Jan 01 00:00:00 PST</b> .	<b>detail extensive</b>

Table 8: show (ospf | ospf3) interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
ReXmit	Configured value for the Retransmit timer.	detail extensive
Stub, Not Stub, or Stub NSSA	Type of area.	detail extensive

## Sample Output

### show ospf interface brief

```

user@host> show ospf interface brief
Intf          State   Area      DR ID      BDR ID      Nbrs
at-5/1/0.0    PtToPt  0.0.0.0   0.0.0.0    0.0.0.0     1
ge-2/3/0.0    DR      0.0.0.0   192.168.4.16 192.168.4.15 1
lo0.0         DR      0.0.0.0   192.168.4.16 0.0.0.0     0
so-0/0/0.0    Down    0.0.0.0   0.0.0.0    0.0.0.0     0
so-6/0/1.0    PtToPt  0.0.0.0   0.0.0.0    0.0.0.0     1
so-6/0/2.0    Down    0.0.0.0   0.0.0.0    0.0.0.0     0
so-6/0/3.0    PtToPt  0.0.0.0   0.0.0.0    0.0.0.0     1

```

### show ospf interface detail

```

user@host> show ospf interface detail
Interface      State   Area      DR ID      BDR ID      Nbrs
fe-0/0/1.0     BDR    0.0.0.0   192.168.37.12 10.255.245.215 1
Type LAN, address 192.168.37.11, Mask 255.255.255.248, MTU 4460, Cost 40
DR addr 192.168.37.12, BDR addr 192.168.37.11, Adj count 1, Priority 128
Hello 10, Dead 40, ReXmit 5, Not Stub
t1-0/2/1.0     PtToPt  0.0.0.0   0.0.0.0    0.0.0.0     0
Type P2P, Address 0.0.0.0, Mask 0.0.0.0, MTU 1500, Cost 2604
Adj count 0
Hello 10, Dead 40, ReXmit 5, Not Stub
Auth type: MD5, Active key ID 3, Start time 2002 Nov 19 10:00:00 PST
IPsec SA Name: sa

```

### show ospf3 interface detail

```

user@host> show ospf3 interface so-0/0/3.0 detail
Interface      State   Area      DR-ID      BDR-ID      Nbrs
so-0/0/3.0     PtToPt  0.0.0.0   0.0.0.0    0.0.0.0     1
Address fe80::2a0:a5ff:fe28:1dfc, Prefix-length 64
OSPF3-Intf-index 1, Type P2P, MTU 4470, Cost 12, Adj-count 1
Hello 10, Dead 40, ReXmit 5, Not Stub

```

### show ospf interface detail (When Multiarea Adjacency Is Configured)

```

user@host> show ospf interface detail
regress@router> show ospf interface detail
Interface      State   Area      DR ID      BDR ID      Nbrs
lo0.0          DR      0.0.0.0   10.255.245.2 0.0.0.0     0

Type: LAN, Address: 127.0.0.1, Mask: 255.255.255.255, MTU: 65535, Cost: 0
DR addr: 127.0.0.1, Adj count: 0, Priority: 128
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None

```

```

Topology default (ID 0) -> Cost: 0
10.0.0.0          DR          0.0.0.0          10.255.245.2    0.0.0.0          0

Type: LAN, Address: 10.255.245.2, Mask: 255.255.255.255, MTU: 65535, Cost: 0
DR addr: 10.255.245.2, Adj count: 0, Priority: 128
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 0
so-0/0/0.0        PtToPt  0.0.0.0          0.0.0.0          0.0.0.0          1

Type: P2P, Address: 0.0.0.0, Mask: 0.0.0.0, MTU: 4470, Cost: 1
Adj count: 1
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 1
so-0/0/0.0        PtToPt  0.0.0.0          0.0.0.0          0.0.0.0          0

Type: P2P, Address: 192.168.37.46, Mask: 255.255.255.254, MTU: 4470, Cost: 1
Adj count: 0, , Passive
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Passive, Cost: 1
so-1/0/0.0        PtToPt  0.0.0.0          0.0.0.0          0.0.0.0          1

Type: P2P, Address: 0.0.0.0, Mask: 0.0.0.0, MTU: 4470, Cost: 1
Adj count: 1
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 1
so-1/0/0.0        PtToPt  0.0.0.0          0.0.0.0          0.0.0.0          0

Type: P2P, Address: 192.168.37.54, Mask: 255.255.255.254, MTU: 4470, Cost: 1
Adj count: 0, , Passive
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Passive, Cost: 1
so-0/0/0.0        PtToPt  1.1.1.1          0.0.0.0          0.0.0.0          1

Type: P2P, Address: 0.0.0.0, Mask: 0.0.0.0, MTU: 4470, Cost: 1
Adj count: 1, Secondary
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 1
so-1/0/0.0        PtToPt  1.1.1.1          0.0.0.0          0.0.0.0          1

Type: P2P, Address: 0.0.0.0, Mask: 0.0.0.0, MTU: 4470, Cost: 1
Adj count: 1, Secondary
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 1
so-0/0/0.0        PtToPt  2.2.2.2          0.0.0.0          0.0.0.0          1

Type: P2P, Address: 0.0.0.0, Mask: 0.0.0.0, MTU: 4470, Cost: 1
Adj count: 1, Secondary
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 1
so-1/0/0.0        PtToPt  2.2.2.2          0.0.0.0          0.0.0.0          1

Type: P2P, Address: 0.0.0.0, Mask: 0.0.0.0, MTU: 4470, Cost: 1
Adj count: 1, Secondary

```



```

Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 1

```

#### show ospf interface area area-id

```

user@host> show ospf interface area 1.1.1.1
Interface      State   Area      DR ID      BDR ID      Nbrs
so-0/0/0.0     PtToPt  1.1.1.1    0.0.0.0    0.0.0.0     1
so-1/0/0.0     PtToPt  1.1.1.1    0.0.0.0    0.0.0.0     1

```

#### show ospf interface extensive (When Flooding Reduction Is Enabled)

```

user@host> show ospf interface extensive
Interface      State   Area      DR ID      BDR ID      Nbrs
fe-0/0/0.0     PtToPt  0.0.0.0    0.0.0.0    0.0.0.0     0

Type: P2P, Address: 10.10.10.1, Mask: 255.255.255.0, MTU: 1500, Cost: 1
Adj count: 0
Secondary, Flood Reduction
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
Topology default (ID 0) -> Cost: 1

```

#### show ospf interface extensive (When LDP Synchronization Is Configured)

```

user@host> show ospf interface extensive
Interface      State   Area      DR ID      BDR ID
Nbrs
so-1/0/3.0     Down    0.0.0.0    0.0.0.0    0.0.0.0
0

Type: P2P, Address: 0.0.0.0, Mask: 0.0.0.0, MTU: 4470, Cost: 65535
Adj count: 0
Hello: 10, Dead: 40, ReXmit: 5, Not Stub
Auth type: None
LDP sync state: in holddown, for: 00:00:08, reason: LDP down during config
config holddown: 10 seconds, remaining: 1

```

## show (ospf | ospf3) io-statistics

<b>List of Syntax</b>	<a href="#">Syntax on page 264</a> <a href="#">Syntax (EX Series Switch and QFX Series) on page 264</a>
<b>Syntax</b>	<pre>show (ospf   ospf3) io-statistics &lt;logical-system (all   <i>logical-system-name</i>)&gt;</pre>
<b>Syntax (EX Series Switch and QFX Series)</b>	show (ospf   ospf3) io-statistics
<b>Release Information</b>	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Display Open Shortest Path First (OSPF) input and output statistics.
<b>Options</b>	<p><b>none</b>—Display OSPF input and output statistics.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p>
<b>Required Privilege Level</b>	view
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">clear (ospf   ospf3) statistics on page 239</a></li> </ul>
<b>List of Sample Output</b>	<a href="#">show ospf io-statistics on page 265</a>
<b>Output Fields</b>	<p><a href="#">Table 9 on page 264</a> lists the output fields for the <b>show ospf io-statistics</b> command. Output fields are listed in the approximate order in which they appear.</p>

**Table 9: show (ospf | ospf3) io-statistics Output Fields**

Field Name	Field Description
<b>Packets read</b>	Number of OSPF packets read since the last time the routing protocol was started.
<b>average per run</b>	Total number of packets divided by the total number of times the OSPF read operation is scheduled to run.
<b>max run</b>	Maximum number of packets for a given run among all scheduled runs.
<b>Receive errors</b>	Number of faulty packets received with errors.

## Sample Output

### show ospf io-statistics

```
user@host> show ospf io-statistics
```

```
Packets read: 7361, average per run: 1.00, max run: 1  
Receive errors:  
None
```

## show (ospf | ospf3) log

<b>List of Syntax</b>	<a href="#">Syntax on page 266</a> <a href="#">Syntax (EX Series Switch and QFX Series) on page 266</a>
<b>Syntax</b>	<pre>show (ospf   ospf3) log &lt;instance <i>instance-name</i>&gt; &lt;logical-system (all   <i>logical-system-name</i>)&gt; &lt;realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)&gt; &lt;topology <i>topology-name</i>&gt;</pre>
<b>Syntax (EX Series Switch and QFX Series)</b>	<pre>show (ospf   ospf3) log &lt;instance <i>instance-name</i>&gt; &lt;topology <i>topology-name</i>&gt;</pre>
<b>Release Information</b>	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p><b>topology</b> option introduced in Junos OS Release 9.0.</p> <p><b>topology</b> option introduced in Junos OS Release 9.0 for EX Series switches.</p> <p><b>realm</b> option introduced in Junos OS Release 9.2.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Display the entries in the Open Shortest Path First (OSPF) log of SPF calculations.
<b>Options</b>	<p><b>none</b>—Display entries in the OSPF log of SPF calculations for all routing instances.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Display entries for the specified routing instance.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p> <p><b>topology <i>topology-name</i></b>—(Optional) (OSPFv2 only) Display entries for the specified topology.</p> <p><b>realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)</b>—(OSPFv3 only) (Optional) Display entries for the specified OSPFv3 realm, or address family. Use the <b>realm</b> option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.</p>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show ospf log on page 267</a> <a href="#">show ospf log topology voice on page 267</a>
<b>Output Fields</b>	<p><a href="#">Table 10 on page 267</a> lists the output fields for the <b>show (ospf   ospf3) log</b> command. Output fields are listed in the approximate order in which they appear.</p>

Table 10: show (ospf | ospf3) log Output Fields

Field Name	Field Description
<b>When</b>	Time, in weeks ( <b>w</b> ) and days ( <b>d</b> ), since the SPF calculation was made.
<b>Type</b>	Type of calculation: <b>Cleanup</b> , <b>External</b> , <b>Interarea</b> , <b>NSSA</b> , <b>Redist</b> , <b>SPF</b> , <b>Stub</b> , <b>Total</b> , or <b>Virtuallink</b> .
<b>Elapsed</b>	Amount of time, in seconds, that elapsed during the operation, or the time required to complete the SPF calculation. The start time is the time displayed in the <b>When</b> field.

## Sample Output

### show ospf log

```

user@host> show ospf log
When          Type          Elapsed
1w4d 17:25:58 Stub          0.000017
1w4d 17:25:58 SPF            0.000070
1w4d 17:25:58 Stub          0.000019
1w4d 17:25:58 Interarea     0.000054
1w4d 17:25:58 External        0.000005
1w4d 17:25:58 Cleanup         0.000203
1w4d 17:25:58 Total          0.000537
1w4d 17:24:48 SPF            0.000125
1w4d 17:24:48 Stub          0.000017
1w4d 17:24:48 SPF            0.000100
1w4d 17:24:48 Stub          0.000016
1w4d 17:24:48 Interarea     0.000056
1w4d 17:24:48 External        0.000005
1w4d 17:24:48 Cleanup         0.000238
1w4d 17:24:48 Total          0.000600
...

```

### show ospf log topology voice

```

user@host> show ospf log topology voice
Topology voice SPF log:

    Last instance of each event type
When          Type          Elapsed
00:06:11      SPF            0.000116
00:06:11      Stub            0.000114
00:06:11      Interarea       0.000126
00:06:11      External        0.000067
00:06:11      NSSA            0.000037
00:06:11      Cleanup         0.000186

    Maximum length of each event type
When          Type          Elapsed
00:13:43      SPF            0.000140
00:13:33      Stub            0.000116
00:13:43      Interarea       0.000128
00:13:33      External        0.000075
00:13:38      NSSA            0.000039

```

00:13:53	Cleanup	0.000657
----------	---------	----------

    Last 100 events

When	Type	Elapsed
00:13:53	SPF	0.000090
00:13:53	Stub	0.000041
00:13:53	Interarea	0.000123
00:13:53	External	0.000040
00:13:53	NSSA	0.000038
00:13:53	Cleanup	0.000657
00:13:53	Total	0.001252

  .

  .

00:06:11	SPF	0.000116
00:06:11	Stub	0.000114
00:06:11	Interarea	0.000126
00:06:11	External	0.000067
00:06:11	NSSA	0.000037
00:06:11	Cleanup	0.000186
00:06:11	Total	0.000818

## show (ospf | ospf3) neighbor

**List of Syntax**    [Syntax on page 269](#)  
                          [Syntax \(EX Series Switches and QFX Series\) on page 269](#)

**Syntax**    `show (ospf | ospf3) neighbor`  
                  `<brief | detail | extensive>`  
                  `<area area-id>`  
                  `<instance (all | instance-name)>`  
                  `<interface interface-name>`  
                  `<logical-system (all | logical-system-name)>`  
                  `<neighbor>`  
                  `<realm (ipv4-multicast | ipv4-unicast | ipv6-multicast)>`

**Syntax (EX Series Switches and QFX Series)**    `show (ospf | ospf3) neighbor`  
                          `<brief | detail | extensive>`  
                          `<area area-id>`  
                          `<instance (all | instance-name)>`  
                          `<interface interface-name>`  
                          `<neighbor>`

**Release Information**    Command introduced before Junos OS Release 7.4.  
                                  Command introduced in Junos OS Release 9.0 for EX Series switches.  
                                  **instance all** option introduced in Junos OS Release 9.1.  
                                  **instance all** option introduced in Junos OS Release 9.1 for EX Series switches.  
                                  **area**, **interface**, and **realm** options introduced in Junos OS Release 9.2.  
                                  **area** and **interface** options introduced in Junos OS Release 9.2 for EX Series switches.  
                                  Command introduced in Junos OS Release 11.3 for the QFX Series.  
                                  Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

**Description**    Display information about OSPF neighbors.

CPU utilization might increase while the device learns its OSPF neighbors. We recommend that you use the **show (ospf | ospf3) neighbor** command after the device learns and establishes OSPF neighbor adjacencies. Depending on the size of your network, this might take several minutes. If you receive a “timeout communicating with routing daemon” error when using the **show (ospf | ospf3) neighbor** command, wait several minutes before attempting to use the command again. This is not a critical system error, but you might experience a delay in using the CLI.

**Options**    **none**—Display standard information about all OSPF neighbors for all routing instances.

**brief | detail | extensive**—(Optional) Display the specified level of output.

**area *area-id***—(Optional) Display information about the OSPF neighbors for the specified area.

**instance (all | *instance-name*)**—(Optional) Display all OSPF interfaces for all routing instances or under the named routing instance.

**interface *interface-name***—(Optional) Display information about OSPF neighbors for the specified logical interface.

**logical-system** (**all** | *logical-system-name*)—(Optional) Perform this operation on all logical systems or on a particular logical system.

**neighbor**—(Optional) Display information about the specified OSPF neighbor.

**realm** (**ipv4-multicast** | **ipv4-unicast** | **ipv6-multicast**)—(OSPFv3 only) (Optional) Display information about the OSPF neighbors for the specified OSPFv3 realm, or address family. Use the **realm** option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.

**Required Privilege Level** view

**Related Documentation** • [clear \(ospf | ospf3\) neighbor on page 237](#)

**List of Sample Output** [show ospf neighbor brief on page 272](#)  
[show ospf neighbor detail on page 272](#)  
[show ospf neighbor extensive on page 273](#)  
[show ospf3 neighbor detail on page 274](#)  
[show ospf neighbor area area-id on page 274](#)  
[show ospf neighbor interface interface-name on page 274](#)  
[show ospf3 neighbor instance all \(OSPFv3 Multiple Family Address Support Enabled\) on page 274](#)

**Output Fields** [Table 11 on page 270](#) lists the output fields for the **show (ospf | ospf3) neighbor** command. Output fields are listed in the approximate order in which they appear.

**Table 11: show (ospf | ospf3) neighbor Output Fields**

Field Name	Field Description	Level of Output
<b>Address</b>	Address of the neighbor.	All levels
<b>Interface</b>	Interface through which the neighbor is reachable.	All levels



Table 11: show (ospf | ospf3) neighbor Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>State</b>	<p>State of the neighbor:</p> <ul style="list-style-type: none"> <li>• <b>Attempt</b>—Valid only for neighbors attached to nonbroadcast networks. It indicates that no recent information has been received from the neighbor, but that a more concerted effort must be made to contact the neighbor.</li> <li>• <b>Down</b>—Initial state of a neighbor conversation. It indicates that no recent information has been received from the neighbor. Hello packets might continue to be sent to neighbors in the <b>Down</b> state, although at a reduced frequency.</li> <li>• <b>Exchange</b>—Routing device is describing its entire link-state database by sending database description packets to the neighbor. Each packet has a sequence number and is explicitly acknowledged.</li> <li>• <b>ExStart</b>—First step in creating an adjacency between the two neighboring routing devices. The goal of this step is to determine which routing device is the master, and to determine the initial sequence number.</li> <li>• <b>Full</b>—Neighboring routing devices are fully adjacent. These adjacencies appear in router link and network link advertisements.</li> <li>• <b>Init</b>—A hello packet has recently been sent by the neighbor. However, bidirectional communication has not yet been established with the neighbor. This state might occur, for example, because the routing device itself did not appear in the neighbor's hello packet.</li> <li>• <b>Loading</b>—Link-state request packets are sent to the neighbor to acquire more recent advertisements that have been discovered (but not yet received) in the <b>Exchange</b> state.</li> <li>• <b>2Way</b>—Communication between the two routing devices is bidirectional. This state has been ensured by the operation of the Hello Protocol. This is the most advanced state short of beginning adjacency establishment. The (backup) designated router is selected from the set of neighbors in state <b>2Way</b> or greater.</li> </ul>	All levels
<b>ID</b>	Router ID of the neighbor.	All levels
<b>Pri</b>	Priority of the neighbor to become the designated router.	All levels
<b>Dead</b>	Number of seconds until the neighbor becomes unreachable.	All levels
<b>Link state acknowledgment list</b>	Number of link-state acknowledgments received.	<b>extensive</b>
<b>Link state retransmission list</b>	<p>Total number of link-state advertisements retransmitted. For <b>extensive</b> output only, the following information is also displayed:</p> <ul style="list-style-type: none"> <li>• <b>Type</b>—Type of link advertisement: <b>ASBR</b>, <b>Sum</b>, <b>Extern</b>, <b>Network</b>, <b>NSSA</b>, <b>OpaqArea</b>, <b>Router</b>, or <b>Summary</b>.</li> <li>• <b>LSA ID</b>—LSA identifier included in the advertisement. An asterisk preceding the identifier marks database entries that originated from the local routing device.</li> <li>• <b>Adv rtr</b>—Address of the routing device that sent the advertisement.</li> <li>• <b>Seq</b>—Link sequence number of the advertisement.</li> </ul>	<b>detail extensive</b>

Table 11: show (ospf | ospf3) neighbor Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Neighbor-address</b>	(OSPFv3 only) If the neighbor uses virtual links, the <b>Neighbor-address</b> is the site-local, local, or global address. If the neighbor uses a physical interface, the <b>Neighbor-address</b> is an IPv6 link-local address.	detail extensive
<b>area</b>	Area that the neighbor is in.	detail extensive
<b>OSPF3-Intf-Index</b>	(OSPFv3 only) Displays the OSPFv3 interface index.	detail extensive
<b>opt</b>	Option bits received in the hello packets from the neighbor.	detail extensive
<b>DR or DR-ID</b>	Address of the designated router.	detail extensive
<b>BDR or BDR-ID</b>	Address of the backup designated router.	detail extensive
<b>Up</b>	Length of time since the neighbor came up.	detail extensive
<b>adjacent</b>	Length of time since the adjacency with the neighbor was established.	detail extensive

## Sample Output

### show ospf neighbor brief

```

user@host> show ospf neighbor brief
  Address      Intf      State      ID          Pri  Dead
192.168.254.225 fxp3.0    2Way       10.250.240.32 128  36
192.168.254.230 fxp3.0    Full       10.250.240.8  128  38
192.168.254.229 fxp3.0    Full       10.250.240.35 128  33
10.1.1.129      fxp2.0    Full       10.250.240.12 128  37
10.1.1.131      fxp2.0    Full       10.250.240.11 128  38
10.1.2.1        fxp1.0    Full       10.250.240.9  128  32
10.1.2.81       fxp0.0    Full       10.250.240.10 128  33

```

### show ospf neighbor detail

```

user@host> show ospf neighbor detail
  Address      Interface      State      ID          Pri  Dead
10.5.1.2      ge-1/2/0.1    Full       10.5.1.2    128  37
area 0.0.0.1, opt 0x42, DR 10.5.1.2, BDR 10.5.1.1
Up 06:09:28, adjacent 05:17:36
Link state acknowledgment list: 3 entries

Link state retransmission list: 9 entries

10.5.10.2     ge-1/2/0.10    ExStart    10.5.1.38   128  34
area 0.0.0.1, opt 0x42, DR 10.5.10.2, BDR 10.5.10.1
Up 06:09:28
master, seq 0xac1530f8, rexmit DBD in 3 sec
rexmit LSREQ in 0 sec
10.5.11.2     ge-1/2/0.11    Full       10.5.1.42   128  38
area 0.0.0.1, opt 0x42, DR 10.5.11.2, BDR 10.5.11.1
Up 06:09:28, adjacent 05:26:46
Link state retransmission list: 1 entries

```

```

10.5.12.2      ge-1/2/0.12      ExStart  10.5.1.46      128    33
area 0.0.0.1, opt 0x42, DR 10.5.12.2, BDR 10.5.12.1
Up 06:09:28
master, seq 0xac188a68, rexmit DBD in 2 sec
rexmit LSREQ in 0 sec

```

### show ospf neighbor extensive

```

user@host> show ospf neighbor extensive
Address      Interface      State      ID      Pri  Dead
10.5.1.2     ge-1/2/0.1    Full      10.5.1.2 128   33
area 0.0.0.1, opt 0x42, DR 10.5.1.2, BDR 10.5.1.1
Up 06:09:42, adjacent 05:17:50
Link state retransmission list:

  Type      LSA ID      Adv rtr      Seq
Summary 10.8.56.0    172.25.27.82 0x8000004d
Router  10.5.1.94    10.5.1.94    0x8000005c
Network 10.5.24.2    10.5.1.94    0x80000036
Summary 10.8.57.0    172.25.27.82 0x80000024
Extern  1.10.90.0   10.8.1.2     0x80000041
Extern  1.4.109.0    10.6.1.2     0x80000041
Router  10.5.1.190    10.5.1.190   0x8000005f
Network 10.5.48.2    10.5.1.190   0x8000003d
Summary 10.8.58.0    172.25.27.82 0x8000004d
Extern  1.10.91.0    10.8.1.2     0x80000041
Extern  1.4.110.0    10.6.1.2     0x80000041
Router  10.5.1.18     10.5.1.18    0x8000005f
Network 10.5.5.2     10.5.1.18    0x80000033
Summary 10.8.59.0    172.25.27.82 0x8000003a
Summary 10.8.62.0    172.25.27.82 0x80000025

10.5.10.2    ge-1/2/0.10    ExStart  10.5.1.38      128    38
area 0.0.0.1, opt 0x42, DR 10.5.10.2, BDR 10.5.10.1
Up 06:09:42
master, seq 0xac1530f8, rexmit DBD in 2 sec
rexmit LSREQ in 0 sec
10.5.11.2    ge-1/2/0.11    Full      10.5.1.42      128    33
area 0.0.0.1, opt 0x42, DR 10.5.11.2, BDR 10.5.11.1
Up 06:09:42, adjacent 05:27:00
Link state retransmission list:

  Type      LSA ID      Adv rtr      Seq
Summary 10.8.58.0    172.25.27.82 0x8000004d

```

Extern	1.10.91.0	10.8.1.2	0x80000041
Extern	1.1.247.0	10.5.1.2	0x8000003f
Extern	1.4.110.0	10.6.1.2	0x80000041
Router	10.5.1.18	10.5.1.18	0x8000005f
Network	10.5.5.2	10.5.1.18	0x80000033
Summary	10.8.59.0	172.25.27.82	0x8000003a

### show ospf3 neighbor detail

```

user@host> show ospf3 neighbor detail
ID          Interface          State    Pri    Dead
10.255.71.13 fe-0/0/2.0          Full     128    30
Neighbor-address fe80::290:69ff:fe9b:e002
area 0.0.0.0, opt 0x13, OSPF3-Intf-Index 2
DR-ID 10.255.71.13, BDR-ID 10.255.71.12
Up 02:51:43, adjacent 02:51:43

```

### show ospf neighbor area area-id

```

user@host >show ospf neighbor area 1.1.1.1
Address      Interface          State    ID          Pri    Dead
192.168.37.47 so-0/0/0.0        Full     10.255.245.4 128    33
Area 1.1.1.1
192.168.37.55 so-1/0/0.0        Full     10.255.245.5 128    37
Area 1.1.1.1

```

### show ospf neighbor interface interface-name

```

user@host >show ospf neighbor interface so-0/0/0.0
Address      Interface          State    ID          Pri    Dead
192.168.37.47 so-0/0/0.0        Full     10.255.245.4 128    37
Area 0.0.0.0
192.168.37.47 so-0/0/0.0        Full     10.255.245.4 128    33
Area 1.1.1.1
192.168.37.47 so-0/0/0.0        Full     10.255.245.4 128    32
Area 2.2.2.2

```

### show ospf3 neighbor instance all (OSPFv3 Multiple Family Address Support Enabled)

```

user @host > show ospf3 neighbor instance all
Instance: ina
Realm: ipv6-unicast
ID          Interface          State    Pri    Dead
100.1.1.1    fe-0/0/2.0          Full     128    37
Neighbor-address fe80::217:cb00:c87c:8c03
Instance: inb
Realm: ipv4-unicast
ID          Interface          State    Pri    Dead
100.1.2.1    fe-0/0/2.1          Full     128    33
Neighbor-address fe80::217:cb00:c97c:8c03

```

## show (ospf | ospf3) overview

<b>List of Syntax</b>	<a href="#">Syntax on page 275</a> <a href="#">Syntax (EX Series Switch and QFX Series) on page 275</a>
<b>Syntax</b>	<pre>show (ospf   ospf3) overview &lt;brief   extensive&gt; &lt;instance <i>instance-name</i>&gt; &lt;logical-system (all   <i>logical-system-name</i>)&gt; &lt;realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)&gt;</pre>
<b>Syntax (EX Series Switch and QFX Series)</b>	<pre>show (ospf   ospf3) overview &lt;brief   extensive&gt; &lt;instance <i>instance-name</i>&gt;</pre>
<b>Release Information</b>	<p>Command introduced in Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p><b>realm</b> option introduced in Junos OS Release 9.2.</p> <p>Database protection introduced in Junos 10.2.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Display Open Shortest Path First (OSPF) overview information.
<b>Options</b>	<p><b>none</b>—Display standard information about all OSPF neighbors for all routing instances.</p> <p><b>brief   extensive</b>—(Optional) Display the specified level of output.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Display all OSPF interfaces under the named routing instance.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p> <p><b>realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)</b>—(Optional) (OSPFv3 only) Display information about the specified OSPFv3 realm, or address family. Use the <b>realm</b> option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.</p>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show ospf overview on page 277</a> <a href="#">show ospf overview (With Database Protection) on page 278</a> <a href="#">show ospf3 overview (With Database Protection) on page 278</a> <a href="#">show ospf overview extensive on page 278</a>
<b>Output Fields</b>	<p><a href="#">Table 12 on page 276</a> lists the output fields for the <b>show ospf overview</b> command. Output fields are listed in the approximate order in which they appear.</p>

Table 12: show ospf overview Output Fields

Field name	Field Description	Level of Output
<b>Instance</b>	OSPF routing instance.	All levels
<b>Router ID</b>	Router ID of the routing device.	All levels
<b>Route table index</b>	Route table index.	All levels
<b>Configured overload</b>	Overload capability is enabled. If the overload timer is also configured, display the time that remains before it is set to expire. This field is not displayed after the timer expires.	All levels
<b>Topology</b>	Topology identifier.	All levels
<b>Prefix export count</b>	Number of prefixes exported into OSPF.	All levels
<b>Full SPF runs</b>	Number of complete Shortest Path First calculations.	All levels
<b>SPF delay</b>	Delay before performing consecutive Shortest Path First calculations.	All levels
<b>SPF holddown</b>	Delay before performing additional Shortest Path First (SPF) calculations after the maximum number of consecutive SPF calculations is reached.	All levels
<b>SPF rapid runs</b>	Maximum number of Shortest Path First calculations that can be performed in succession before the hold-down timer begins.	All levels
<b>LSA refresh time</b>	Refresh period for link-state advertisement (in minutes).	All levels
<b>Database protection state</b>	Current state of database protection.	All levels
<b>Warning threshold</b>	Threshold at which a warning message is logged (percentage of maximum LSA count).	All levels
<b>Non self-generated LSAs</b>	Number of LSAs whose router ID is not equal to the local router ID: <b>Current</b> , <b>Warning</b> (threshold), and <b>Allowed</b> .	All levels
<b>Ignore time</b>	How long the database has been in the ignore state.	All levels
<b>Reset time</b>	How long the database must stay out of the ignore or isolated state before it returns to normal operations.	All levels
<b>Ignore count</b>	Number of times the database has been in the ignore state: <b>Current</b> and <b>Allowed</b> .	All levels
<b>Restart</b>	Graceful restart capability: <b>enabled</b> or <b>disabled</b> .	All levels
<b>Restart duration</b>	Time period for complete reacquisition of OSPF neighbors.	All levels
<b>Restart grace period</b>	Time period for which the neighbors should consider the restarting routing device as part of the topology.	All levels

Table 12: show ospf overview Output Fields (*continued*)

Field name	Field Description	Level of Output
Graceful restart helper mode	(OSPFv2) Standard graceful restart helper capability (based on RFC 3623): <b>enabled</b> or <b>disabled</b> .	All levels
Restart-signaling helper mode	(OSPFv2) Restart signaling-based graceful restart helper capability (based on RFC 4811, RFC 4812, and RFC 4813): <b>enabled</b> or <b>disabled</b> .	All levels
Helper mode	(OSPFv3) Graceful restart helper capability: <b>enabled</b> or <b>disabled</b> .	All levels
Trace options	OSPF-specific trace options.	<b>extensive</b>
Trace file	Name of the file to receive the output of the tracing operation.	<b>extensive</b>
Area	Area number. Area 0.0.0.0 is the backbone area.	All levels
Stub type	Stub type of area: <b>Normal Stub</b> , <b>Not Stub</b> , or <b>Not so Stubby Stub</b> .	All levels
Authentication Type	Type of authentication: <b>None</b> , <b>Password</b> , or <b>MD5</b> .  <b>NOTE:</b> The <b>Authentication Type</b> field refers to the authentication configured at the <code>[edit protocols ospf area area-id]</code> level. Any authentication configured for an interface in this area will not affect the value of this field.	All levels
Area border routers	Number of area border routers.	All levels
Neighbors	Number of autonomous system boundary routers.	All levels

## Sample Output

### show ospf overview

```

user@host> show ospf overview
Instance: master
  Router ID: 10.255.245.6
  Route table index: 0
  Configured overload, expires in 118 seconds
  LSA refresh time: 50 minutes
  Restart: Enabled
    Restart duration: 20 sec
    Restart grace period: 40 sec
    Helper mode: enabled
  Area: 0.0.0.0
    Stub type: Not Stub
    Authentication Type: None
    Area border routers: 0, AS boundary routers: 0
    Neighbors
      Up (in full state): 0
  Topology: default (ID 0)
  Prefix export count: 0
  Full SPF runs: 1
  SPF delay: 0.200000 sec, SPF holddown: 5 sec, SPF rapid runs: 3

```

### show ospf overview (With Database Protection)

```
user@host> show ospf overview
Instance: master
  Router ID: 10.255.112.218
  Route table index: 0
  LSA refresh time: 50 minutes
  Traffic engineering
  Restart: Enabled
    Restart duration: 180 sec
    Restart grace period: 210 sec
    Graceful restart helper mode: Enabled
    Restart-signaling helper mode: Enabled
  Database protection state: Normal
    Warning threshold: 70 percent
    Non self-generated LSAs: Current 582, Warning 700, Allowed 1000
    Ignore time: 30, Reset time: 60
    Ignore count: Current 0, Allowed 1
  Area: 0.0.0.0
    Stub type: Not Stub
    Authentication Type: None
    Area border routers: 0, AS boundary routers: 0
  Neighbors
    Up (in full state): 160
  Topology: default (ID 0)
  Prefix export count: 0
  Full SPF runs: 70
  SPF delay: 0.200000 sec, SPF holddown: 5 sec, SPF rapid runs: 3
  Backup SPF: Not Needed
```

### show ospf3 overview (With Database Protection)

```
user@host> show ospf3 overview
Instance: master
  Router ID: 10.255.112.128
  Route table index: 0
  LSA refresh time: 50 minutes
  Database protection state: Normal
    Warning threshold: 80 percent
    Non self-generated LSAs: Current 3, Warning 8, Allowed 10
    Ignore time: 30, Reset time: 60
    Ignore count: Current 0, Allowed 2
  Area: 0.0.0.0
    Stub type: Not Stub
    Area border routers: 0, AS boundary routers: 0
  Neighbors
    Up (in full state): 1
  Topology: default (ID 0)
  Prefix export count: 0
  Full SPF runs: 7
  SPF delay: 0.200000 sec, SPF holddown: 5 sec, SPF rapid runs: 3
  Backup SPF: Not Needed
```

### show ospf overview extensive

```
user@host> show ospf overview extensive
Instance: master
  Router ID: 1.1.1.103
  Route table index: 0
  Full SPF runs: 13, SPF delay: 0.200000 sec
  LSA refresh time: 50 minutes
```



```
Restart: Disabled
Trace options: lsa
Trace file: /var/log/ospf size 131072 files 10
Area: 0.0.0.0
  Stub type: Not Stub
  Authentication Type: None
  Area border routers: 0, AS boundary routers: 0
  Neighbors
    Up (in full state): 1
```

## show (ospf | ospf3) route

**List of Syntax**    [Syntax on page 280](#)  
                          [Syntax \(EX Series Switch and QFX Series\) on page 280](#)

**Syntax**    show (ospf | ospf3) route  
                  <brief | detail | extensive>  
                  <abr | asbr | extern | inter | intra>  
                  <destination>  
                  <instance (default | ipv4-multicast | *instance-name*)>  
                  <logical-system (default | ipv4-multicast | *logical-system-name*)>  
                  <network>  
                  <no-backup-coverage>  
                  <realm (ipv4-multicast | ipv4-unicast | ipv6-multicast)>  
                  <router>  
                  <topology (default | ipv4-multicast | *topology-name*)>  
                  <transit>

**Syntax (EX Series Switch and QFX Series)**    show (ospf | ospf3) route  
                  <brief | detail | extensive>  
                  <abr | asbr | extern | inter | intra>  
                  <destination>  
                  <instance *instance-name*>  
                  <network>  
                  <no-backup-coverage>  
                  <router>  
                  <topology (default | ipv4-multicast | *topology-name*)>  
                  <transit>

**Release Information**    Command introduced before Junos OS Release 7.4.  
                                  Command introduced in Junos OS Release 9.0 for EX Series switches.  
                                  **topology** option introduced in Junos OS Release 9.0.  
                                  **realm** option introduced in Junos OS Release 9.2.  
                                  Command introduced in Junos OS Release 11.3 for the QFX Series.  
                                  Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

**Description**    Display the entries in the Open Shortest Path First (OSPF) routing table.

**Options**    **none**—Display standard information about all entries in the OSPF routing table for all routing instances and all topologies.

**destination**—Display routes to the specified IP address (with optional destination prefix length).

**brief | detail | extensive**—(Optional) Display the specified level of output.

**abr**—(Optional) Display routes to area border routers.

**asbr**—(Optional) Display routes to autonomous system border routers.

**extern**—(Optional) Display external routes.

**inter**—(Optional) Display interarea routes.

**intra**—(Optional) Display intra-area routes.

**instance** (**default** | **ipv4-multicast** | *instance-name*)—(Optional) Display entries for the default routing instance, the IPv4 multicast routing instance, or for the specified routing instance.

**logical-system** (**default** | **ipv4-multicast** | *logical-system-name*)—(Optional) Perform this operation on the default logical system, the IPv4 multicast logical system, or on a particular logical system.

**network**—(Optional) Display routes to networks.

**no-backup-coverage**—(Optional) Display routes with no backup coverage.

**realm** (**ipv4-multicast** | **ipv4-unicast** | **ipv6-multicast**)—(OSPFv3 only) (Optional) Display entries in the routing table for the specified OSPFv3 realm, or address family. Use the **realm** option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.

**router**—(Optional) Display routes to all routers.

**topology** (**default** | **ipv4-multicast** | *topology-name*)—(OSPFv2 only) (Optional) Display routes for the default OSPF topology, IPv4 multicast topology, or for a particular topology.

**transit**—(Optional) (OSPFv3 only) Display OSPFv3 routes to pseudonodes.

**Required Privilege Level**

view

**List of Sample Output**

[show ospf route on page 283](#)  
[show ospf route detail on page 283](#)  
[show ospf3 route on page 283](#)  
[show ospf3 route detail on page 284](#)  
[show ospf route topology voice on page 284](#)

**Output Fields**

[Table 13 on page 281](#) list the output fields for the **show (ospf | ospf3) route** command. Output fields are listed in the approximate order in which they appear.

**Table 13: show (ospf | ospf3) route Output Fields**

Field Name	Field Description	Output Level
<b>Topology</b>	Name of the topology.	All levels
<b>Prefix</b>	Destination of the route.	All levels

Table 13: show (ospf | ospf3) route Output Fields (*continued*)

Field Name	Field Description	Output Level
<b>Path type</b>	How the route was learned: <ul style="list-style-type: none"> <li><b>Inter</b>—Interarea route</li> <li><b>Ext1</b>—External type 1 route</li> <li><b>Ext2</b>—External type 2 route</li> <li><b>Intra</b>—Intra-area route</li> </ul>	All levels
<b>Route type</b>	The type of routing device from which the route was learned: <ul style="list-style-type: none"> <li><b>AS BR</b>—Route to AS border router.</li> <li><b>Area BR</b>—Route to area border router.</li> <li><b>Area/AS BR</b>—Route to router that is both an <b>Area BR</b> and <b>AS BR</b>.</li> <li><b>Network</b>—Network router.</li> <li><b>Router</b>—Route to a router that is neither an <b>Area BR</b> nor an <b>AS BR</b>.</li> <li><b>Transit</b>—(OSPFv3 only) Route to a pseudonode representing a transit network, LAN, or nonbroadcast multiaccess (NBMA) link.</li> <li><b>Discard</b>—Route to a summary discard.</li> </ul>	All levels
<b>NH Type</b>	Next-hop type: <b>LSP</b> or <b>IP</b> .	All levels
<b>Metric</b>	Route's metric value.	All levels
<b>NH-interface</b>	(OSPFv3 only) Interface through which the route's next hop is reachable.	All levels
<b>NH-addr</b>	(OSPFv3 only) IPv6 address of the next hop.	All levels
<b>NextHop Interface</b>	(OSPFv2 only) Interface through which the route's next hop is reachable.	All levels
<b>Nexthop addr/label</b>	(OSPFv2 only) If the <b>NH Type</b> is <b>IP</b> , then it is the address of the next hop. If the <b>NH Type</b> is <b>LSP</b> , then it is the name of the label-switched path.	All levels
<b>Area</b>	Area ID of the route.	detail
<b>Origin</b>	Router from which the route was learned.	detail
<b>Type 7</b>	Route was learned through a not-so-stubby area (NSSA) link-state advertisement (LSA).	detail
<b>P-bit</b>	Route was learned through NSSA LSA and the propagate bit was set.	detail
<b>Fwd NZ</b>	Forwarding address is nonzero. <b>Fwd NZ</b> is only displayed if the route is learned through an NSSA LSA.	detail

Table 13: show (ospf | ospf3) route Output Fields (*continued*)

Field Name	Field Description	Output Level
<b>optional-capability</b>	Optional capabilities propagated in the router LSA. This field is in the output for intra-area router routes only (when <b>Route Type</b> is <b>Area BR</b> , <b>AS BR</b> , <b>Area/AS BR</b> , or <b>Router</b> ), not for interarea router routes or network routes. Three bits in this field are defined as follows: <ul style="list-style-type: none"> <li>• <b>0x4 (V)</b>—Routing device is at the end of a virtual active link.</li> <li>• <b>0x2 (E)</b>—Routing device is an autonomous system boundary router.</li> <li>• <b>0x1 (B)</b>—Routing device is an area border router.</li> </ul>	<b>detail</b>
<b>priority</b>	The priority assigned to the prefix: <ul style="list-style-type: none"> <li>• <b>high</b></li> <li>• <b>medium</b></li> <li>• <b>low</b></li> </ul> <p><b>NOTE:</b> The <b>priority</b> field applies only to routes of type <b>Network</b>.</p>	<b>detail</b>

## Sample Output

### show ospf route

```

user@host> show ospf route
Prefix          Path   Route   NH   Metric  NextHop      Nexthop
                Type   Type    Type                Interface    addr/label
10.255.71.12     Intra Router  IP    1      fe-0/0/2.0   192.16.22.86
10.255.71.13/32  Intra Network IP    0      lo0.0
192.168.222.84/30 Intra Network LSP   1      fe-0/0/2.0   1sp-ab

```

### show ospf route detail

```

user@host> show ospf route detail
Topology default Route Table:

Prefix          Path   Route   NH   Metric  NextHop      Nexthop
                Type   Type    Type                Interface    addr/label
10.255.14.174    Inter AS BR  IP      210    t1-3/0/1.0
  area 0.0.0.2, origin 10.255.14.185
10.255.14.178    Intra Router  IP      200    t3-3/1/3.0
  area 0.0.0.2, origin 10.255.14.178, optional-capability 0x0
10.210.1.0/30    Intra Network IP      10     t3-3/1/2.0
  area 0.0.0.2, origin 10.255.14.172, priority medium
100.1.1.1/32     Inter Network IP      210    t1-3/0/1.0
  area 0.0.0.2, origin 10.255.14.185, priority low
112.3.1.0/24     Ext2 Network IP      0      t1-3/0/1.0
  area 0.0.0.0, origin 10.255.14.174, priority high
200.3.3.0/30     Inter Network IP      220    t1-3/0/1.0
  area 0.0.0.2, origin 10.255.14.185, priority high

```

### show ospf3 route

```

user@host> show ospf3 route
Prefix          Path   Route   NH   Metric  NextHop      Nexthop
                Type   Type    Type                Interface    addr/label

```

```

10.255.71.13      Intra Router   IP      1
NH-interface fe-0/0/2.0, NH-addr fe80::290:69ff:fe9b:e002
10.255.71.13;0.0.0.2
10.255.245.1      Intra Router   IP      40 fxp1.1      192.168.36.17

    area 0.0.0.0, origin 10.255.245.1 optional-capability 0x0,
10.255.245.3      Intra AS BR    IP      1 fxp2.3      192.168.36.34

    area 0.0.0.0, origin 10.255.245.3 optional-capability 0x0,
10.255.245.1/32   Intra Network IP      40 fxp1.1      192.168.36.17

    area 0.0.0.0, origin 10.255.245.1, priority high
10.255.245.2/32   Intra Network IP      0 lo0.0
    area 0.0.0.0, origin 10.255.245.2, priority medium
10.255.245.3/32   Intra Network IP      1 fxp2.3      192.168.36.34

    area 0.0.0.0, origin 10.255.245.3, priority low
    Intra Transit   IP      1
NH-interface fe-0/0/2.0
192::168:222:84/126 Intra Network IP      1
NH-interface fe-0/0/2.0
abcd::71:12/128   Intra Network IP      0
NH-interface lo0.0
abcd::71:13/128   Intra Network LSP     1
NH-interface fe-0/0/2.0, NH-addr lsp-cd

```

#### show ospf3 route detail

```

user@host> show ospf3 route detail
Prefix                                     Path   Route   NH   Metric
                                     type   type
10.255.14.174                           Intra  Area/AS BR IP    110
NH-interface so-1/2/2.0
Area 0.0.0.0, Origin 10.255.14.174, Optional-capability 0x3
10.255.14.178                           Intra  Router  IP    200
NH-interface t3-3/1/3.0
Area 0.0.0.0, Origin 10.255.14.178, Optional-capability 0x0
10.255.14.185;0.0.0.2                   Intra  Transit IP    200
NH-interface t1-3/0/1.0
NH-interface so-1/2/2.0
Area 0.0.0.0, Origin 10.255.14.185
1000:1:1::1/128                         Inter  Network IP    110
NH-interface so-1/2/2.0
Area 0.0.0.0, Origin 10.255.14.174, Priority low
1001:2:1::/48                           Ext1   Network IP    110
NH-interface so-1/2/2.0
Area 0.0.0.0, Origin 10.255.14.174, Fwd NZ, Priority medium
1002:1:7::/48                           Ext2   Network IP    0
NH-interface so-1/2/2.0
Area 0.0.0.0, Origin 10.255.14.174, Fwd NZ, Priority low
1002:3:4::/48                           Ext2   Network IP    0
NH-interface so-1/2/2.0
Area 0.0.0.0, Origin 10.255.14.174, Fwd NZ, Priority high
abcd::10:255:14:172/128                 Intra  Network IP    0
NH-interface lo0.0
Area 0.0.0.0, Origin 10.255.14.172, Priority low

```

#### show ospf route topology voice

```
user@host show ospf route topology voice
```

## Topology voice Route Table:

Prefix	Path Type	Route Type	NH Type	Metric	NextHop Interface	Nexthop addr/label
10.255.8.2	Intra	Router	IP	1	so-0/2/0.0	
10.255.8.3	Intra	Router	IP	2	so-0/2/0.0	
10.255.8.1/32	Intra	Network	IP	0	lo0.0	
10.255.8.2/32	Intra	Network	IP	1	so-0/2/0.0	
10.255.8.3/32	Intra	Network	IP	2	so-0/2/0.0	
192.168.8.0/29	Intra	Network	IP	2	so-0/2/0.0	
192.168.8.44/30	Intra	Network	IP	2	so-0/2/0.0	
192.168.8.46/32	Intra	Network	IP	1	so-0/2/0.0	
192.168.8.48/30	Intra	Network	IP	1	so-0/2/1.0	
192.168.8.52/30	Intra	Network	IP	2	so-0/2/0.0	
192.168.9.44/30	Intra	Network	IP	1	so-0/2/0.0	
192.168.9.45/32	Intra	Network	IP	2	so-0/2/0.0	

## show (ospf | ospf3) statistics

<b>List of Syntax</b>	<a href="#">Syntax on page 286</a> <a href="#">Syntax (EX Series Switch and QFX Series) on page 286</a>
<b>Syntax</b>	<pre>show (ospf   ospf3) statistics &lt;instance <i>instance-name</i>&gt; &lt;logical-system (all   <i>logical-system-name</i>)&gt; &lt;realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)&gt;</pre>
<b>Syntax (EX Series Switch and QFX Series)</b>	<pre>show (ospf   ospf3) statistics &lt;instance <i>instance-name</i>&gt;</pre>
<b>Release Information</b>	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p><b>realm</b> option introduced in Junos OS Release 9.2.</p> <p>Command introduced in Junos OS Release 11.3 for the QFX Series.</p> <p>Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.</p>
<b>Description</b>	Display OSPF statistics.
<b>Options</b>	<p><b>none</b>—Display OSPF statistics for all routing instances.</p> <p><b>instance <i>instance-name</i></b>—(Optional) Display all statistics for the specified routing instance.</p> <p><b>logical-system (all   <i>logical-system-name</i>)</b>—(Optional) Perform this operation on all logical systems or on a particular logical system.</p> <p><b>realm (ipv4-multicast   ipv4-unicast   ipv6-multicast)</b>—(Optional) (OSPFv3 only) Display all statistics for the specified OSPFv3 realm, or address family. Use the <b>realm</b> option to specify an address family for OSPFv3 other than IPv6 unicast, which is the default.</p>
<b>Required Privilege Level</b>	view
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">clear (ospf   ospf3) statistics on page 239</a></li> </ul>
<b>List of Sample Output</b>	<a href="#">show ospf statistics on page 288</a> <a href="#">show ospf statistics logical-system all on page 288</a> <a href="#">show ospf3 statistics on page 289</a>
<b>Output Fields</b>	<p><a href="#">Table 14 on page 286</a> lists the output fields for the <b>show (ospf   ospf3) statistics</b> command. Output fields are listed in the approximate order in which they appear.</p>

**Table 14: show (ospf | ospf3) statistics Output Fields**

Field Name	Field Description
Packet type	Type of OSPF packet.



Table 14: show (ospf | ospf3) statistics Output Fields (*continued*)

Field Name	Field Description
<b>Total Sent/Total Received</b>	Total number of packets sent and received.
<b>Last 5 seconds Sent/Last 5 seconds Received</b>	Total number of packets sent and received in the last 5 seconds.
<b>DBDs retransmitted</b>	Total number of database description packets retransmitted, and number retransmitted in the last 5 seconds.
<b>LSAs flooded</b>	Total number of link-state advertisements flooded, and number flooded in the last 5 seconds.
<b>LSAs flooded high-prio</b>	<p>Total number of high priority link-state advertisements flooded, and number flooded in the last 5 seconds.</p> <p>A link-state advertisement is deemed a high priority if it has changed since it was last sent.</p>
<b>LSAs retransmitted</b>	Total number of link-state advertisements retransmitted, and number retransmitted in the last 5 seconds.
<b>LSAs transmitted to nbr</b>	Total number of link-state advertisements transmitted to a neighbor, and number transmitted in the last 5 seconds.
<b>LSAs requested</b>	Total number of link-state advertisements requested by neighboring devices, and number requested in the last 5 seconds.
<b>LSAs acknowledged</b>	Total number of link-state advertisements acknowledged, and number acknowledged in the last 5 seconds.
<b>Flood queue depth</b>	Total number of entries in the extended queue.
<b>Total rexmit entries</b>	Total number of retransmission entries waiting to be sent from the OSPF routing instance.
<b>db summaries</b>	Total number of database description summaries waiting to be sent from the OSPF routing instance.
<b>lsreq entries</b>	Total number of link-state request entries waiting to be sent from the OSPF routing instance.

Table 14: show (ospf | ospf3) statistics Output Fields (*continued*)

Field Name	Field Description
<b>Receive errors</b>	<p>Number and type of receive errors. Some sample receive errors include:</p> <ul style="list-style-type: none"> <li>• mtu mismatches</li> <li>• no interface found</li> <li>• no virtual link found</li> <li>• nssa mismatches</li> <li>• stub area mismatches</li> <li>• subnet mismatches</li> </ul> <p>If there are no receive errors, the output displays <b>none</b>.</p>

## Sample Output

### show ospf statistics

```

user@host> show ospf statistics
Packet type          Total          Last 5 seconds
                   Sent      Received      Sent      Received
Hello                31         14           2           2
  DbD                 9          10           0           0
  LSReq               2           2           0           0
LSUpdate             8          16           0           0
LSAck                9           9           0           0

DBDs retransmitted   :           3, last 5 seconds :           0
LSAs flooded         :          12, last 5 seconds :           0
LSAs flooded high-prio :           0, last 5 seconds :           0
LSAs retransmitted   :           0, last 5 seconds :           0
LSAs transmitted to nbr:           3, last 5 seconds :           0
LSAs requested       :           5, last 5 seconds :           0
LSAs acknowledged   :          19, last 5 seconds :           0

Flood queue depth    :           0
Total rexmit entries :           0
db summaries         :           0
lsreq entries        :           0

Receive errors:
  862 no interface found
 115923 no virtual link found

```

### show ospf statistics logical-system all

```

user@host> show ospf statistics logical-system all
logical-system: C
OSPF instance is not running
-----

logical-system: B

Packet type          Total          Last 5 seconds
                   Sent      Received      Sent      Received
Hello               313740       313653           1           0

```

```

        DbD          3          2          0          0
        LSReq         1          1          0          0
        LSUpdate      2752      1825          0          0
        LSAck         1821      2747          0          0

DBDs retransmitted :          0, last 5 seconds :          0
LSAs flooded       :          2741, last 5 seconds :          0
LSAs flooded high-prio :          10, last 5 seconds :          0
LSAs retransmitted :          0, last 5 seconds :          0
LSAs transmitted to nbr:          2, last 5 seconds :          0
LSAs requested     :          1, last 5 seconds :          0
LSAs acknowledged  :          1831, last 5 seconds :          0

Flood queue depth  :          0
Total rexmit entries :          0
db summaries       :          0
lsreq entries      :          0

Receive errors:
  None
-----

logical-system: A

Packet type          Total          Last 5 seconds
                   Sent    Received    Sent    Received
Hello               313698    313695         0         0
DbD                  2         3         0         0
LSReq                1         1         0         0
LSUpdate            1825    2752         0         0
LSAck               2747    1821         0         0

DBDs retransmitted :          0, last 5 seconds :          0
LSAs flooded       :          1825, last 5 seconds :          0
LSAs flooded high-prio :          10, last 5 seconds :          0
LSAs retransmitted :          0, last 5 seconds :          0
LSAs transmitted to nbr:          1, last 5 seconds :          0
LSAs requested     :          2, last 5 seconds :          0
LSAs acknowledged  :          2748, last 5 seconds :          0

Flood queue depth  :          0
Total rexmit entries :          0
db summaries       :          0
lsreq entries      :          0

Receive errors:
  None
-----

```

### show ospf3 statistics

```

user@host> show ospf3 statistics
Packet type          Total          Last 5 seconds
                   Sent    Received    Sent    Received
Hello                0         0         0         0
DbD                  0         0         0         0
LSReq                0         0         0         0
LSUpdate            0         0         0         0
LSAck               0         0         0         0

DBDs retransmitted :          0, last 5 seconds :          0

```

LSAs flooded	:	0, last 5 seconds :	0
LSAs flooded high-prio	:	0, last 5 seconds :	0
LSAs retransmitted	:	0, last 5 seconds :	0
LSAs transmitted to nbr:	:	0, last 5 seconds :	0
LSAs requested	:	0, last 5 seconds :	0
LSAs acknowledged	:	0, last 5 seconds :	0
Flood queue depth	:	0	
Total rexmit entries	:	0	
db summaries	:	0	
lsreq entries	:	0	
Receive errors:			
None			