

# Sun Ethernet Fabric Operating System

## OSPFv3 Administration Guide



Part No.: E25212-02  
July 2012

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# Contents

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## **Using This Documentation 1**

- Product Notes 1
- Related Documentation 2
- Acronyms and Abbreviations 2
- CLI Command Modes 3
- Feedback 4
- Support and Accessibility 5

## **OSPFv3 Overview 7**

- Protocol Description 7

## **OSPFv3 Topologies 9**

- Configuration and Testing Topologies 9
- IPv6 Example Topology Interface and Host Addresses 9
  - IPv6 Example Topology 11
  - Stub Area Topology 11
  - Route Redistribution Topology 12
  - NSSA Type-7/-5 Conversion Topology 13
  - Virtual Link and Route Summarization Topology 14
  - Host Topology 15

## **OSPFv3 Configurations 17**

- Default Configuration Values 17

SNMP MIB Files	19
Creating the Base Configuration	20
▼ Access Global Configuration Mode	20
▼ Access Interface Configuration Mode	20
Enabling IPv6 Support and Assigning IPv6 Addresses	21
▼ Enable IPv6	21
▼ Disable IPv6	22
▼ Delete an IPv6 Address	22
Configuring IPv6 Static Routes	23
▼ Configure Static Routes	23
▼ Delete a Static Route	24
Creating the Base Configuration for Example Topologies	24
▼ Configure SEFOS1	25
▼ Configure SEFOS2	25
▼ Configure SEFOS3	26
▼ Configure SEFOS4	26
▼ Configure SEFOS5	27
▼ Configure SEFOS6	27
▼ Configure SEFOS7	28
▼ Configure SEFOS8	28
▼ Configure SEFOS9	29
<b>Configuring OSPFv3 Features</b>	<b>31</b>
OSPFv3 Features	31
Configuring Basic OSPFv3	32
▼ Enable OSPFv3	32
▼ Disable OSPFv3	33
Creating an OSPFv3 Interface	33
▼ Configure an OSPFv3 Interface	33

Configuring Neighbors	36
▼ Configure an OSPFv3 Neighbor	36
Configuring OSPFv3 Interface Parameters	37
OSPFv3 Interface Parameters	38
▼ Configure Interface Priority	38
▼ Restore the Default Interface Priority	39
▼ Configure the Retransmission Interval	39
▼ Restore the Default Retransmission Value	40
▼ Configure Transmission Delay	40
▼ Restore the Default Transmission Delay	41
▼ Configure the Hello Interval	41
▼ Restore the Default Hello Interval	42
▼ Configure the Dead Interval	42
▼ Restore the Default Dead Interval	43
▼ Configure the Network Type	43
▼ Restore the Default OSPF Network Type	44
▼ Configure the Interface Cost	44
▼ Restore the Default Interface Cost	45
Configuring a Demand Circuit	45
▼ Enable a Demand Circuit	46
▼ Remove the Demand Circuit Setting	46
▼ Enable Neighbor Probing on a Demand Circuit	46
▼ Remove Neighbor Probing on a Demand Circuit	47
Configuring Neighbor Probe Values	47
▼ Configure the Neighbor Probe Retransmission Limit	48
▼ Restore the Default Neighbor Probe Retransmission Limit	49
▼ Configure the Neighbor Probe Interval	49
▼ Restore the Default Neighbor Probe Interval	50

Configuring a Passive Interface	50
▼ Configure All Interfaces To Be Passive	50
▼ Configure Specified Interfaces To Be Passive	51
▼ Restore the Default Routing Updates	52
Configuring Route Redistribution	52
▼ Configure an ASBR Router	52
▼ Disable the ASBR Router	53
▼ Configure Route Redistribution	54
▼ Disable Route Redistribution	55
▼ Configure the Stub Area, ASBR, and Route Distribution	55
Configuring Attributes for Redistributed Routes	57
▼ Configure Redistributed Route Attributes	57
▼ Delete Redistributed Route Attributes	59
Configuring the Redistribution of Routes	59
▼ Configure Route Redistribution	59
▼ Restore the Default Redistribution Configuration	60
Configuring Area Route Summarization	61
Area Route Overview	61
▼ Configure Address Range Aggregation	62
▼ Disable an Address Range	63
▼ Configure an Internal Address Range	64
▼ Disable an Internal Address Range	65
Configuring a Stub Area	67
▼ Configure a Stub Area	67
▼ Convert a Stub Area to a Normal Area	68
▼ Configure a Default Summary Route for a Stub Area	68
▼ Configure the Default Summary Route Cost for a Stub Area	69
Configuring an NSSA	70

- ▼ Configure the Stability Interval for NSSA 71
- ▼ Restore the Default Stability Interval 72
- ▼ Configure an NSSA Translation Role 72
- ▼ Restore the Default Translation Role 74
- ▼ Configure Default Summary Route for an NSSA 74
- ▼ Configure the Metric Type for an NSSA 75

Configuring the Capability in an NSSA Internal Border Router 76

- ▼ Configure NSSA Type-7/-5 Conversion 76

Configuring Virtual Links 80

- ▼ Configure a Virtual Link 80
- ▼ Delete a Virtual Link 81
- ▼ Configure Virtual Link and Route Summarization 81

Configuring External Database Limit 85

- ▼ Configure the External Database Limit 85
- ▼ Restore the Default External Database Limit 86

Configuring the Overflow Exit Interval 87

- ▼ Configure the Overflow Exit Interval 87

Configuring a Demand Extension 89

- ▼ Disable a Demand Extension 89
- ▼ Re-Enable Demand Extensions 90

Configuring the Host 91

- ▼ Configure the Host 91
- ▼ Test the Host 92

Configuring Route Calculation SPF Timers 93

- ▼ Configure SPF Timers 93
- ▼ Restore the Default Delay Time 94





# Using This Documentation

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This guide describes the OSPFv3 module configuration on a switch running Oracle SEFOS. The configurations are done through CLI and SNMP.

This guide describes the configuration of specific features, in a manner using example values. Refer to the Oracle CLI user manual for a detailed explanation of the configuration parameters and the related values, if any.

- [“Product Notes”](#) on page 1
- [“Related Documentation”](#) on page 2
- [“Acronyms and Abbreviations”](#) on page 2
- [“CLI Command Modes”](#) on page 3
- [“Feedback”](#) on page 4
- [“Support and Accessibility”](#) on page 5

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## Product Notes

For late-breaking information and known issues about the following products, refer to the product notes at:

Sun Blade 6000 Ethernet Switched NEM 24p 10GbE:

<http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE>

Sun Network 10GbE Switch 72p:

<http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p>

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## Related Documentation

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Documentation	Links
All Oracle products	<a href="http://oracle.com/documentation">http://oracle.com/documentation</a>
Sun Blade 6000 Ethernet Switched NEM 24p 10GbE	<a href="http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE">http://www.oracle.com/pls/topic/lookup?ctx=SB6K-24p-10GbE</a>
Sun Network 10GbE Switch 72p	<a href="http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p">http://www.oracle.com/pls/topic/lookup?ctx=SN-10GbE-72p</a>
Sun Blade 6000 modular system	<a href="http://www.oracle.com/pls/topic/lookup?ctx=sb6000">http://www.oracle.com/pls/topic/lookup?ctx=sb6000</a>
Oracle Integrated Lights Out Manager (Oracle ILOM) 3.0	<a href="http://www.oracle.com/pls/topic/lookup?ctx=ilom30">http://www.oracle.com/pls/topic/lookup?ctx=ilom30</a>

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For detailed information about the commands and options described in this document, refer to the *Sun Ethernet Fabric Operating System CLI Base Reference Manual*.

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## Acronyms and Abbreviations

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Acronym or Abbreviation	Explanation
ABR	Area border router
AH	Authentication header
AS	Autonomous system
ASBR	Autonomous system border router
BGP	Border Gateway Protocol
CLI	Command-line interface
DDP	Database description packet
DR	Designated router
ESP	Encapsulating security payload

---

Acronym or Abbreviation	Explanation
IPsec	IP Security Protocol
IPv6	Internet Protocol version 6
ISM	Interface state machine
LAN	Local area network
LSA	Link state acknowledgment packet
LRQ	Link state request packet
LS	Link state
LSA	Link state advertisement
LSDB	Link state database
LSP	Label-switched path
LSU	Link state update
NBMA	Non-broadcast multi-access
ND	Neighbor discovery
NSSA	Not-so-stubby-area
OSPFv3	Open Shortest Path First version 3
RIP	Routing Information Protocol
RRD	Route redistribution
RTM6	Route table manager for IP version 6
SEFOS	Sun Ethernet Fabric Operating System
SPF	Shortest Path First
VLAN	Virtual LAN
VPN	Virtual private network
VRF	Virtual routing and forwarding

## CLI Command Modes

The following table lists the configuration modes used in this document with their access and exit methods.

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Access SEFOS from Oracle ILOM with read-only rights (privilege level 1).	SEFOS>	Use the <code>logout</code> or <code>exit</code> command to return to the Oracle ILOM prompt.
Privileged EXEC	Access SEFOS from Oracle ILOM with full administrative rights (privilege level 15).	SEFOS#	Use the <code>logout</code> or <code>exit</code> command to return to the Oracle ILOM prompt.
Global Configuration	From User EXEC mode, use the <code>enable</code> command.	SEFOS(config)#	Use the <code>end</code> command to return to Privileged EXEC mode.
Interface Configuration	From Global Configuration mode, use the <code>interface interface-type interface-id</code> command.	SEFOS(config-if)#	Use the <code>exit</code> command to return to Global Configuration mode, or use the <code>end</code> command to return to Privileged EXEC mode.
Router Configuration	Use the protocol-specific Global Configuration mode router command (for example, <code>router rip</code> ).	SEFOS(config-router)#	Use the <code>exit</code> command to return to Global Configuration mode, or use the <code>end</code> command to return to Privileged EXEC mode.
VLAN Configuration	Use the Global Configuration mode command <code>vlan vlan no.</code>	SEFOS(config-vlan)#	Use the <code>exit</code> command to return to Global Configuration mode, or use the <code>end</code> command to return to Privileged EXEC mode.
Router Map Configuration	Use the route map-specific Global Configuration mode command (for example, <code>route-map aa permit 1</code> ).	SEFOS(config-rmap aa)#	Use the <code>exit</code> command to return to Global Configuration mode, or use the <code>end</code> command to return to Privileged EXEC mode.

## Feedback

Provide feedback on this documentation at:

<http://www.oracle.com/goto/docfeedback>

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# Support and Accessibility

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Description	Links
Access electronic support through My Oracle Support	<a href="http://support.oracle.com">http://support.oracle.com</a>
	For hearing impaired: <a href="http://www.oracle.com/accessibility/support.html">http://www.oracle.com/accessibility/support.html</a>
Learn about Oracle's commitment to accessibility	<a href="http://www.oracle.com/us/corporate/accessibility/index.html">http://www.oracle.com/us/corporate/accessibility/index.html</a>

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# OSPFv3 Overview

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This section describes the OSPFv3 protocol.

- [“Protocol Description” on page 7](#)

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## Protocol Description

OSPFv3 adds support for IPv6 in the OSPF routing protocol, as described in RFC 2740. Most configurations and operational commands function essentially the same in OSPFv3 as they do in OSPFv2. For example, OSPFv3 router IDs, area IDs, and LSA link state IDs are 32 bits, just as they are in OSPFv2 IPv4. In addition, all of the optional capabilities of OSPFv2 for IPv4, for example, NSSA, are supported in OSPFv3 for IPv6.

However, there are also many significant changes in OSPFv3 for IPv6, including the following:

- Router LSAs and network LSAs no longer carry prefix information. In OSPFv3, these LSAs carry only the topology information.
- New and modified LSAs have been created to handle the flow of IPv6 addresses and prefixes in an OSPFv3 network.
- OSPFv3 runs on a per-link basis, instead of a per-IP-subnet basis.
- IPv6 link-local addresses are used for OSPFv3 neighbor exchanges, except over virtual links.
- The flooding scope for LSAs is generalized into three categories for OSPFv3:
  - **Link-local scope.** The OSPFv3 packet is flooded only to the members connected on a link.
  - **Area scope.** The OSPFv3 packet is flooded to all members of an OSPFv3 area.
  - **AS scope.** The OSPFv3 packet is flooded to all members of an AS.
- Authentication is removed from the OSPFv3 protocol. Instead, OSPFv3 relies on the AH and ESP portions of the IPsec for all authentication tasks in IPv6.
- LSPs and traffic engineering are not supported in OSPFv3.

The 32-bit router ID in OSPFv3 always identifies neighboring routers.



# OSPFv3 Topologies

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These sections provide sample topologies that you can use to configure and test the basic features of OSPFv3.

- [“Configuration and Testing Topologies”](#) on page 9
- [“IPv6 Example Topology Interface and Host Addresses”](#) on page 9

---

## Configuration and Testing Topologies

The examples presented in this guide show various topology scenarios that can be used to configure and test OSPFv3.

The following components are used in the example topology, as shown in [“IPv6 Example Topology Interface and Host Addresses”](#) on page 9.

- SEFOS1 through SEFOS9 are SEFOS switches.
- Host A includes host devices that are connected to switch SEFOS3.
- VLAN 1, VLAN 2, VLAN 3, VLAN 4, VLAN 5, VLAN 10, and VLAN 11 are VLAN interfaces.
- VL represents the virtual link between two areas.
- Each SEFOS switch has a router ID.

---

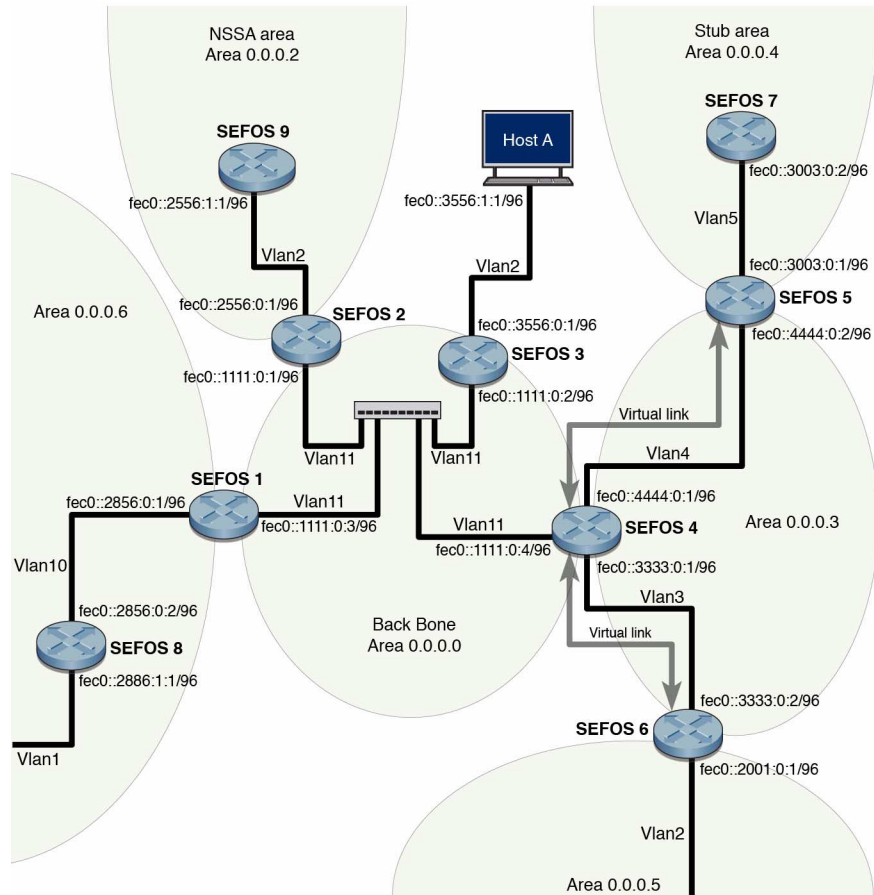
## IPv6 Example Topology Interface and Host Addresses

This table lists detailed information about the routers used in the example topologies presented in this guide.

Router/Host	IPv4 Router ID	Interface	IPv6 Address/Prefix Length
SEFOS1	10.0.0.1	VLAN 11	fec0::1111:0:3/96
		VLAN 10	fec0::2856:0:1/96
SEFOS2	10.0.0.2	VLAN 11	fec0::1111:0:1/96
		VLAN 2	fec0::2556:0:1/96
SEFOS3	10.0.0.3	VLAN 11	fec0::1111:0:2/96
		VLAN 2	fec0::3556:0:1/96
SEFOS4	10.0.0.4	VLAN 11	fec0::1111:0:4/96
		VLAN 3	fec0::3333:0:2/96
		VLAN 4	fec0::4444:0:1/96
SEFOS5	10.0.0.5	VLAN 5	fec0::3003:0:1/96
		VLAN 4	fec0::4444:0:2/96
SEFOS6	10.0.0.6	VLAN 2	fec0::2001:0:1/96
		VLAN 3	fec0::3333:0:2/96
SEFOS7	10.0.0.7	VLAN 5	fec0::3003:0:2/96
SEFOS8	10.0.0.8	VLAN 1	fec0::2886:1:1/96
		VLAN 10	fec0::2856:0:2/96
SEFOS9	10.0.0.9	VLAN 2	fec0::2556:1:1/96
Host A	NA	NA	fec0::3556:1:1/96

The following figure illustrates this configuration:

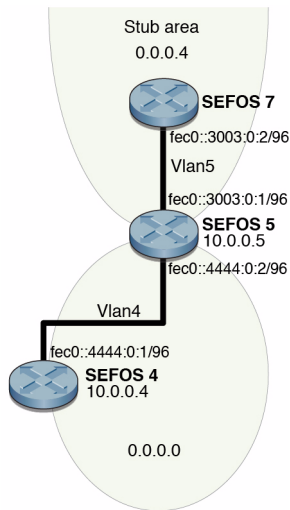
# IPv6 Example Topology



## Stub Area Topology

This figure shows the components that are used to test and configure the stub area, ASBR, and route redistribution in the example topology.

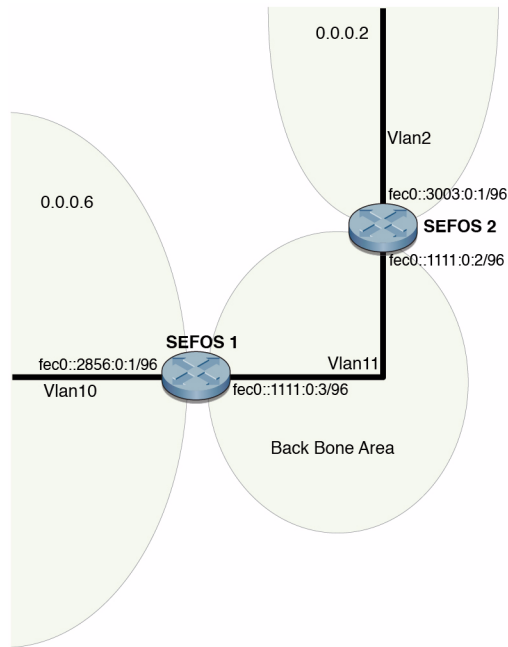
See [“IPv6 Example Topology Interface and Host Addresses”](#) on page 9 for the configuration details of this topology.



## Route Redistribution Topology

This figure shows the components that are used to test and configure route redistribution in the example topology.

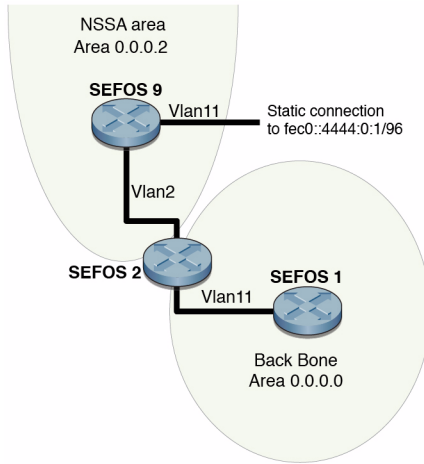
See “[IPv6 Example Topology Interface and Host Addresses](#)” on page 9 for the configuration details of this topology.



## NSSA Type-7/-5 Conversion Topology

This figure shows the components that are used that are used to test and configure NSSA in the example topology.

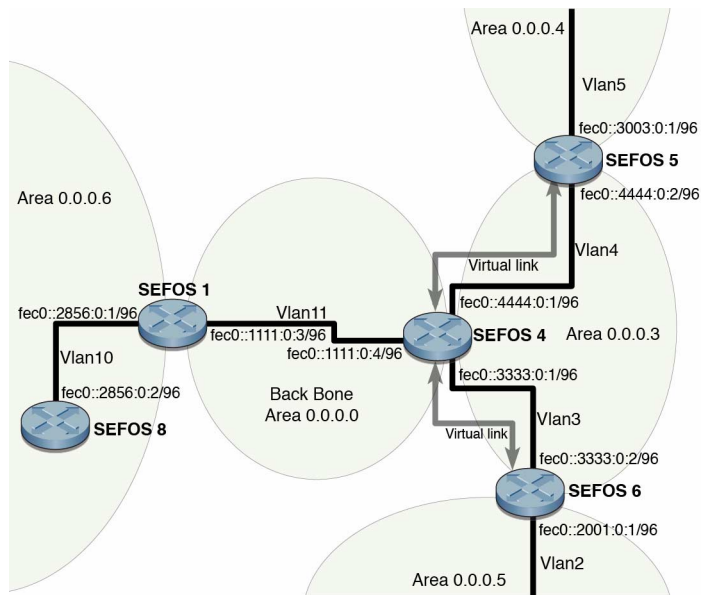
See ["IPv6 Example Topology Interface and Host Addresses"](#) on page 9 for the configuration details of this topology.



## Virtual Link and Route Summarization Topology

This figure shows the components that are used to test and configure virtual link and route summarization in the example topology.

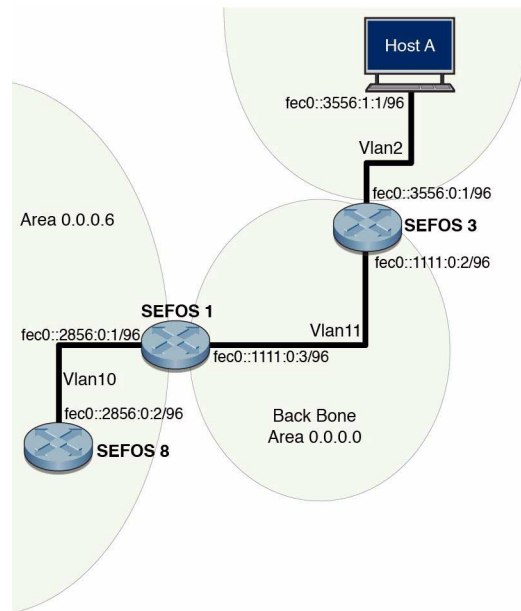
See “[IPv6 Example Topology Interface and Host Addresses](#)” on page 9 for the configuration details of this topology.



# Host Topology

This figure shows the components that are used to test and configure the host in the example topology.

See “IPv6 Example Topology Interface and Host Addresses” on page 9 for the configuration details of this topology.







# OSPFv3 Configurations

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Configure the SEFOS implementation of OSPFv3 through the CLI interface. You can use SNMP to view the changes you make to the configuration.

These sections describe the preliminary configurations of Oracle OSPFv3 and describe only IPv6-related configurations. For information about other configurations that you can use to create interfaces and information about entering CLI configuration modes, see [“CLI Command Modes” on page 3](#). For information on IPv6-related configurations, refer to the *Sun Ethernet Fabric Operating System IPv6 Administration Guide*. Refer to other feature-related administration guides for detailed information about using specific features used in the example configurations in this guide.

- [“Default Configuration Values” on page 17](#)
- [“SNMP MIB Files” on page 19](#)
- [“Creating the Base Configuration” on page 20](#)
- [“Enabling IPv6 Support and Assigning IPv6 Addresses” on page 21](#)
- [“Configuring IPv6 Static Routes” on page 23](#)
- [“Creating the Base Configuration for Example Topologies” on page 24](#)

---

## Default Configuration Values

By default, OSPFv3 and IPv6 addressing are disabled on a switch running SEFOS. To configure an OSPFv3 router or to configure an interface with an IPv6 address, you must first enable OSPFv3 or IPv6 on the interfaces.

---

Parameter	Default Configuration
ABR-type	Standard
Area default-cost	10
Area metric value	1

---

<b>Parameter</b>	<b>Default Configuration</b>
Area type	Transit
AS-external LSDB-limit	-1 (no limit)
Dead-interval	40
Default network type	Broadcast
Default OSPFv3 trace level	Critical (If enabled)
Default-information originate always metric	10
Default-information originate always metric-type	2
Demand circuit	Enabled
Exit overflow interval	0
Hello-interval	10
IETF non-stop forwarding	Disabled
IETF NSF helper strict LSA check	Disabled
IETF NSF helper support unknown/s/w restart/s/w upgrade/ switch to redundant	Enabled
Interface metric	From the reference bandwidth
IPv6 on the interface	Disabled
Neighbor-probe retransmit - interval	120
Neighbor-probe retransmit-limit	10
nssa asbr-default-route translator	Disabled
OSPFv3 module on the router	Disabled
OSPFv3 traces	Disabled
Passive interface	Disabled
Poll-interval	120
Redist-config metric-type	Type-2
Redist-config metric-value	10
Redist-config tag	0
Reference bandwidth	100000
Retransmit-interval	5
Route calculation staggering	Enabled
Router priority	1

Parameter	Default Configuration
SPF hold time	10
SPF timer delay	5
Stability interval	40
Staggering interval	10
Summary-address	Advertise
Translation	Enabled
Translation-role	Candidate
Transmit-delay	1

## SNMP MIB Files

File Name	MIB Name	Description
ospf3.mib	ospfv3MIB	The MIB module to describe OSPF version 3.
SUN-SEFOS-MISTDBRIDGE-MIB.mib	SEFOS-MISTdBRIDGE-MIB	The MIB module for standard bridge MIB with multiple instance capability.
SUN-SEFOS-QBRIDGE-MIB.mib	SEFOS-QBRIDGE-MIB	The VLAN bridge MIB module for managing virtual bridged LANs with multiple instance capability.
SUN-SEFOS-RTM6-MIB.mib	SEFOS-RTM6-MIB	The MIB module for the SEFOS RTMv6 module.
SUN-SEFOS-IPVX-MIB.mib	SEFOS-IPVX-MIB	The MIB module for SEFOS IPVX.
SUN-SEFOS-CFA-MIB.mib	SEFOS-CFA-MIB	The MIB module for SEFOS CFA.
SUN-SEFOS-VCM-MIB.mib	SEFOS-VCM-MIB	The MIB module for the virtual context manager.

---

# Creating the Base Configuration

To configure SEFOS OSPFv3 features, access Global Configuration mode or Interface Configuration mode. See [“CLI Command Modes” on page 3](#) for information about accessing and exiting these modes through the CLI.

See [“IPv6 Example Topology Interface and Host Addresses” on page 9](#) for the topology used for the base configuration.

- [“Access Global Configuration Mode” on page 20](#)
- [“Access Interface Configuration Mode” on page 20](#)

## ▼ Access Global Configuration Mode

- **Type.**

```
SEFOS#  
SEFOS# configure terminal  
SEFOS(config)#
```

## ▼ Access Interface Configuration Mode

This example creates interface VLAN 11.

- **Access interface configuration mode and create an interface.**

```
SEFOS#  
SEFOS# configure terminal  
SEFOS(config)#  
SEFOS# interface vlan 11  
SEFOS(config-if)#
```

---

# Enabling IPv6 Support and Assigning IPv6 Addresses

IPv6 support is disabled by default, but you must enable it before configuring an interface with an IPv6 address.

- [“Enable IPv6” on page 21](#)
- [“Disable IPv6” on page 22](#)
- [“Delete an IPv6 Address” on page 22](#)

## ▼ Enable IPv6

This example enables IPv6 support in the `VLAN 11` interface and assigns IPv6 addresses to `VLAN 11`.

See [“IPv6 Example Topology Interface and Host Addresses” on page 9](#) for the topology used for this sample configuration.

### 1. Enter Global Configuration mode and Interface Configuration mode in SEFOS1.

```
SEFOS# configure terminal  
SEFOS# interface vlan 11
```

### 2. Enable IPv6 support in the `VLAN 11` interface.

The command used in this example automatically configures an IPv6 link-local address on the interface and enables the interface for IPv6 processing.

```
SEFOS(config-if)# ipv6 enable
```

### 3. View the automatically configured link-local address and the operational status of the interface in Privileged EXEC mode.

```
SEFOS# show ipv6 interface  
  
vlan11 is up, line protocol is up  
Link local address:  
    ffe80::214:4fff:fe6c:628f  
Global unicast address(es):  
    Not Configured.  
Joined group address(es):
```

```
ff02::1
ff02::2
ff02::1:ff00:3
ff02::1:ff6c:628f
MTU is 9216
ICMP redirects are enabled
ND DAD is enabled, Number of DAD attempts: 1
ND router advertisement is disabled
```

#### 4. Configure the IPv6 address in the VLAN 11 interface.

The type of address can be link-local, unicast, anycast, or eui64.

Type one of these:

```
SEFOS(config-if)# ipv6 address fec0::1111:0:1/96 unicast
```

```
SEFOS(config-if)# ipv6 address fec0::1111:0:1 96 unicast
```

#### 5. View the automatically configured link-local address and the unicast address configured in the previous step in SEFOS1.

```
SEFOS# show ipv6 interface

vlan11 is up, line protocol is up
  Link local address:
    ffe80::214:4fff:fe6c:628f
  Global unicast address(es):
    fec0::1111:0:1/96
```

## ▼ Disable IPv6

This example disables IPv6 support in the active VLAN interface.

- **Disable IPv6 support.**

```
SEFOS(config-if)# no ipv6 enable
```

## ▼ Delete an IPv6 Address

This example deletes the IPv6 address configured in [“Enable IPv6” on page 21](#).

- Delete an IPv6 address.

```
SEFOS(config-if)# no ipv6 address fec0::1111:0:1 96 unicast
```

---

## Configuring IPv6 Static Routes

Routing defines the paths over which packets travel in the network. You can use manually configured static routes instead of dynamic routing protocols for smaller networks or for sections of a network that have only one path to an outside network.

See “IPv6 Example Topology Interface and Host Addresses” on page 9 for the topology used for this configuration.

- “Configure Static Routes” on page 23
- “Delete a Static Route” on page 24

### ▼ Configure Static Routes

Add static routes to the routing table.

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Add the static route to 3333::/64 through VLAN 10 with next hop as fec0::2856:0:1 in SEFOS8.

```
SEFOS(config)# ipv6 route 3333:: 64 fec0::2856:0:2
```

3. Ensure that static routes are properly configured in the SEFOS1 routing table.

```
SEFOS# show ipv6 route

IPv6 Routing Table - 3 entries
Codes : C - Connected, S - Static
        O - OSPF, R - RIP, B - BGP
S   3333::/64    [1/20]
    via fec0::2856:0:2, vlan10
C   fec0::1111:0:0/96  [1/1]
```

```
via ::, vlan11
C   fec0::2856:0:0/96   [1/1]
    via ::, vlan10
```

## ▼ Delete a Static Route

This example deletes the static route for the SEFOS2 VLAN 2 interface in the SEFOS1 routing table.

### 1. Delete the static route.

```
SEFOS# configure terminal
SEFOS(config)# no ipv6 route 3333:: 64 fec0::2856:0:2
```

### 2. Ensure that the static route was removed from the SEFOS1 routing table.

```
SEFOS# show ipv6 route

IPv6 Routing Table - 2 entries
Codes : C - Connected, S - Static
C   fec0::1111:0:0/96   [1/1]
    via ::, vlan11
C   fec0::2856:0:0/96   [1/1]
    via ::, vlan10
```

---

## Creating the Base Configuration for Example Topologies

These sections show how to configure IPv6 interfaces in the switches used for the example topologies.

- [“Configure SEFOS1” on page 25](#)
- [“Configure SEFOS2” on page 25](#)
- [“Configure SEFOS3” on page 26](#)
- [“Configure SEFOS4” on page 26](#)
- [“Configure SEFOS5” on page 27](#)
- [“Configure SEFOS6” on page 27](#)
- [“Configure SEFOS7” on page 28](#)



- “Configure SEFOS8” on page 28
- “Configure SEFOS9” on page 29

## ▼ Configure SEFOS1

Use the following commands and values to configure the VLAN interfaces in SEFOS1 used in the example topologies presented in this guide (VLAN 11 and VLAN 10).

- Type.

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 11
SEFOS(config-if)# shutdown
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::1111:0:3/96
SEFOS(config-if)# no shutdown
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 10
SEFOS(config-if)# shutdown
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::2856:0:1/96
SEFOS(config-if)# no shutdown
SEFOS(config-if)# end
```

## ▼ Configure SEFOS2

Use the following commands and values to configure the VLAN interfaces in SEFOS2 used in the example topologies presented in this guide (VLAN 11 and VLAN 2).

- Type.

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 11
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::1111:0:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::2556:0:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```

## ▼ Configure SEFOS3

Use the following commands and values to configure the VLAN interfaces in SEFOS3 used in the example topologies presented in this guide (VLAN 11 and VLAN 2).

- **Type.**

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 11
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::1111:0:2/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::3556:0:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```

## ▼ Configure SEFOS4

Use the following commands and values to configure the VLAN interfaces in SEFOS4 used in the example topologies presented in this guide (VLAN 11, VLAN 3, and VLAN 4).

- **Type.**

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 11
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::1111:0:4/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 3
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::3333:0:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 4
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
```

```
SEFOS(config-if)# ipv6 address fec0::4444:0:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```

## ▼ Configure SEFOS5

Use the following commands and values to configure the VLAN interfaces in SEFOS5 used in the example topologies presented in this guide (VLAN 5 and VLAN 4).

- **Type.**

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 5
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::3003:0:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 4
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::4444:0:2/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```

## ▼ Configure SEFOS6

Use the following commands and values to configure the VLAN interfaces in SEFOS6 used in the example topologies presented in this guide (VLAN 2 and VLAN 3).

- **Type.**

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::2001:0:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 3
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
```

```
SEFOS(config-if)# ipv6 address fec0::3333:0:2/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```

## ▼ Configure SEFOS7

Use the following commands and values to configure the VLAN interfaces in SEFOS7 used in the example topologies presented in this guide (VLAN 5).

- **Type.**

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 5
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::3003:0:2/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```

## ▼ Configure SEFOS8

Use the following commands and values to configure the VLAN interfaces in SEFOS8 used in the example topologies presented in this guide (VLAN 10 and VLAN 1).

- **Type.**

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 10
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::2856:0:2/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 1
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::2886:1:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```

## ▼ Configure SEFOS9

Use the following commands and values to configure the VLAN interfaces in SEFOS9 used in the example topologies presented in this guide (VLAN 2).

- **Type.**

```
SEFOS# configure terminal
SEFOS(config)# interface vlan 2
SEFOS(config-if)# shut
SEFOS(config-if)# ipv6 enable
SEFOS(config-if)# ipv6 address fec0::2556:1:1/96
SEFOS(config-if)# no shut
SEFOS(config-if)# exit
```



# Configuring OSPFv3 Features

---

These sections show how to configure OSPFv3 features.

- “OSPFv3 Features” on page 31
- “Configuring Basic OSPFv3” on page 32
- “Creating an OSPFv3 Interface” on page 33
- “Configuring Neighbors” on page 36
- “Configuring OSPFv3 Interface Parameters” on page 37
- “Configuring a Demand Circuit” on page 45
- “Configuring Neighbor Probe Values” on page 47
- “Configuring a Passive Interface” on page 50
- “Configuring Route Redistribution” on page 52
- “Configuring Attributes for Redistributed Routes” on page 57
- “Configuring the Redistribution of Routes” on page 59
- “Configuring Area Route Summarization” on page 61
- “Configuring a Stub Area” on page 67
- “Configuring an NSSA” on page 70
- “Configuring the Capability in an NSSA Internal Border Router” on page 76
- “Configuring Virtual Links” on page 80
- “Configuring External Database Limit” on page 85
- “Configuring the Overflow Exit Interval” on page 87
- “Configuring a Demand Extension” on page 89
- “Configuring the Host” on page 91
- “Configuring Route Calculation SPF Timers” on page 93

---

## OSPFv3 Features

- Basic OPSFv3

- OSPFv3 interface
- Passive interface
- Redistribution and its attributes
- OSPFv4 area parameters
- Virtual link
- External database limit
- Demand extension
- Configuring host
- Graceful restart
- GR helper support
- Route calculation staggering
- Route calculation SPF timers
- Inboard filtering routes
- Administrative distance for OSPF routes in the routing table

---

## Configuring Basic OSPFv3

The basic OSPFv3 operations include enabling OSPFv3, creating interfaces, and configuring neighbors.

- [“Enable OSPFv3” on page 32](#)
- [“Disable OSPFv3” on page 33](#)

### ▼ Enable OSPFv3

Enabling OSPFv3 takes you to Router Configuration mode, from which you can execute router-related commands. This procedure also enables all interfaces and enables self-originated LSAs.

#### 1. Enter Global Configuration mode.

```
SEFOS# configure terminal
```



2. Enable OSPFv3 globally in SEFOS1, which will take you to Router Configuration mode.

```
SEFOS(config)# ipv6 router ospf
```

## ▼ Disable OSPFv3

This example disables OSPFv3 globally in the SEFOS1 switch.

- **Disable OSPFv3 in the switch.**

```
SEFOS(config)# no ipv6 router ospf
```

---

# Creating an OSPFv3 Interface

You can create an OSPFv3 interface by interfacing with IPv6. This process facilitates the transmission and reception of protocol packets. OSPFv3 interacts with IPv6 before joining or leaving the multicast addresses for packet reception.

Before configuring the interface, you must configure the router ID. The router ID can be an arbitrary, but unique, IPv4 or IPv6 address.

IPv6 expects that the following information will be provided to OSPFv3:

- Interface state change notifications
- Addition or deletion of IPv6 addresses on an interface

See [“IPv6 Example Topology Interface and Host Addresses”](#) on page 9 for the topology used for this configuration.

- [“Configure an OSPFv3 Interface”](#) on page 33

## ▼ Configure an OSPFv3 Interface

In this example, OSPFv3 is enabled on the SEFOS1 switch, and 10.0.0.1 is specified as the router ID.

1. Enter Global Configuration mode.

```
SEFOS# configure terminal
```

## 2. Enable OSPFv3 globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

## 3. Configure the OSPFv3 router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

---

**Note** – The no form of this command is not supported. Therefore, you cannot remove the router ID, you can only change it to a different router ID IP.

---

## 4. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

## 5. Ensure that the router ID value is correct.

```
SEFOS# show ipv6 ospf

Router Id: 10.0.0.1           ABR Type: Standard ABR
SPF schedule delay: 5 secs    Hold time between two SPF's: 10 secs
Exit Overflow Interval: 0     Ref BW: 100000           Ext Lsdb
Limit: -1
Trace Value: 0x00000800      As Scope Lsa: 0         Checksum
Sum: 0x0
Demand Circuit: Enable       Passive Interface: Disable
Nssa Asbr Default Route Translation: Disable
Number of Areas in this router 1
      Area      0.0.0.0
      Number of interfaces in this area is 0
      Number of Area Scope Lsa: 0           Checksum Sum: 0x0
      Number of Indication Lsa: 0           SPF algorithm executed: 0 times
```

## 6. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

## 7. Enable the OSPFv3 interface on the VLAN interfaces.

This action defines the interfaces on which OSPFv3 runs and the area ID for those interfaces.

```
SEFOS(config)# interface vlan 11
SEFOS(config-if)# ipv6 ospf area 0.0.0.0
SEFOS(config-if)# exit
SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf area 0.0.0.6
SEFOS(config-if)# end
```

## 8. Ensure that OSPFv3 is set to run the correct interfaces.

```
SEFOS# show ipv6 ospf interface

Interface Name: vlan11      Interface Id: 40      Area Id: 0.0.0.0
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST    Cost: 1              State: DR
Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Backup Designated Router Id: 0.0.0.0      local address: (null)
Transmit Delay: 1 sec      Priority: 1          IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 8 sec
Neighbor Count is: 0

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST    Cost: 1              State: DR
Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Backup Designated Router Id: 0.0.0.0      local address: (null)
Transmit Delay: 1 sec      Priority: 1          IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 9 sec
Neighbor Count is: 0
```

---

# Configuring Neighbors

You can use the neighbor configuration information to create neighbors that allocate memory for the neighbor structure and initialize it with default values. This configuration is also used to activate configured neighbors invoking the NSM with a start or down event. You can configure neighbors only in NBMA networks, but you can then point to multipoint networks.

See “IPv6 Example Topology Interface and Host Addresses” on page 9 for the topology used for this configuration.

- “Configure an OSPFv3 Neighbor” on page 36

## ▼ Configure an OSPFv3 Neighbor

In this example, SEFOS1 is the switch on which OSPFv3 is enabled, 10.0.0.1 is specified as the router ID, and VLAN 10 is configured on the NBMA network with a neighbor priority of 10.

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

4. Exit Router Configuration mode.

```
SEFOS(config-router)# exit
```

5. Enter Interface Configuration mode.

```
SEFOS(config)# interface vlan 10
```

## 6. Configure the network type as NBMA.

```
SEFOS(config-if)# ipv6 ospf network non-broadcast
```

## 7. Configure the neighbor with priority#10.

```
SEFOS(config-if)# ipv6 ospf neighbor fe80::214:4fff:fe6c:d04d  
priority 10
```

## 8. View the SEFOS1 configuration.

```
SEFOS# show ipv6 ospf neighbor
```

ID	Pri	State	DeadTime	Address
10.0.0.8	1	FULL/BACKUP	38	fe80::214:4fff:fe6c:d04d

---

# Configuring OSPFv3 Interface Parameters

All of the OSPF interface sample configurations in this section are executed in SEFOS1. See “IPv6 Example Topology Interface and Host Addresses” on page 9 for the topology used for the configuration of the parameters in this section.

- “OSPFv3 Interface Parameters” on page 38
- “Configure Interface Priority” on page 38
- “Restore the Default Interface Priority” on page 39
- “Configure the Retransmission Interval” on page 39
- “Restore the Default Retransmission Value” on page 40
- “Configure Transmission Delay” on page 40
- “Restore the Default Transmission Delay” on page 41
- “Configure the Hello Interval” on page 41
- “Restore the Default Hello Interval” on page 42
- “Configure the Dead Interval” on page 42
- “Restore the Default Dead Interval” on page 43
- “Configure the Network Type” on page 43
- “Restore the Default OSPF Network Type” on page 44

- “Configure the Interface Cost” on page 44
- “Restore the Default Interface Cost” on page 45

## OSPFv3 Interface Parameters

There are a number of OSPFv3 interface parameters you can configure. This section explains how to configure and disable the following features:

- Interface priority
- Retransmission level
- Transmission delay
- Hello interval
- Dead interval
- Network type
- Interface cost

### ▼ Configure Interface Priority

You can set the router priority to help determine the designated router for a given network. Values are 1-255, with a value of 0 signifying that the router is not eligible to become the designated router on a particular network.

This example configures VLAN 10 with an interface priority of 10.

#### 1. Configure the interface priority through the CLI.

```
SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf priority 10
SEFOS(config-if)# end
```

#### 2. View the configuration.

```
SEFOS# show ipv6 ospf interface vlan 10

      OspfV3  Interface  Information
Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST    Cost: 1              State: BACKUP
Designated Router Id: 10.0.0.8      local address:
fe80::214:4fff:fe6c:d04d
```

```
Backup Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Transmit Delay: 1 sec      Priority: 10      IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 0 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8
```

## ▼ Restore the Default Interface Priority

This example restores the default OSPF interface priority to 1.

- Restore the default value of the OSPF interface.

```
SEFOS(config-if)# no ipv6 ospf priority
```

## ▼ Configure the Retransmission Interval

You can configure the LSA retransmission interval to specify the amount of time between successive LSA retransmissions. You can also use the retransmission interval value to retransmit database description and link-state request packets.

This example configures VLAN 10 with a retransmission interval of 10 seconds.

1. Configure the retransmission interval through the CLI.

```
SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf retransmit-interval 10
SEFOS(config-if)# end
```

2. Ensure that the correct retransmission interval is set on the specified interface.

```
SEFOS# show ipv6 ospf interface vlan 10

      OspfV3  Interface  Information

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST      Cost: 1      State: BACKUP
```

```

Designated Router Id: 10.0.0.8      local address:
fe80::214:4fff:fe6c:d04d
Backup Designated Router Id: 10.0.0.1    local address:
fe80::214:4fff:fe6c:628f
Transmit Delay: 1 sec          Priority: 1          IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 10, Poll: 120
Demand Circuit: Disable          Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 7 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8

```

## ▼ Restore the Default Retransmission Value

This example restores the default retransmission value to five seconds.

- Restore the default retransmission value.

```
SEFOS(config-if)# no ipv6 ospf retransmit-interval
```

## ▼ Configure Transmission Delay

You can set the estimated time required to transmit a link-state update packet on the interface using the configuration in this section. Values are 1-1800 seconds.

This example configures VLAN 10 with a transmission delay of 5 seconds.

1. Configure OSPFv3 transmission delay through the CLI.

```

SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf transmit-delay 5
SEFOS(config-if)# end

```

2. Ensure that the correct transmission delay is set for the specified interface.

```

SEFOS# show ipv6 ospf interface vlan 10

      OspfV3  Interface  Information
-----
Interface Name:  vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address:  fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type:  BROADCAST      Cost: 1              State: DR

```



```

Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Backup Designated Router Id: 10.0.0.8    local address:
fe80::214:4fff:fe6c:d04d
Transmit Delay: 5 sec      Priority: 1      IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 3 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8

```

## ▼ Restore the Default Transmission Delay

This example restores the default time for transmitting a link state update packet on an interface to 1 second.

- Restore the default transmit delay.

```
SEFOS(config-if)# no ipv6 ospf transmit-delay
```

## ▼ Configure the Hello Interval

You can configure the OSPFv3 hello interval to specify the interval between the hello packets sent on the interface. The hello interval value must be the same for all routers attached to a common link. Values are 1-65535 seconds.

This example configures VLAN 10 with a hello interval of 40 seconds.

1. Configure the hello interval through the CLI.

```

SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf hello-interval 40
SEFOS(config-if)# end

```

2. Ensure that the correct hello interval is set for the specified interface.

```

SEFOS# show ipv6 ospf interface vlan 10

      OspfV3  Interface  Information
-----
Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6

```

```

Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST      Cost: 1      State: DR
Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Backup Designated Router Id: 10.0.0.8      local address:
fe80::214:4fff:fe6c:d04d
Transmit Delay: 1 sec      Priority: 1      IfOptions: 0x0
Timer intervals configured:
Hello: 40, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 33 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8

```

## ▼ Restore the Default Hello Interval

This example restores the default hello value to 10 seconds.

- Restore the default hello interval.

```
SEFOS(config-if)# no ipv6 ospf hello-interval
```

## ▼ Configure the Dead Interval

You can configure the dead interval to specify how long hello packets will not be received by the router before neighbors declare that the router is down. This value must be a multiple of the hello interval value, and must be the same for all routers attached to the same link.

This example sets the dead interval for VLAN 10 to 120 seconds.

1. Configure the dead interval through the CLI.

```

SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf dead-interval 120
SEFOS(config-if)# end

```

2. Ensure that the correct dead interval is set for the specified interface.

```

SEFOS# show ipv6 ospf interface vlan 10

      OspfV3 Interface Information

```

```

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST    Cost: 1              State: BACKUP
Designated Router Id: 10.0.0.8      local address:
fe80::214:4fff:fe6c:d04d
Backup Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Transmit Delay: 1 sec      Priority: 1          IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 120, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 4 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8

```

## ▼ Restore the Default Dead Interval

This example restores the default dead interval to 40 seconds.

- Restore the default dead interval.

```
SEFOS(config-if)# no ipv6 ospf dead-interval
```

## ▼ Configure the Network Type

You can specify the OSPF network type to be broadcast, non-broadcast, point-to-multipoint, or point-to-point. The default value is broadcast. The OSPF network type can be configured to a type other than the default for a given media.

This example configures the network type for VLAN 10 as point-to-point, meaning that it is a network that joins a single pair of routers.

1. Configure the network type through the CLI.

```

SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf network point-to-point
SEFOS(config-if)# end

```

## 2. View the configuration.

```
SEFOS# show ipv6 ospf interface vlan 10

      OspfV3 Interface Information

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: PTOp      Cost: 1      State: PTOp
Designated Router Id: 0.0.0.0      local address: (null)
Backup Designated Router Id: 0.0.0.0      local address: (null)
Transmit Delay: 1 sec      Priority: 1      IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 4 sec
Neighbor Count is: 0
```

## ▼ Restore the Default OSPF Network Type

This example restores the default OSPF network type to broadcast.

- **Restore the default network type.**

```
SEFOS(config-if)# no ipv6 ospf network
```

## ▼ Configure the Interface Cost

You can configure the interface cost explicitly to specify the cost of sending a packet on an interface. Values are 1-65535.

This example configures the interface cost to be 20.

1. **Configure the interface cost through the CLI.**

```
SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf metric 20
SEFOS(config-if)# end
```

## 2. Ensure that the correct interface cost is set.

```
SEFOS# show ipv6 ospf interface vlan 10

      OspfV3 Interface Information

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST      Cost: 20      State: BACKUP
Designated Router Id: 10.0.0.8      local address:
fe80::214:4fff:fe6c:d04d
Backup Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Transmit Delay: 1 sec      Priority: 1      IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Enable      Neighbor Probing: Enable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 4 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8
```

## ▼ Restore the Default Interface Cost

This example restores the default OSPF metric to 1.

- Restore the default OSPF metric.

```
SEFOS(config-if)# no ipv6 ospf metric
```

---

## Configuring a Demand Circuit

Configuring an interface as a demand circuit allows OSPF to treat the specified interface as an OSPF demand circuit. This configuration is possible only when the demand extensions are enabled. See [“Configuring a Demand Extension”](#) on page 89 for details on configuring demand extensions.

- [“Enable a Demand Circuit”](#) on page 46
- [“Remove the Demand Circuit Setting”](#) on page 46
- [“Enable Neighbor Probing on a Demand Circuit”](#) on page 46
- [“Remove Neighbor Probing on a Demand Circuit”](#) on page 47

## ▼ Enable a Demand Circuit

This example enables VLAN 10 to be used as an OSPF demand circuit.

### 1. Configure a demand circuit through the CLI.

```
SEFOS(config)# interface vlan 10  
SEFOS(config-if)# ipv6 ospf demand-circuit  
SEFOS(config-if)# end
```

### 2. Ensure that the specified interface has been identified as a demand circuit.

```
SEFOS# show ipv6 ospf interface vlan 10  
  
OspfV3 Interface Information  
  
Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6  
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1  
Network Type: BROADCAST    Cost: 1              State: WAITING  
Designated Router Id: 0.0.0.0      local address: (null)  
Backup Designated Router Id: 0.0.0.0      local address: (null)  
Transmit Delay: 1 sec      Priority: 1          IfOptions: 0x0  
Timer intervals configured:  
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120  
Demand Circuit: Enable          Neighbor Probing: Disable  
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120  
Hello due in 5 sec  
Neighbor Count is: 1  
Adjacent with neighbor 0.0.0.0
```

## ▼ Remove the Demand Circuit Setting

- Remove the demand circuit designation.

```
SEFOS(config-if)# no ipv6 ospf demand-circuit
```

## ▼ Enable Neighbor Probing on a Demand Circuit

This example enables neighbor probing on VLAN 10 after it has been identified as an OSPF demand circuit.

### 1. Enable neighbor probing for a specific interface through the CLI.

```
SEFOS(config)# interface vlan 10  
SEFOS(config-if)# ipv6 ospf demand-circuit  
SEFOS(config-if)# ipv6 ospf neighbor probing  
SEFOS(config-if)# end
```

### 2. Ensure that neighbor probing is enabled for the specified interface.

```
SEFOS# show ipv6 ospf interface vlan 10  
  
OspfV3 Interface Information  
  
Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6  
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1  
Network Type: BROADCAST      Cost: 1      State: BACKUP  
Designated Router Id: 10.0.0.8      local address:  
fe80::214:4fff:fe6c:d04d  
Backup Designated Router Id: 10.0.0.1      local address:  
fe80::214:4fff:fe6c:628f  
Transmit Delay: 1 sec      Priority: 1      IfOptions: 0x0  
Timer intervals configured:  
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120  
Demand Circuit: Enable      Neighbor Probing: Enable  
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120  
Hello due in 5 sec  
Neighbor Count is: 1  
Adjacent with neighbor 10.0.0.8
```

## ▼ Remove Neighbor Probing on a Demand Circuit

- Remove neighbor probing from the interface.

```
SEFOS(config-if)# no ipv6 ospf neighbor probing
```

---

## Configuring Neighbor Probe Values

You can set the number of consecutive LSA retransmissions before the neighbor is deemed inactive, and can also specify how often the neighbor is probed.

- [“Configure the Neighbor Probe Retransmission Limit” on page 48](#)

- “Restore the Default Neighbor Probe Retransmission Limit” on page 49
- “Configure the Neighbor Probe Interval” on page 49
- “Restore the Default Neighbor Probe Interval” on page 50

## ▼ Configure the Neighbor Probe Retransmission Limit

This example specifies that the neighbor will be deemed inactive after 20 consecutive LSA transmissions.

1. **Configure the number of consecutive LSA retransmissions before the neighbor is deemed inactive.**

```
SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf demand-circuit
SEFOS(config-if)# ipv6 ospf neighbor-probe retransmit-limit 20
SEFOS(config-if)# end
```

2. **Ensure that the correct retransmission limit was set.**

```
SEFOS# show ipv6 ospf interface vlan 10

      OspfV3  Interface  Information

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST      Cost: 1      State: BACKUP
Designated Router Id: 10.0.0.8      local address:
fe80::214:4fff:fe6c:d04d
Backup Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Transmit Delay: 1 sec      Priority: 1      IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Enable      Neighbor Probing: Enable
Nbr Probe Retrans Limit: 20      Nbr Probe Interval: 120
Hello due in 5 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8
```



## ▼ Restore the Default Neighbor Probe Retransmission Limit

This example restores the default neighbor probe retransmission limit to 10 consecutive LSA transmissions.

- Restore the default neighbor probe retransmission limit.

```
SEFOS(config-if)# no ipv6 ospf neighbor-probe retransmit-limit
```

## ▼ Configure the Neighbor Probe Interval

This example specifies that the neighbor will be probed every 130 seconds.

1. Configure the neighbor probe interval for the specified interface.

```
SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf demand-circuit
SEFOS(config-if)# ipv6 ospf neighbor-probe interval 130
```

2. Ensure that the specified interface will be probed at the correct interval.

```
SEFOS# show ipv6 ospf interface vlan 10

      OspfV3  Interface  Information

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST    Cost: 1              State: BACKUP
Designated Router Id: 10.0.0.8      local address:
fe80::214:4fff:fe6c:d04d
Backup Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Transmit Delay: 1 sec      Priority: 1          IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Enable      Neighbor Probing: Enable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 130
Hello due in 2 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.8
```

## ▼ Restore the Default Neighbor Probe Interval

This example restores the default neighbor probe interval as 120 seconds.

- Restore the default neighbor probe interval.

```
SEFOS(config-if)# no ipv6 ospf neighbor-probe interval
```

---

## Configuring a Passive Interface

You can configure a passive interface to suppress routing updates on all interfaces or specified interfaces. If you configure a passive interface for all interfaces, all OSPF interfaces will be passive. This situation is useful in ISP environments and for large enterprise networks, where many of the distribution routers have more than 200 interfaces.

- [“Configure All Interfaces To Be Passive” on page 50](#)
- [“Configure Specified Interfaces To Be Passive” on page 51](#)
- [“Restore the Default Routing Updates” on page 52](#)

## ▼ Configure All Interfaces To Be Passive

If you want to configure all interfaces to be passive, you must do so before you create the interfaces.

1. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

2. Suppress routing updates.

```
SEFOS(config-router)# passive-interface  
SEFOS(config-router)# end
```

3. Configure the interface, then view the modified configuration.

```
SEFOS# show ipv6 ospf interface vlan 10
```

```
OspfV3 Interface Information
```

```

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST    Cost: 1              State: DR
Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Backup Designated Router Id: 0.0.0.0      local address: (null)
Transmit Delay: 1 sec      Priority: 1          IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
No Hellos (Passive interface)
Neighbor Count is: 0

```

## ▼ Configure Specified Interfaces To Be Passive

If you don't want to configure all interfaces to be passive, you can specify which interfaces should be passive.

This example configures VLAN 10 as a passive interface.

### 1. Identify the interface that should be passive and suppress routing updates.

```

SEFOS(config)# interface vlan 10
SEFOS(config-if)# ipv6 ospf passive-interface
SEFOS(config-if)# end

```

### 2. View the configuration details by executing the following show command.

```

SEFOS# show ipv6 ospf interface vlan 10

      OspfV3 Interface Information

Interface Name: vlan10      Interface Id: 41      Area Id: 0.0.0.6
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST    Cost: 1              State: DR
Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Backup Designated Router Id: 0.0.0.0      local address: (null)
Transmit Delay: 1 sec      Priority: 1          IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable

```

```
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
No Hellos (Passive interface)
Neighbor Count is: 0
```

## ▼ Restore the Default Routing Updates

You can restore the default routing updates (restore to non-passive) for all interfaces that have been made passive.

- **Restore the default routing update.**

```
SEFOS(config-if)# no ipv6 ospf passive-interface
```

---

## Configuring Route Redistribution

Oracle OSPFv3 interacts with the route table manager for IPv6 (RTM6) for route redistribution. Oracle OSPFv3 updates the RTM6 module with its learned routes. RTM6 redistributes this route to other routing protocols if redistribution is enabled for these corresponding protocols.

- [“Configure an ASBR Router” on page 52](#)
- [“Disable the ASBR Router” on page 53](#)
- [“Configure Route Redistribution” on page 54](#)
- [“Disable Route Redistribution” on page 55](#)
- [“Configure the Stub Area, ASBR, and Route Distribution” on page 55](#)

## ▼ Configure an ASBR Router

Routers that act as gateways (redistribution) between OSPF and other routing protocols (IGRP, EIGRP, RIP, BGP, static) or other instances of the OSPF routing process, are called ASBRs. An ASBR must be enabled for routes to be redistributed from other protocols.

This example configures router 10.0.0.1 to act as an ASBR.

## 1. Configure a router as an ASBR.

```
SEFOS(config)# ipv6 router ospf  
SEFOS(config-router)# asbr router  
SEFOS(config-router)# end
```

## 2. Ensure that the router is configured as an ASBR.

```
SEFOS# show ipv6 ospf  
  
Router Id: 10.0.0.1                ABR Type: Standard ABR  
SPF schedule delay: 5 secs        Hold time between two SPF's: 10 secs  
Exit Overflow Interval: 0         Ref BW: 100000                Ext Lsdb  
Limit: -1  
Trace Value: 0x00000800          As Scope Lsa: 0                Checksum  
Sum: 0x0  
Demand Circuit: Enable            Passive Interface: Disable  
Nssa Asbr Default Route Translation: Disable  
It is an Area Border Router  
Autonomous System Boundary Router  
Number of Areas in this router 2  
    Area 0.0.0.0  
    Number of interfaces in this area is 1  
    Number of Area Scope Lsa: 5    Checksum Sum: 0x2caf7  
    Number of Indication Lsa: 0    SPF algorithm executed: 7 times  
    Area 0.0.0.6  
    Number of interfaces in this area is 1  
    Number of Area Scope Lsa: 5    Checksum Sum: 0x3507d  
    Number of Indication Lsa: 0    SPF algorithm executed: 7 times
```

## ▼ Disable the ASBR Router

This example disables the ASBR status of the router. Once you disable ASBR status, a router no longer redistributes routes into OSPFv3.

### ● Disable ASBR in the router.

```
SEFOS(config-if)# no asbr router
```

## ▼ Configure Route Redistribution

All OSPFv3 routes are maintained in RTM6. The RTM redistributes the best route. The RTM6 allows different routing protocols to exchange IPv6 routing information. This section describes the CLI and SNMP modes of configuration for route redistribution (static or dynamic) to routing protocols registered with RTM6.

While configuring redistribution, the protocol with routes to be redistributed into OSPFv3 is also configured.

This example enables route redistribution on SEFOS4 and specifies that static routes are redistributed.

### 1. Enter Global Configuration mode in SEFOS4.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in SEFOS4.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.4
```

### 4. Configure the router as ASBR router.

```
SEFOS(config-router)# asbr router
```

### 5. Configure the redistribution of static routes.

```
SEFOS(config-router)# redistribute static
```

### 6. View the configuration.

```
SEFOS# show running-config ospf3
```

```
Building configuration...  
ipv6 router ospf  
router-id 10.0.0.4  
ASBR Router  
redistribute static  
!  
interface vlan 4
```

```
ipv6 ospf area 0.0.0.3
!
interface vlan 11
ipv6 ospf area 0.0.0.0
!
end
```

## ▼ Disable Route Redistribution

This example disables the redistribution of static routes.

- **Disable redistribution in the router.**

```
SEFOS(config-router)# no redistribute static
```

## ▼ Configure the Stub Area, ASBR, and Route Distribution

See [“Creating the Base Configuration for Example Topologies” on page 24](#) for prerequisite configurations for SEFOS4, SEFOS5, and SEFOS7. See [“IPv6 Example Topology Interface and Host Addresses” on page 9](#) for the sample configuration of the stub, ASBR, and route redistribution areas.

This example shows how to configure SEFOS4 as an ASBR router for redistributing the external routes into the OSPF domain. This example also shows how to configure area 0.0.0.4 of SEFOS5 as a stub area, and how to configure area 0.0.0.4 of SEFOS7 as a stub area with external routes that are not redistributed into the stub area.

1. **Configure SEFOS4 as an ASBR router.**

```
SEFOS# configure terminal
SEFOS(config)# ipv6 router ospf
SEFOS(config-router)# router-id 10.0.0.4
SEFOS(config-router)# asbr router
SEFOS(config-router)# redistribute static
SEFOS(config-router)# exit
SEFOS(config)# ipv6 route 3333:: 96 fec0::4444:0:2
SEFOS(config)# exit
```

## 2. Configure a stub area in SEFOS5.

```
SEFOS# configure terminal
SEFOS(config)# ipv6 router ospf
SEFOS(config-router)# router-id 10.0.0.5
SEFOS(config-router)# area 0.0.0.4 stub
SEFOS(config-router)# exit
```

## 3. Configure a stub area in SEFOS7.

```
SEFOS# configure terminal
SEFOS(config)# ipv6 router ospf
SEFOS(config-router)# router-id 10.0.0.7
SEFOS(config-router)# area 0.0.0.4 stub
SEFOS(config-router)# exit
```

## 4. View the configuration details in SEFOS4.

```
SEFOS# show ipv6 ospf route

*****
Dest/Prefix-Length      NextHop/IfIndex      Cost    Rt.Type    Area
fec0::3003:0:0/96 fe80::207:2ff:fe03:401/vlan4  2  interArea
0.0.0.0
fec0::4444:0:0/96      :: /vlan4  1  intraArea  0.0.0.0

SEFOS# show ipv6 ospf database as-external detail

Age: 0    Seconds          LS Type: External Lsa
Link State Id: 0.0.0.2    Adv Rtr Id: 10.0.0.4
Sequence: 0x80000001      Checksum: 0x0bc4    Length: 56
Metric Type: Ext Type2    Metric: 0xa
Prefix Length: 96        Prefix Options: 0x00
Referenced LS Type: 0
Address Prefix: 3333::
Fw Address Prefix: 3333::fec0:0
External Route Tag: 0
```

## 5. Ensure that the external routes are redistributed in SEFOS5.

```
SEFOS# show ipv6 ospf route

OSPFV3 Process Routing Table
Dest/Prefix-Length      NextHop/IfIndex      Cost    Rt.Type
Area
```



```

3333::/96fec0::4444:0:2/vlan4 10 type2Ext 0.0.0.0
SEFOS# show ipv6 ospf database as-external detail
fec0::3003:0:0/96      ::/vlan5 1 intraArea 0.0.0.4
fec0::4444:0:0/96     ::/vlan4 1 intraArea 0.0.0.3
Age: 63 Seconds      LS Type: External Lsa
Link State Id: 0.0.0.2 Adv Rtr Id: 10.0.0.4
Sequence: 0x80000001 Checksum: 0x0bc4 Length: 56
Metric Type: Ext Type2 Metric: 0xa
Prefix Length: 96    Prefix Options: 0x00
Referenced LS Type: 0
Addres Prefix: 3333::
Fw Addres Prefix: 3333::fec0:0
External Route Tag: 0

```

## Configuring Attributes for Redistributed Routes

When you configure redistributed routes (using the `redist-config` command), the information to be applied to routes learned from RTM is configured by default.

- [“Configure Redistributed Route Attributes” on page 57](#)
- [“Delete Redistributed Route Attributes” on page 59](#)

### ▼ Configure Redistributed Route Attributes

This example configures the IPv6 address prefix as `3333::`, with a prefix length of 64. The metric value of 100 is applied to the route before it is advertised to the OSPFv3 domain, with a metric type of as `Exttype1` and a tag of 10.

1. Enter the Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

### 4. Configure the ASBR router.

```
SEFOS(config-router)# asbr router
```

### 5. Configure the redistribution of static routes.

```
SEFOS(config-router)# redistribute static
```

### 6. Configure the redistribution configuration.

```
SEFOS(config-router)# redist-config 3333:: 64 metric-value 100  
metric-type asExttype1 tag 10
```

### 7. View the effect of the configuration.

```
SEFOS# show running-config ospf3  
  
Building configuration...  
ipv6 router ospf  
router-id 10.0.0.1  
ASBR Router  
passive-interface  
redistribute static  
redist-config 3333:: 64 metric-value 100 metric-type asExttype1  
tag 10  
!  
interface vlan 11  
ipv6 ospf area 0.0.0.0  
ipv6 ospf passive-interface  
!  
interface vlan 10  
ipv6 ospf area 0.0.0.6  
ipv6 ospf passive-interface  
!  
  
end
```

## ▼ Delete Redistributed Route Attributes

You can delete the information applied to the routes learned from RTM.

- Delete redistributed route attributes.

```
SEFOS(config-router)# no redistrib-config 3333:: 64
```

---

# Configuring the Redistribution of Routes

See “IPv6 Example Topology Interface and Host Addresses” on page 9 for the topology used to configure and test route redistribution. See “Creating the Base Configuration for Example Topologies” on page 24 for some basic configuration steps that you need to complete before configuring OSPFv3.

- “Configure Route Redistribution” on page 59
- “Restore the Default Redistribution Configuration” on page 60

## ▼ Configure Route Redistribution

This example shows how to configure the information to be applied to routes learned from RTM in SEFOS1. The IPv6 address prefix is 3333::1111:0:0, with a length of 96. A metric value of 100 is applied to the route before it is advertised to the OSPFv3 domain. A tag with the value 10 is applied to the sample route.

1. Test the redistribution configuration in SEFOS1.

```
SEFOS# configure terminal
SEFOS(config)# ipv6 router ospf
```

2. Configure redistribution of static route’s redistribution configuration.

```
SEFOS(config-router)# redistribute static
```

3. Configure redistribution configuration.

```
SEFOS(config-router)# redistrib-config 3333::1111:0:0 96
metric-value 100 metric-type asExttype1 tag 10
SEFOS(config-router)# exit
```

#### 4. Add a static route for the network.

```
SEFOS(config)# ipv6 route 3333::1111:0:0 96 fec0::1111:0:2  
SEFOS(config)# end  
SEFOS#
```

#### 5. View the configuration details in SEFOS1.

An external LSA is generated for 3333::1111:0:0 with metric as 100, metric type as asExtType1, and tag as 10.

```
SEFOS# show ipv6 ospf database as-external detail  
  
Age: 0    Seconds           LS Type: External Lsa  
Link State Id: 0.0.0.1     Adv Rtr Id: 10.0.0.1  
Sequence: 0x80000001       Checksum: 0x6151    Length: 60  
Metric Type: Ext Type1     Metric: 0x64  
Prefix Length: 96         Prefix Options: 0x00  
Referenced LS Type: 0  
Address Prefix: 3333::1111:0:0  
Fw Address Prefix: 3333::1111:0:0  
External Route Tag: 10
```

#### 6. View the configuration details in SEFOS2.

View the external route 3333::1111:0:0 with metric as 101.

```
SEFOS# show ipv6 ospf route  
  
OSPFV3 Process Routing Table  
Dest/Prefix-Length  NextHop/IfIndex      Cost    Rt.Type    Area  
3333::1111:0:0/96  fec0::1111:0:2/vlan11  101    type1Ext  
0.0.0.0  
fec0::1111:0:0/96  ::/vlan11           1      intraArea  0.0.0.0  
fec0::4444:0:0/96  ::/vlan4             1      intraArea  0.0.0.3
```

## ▼ Restore the Default Redistribution Configuration

The following example deletes the external LSA generated for 3333::1111:0:0, and a new external LSA is generated with the default redistribution configuration.

#### 1. Test no redistrib-config in SEFOS1.

```
SEFOS# configure terminal  
SEFOS(config)# ipv6 router ospf
```

## 2. Restore the default redistribution configuration.

```
SEFOS(config-router)# no redistrib-config 3333::1111:0:0 96
SEFOS(config-router)# end
```

## 3. View the configuration details in SEFOS1.

```
SEFOS# show ipv6 ospf database as-external detail

Age: 0      Seconds           LS Type: External Lsa
Link State Id: 0.0.0.1       Adv Rtr Id: 10.0.0.1
Sequence: 0x80000006         Checksum: 0x947e     Length: 56
Metric Type: Ext Type2      Metric: 0xa
Prefix Length: 96           Prefix Options: 0x00
Referenced LS Type: 0
Addres Prefix: 3333::1111:0:0
Fw Addres Prefix: 3333::1111:fec0:0
External Route Tag: 0
```

---

# Configuring Area Route Summarization

These sections show how to configure area route summarization.

- [“Area Route Overview” on page 61](#)
- [“Configure Address Range Aggregation” on page 62](#)
- [“Disable an Address Range” on page 63](#)
- [“Configure an Internal Address Range” on page 64](#)
- [“Disable an Internal Address Range” on page 65](#)

## Area Route Overview

You can configure ASBR routers in various ways to summarize the routes to different areas. This summary will be advertised, by default. The aggregating routes can be internal address range or AS-external address range. You can configure area parameters only after enabling the OSPF process. Configure these parameters in Router Configuration mode.

Internal address ranges are one of two types:

- Type-3 aggregation

- Type-7 translation aggregation

For AS-external address range aggregation, Type-5 and Type-7 address ranges can be aggregated, and Type-5/Type-7 LSA conversion and generation can also be configured.

## ▼ Configure Address Range Aggregation

This example configures address range aggregation in SEFOS8 as AS-external.

### 1. Enter Global Configuration mode in SEFOS8.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in SEFOS8.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.8
```

### 4. Configure the router as an ASBR router.

```
SEFOS(config-router)# asbr router  
SEFOS(config-router)# redistribute static  
SEFOS(config-router)# exit
```

### 5. Add static routes.

```
SEFOS(config)# ipv6 route 3333::2222:0:0 96 fec0::2856:0:1  
SEFOS(config)# ipv6 route 3333::4444:0:0 96 fec0::2886:0:10
```

### 6. View the database.

```
SEFOS# show ipv6 ospf database as-external detail  
  
Age: 0    Seconds           LS Type: External Lsa  
Link State Id: 0.0.0.1     Adv Rtr Id: 10.0.0.8  
Sequence: 0x80000001       Checksum: 0x593a    Length: 56  
Metric Type: Ext Type2     Metric: 0xa  
Prefix Length: 96         Prefix Options: 0x00  
Referenced LS Type: 0
```

```

Addres Prefix: 3333::2222:0:0
Fw Addres Prefix: 3333::2222:fec0:0
External Route Tag: 0

Age: 0    Seconds           LS Type: External Lsa
Link State Id: 0.0.0.2     Adv Rtr Id: 10.0.0.8
Sequence: 0x80000001      Checksum: 0x1f80    Length: 40
Metric Type: Ext Type2    Metric: 0xa
Prefix Length: 96         Prefix Options: 0x00
Referenced LS Type: 0
Addres Prefix: 3333::4444:0:0
Fw Addres Prefix: 3333::4444:0:0
External Route Tag: 0

```

### 7. Configure the entire summary for this 3333:: address range.

```

SEFOS(config-router)# area 0.0.0.0 summary-prefix 3333:: 64
advertise

```

### 8. View the configuration results in SEFOS8.

```

SEFOS# show ipv6 ospf database as-external detail

Age: 3    Seconds           LS Type: External Lsa
Link State Id: 0.0.0.3     Adv Rtr Id: 10.0.0.8
Sequence: 0x80000001      Checksum: 0xb496    Length: 36
Metric Type: Ext Type2    Metric: 0xa
Prefix Length: 64         Prefix Options: 0x00
Referenced LS Type: 0
Addres Prefix: 3333::
Fw Addres Prefix: 3333::
External Route Tag: 0

```

## ▼ Disable an Address Range

This example disables the entire range that is not to be advertised.

### 1. Disable a previously specified range so that it is not advertised.

```

SEFOS(config-router)# area 0.0.0.0 summary-prefix 3333:: 64
not-advertise

```

2. Verify that the database entry has been removed.

```
SEFOS# show ipv6 ospf database as-external detail
```

## ▼ Configure an Internal Address Range

This example configures an internal address range in SEFOS1.

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

4. Configure the entire summary for this fec0::1111:0:0 address range.

```
SEFOS(config-router)# area 0.0.0.6 range fec0::1111:0:0 96  
advertise summary
```

5. View the results in SEFOS1.

```
SEFOS# show ipv6 ospf area 0.0.0.0 database detail  
  
Age: 0 Seconds LS Type: Link Lsa  
Link State Id: 0.0.0.41 Adv Rtr Id: 10.0.0.1  
Sequence: 0x8000001f Checksum: 0xc50c Length: 60  
Router Priority: 1 Options: 0x33  
Prefix: fe80::214:4fff:fe6c:628f  
#Prefixes: 1  
Prefix Length (Bytes): 12 Prefix Options: 0x00  
Prefix: fec0::2856:0:0  
Age: 3 Seconds LS Type: Link Lsa  
Link State Id: 0.0.0.40 Adv Rtr Id: 10.0.0.8  
Sequence: 0x8000001f Checksum: 0xda3b Length: 60  
Router Priority: 1 Options: 0x33  
Prefix: fe80::221:28ff:fe54:7069  
#Prefixes: 1
```



```

Prefix Length (Bytes): 12   Prefix Options: 0x00
Prefix: fec0::2856:0:0

Age: 0   Seconds           LS Type: Router Lsa
Link State Id: 0.0.0.0     Adv Rtr Id: 10.0.0.1
Sequence: 0x80000020       Checksum: 0x0e62   Length: 40
Router is an Area Border Router
Number of Links: 1         Options: 0x33
Link connected to : transit network
Metric: 0x1                Interface Id: 41
Nbr Interface Id: 40       Nbr Router Id: 10.0.0.8

Age: 3   Seconds           LS Type: Router Lsa
Link State Id: 0.0.0.0     Adv Rtr Id: 10.0.0.8
Sequence: 0x80000020       Checksum: 0xd890   Length: 40
Router is an AS Boundary Router
Number of Links: 1         Options: 0x33
Link connected to : transit network
Metric: 0x1                Interface Id: 40
Nbr Interface Id: 40       Nbr Router Id: 10.0.0.8

Age: 3   Seconds           LS Type: Network Lsa
Link State Id: 0.0.0.40    Adv Rtr Id: 10.0.0.8
Sequence: 0x8000001f       Checksum: 0xab7    Length: 32
Options: 0x33
Attached Router: 10.0.0.8
Attached Router: 10.0.0.1
Age: 3   Seconds           LS Type: Intra Area Prefix Lsa
Link State Id: 0.0.0.0     Adv Rtr Id: 10.0.0.8
Sequence: 0x80000040       Checksum: 0xdff7   Length: 48
#Prefixes: 1               Referenced LS Type: Network Lsa
Ref Link State Id: 0.0.0.40 Ref Adv Router: 10.0.0.8
Prefix Length (Bytes): 12   Prefix Options: 0x00
Metric: 0x0
Prefix: fec0::2856:0:0

```

## ▼ Disable an Internal Address Range

This example disables an internal range that is not to be advertised.

1. Ensure that the entire summary for this `fec0::1111:0:0` address range is not advertised.

```

SEFOS(config-router)# area 0.0.0.6 range fec0::1111:0:0 96
not-advertise summary

```

**2. In SEFOS1, check whether the inter area prefix LSA advertised by 10.0.0.1 is missing.**

```
SEFOS# show ipv6 ospf area 0.0.0.0 database detail

Age: 0    Seconds           LS Type: Link Lsa
Link State Id: 0.0.0.34     Adv Rtr Id: 10.0.0.1
Sequence: 0x80000003       Checksum: 0xb6f4    Length: 60
Router Priority: 1         Options: 0x33
Prefix: fe80::201:2ff:fe03:401
#Prefixes: 1
Prefix Length (Bytes): 12   Prefix Options: 0x00
Prefix: fec0::2856:0:0

Age: 3    Seconds           LS Type: Link Lsa
Link State Id: 0.0.0.34     Adv Rtr Id: 10.0.0.8
Sequence: 0x80000002       Checksum: 0x9e06    Length: 60
Router Priority: 1         Options: 0x33
Prefix: fe80::202:2ff:fe03:401
#Prefixes: 1
Prefix Length (Bytes): 12   Prefix Options: 0x00
Prefix: fec0::2856:0:0

Age: 0    Seconds           LS Type: Router Lsa
Link State Id: 0.0.0.0     Adv Rtr Id: 10.0.0.1
Sequence: 0x80000003       Checksum: 0x7921    Length: 40
Router is an Area Border Router
Number of Links: 1         Options: 0x33
Link connected to : transit network
Metric: 0x1                Interface Id: 34
Nbr Interface Id: 34       Nbr Router Id: 10.0.0.8

Age: 3    Seconds           LS Type: Router Lsa
Link State Id: 0.0.0.0     Adv Rtr Id: 10.0.0.8
Sequence: 0x80000003       Checksum: 0x5240    Length: 40
Router is an AS Boundary Router
Number of Links: 1         Options: 0x33
Link connected to : transit network
Metric: 0x1                Interface Id: 34
Nbr Interface Id: 34       Nbr Router Id: 10.0.0.8

Age: 3    Seconds           LS Type: Network Lsa
Link State Id: 0.0.0.34     Adv Rtr Id: 10.0.0.8
Sequence: 0x80000002       Checksum: 0x2294    Length: 32
Options: 0x33
Attached Router: 10.0.0.8
Attached Router: 10.0.0.1
```

```
Age: 3      Seconds      LS Type: Intra Area Prefix Lsa
Link State Id: 0.0.0.0    Adv Rtr Id: 10.0.0.8
Sequence: 0x80000006     Checksum: 0x18ff      Length: 48
#Prefixes: 1             Referenced LS Type: Network Lsa
Ref Link State Id: 0.0.0.34  Ref Adv Router: 10.0.0.8
Prefix Length (Bytes): 12   Prefix Options: 0x00
Metric: 0x0
Prefix: fec0::2856:0:0
```

---

## Configuring a Stub Area

If an area is configured as a stub area, you can inject summary routes into it. You can also configure other parameters related to that area.

In a stub area, the generation of summary LSAs is optional. If you specify the `no-summary` option, the router will not propagate summary LSAs. By default, the stub area sends summary information.

You can configure area parameters only after enabling the OSPF process. Configure these parameters in Router Configuration mode.

- [“Configure a Stub Area” on page 67](#)
- [“Convert a Stub Area to a Normal Area” on page 68](#)
- [“Configure a Default Summary Route for a Stub Area” on page 68](#)
- [“Configure the Default Summary Route Cost for a Stub Area” on page 69](#)

### ▼ Configure a Stub Area

This example configures the IP address `0.0.0.6` as a stub area in SEFOS1 (router ID `10.0.0.1`).

#### 1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

#### 2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

### 4. Configure the desired area associated with the OSPF address range as a stub area.

```
SEFOS(config-router)# area 0.0.0.6 stub  
SEFOS(config-router)# end
```

### 5. Ensure that the stub area is created.

```
SEFOS# show ipv6 ospf areas  
  
OSPFV3 AREA CONFIGURATION INFORMATION  
AreaId: 0.0.0.0 Area Type: NORMAL AREA  
Spf Calculation: 4 (times) Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0 Area Summary: Send Summary  
  
AreaId: 0.0.0.6 Area Type: STUB AREA  
Spf Calculation: 4 (times) Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0 Area Summary: Send Summary  
Stub Metric: 0x1 Stub Metric Type: 1
```

## ▼ Convert a Stub Area to a Normal Area

You can convert an area previously identified as a stub area to a normal area.

This example reconfigures area 0.0.0.6 as a normal area.

- **Return a stub area to a normal area.**

```
SEFOS(config-router)# no area 0.0.0.6 stub
```

## ▼ Configure a Default Summary Route for a Stub Area

Configuring a stub area with the `no-summary` option specifies that the router will neither originate nor propagate summary LSAs into the stub area, and will, instead, depend entirely on its default route. You can specify the `no-summary` option only in ABRs.

This example configures the IP address 0.0.0.6 as a stub area in SEFOS1 (router ID 10.0.0.1), with no summary LSAs being originated or propagated by the router to the stub area.

**1. Enter Global Configuration mode in SEFOS1.**

```
SEFOS# configure terminal
```

**2. Enable OSPF globally in SEFOS1.**

```
SEFOS(config)# ipv6 router ospf
```

**3. Configure the OSPF router ID.**

```
SEFOS(config-router)# router-id 10.0.0.1
```

**4. Configure the area 0.0.0.6 as a stub area.**

```
SEFOS(config-router)# area 0.0.0.6 stub no-summary  
SEFOS(config-router)# end
```

**5. Ensure that the default summary route is set.**

```
SEFOS# show ipv6 ospf areas  
OSPFV3  AREA  CONFIGURATION  INFORMATION  
  
AreaId: 0.0.0.0                Area Type: NORMAL AREA  
Spf Calculation: 10 (times)     Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0            Area Summary: Send Summary  
  
AreaId: 0.0.0.6                Area Type: STUB AREA  
Spf Calculation: 10 (times)     Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0            Area Summary: No Summary  
Stub Metric: 0x1                Stub Metric Type: 1
```

## ▼ Configure the Default Summary Route Cost for a Stub Area

If default summary routes are selected, you can configure the cost for the default summary route that is sent to a stub area.

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

4. Configure the area 0.0.0.6 as a stub area.

```
SEFOS(config-router)# area 0.0.0.6 stub
```

5. Configure the cost as 20.

```
SEFOS(config-router)# area 0.0.0.6 default-metric 20  
SEFOS(config-router)# end
```

6. Ensure that the correct cost is set.

```
SEFOS# show ipv6 ospf areas  
  
OSPFV3  AREA  CONFIGURATION  INFORMATION  
  
AreaId: 0.0.0.0                Area Type: NORMAL AREA  
Spf Calculation: 11 (times)    Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0           Area Summary: Send Summary  
  
AreaId: 0.0.0.6                Area Type: STUB AREA  
Spf Calculation: 11 (times)    Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0           Area Summary: Send Summary  
Stub Metric: 0x14             Stub Metric Type: 1
```

---

## Configuring an NSSA

This section describes various options you can configure when configuring an NSSA.

You can configure area parameters only after enabling the OSPF process. Configure these parameters in Router Configuration mode.

- “Configure the Stability Interval for NSSA” on page 71
- “Restore the Default Stability Interval” on page 72
- “Configure an NSSA Translation Role” on page 72
- “Restore the Default Translation Role” on page 74
- “Configure Default Summary Route for an NSSA” on page 74
- “Configure the Metric Type for an NSSA” on page 75

## ▼ Configure the Stability Interval for NSSA

The stability interval is used when an elected translator determines that its services are no longer required and the translator continues its translation duties for additional time.

This example configures area 0.0.0.6 to be an NSSA with the stability interval set to 120 seconds.

### 1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

### 4. Configure the ASBR router status.

```
SEFOS(config-router)# asbr router
```

### 5. Configure an area as an NSSA.

```
SEFOS(config-router)# area 0.0.0.6 nssa
```

## 6. Configure the stability interval for the NSSA area.

```
SEFOS(config-router)# area 0.0.0.6 stability-interval 120
```

## 7. Ensure that the stability interval is correct.

```
SEFOS# show ipv6 ospf areas

OSPFV3 AREA CONFIGURATION INFORMATION

AreaId: 0.0.0.0                Area Type: NORMAL AREA
Spf Calculation: 12 (times)     Area Bdr Rtr Count: 0
As Bdr Rtr Count: 0            Area Summary: Send Summary

AreaId: 0.0.0.6                Area Type: NSSA AREA
Spf Calculation: 12 (times)     Area Bdr Rtr Count: 0
As Bdr Rtr Count: 0            Area Summary: Send Summary
Stub Metric: 0x1               Stub Metric Type: 2
Translator Role: Candidate      Translator State: Elected/Enabled
Nssa Stability Interval: 120
```

## ▼ Restore the Default Stability Interval

This example restores the stability interval for area 0.0.0.0 to the default of 40 seconds.

- Restore the default stability interval for the NSSA.

```
SEFOS(config-router)# no area 0.0.0.6 stability-interval
```

## ▼ Configure an NSSA Translation Role

You can configure the translation role for an NSSA to ensure that Type-7 LSAs are always translated into Type-5 LSAs. Alternatively, the default setting simply identifies an NSSA border router as a candidate that can participate in the translator election process.

This example configures area 0.0.0.6 as an NSSA in SEFOS1 (router ID 10.0.0.1) and specifies that the border router will always be able to translate Type-7 LSAs into Type-5 LSAs.



1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

4. Configure the ASBR router status.

```
SEFOS(config-router)# asbr router
```

5. Configure an area as an NSSA.

```
SEFOS(config-router)# area 0.0.0.6 nssa
```

6. Configure the translator role.

```
SEFOS(config-router)# area 0.0.0.6 translation-role always
```

7. Ensure that the translation role is correct.

```
SEFOS# show ipv6 ospf areas
```

```
OSPFV3 AREA CONFIGURATION INFORMATION
```

```
AreaId: 0.0.0.0 Area Type: NORMAL AREA  
Spf Calculation: 13 (times) Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0 Area Summary: Send Summary
```

```
AreaId: 0.0.0.6 Area Type: NSS AREA  
Spf Calculation: 13 (times) Area Bdr Rtr Count: 0  
As Bdr Rtr Count: 0 Area Summary: Send Summary  
Stub Metric: 0x1 Stub Metric Type: 2  
Translator Role: Always Translator State: Elected/Enabled  
Nssa Stability Interval: 40
```

## ▼ Restore the Default Translation Role

This example restores the default translation role to candidate for area 0.0.0.6.

- Restore the default translation role.

```
SEFOS(config-router)# no area 0.0.0.6 translation-role
```

## ▼ Configure Default Summary Route for an NSSA

Configuring a NSSA with the `no-summary` option specifies that the router will neither originate nor propagate summary LSAs into the NSSA, and will, instead, depend entirely on its default route. You can specify the `no-summary` option only in ABRs.

This example configures area 0.0.0.6 as an NSSA in SEFOS1 (router ID 10.0.0.1), with no summary LSAs being originated or propagated by the router to the NSSA.

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

4. Configure the area 0.0.0.6 as a stub area.

```
SEFOS(config-router)# area 0.0.0.6 nssa no-summary  
SEFOS(config-router)# end
```

5. Ensure that the default summary route is set.

```
SEFOS# show ipv6 ospf areas  
  
OSPFV3 AREA CONFIGURATION INFORMATION  
  
AreaId: 0.0.0.0 Area Type: NORMAL AREA  
Spf Calculation: 10 (times) Area Bdr Rtr Count: 0
```

As Bdr Rtr Count: 0	Area Summary: Send Summary
AreaId: 0.0.0.6	Area Type: NSS AREA
Spf Calculation: 14 (times)	Area Bdr Rtr Count: 0
As Bdr Rtr Count: 0	Area Summary: No Summary
Stub Metric: 0x1	Stub Metric Type: 2
Translator Role: Candidate	Translator State: Elected/Enabled
Nssa Stability Interval: 40	

## ▼ Configure the Metric Type for an NSSA

If default summary routes are selected, you can configure the metric type for the default summary route that is sent to an NSSA.

This example configures the IP address 0.0.0.6 as an NSSA in SEFOS1 (router ID 10.0.0.1) and specifies that the metric type for the NSSA is Type-2 external cost (value 3).

### 1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

### 4. Configure an area as an NSSA.

```
SEFOS(config-router)# area 0.0.0.6 nssa
```

### 5. Configure the metric type as Type-2 external cost (value 3).

```
SEFOS(config-router)# area 0.0.0.6 default-metric type 3  
SEFOS(config-router)# exit
```

## 6. Ensure that the correct metric type is set.

```
SEFOS# show ipv6 ospf areas

OSPFV3 AREA CONFIGURATION INFORMATION

AreaId: 0.0.0.0                Area Type: NORMAL AREA
Spf Calculation: 14 (times)     Area Bdr Rtr Count: 0
As Bdr Rtr Count: 0           Area Summary: Send Summary

AreaId: 0.0.0.6                Area Type: NSSA AREA
Spf Calculation: 14 (times)     Area Bdr Rtr Count: 0
As Bdr Rtr Count: 0           Area Summary: Send Summary
Stub Metric: 0x1              Stub Metric Type: 3
Translator Role: Candidate     Translator State: Elected/Enabled
Nssa Stability Interval: 40
```

---

# Configuring the Capability in an NSSA Internal Border Router

Configuring the p-bit in the Type-7 LSA allows the Type-7 LSA to get converted into a Type-5 LSA by the NSSA ABR, or to not to convert it. Type-7 LSAs are generated from an AS-external border router that contains the routing information about the external AS link RIPng, BGP, and the like.

- [“Configure NSSA Type-7/-5 Conversion” on page 76](#)

## ▼ Configure NSSA Type-7/-5 Conversion

See [“NSSA Type-7/-5 Conversion Topology” on page 13](#) for the NSSA Type-7/-5 conversion topology created in this example.

### 1. Configure the interfaces with their corresponding IPv6 address.

See [“IPv6 Example Topology Interface and Host Addresses” on page 9](#).

2. Configure OSPFv3 by enabling OSPFv3 routing protocol in VLAN 2 (area 0.0.0.2) on SEFOS9 (router ID 10.0.0.9).

```
SEFOS(config)# ipv6 router ospf  
SEFOS(config-router)# router-id 10.0.0.9  
SEFOS(config-router)# ASBR Router  
SEFOS(config-router)# redistribute static  
SEFOS(config-router)# exit  
SEFOS(config)# interface vlan 2  
SEFOS(config-if)# ipv6 ospf area 0.0.0.2  
SEFOS(config-if)# exit
```

3. Configure the area as an NSSA.

```
SEFOS(config)# ipv6 router ospf  
SEFOS(config-router)# area 0.0.0.2 nssa  
SEFOS(config-router)# end
```

4. Enable OSPFv3 routing protocol in VLAN 2 (area 0.0.0.2) on SEFOS2 (router ID 10.0.0.2).

```
SEFOS(config)# ipv6 router ospf  
SEFOS(config-router)# router-id 10.0.0.2  
SEFOS(config-router)# exit  
SEFOS(config)# interface vlan 2  
SEFOS(config-if)# ipv6 ospf area 0.0.0.2  
SEFOS(config-if)# exit  
SEFOS(config)# interface vlan 11  
SEFOS(config-if)# ipv6 ospf area 0.0.0.0  
SEFOS(config-if)# exit
```

5. Configure area 0.0.0.2 as an NSSA.

```
SEFOS(config)# ipv6 router ospf  
SEFOS(config-router)# area 0.0.0.2 nssa  
SEFOS(config-router)# exit
```

6. Enable OSPFv3 routing protocol on VLAN 11 (area 0.0.0.0) on SEFOS1 (router ID 10.0.0.1).

```
SEFOS(config)# ipv6 router ospf  
SEFOS(config-router)# router-id 10.0.0.1  
SEFOS(config-router)# exit  
SEFOS(config)# interface vlan 11  
SEFOS(config-if)# ipv6 ospf area 0.0.0.0
```

```
SEFOS(config-if)# exit
SEFOS(config)# ipv6 router ospf
SEFOS(config-router)# end
```

## 7. Configure the static route.

Add a static route to 4444::/96 through VLAN 1, where the IPv6 address for VLAN 1 on SEFOS9 is 3333::2222:0:1/96, with a next hop of 3333::2222:0:10/96.

```
SEFOS(config)# ipv6 route 4444:: 96 3333::2222:0:10
SEFOS(config)# exit
```

## 8. View the Type-7 and Type-5 LSA. By default the P-bit will be in clear state. Type-7 LSAs will be converted into a Type-5 LSA.

- In SEFOS9, type.

```
SEFOS# show ipv6 ospf database nssa detail

Age: 42 Seconds           LS Type: Type-7 Lsa
Link State Id: 0.0.0.0    Adv Rtr Id: 10.0.0.2
Sequence: 0x80000002      Checksum: 0x0d20      Length: 28
Metric: 0x1
Metric Type: Ext Type1    Prefix Length: 0      Prefix
Options: 0x00
Referenced LS Type: 0
Address Prefix: ::10:10f8:5830:300:e450
Fw Address Prefix: 3ddf:c7e8:3ddf:c738:ff4:324:3d50:10
External Route Tag: 0

Age: 0 Seconds           LS Type: Type-7 Lsa
Link State Id: 0.0.0.1    Adv Rtr Id: 10.0.0.9
Sequence: 0x80000001      Checksum: 0xe6e5      Length: 56
Metric: 0xa
Metric Type: Ext Type2    Prefix Length: 96     Prefix
Options: 0x08
Referenced LS Type: 0
Address Prefix: 4444::300:e450
```

- In SEFOS2, type.

```
SEFOS# show ipv6 ospf database nssa detail

Age: 0 Seconds           LS Type: Type-7 Lsa
Link State Id: 0.0.0.0    Adv Rtr Id: 10.0.0.2
Sequence: 0x80000002      Checksum: 0x0d20      Length: 28
Metric: 0x1
```

```

Metric Type: Ext Type1      Prefix Length: 0      Prefix
Options: 0x00
Referenced LS Type: 0
Address Prefix: ::10:10f8:5920:300:2450
Fw Address Prefix: 3621:828:3621:778:ff4:324:fe4:2988
External Route Tag: 0

Age: 3    Seconds          LS Type: Type-7 Lsa
Link State Id: 0.0.0.1    Adv Rtr Id: 10.0.0.9
Sequence: 0x80000001      Checksum: 0xe6e5     Length: 56
Metric: 0xa
Metric Type: Ext Type2    Prefix Length: 96      Prefix
Options: 0x08
Referenced LS Type: 0
Address Prefix: 4444::300:2450

```

- In SEFOS1, type.

```

SEFOS# show ipv6 ospf database as-external detail

Age: 3    Seconds          LS Type: External Lsa
Link State Id: 0.0.0.1    Adv Rtr Id: 10.0.0.2
Sequence: 0x80000001      Checksum: 0x0bb2     Length: 56
Metric Type: Ext Type2    Metric: 0xa
Prefix Length: 96         Prefix Options: 0x00
Referenced LS Type: 0
Address Prefix: 4444::
Fw Address Prefix: 4444::fec0:0
External Route Tag: 0

```

9. In SEFOS9, set the P-bit in the default Type-7 LSA generated by an NSSA internal ASBR.

```

SEFOS(config)# ipv6 router ospf
SEFOS(config-router)# no nssaAsbrDfRtTrans

```

10. Configure aggregation, if necessary.

```

SEFOS(config-router)# area 0.0.0.0 summary-prefix 4444::64
translation disabled
SEFOS(config-router)# exit

```

11. View the results in SEFOS1.

---

**Note** – No external LSA is sent to 10.0.0.1.

---

```
SEFOS# show ipv6 ospf database as-external detail
```

---

## Configuring Virtual Links

You can configure a virtual link to define an OSPF virtual link and its related parameters. In OSPFv3, all areas must be connected to a backbone area. If there is a break in backbone continuity, or the backbone is purposefully partitioned, a virtual link can be established. The two endpoints of a virtual link are ABRs. The virtual link must be configured in both routers.

The configuration information in each router consists of the other virtual endpoint (the other ABR) and the non-backbone area that the two routers have in common (called the transit area).

See “[Virtual Link and Route Summarization Topology](#)” on page 14 for the topology for configuring and testing virtual link and route summarization.

- “[Configure a Virtual Link](#)” on page 80
- “[Configure Virtual Link and Route Summarization](#)” on page 81

### ▼ Configure a Virtual Link

This example configures area 0.0.0.6 as a virtual link, with 20.0.0.1 as the virtual neighbor, and an interface index value of 100.

#### 1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

#### 2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

#### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```



#### 4. Configure the virtual link.

```
SEFOS(config-router)# area 0.0.0.6 virtual-link 20.0.0.1 100
```

#### 5. View the configuration.

---

**Note** – The neighbor state will be down until other end of the virtual link becomes active.

---

```
SEFOS# show ipv6 ospf virtual-links  
  
Interface State: DOWN, Neighbor State: DOWN  
Transit Area: 0.0.0.6, Virtual Neighbor: 20.0.0.1  
Intervals Configured for the Virtual Interface:  
Hello: 10, Dead: 60, Transit: 1, Retransmit : 5
```

## ▼ Delete a Virtual Link

- Type.

```
SEFOS(config-router)# no area 0.0.0.6 virtual-link 20.0.0.1 100
```

## ▼ Configure Virtual Link and Route Summarization

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

**4. Exit Router Configuration mode.**

```
SEFOS(config-router)# end
```

**5. Enter Global Configuration mode in SEFOS4.**

```
SEFOS# configure terminal
```

**6. Enable OSPF globally in SEFOS4.**

```
SEFOS(config)# ipv6 router ospf
```

**7. Configure the OSPF router ID.**

```
SEFOS(config-router)# router-id 10.0.0.4
```

**8. Configure the virtual link for backbone connectivity.**

```
SEFOS(config-router)# area 0.0.0.3 virtual-link 10.0.0.6 100  
SEFOS(config-router)# area 0.0.0.3 virtual-link 10.0.0.5 120
```

**9. Exit Router Configuration mode.**

```
SEFOS(config-router)# end
```

**10. Enter Global Configuration mode in SEFOS5.**

```
SEFOS# configure terminal
```

**11. Enable OSPF globally in SEFOS5.**

```
SEFOS(config)# ipv6 router ospf
```

**12. Configure the OSPF router ID.**

```
SEFOS(config-router)# router-id 10.0.0.5
```

**13. Configure the virtual link for backbone connectivity.**

```
SEFOS(config-router)# area 0.0.0.3 virtual-link 10.0.0.4 120
```

14. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

15. Enter Global Configuration mode in SEFOS6.

```
SEFOS# configure terminal
```

16. Enable OSPF globally in SEFOS6.

```
SEFOS(config)# ipv6 router ospf
```

17. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.6
```

18. Configure the virtual link for backbone connectivity.

```
SEFOS(config-router)# area 0.0.0.3 virtual-link 10.0.0.4 100
```

19. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

20. Enter Global Configuration mode in SEFOS8.

```
SEFOS# configure terminal
```

21. Enable OSPF globally in SEFOS8.

```
SEFOS(config)# ipv6 router ospf
```

22. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.8
```

23. Exit configuration mode.

```
SEFOS(config-router)# end
```

#### 24. View the route summarization information in SEFOS1.

```
SEFOS# show ipv6 ospf area-range

OspfV3 Summary Address Configuration Information

Network          PfxLength  LSA Type  Area      Effect
Tag
fec0::1111:0:0    96         Summary   0.0.0.0   advertise 0
fec0::2856:0:0    96         Summary   0.0.0.6   advertise 0
```

#### 25. View the virtual link and the status of the link in SEFOS4.

```
SEFOS# show ipv6 ospf virtual-links

Interface State: PointToPoint, Neighbor State: FULL
Transit Area: 0.0.0.3, Virtual Neighbor: 10.0.0.5
Intervals Configured for the Virtual Interface:
Hello: 10, Dead: 60, Transit: 1, Retransmit : 5

Interface State: PointToPoint, Neighbor State: FULL
Transit Area: 0.0.0.3, Virtual Neighbor: 10.0.0.6
Intervals Configured for the Virtual Interface:
Hello: 10, Dead: 60, Transit: 1, Retransmit : 5
```

#### 26. View the virtual link in SEFOS5.

```
SEFOS# show ipv6 ospf virtual-links

Interface State: PointToPoint, Neighbor State: FULL
Transit Area: 0.0.0.3, Virtual Neighbor: 10.0.0.4
Intervals Configured for the Virtual Interface:
Hello: 10, Dead: 60, Transit: 1, Retransmit : 5
```

#### 27. View the virtual link in SEFOS6.

```
SEFOS# show ipv6 ospf virtual-links

Interface State: PointToPoint, Neighbor State: FULL
Transit Area: 0.0.0.3, Virtual Neighbor: 10.0.0.4
Intervals Configured for the Virtual Interface:
Hello: 10, Dead: 60, Transit: 1, Retransmit : 5
```

## 28. View the route available to reach ABR SEFOS1.

```
SEFOS# show ipv6 ospf border-routers

Ospfv3 Process Border Router Information

Destination      Type                NextHop            Cost    Rt Type
Area Id
10.0.0.1         ABR ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff0
0.0.0.0
10.0.0.4         ABR fe80::207:2ff:fe03:401    1      intraArea
0.0.0.3
10.0.0.5         ABR fe80::207:2ff:fe03:401    2      intraArea
0.0.0.3
```

---

# Configuring External Database Limit

Configuring the external database limit provides the upper limit for the number of non-default AS-external-LSAs in a router's link-state database. The router enters overflow state when it reaches the limit. The router does not hold more than the configured non-default AS-external-LSAs in its database.

You must set the LSDB limit identically in all routers that are attached to the OSPFv3 backbone or any regular OSPFv3 area (for example, OSPFv3 stub areas and NSSAs are excluded).

- [“Configure the External Database Limit” on page 85](#)
- [“Restore the Default External Database Limit” on page 86](#)

## ▼ Configure the External Database Limit

This example configures the external database limit in SEFOS1 (router 10.0.0.1) to 20 entries.

### 1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in the switch SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

### 4. Configure the external LSDB limit.

```
SEFOS(config-router)# as-external lsdb-limit 20
```

### 5. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

### 6. View the configuration details.

```
SEFOS# show ipv6 ospf

Router Id: 10.0.0.1           ABR Type: Standard ABR
SPF schedule delay: 5 secs   Hold time between two SPFs: 10 secs
Exit Overflow Interval: 0    Ref BW: 100000           Ext Lsdb
Limit: 20
Trace Value: 0x00000800     As Scope Lsa: 1         Checksum
Sum: 0xf4c5
Demand Circuit: Enable      Passive Interface: Disable
Nssa Asbr Default Route Translation: Disable
It is an Area Border Router
Number of Areas in this router  2
    Area 0.0.0.0
        Number of interfaces in this area is 1
        Number of Area Scope Lsa: 7           Checksum Sum: 0x30ece
        Number of Indication Lsa: 1           SPF algorithm executed: 22
times
    Area 0.0.0.6
        Number of interfaces in this area is 1
        Number of Area Scope Lsa: 7           Checksum Sum: 0x4d7f3
        Number of Indication Lsa: 0           SPF algorithm executed: 23
times
```

## ▼ Restore the Default External Database Limit

This example restores the default external database limit to -1 (no limit) for SEFOS1 (router 10.0.0.1).

---

**Note** – The exit overflow interval will be 0 until you configure it.

---

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in the switch SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

4. Configure the external LSDB limit.

```
SEFOS(config-router)# as-external lsdb-limit -1
```

5. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

---

## Configuring the Overflow Exit Interval

Configuring the overflow exit interval specifies how much time must pass (in seconds) before a router will attempt to leave the overflow state. If you specify a value of 0, the router will remain in the overflow state.

- [“Configure the Overflow Exit Interval” on page 87](#)

### ▼ Configure the Overflow Exit Interval

This example configures the external database limit in SEFOS1 (router 10.0.0.1) to 20 and the overflow exit interval in SEFOS1 to 10 seconds.

**1. Enter Global Configuration mode in SEFOS1.**

```
SEFOS# configure terminal
```

**2. Enable OSPF globally in the switch SEFOS1.**

```
SEFOS(config)# ipv6 router ospf
```

**3. Configure the OSPF router ID.**

```
SEFOS(config-router)# router-id 10.0.0.1
```

**4. Configure the as-external LSDB limit and overflow exit interval.**

```
SEFOS(config-router)# as-external lsdb-limit 20  
SEFOS(config-router)# exit-overflow-interval 10
```

**5. Exit Router Configuration mode.**

```
SEFOS(config-router)# end
```

**6. View the configuration details.**

```
SEFOS# show ipv6 ospf  
  
Router Id: 10.0.0.1           ABR Type: Standard ABR  
SPF schedule delay: 5 secs    Hold time between two SPFs: 10 secs  
Exit Overflow Interval: 10    Ref BW: 100000           Ext Lsdb  
Limit: 20  
Trace Value: 0x00000800      As Scope Lsa: 1         Checksum  
Sum: 0xf4c5  
Demand Circuit: Enable       Passive Interface: Disable  
Nssa Asbr Default Route Translation: Disable  
It is an Area Border Router  
Number of Areas in this router 2  
    Area 0.0.0.0  
    Number of interfaces in this area is 1  
    Number of Area Scope Lsa: 7      Checksum Sum: 0x30ece  
    Number of Indication Lsa: 1      SPF algorithm executed: 22  
times  
    Area 0.0.0.6
```



```
Number of interfaces in this area is 1
Number of Area Scope Lsa: 7      Checksum Sum: 0x4d7f3
Number of Indication Lsa: 0      SPF algorithm executed: 23
times
```

---

## Configuring a Demand Extension

Demand extensions are configured by default to enable demand routing. To disable demand routing on any router interface that is configured as a demand circuit, you must disable demand extensions on those interfaces.

- [“Disable a Demand Extension” on page 89](#)
- [“Re-Enable Demand Extensions” on page 90](#)

### ▼ Disable a Demand Extension

This example disables demand extensions on SEFOS1 (router 10.0.0.1).

1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

2. Enable OSPF globally in the switch SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

4. Disable the demand-extension.

```
SEFOS(config-router)# no demand-extensions
```

5. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

## 6. View the result of the configuration.

```
SEFOS# show ipv6 ospf interface vlan 11

      OspfV3 Interface Information

Interface Name: vlan11      Interface Id: 41      Area Id: 0.0.0.0
Local Address: fe80::214:4fff:fe6c:628f      Router Id: 10.0.0.1
Network Type: BROADCAST      Cost: 1      State: DR
Designated Router Id: 10.0.0.1      local address:
fe80::214:4fff:fe6c:628f
Backup Designated Router Id: 10.0.0.2      local address:
fe80::214:4fff:fe6c:d04d
Transmit Delay: 1 sec      Priority: 1      IfOptions: 0x0
Timer intervals configured:
Hello: 10, Dead: 40, Retransmit: 5, Poll: 120
Demand Circuit: Disable      Neighbor Probing: Disable
Nbr Probe Retrans Limit: 10      Nbr Probe Interval: 120
Hello due in 6 sec
Neighbor Count is: 1
Adjacent with neighbor 10.0.0.2
```

## ▼ Re-Enable Demand Extensions

You can re-enable the demand circuit after it has been disabled.

This example enables demand extensions on SEFOS1 (router 10.0.0.1).

### 1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in the switch SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 10.0.0.1
```

### 4. Enable demand extensions.

```
SEFOS(config-router)# demand extensions
```

## 5. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

---

# Configuring the Host

Configuring the host creates a router to advertise the directly attached host information.

- [“Configure the Host” on page 91](#)
- [“Test the Host” on page 92](#)

## ▼ Configure the Host

This example configures SEFOS10 as the host.

### 1. Enter Global Configuration mode in SEFOS10.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in the switch SEFOS10.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 11.0.0.1
```

### 4. Configure the host.

```
SEFOS(config-router)# host fec0::3556:1:1 metric 10 area-id  
0.0.0.1
```

### 5. Exit Router Configuration mode.

```
SEFOS(config-router)# end
```

## 6. View the result of the configuration.

```
SEFOS# show ipv6 ospf host

OSPFV3 HOST CONFIGURATION Information
Address                               AreaId                               StubMetric
fec0::3556:1:1                       0.0.0.1                             10
```

## ▼ Test the Host

This example tests whether an intra-area-prefix-LSA carries the host entries.

### ● Test the host, SEFOS10.

```
SEFOS# show ipv6 ospf database intra-prefix detail

Age: 0 Seconds           LS Type: Intra Area Prefix Lsa
Link State Id: 0.0.0.0   Adv Rtr Id: 11.0.0.1
Sequence: 0x80000004     Checksum: 0xe526   Length: 52
#Prefixes: 1            Referenced LS Type: Router Lsa
Ref Link State Id: 0.0.0.0   Ref Adv Router: 11.0.0.1
Prefix Length (Bytes): 16   Prefix Options: 0x00
Metric: 0xa
Prefix: fec0::3556:1:1

Age: 0 Seconds           LS Type: Intra Area Prefix Lsa
Link State Id: 0.0.0.1   Adv Rtr Id: 11.0.0.1
Sequence: 0x80000001     Checksum: 0x5cbe   Length: 48
#Prefixes: 1            Referenced LS Type: Network Lsa
Ref Link State Id: 0.0.0.34 Ref Adv Router: 11.0.0.1
Prefix Length (Bytes): 12   Prefix Options: 0x00
Metric: 0x0
Prefix: fec0::3556:0:0
```

---

# Configuring Route Calculation SPF Timers

You can configure an SPF timer to specify the delay time and hold time between two consecutive SPF calculations. Delay time is the time interval between when OSPFv3 receives a topology change and when it starts an SPF calculation. Hold time is the minimum time between two consecutive SPF calculations.

- [“Configure SPF Timers” on page 93](#)
- [“Restore the Default Delay Time” on page 94](#)

## ▼ Configure SPF Timers

This example configures an SPF delay time of 10 seconds and a SPF hold time of 20 seconds for SEFOS1 (router 10.0.0.1).

### 1. Enter Global Configuration mode in SEFOS1.

```
SEFOS# configure terminal
```

### 2. Enable OSPF globally in the switch SEFOS1.

```
SEFOS(config)# ipv6 router ospf
```

### 3. Configure the OSPF router ID.

```
SEFOS(config-router)# router-id 11.0.0.1
```

### 4. Configure the SPF delay and hold times.

```
SEFOS(config-router)# timers spf 10 20  
SEFOS(config-router)# end
```

### 5. View the configuration details.

```
SEFOS# show ipv6 ospf  
  
Router Id: 10.0.0.1           ABR Type: Standard ABR  
SPF schedule delay: 10 secs   Hold time between two SPFs: 20 secs
```

```

Exit Overflow Interval: 0      Ref BW: 100000      Ext Lsdb
Limit: -1
Trace Value: 0x00000800      As Scope Lsa: 1      Checksum
Sum: 0xf0c7
Demand Circuit: Enable      Passive Interface: Disable
Nssa Asbr Default Route Translation: Disable
It is an Area Border Router
Number of Areas in this router 2
    Area 0.0.0.0
        Number of interfaces in this area is 1
        Number of Area Scope Lsa: 7      Checksum Sum: 0x2f2dc
        Number of Indication Lsa: 1      SPF algorithm executed: 24
times
    Area 0.0.0.6
        Number of interfaces in this area is 1
        Number of Area Scope Lsa: 7      Checksum Sum: 0x4c3fd
        Number of Indication Lsa: 0      SPF algorithm executed: 25
times

```

## ▼ Restore the Default Delay Time

This example restores the default delay time (5 seconds) and hold time (10 seconds).

- Restore the default delay and hold times.

```
SEFOS(config-router)# no spf timer
```