
Chapter 6

Configuring OSPF

This chapter describes how to configure OSPF on the HP 9308M, HP 9304M, and HP 6308M-SX routing switches using the CLI and Web management interface.

To display OSPF configuration information and statistics, see “Displaying OSPF Information” on page 6-38.

For complete syntax information for the CLI commands shown in this chapter, see the *Command Line Interface Reference*.

NOTE: The HP 6308M-SX and Chassis devices that use non-redundant management modules can contain a maximum of 10000 IP routes by default. If you need to increase the capacity of the IP route table for BGP4, see “Displaying and Modifying System Parameter Default Settings” in the “Configuring Basic Features” chapter of Book 1.

Overview of OSPF

OSPF is a link-state routing protocol. The protocol uses link-state advertisements (LSA) to update neighboring routers regarding its interfaces and information on those interfaces. The routing switch floods these LSAs to all neighboring routers to update them regarding the interfaces. Each routing switch maintains an identical database that describes its area topology to help a routing switch determine the shortest path between it and any neighboring router.

The HP 9308M, HP 9304M, and HP 6308M-SX routing switches support the following types of LSAs, which are described in RFC 1583:

- Router link
- Network link
- Summary link
- Autonomous system (AS) summary link
- AS external link
- NSSA external link

OSPF is built upon a hierarchy of network components. The highest level of the hierarchy is the **Autonomous System (AS)**. An autonomous system is defined as a number of networks, all of which share the same routing and administration characteristics.

An AS can be divided into multiple **areas** as shown in Figure 6.1. Each area represents a collection of contiguous networks and hosts. Areas limit the area to which link-state advertisements are broadcast, thereby limiting the amount of flooding that occurs within the network. An area is represented in OSPF by either an IP address or a number.

You can further limit the broadcast area of flooding by defining an **area range**. The area range allows you to assign an aggregate value to a range of IP addresses. This aggregate value becomes the address that is advertised instead all of the individual addresses it represents being advertised. You can assign up to four ranges in an OSPF area.

An OSPF router can be a member of multiple areas. Routers with membership in multiple areas are known as **Area Border Routers (ABRs)**. Each ABR maintains a separate topological database for each area the router is in. Each topological database contains all of the LSA databases for each router within a given area. The routers within the same area have identical topological databases. The ABR is responsible for forwarding routing information or changes between its border areas.

An **Autonomous System Boundary Router (ASBR)** is a router that is running multiple protocols and serves as a gateway to routers outside an area and those operating with different protocols. The ASBR is able to import and translate different protocol routes into OSPF through a process known as **redistribution**. For more details on redistribution and configuration examples, see “Enable Route Redistribution” on page 6-26.

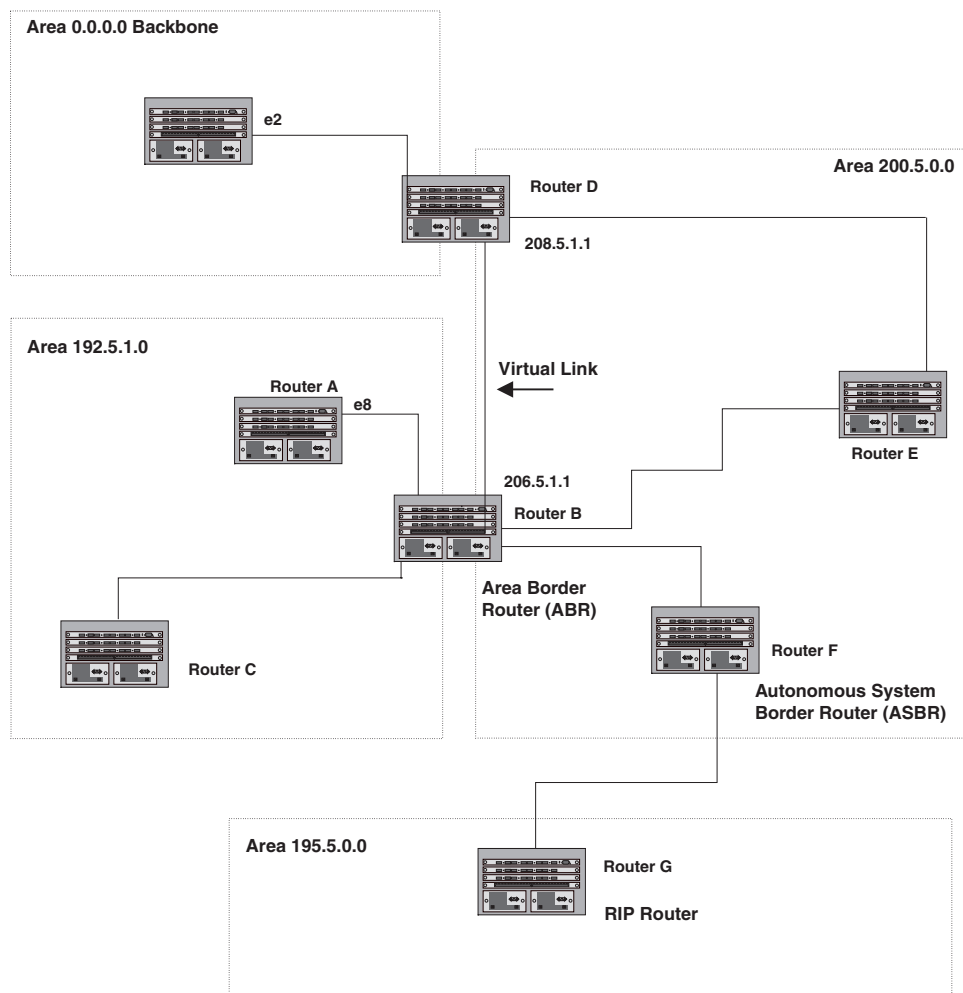


Figure 6.1 OSPF operating in a network

Designated Routers in Multi-Access Networks

In a network that has multiple routers attached, OSPF elects one router to serve as the designated router (DR) and another router on the segment to act as the backup designated router (BDR). This arrangement minimizes the amount of repetitive information that is forwarded on the network by forwarding all messages to the designated router and backup designated routers responsible for forwarding the updates throughout the network.

Designated Router Election

In a network with no designated router and no backup designated router, the neighboring router with the highest priority is elected as the DR, and the router with the next largest priority is elected as the BDR, as shown in Figure 6.2.

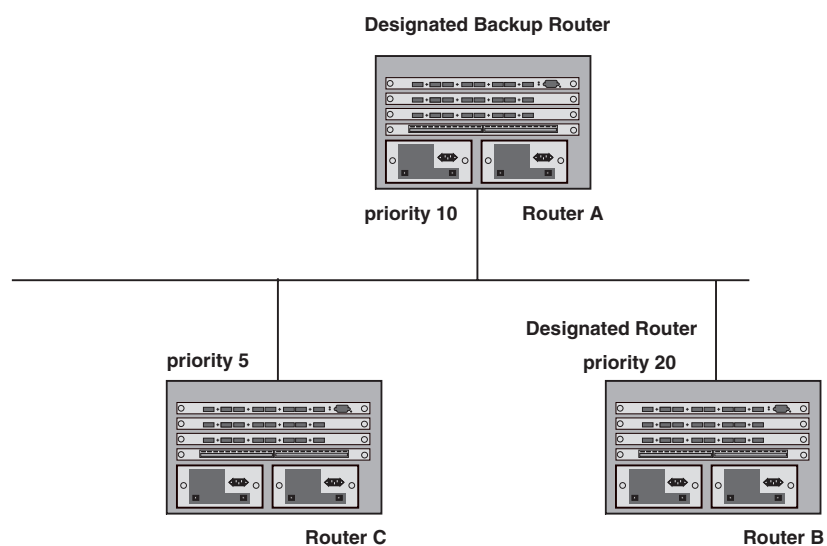


Figure 6.2 Designated and backup router election

If the DR goes off-line, the BDR automatically becomes the DR. The router with the next highest priority becomes the new BDR. This process is shown in Figure 6.3.

NOTE: Priority is a configurable option at the interface level. You can use this parameter to help bias one router as the DR.

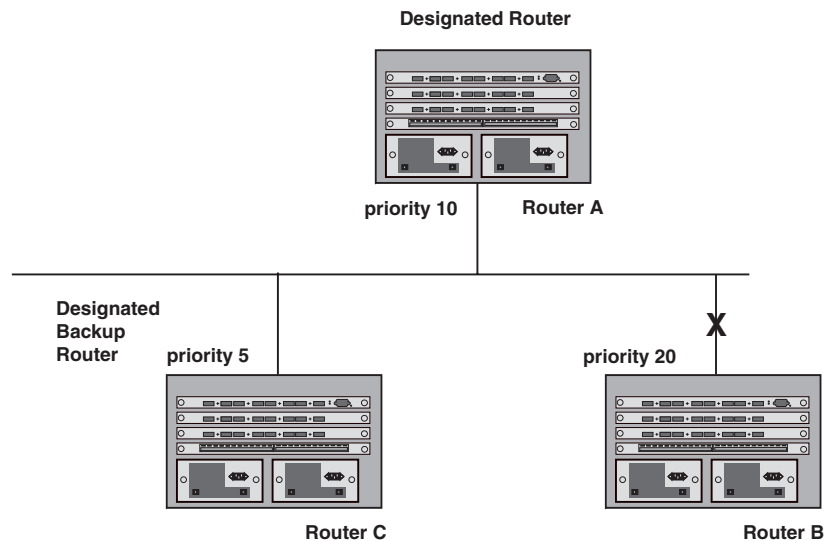


Figure 6.3 Backup designated router becomes designated router

If two neighbors share the same priority, the router with the highest router ID is designated as the DR. The router with the next highest router ID is designated as the BDR.

NOTE: By default, the HP router ID is the IP address configured on the lowest numbered loopback interface. If the routing switch does not have a loopback interface, the default router ID is the lowest numbered IP address configured on the device. For more information or to change the router ID, see “Changing the Router ID” on page 5-8.

When multiple routers on the same network are declaring themselves as DRs, then both priority and router ID are used to select the designated router and backup designated routers.

When only one router on the network claims the DR role despite neighboring routers with higher priorities or router IDs, this router remains the DR. This is also true for BDRs.

The DR and BDR election process is performed when one of the following events occurs:

- an interface is in a waiting state and the wait time expires
- an interface is in a waiting state and a hello packet is received that addresses the BDR
- a change in the neighbor state occurs, such as:
 - a neighbor state transitions from 2 or higher
 - communication to a neighbor is lost
 - a neighbor declares itself to be the DR or BDR for the first time

OSPF RFC 1583 and 2178 Compliance

The HP 9308M, HP 9304M, and HP 6308M-SX routing switches are configured, by default, to be compliant with the RFC 1583 OSPF V2 specification. The routing switches can also be configured to operate with the latest OSPF standard, RFC 2178.

NOTE: For details on how to configure the system to operate with the RFC 2178, see “Configuring OSPF” on page 6-5.

Dynamic OSPF Activation and Configuration

OSPF is automatically activated when you enable it. The protocol does not require a software reload.

You can configure and save the following OSPF changes without resetting the system:

- all OSPF interface-related parameters (for example: area, hello timer, router dead time cost, priority, re-transmission time, transit delay)
- all area parameters
- all area range parameters
- all virtual-link parameters
- all global parameters
- creation and deletion of an area, interface or virtual link

In addition, you can make the following changes without a system reset by first disabling and then re-enabling OSPF operation:

- changes to address ranges
- changes to global values for redistribution
- addition of new virtual links

You also can change the amount of memory allocated to various types of LSA entries. However, these changes require a system reset or reboot.

Configuring OSPF

To begin using OSPF on the routing switch, perform the steps outlined below:

1. Enable OSPF on the routing switch.
2. Assign the areas to which the routing switch will be attached.
3. Assign individual interfaces to the OSPF areas.
4. Define redistribution filters, if desired.
5. Enable redistribution, if you defined redistribution filters.
6. Modify default global and port parameters as required.
7. Modify OSPF standard compliance, if desired.

NOTE: OSPF is automatically enabled without a system reset. An exception to this is if you later disable OSPF, save the change by writing the configuration to flash, then reset the system.

Configuration Rules

- If a routing switch is to operate as an ASBR, you must enable the ASBR capability at the system level.
- Redistribution must be enabled on routing switches configured to operate as ASBRs.
- All routing switch ports must be assigned to one of the defined areas on an OSPF routing switch. When a port is assigned to an area, all corresponding sub-nets on that port are automatically included in the assignment.

OSPF Parameters

You can modify or set the following global and interface OSPF parameters.

Global Parameters

- Modify OSPF standard compliance setting.
- Assign an area.
- Define an area range.
- Define the area virtual link.
- Set global default metric for OSPF.
- Disable or re-enable load sharing.
- Disable or re-enable default-information-originate.
- Modify Shortest Path First (SPF) timers
- Define external route summarization
- Define redistribution metric type.
- Define deny redistribution.
- Define permit redistribution.
- Enable redistribution.
- Modify database overflow interval.
- Modify the maximum number of OSPF routes.
- Modify LSDB limits.
- Modify OSPF Traps generated.

Interface Parameters

- Assign interfaces to an area.
- Define the authentication key for the interface.
- Modify the cost for a link.
- Modify the dead interval.
- Modify MD5 authentication key parameters.
- Modify the priority of the interface.
- Modify the retransmit interval for the interface.
- Modify the transit delay of the interface.

NOTE: When using CLI, you set global level parameters at the OSPF CONFIG Level of the CLI. To reach that level, enter **router ospf...** at the global CONFIG Level. Interface parameters for OSPF are set at the interface CONFIG Level using the CLI command, **ip ospf...** .

When using the Web management interface, you set OSPF global parameters using the OSPF configuration panel. All other parameters are accessed through links accessed from the OSPF configuration sheet.

Enable OSPF on the Routing Switch

When you enable OSPF on the routing switch, the protocol is automatically activated. To enable OSPF on the routing switch, use one of the following methods:

USING THE CLI

```
HP9300 (config)# router ospf
```

This command launches you into the OSPF router level where you can assign areas and modify OSPF global parameters.

USING THE WEB MANAGEMENT INTERFACE

Use the System configuration sheet to enable OSPF.

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Select Enable next to OSPF.
3. Click the Apply button to save the change to the device's running-config file.
4. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Assign OSPF Areas

Once OSPF is enabled on the system, you can assign areas. Assign an IP address or number as the **area ID** for each area. The area ID is representative of all IP addresses (sub-nets) on a router port. Each port on a router can support one area.

An area can be **normal**, a **stub**, or a **Not-So-Stubby Area (NSSA)**.

- Normal – OSPF routers within a normal area can send and receive External Link State Advertisements (LSAs).
- Stub – OSPF routers within a stub area cannot send or receive External LSAs. In addition, OSPF routers in a stub area must use a default route to the area's Area Border Router (ABR) or Autonomous System Boundary Router (ASBR) to send traffic out of the area.
- NSSA – The ASBR of an NSSA can import external route information into the area.
 - ASBRs redistribute (import) external routes into the NSSA as type 7 LSAs. Type-7 External LSAs are a special type of LSA generated only by ASBRs within an NSSA, and are flooded to all the routers within only that NSSA.
 - ABRs translate type 7 LSAs into type 5 External LSAs, which can then be flooded throughout the AS. You can configure address ranges on the ABR of an NSSA so that the ABR converts multiple type-7 External LSAs received from the NSSA into a single type-5 External LSA.

When an NSSA contains more than one ABR, OSPF elects one of the ABRs to perform the LSA translation for NSSA. OSPF elects the ABR with the highest router ID. If the elected ABR becomes unavailable, OSPF automatically elects the ABR with the next highest router ID to take over translation of LSAs for the NSSA. The election process for NSSA ABRs is automatic.

EXAMPLE:

To set up the OSPF areas shown in Figure 6.1 on 6-2, use one of the following methods.

USING THE CLI

```
HP9300 (config-ospf-router)# area 192.5.1.0
HP9300 (config-ospf-router)# area 200.5.0.0
HP9300 (config-ospf-router)# area 195.5.0.0
HP9300 (config-ospf-router)# area 0.0.0.0
HP9300 (config-ospf-router) write memory
```

Syntax: area <num> | <ip-addr> [nssa <cost> | stub <cost> [no-summary]]

The <num> | <ip-addr> parameter specifies the area number, which can be a number or in IP address format. If you specify an number, the number can be from 0 – 2,147,483,647.

The **nssa** parameter specifies that this is an NSSA. For more information about configuring NSSAs, see “Assign a Not-So-Stubby Area (NSSA)” on page 6-9.

The <cost> specifies an additional cost for using a route to or from this area and can be from 1 – 16777215. If you configure a stub area or NSSA, you must specify the cost. There is no default. Normal areas do not use the cost parameter.

The **no-summary** parameter applies only to stub areas and disables summary LSAs from being sent into the area. See “Assign a Totally Stubby Area” on page 6-9.

NOTE: You can assign one area on a router interface. For example, if the system or chassis module has 16 ports, 16 areas are supported on the chassis or module.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-write access.
2. If you have not already enabled OSPF, enable it by clicking on the Enable radio button next to OSPF on the System configuration panel, then clicking Apply to apply the change.
3. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
4. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
5. Click on the [Area](#) link to display the OSPF Area configuration panel, as shown in the following figure.

OSPF Area

Area ID:	<input type="text" value="1.1.1.1"/>
Type:	<input type="radio"/> Stub <input type="radio"/> Normal <input checked="" type="radio"/> NSSA
Stub Cost:	<input type="text" value="0"/>

[\[Show\]](#)

[\[Home\]](#)
[\[Site Map\]](#)
[\[Logout\]](#)
[\[Save\]](#)
[\[Frame Enable\]](#)
[\[Disable\]](#)
[\[TELNET\]](#)

NOTE: If the device already has OSPF areas, a table listing the areas is displayed. Click the Modify button to the right of the row describing an area to change its configuration, or click the [Add Area](#) link to display the OSPF Area configuration panel.

6. Enter the area ID in the Area ID field. The ID can be a number or an IP address.
7. Select the area type by clicking on the radio button next to its description in the Type field. For example, to select NSSA, click next to NSSA.
8. If you are configuring a stub area or NSSA, enter a cost in the Stub Cost field. The parameter is required for those area types but is not required for normal areas. You can specify from 1 – 16777215. There is no default.
9. Click the Add button to add the area to the running-config file.
10. Select the [Save](#) link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Assign a Totally Stubby Area

By default, the routing switch sends summary LSAs (LSA type 3) into stub areas. You can further reduce the number of link state advertisements (LSA) sent into a stub area by configuring the routing switch to stop sending summary LSAs (type 3 LSAs) into the area. You can disable the summary LSAs when you are configuring the stub area or later after you have configured the area.

This feature disables origination of summary LSAs, but the routing switch still accepts summary LSAs from OSPF neighbors and floods them to other neighbors. The routing switch can form adjacencies with other routers regardless of whether summarization is enabled or disabled for areas on each router.

When you enter a command or apply a Web management option to disable the summary LSAs, the change takes effect immediately. If you apply the option to a previously configured area, the routing switch flushes all of the summary LSAs it has generated (as an ABR) from the area.

NOTE: This feature applies only when the routing switch is configured as an Area Border Router (ABR) for the area. To completely prevent summary LSAs from being sent to the area, disable the summary LSAs on each OSPF router that is an ABR for the area.

This feature does not apply to Not So Stubby Areas (NSSAs).

To disable summary LSAs for a stub area, use the following CLI method.

USING THE CLI

To disable summary LSAs for a stub area, enter commands such as the following:

```
HP9300(config-ospf-router)# area 40 stub no-summary
```

Syntax: area <num> | <ip-addr> [nssa <cost> | stub <cost> [no-summary]]

The <num> | <ip-addr> parameter specifies the area number, which can be a number or in IP address format. If you specify an number, the number can be from 0 – 2,147,483,647.

The **nssa** parameter specifies that this is an NSSA. For more information about configuring NSSAs, see “Assign a Not-So-Stubby Area (NSSA)” on page 6-9.

The <cost> specifies an additional cost for using a route to or from this area and can be from 1 – 16777215. If you configure a stub area or NSSA, you must specify the cost. There is no default. Normal areas do not use the cost parameter.

The **no-summary** parameter applies only to stub areas and disables summary LSAs from being sent into the area.

NOTE: You can assign one area on a router interface. For example, if the system or chassis module has 16 ports, 16 areas are supported on the chassis or module.

USING THE WEB MANAGEMENT INTERFACE

You can configure a stubby area using the Web management interface, but you cannot disable summary LSAs for the area. You must use the CLI to disable the summary LSAs.

Assign a Not-So-Stubby Area (NSSA)

The OSPF Not So Stubby Area (NSSA) feature enables you to configure OSPF areas that provide the benefits of stub areas, but that also are capable of importing external route information. OSPF does not flood external routes from other areas into an NSSA, but does translate and flood route information from the NSSA into other areas such as the backbone.

NSSAs are especially useful when you want to summarize Type-5 External LSAs (external routes) before forwarding them into an OSPF area. The OSPF specification (RFC 2328) prohibits summarization of Type-5 LSAs and requires OSPF to flood Type-5 LSAs throughout a routing domain. When you configure an NSSA, you can specify an address range for aggregating the external routes that the NSSA's ABR exports into other areas.

The HP implementation of NSSA is based on RFC 1587.

Figure 6.4 shows an example of an OSPF network containing an NSSA.

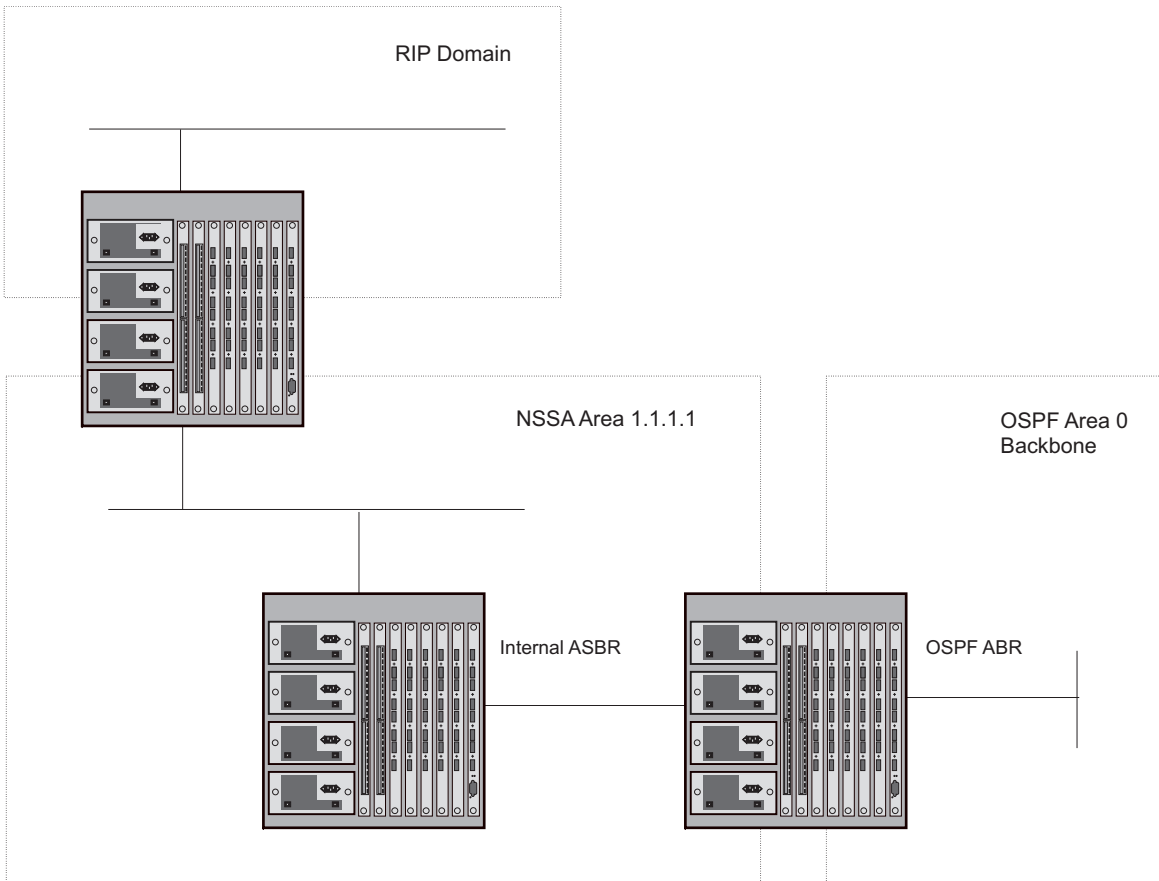


Figure 6.4 OSPF network containing an NSSA

This example shows two routing domains, a RIP domain and an OSPF domain. The ASBR inside the NSSA imports external routes from RIP into the NSSA as Type-7 LSAs, which the ASBR floods throughout the NSSA.

The ABR translates the Type-7 LSAs into Type-5 LSAs. If an area range is configured for the NSSA, the ABR also summarizes the LSAs into an aggregate LSA before flooding the Type-5 LSA(s) into the backbone.

Since the NSSA is partially “stubby” the ABR does not flood external LSAs from the backbone into the NSSA. To provide access to the rest of the Autonomous System (AS), the ABR generates a default Type-7 LSA into the NSSA.

Configuring an NSSA

To configure an NSSA, use one of the following methods.

USING THE CLI

To configure OSPF area 1.1.1.1 as an NSSA, enter the following commands.

```
HP9300(config)# router ospf
HP9300(config-ospf-router)# area 1.1.1.1 nssa 1
HP9300(config-ospf-router)# write memory
```

Syntax: area <num> | <ip-addr> [nssa <cost> | stub <cost> [no-summary]]

The <num> | <ip-addr> parameter specifies the area number, which can be a number or in IP address format. If you specify an number, the number can be from 0 – 2,147,483,647.

The **nssa** parameter specifies that this is an NSSA. For more information about configuring NSSAs, see “Assign a Not-So-Stubby Area (NSSA)” on page 6-9.

The <cost> specifies an additional cost for using a route to or from this area and can be from 1 – 16777215. If you configure a stub area or NSSA, you must specify the cost. There is no default. Normal areas do not use the cost parameter.

The **no-summary** parameter applies only to stub areas and disables summary LSAs from being sent into the area. See “Assign a Totally Stubby Area” on page 6-9.

NOTE: You can assign one area on a router interface. For example, if the system or chassis module has 16 ports, 16 areas are supported on the chassis or module.

To configure additional parameters for OSPF interfaces in the NSSA, use the **ip ospf area...** command at the interface level of the CLI.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-write access.
2. If you have not already enabled OSPF, enable it by clicking on the Enable radio button next to OSPF on the System configuration panel, then clicking Apply to apply the change.
3. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
4. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
5. Click on the [Area](#) link to display the OSPF Area configuration panel, as shown in the following figure.

OSPF Area

Area ID:	<input type="text" value="1.1.1.1"/>
Type:	<input type="radio"/> Stub <input type="radio"/> Normal <input checked="" type="radio"/> NSSA
Stub Cost:	<input type="text" value="0"/>

[\[Show\]](#)

[\[Home\]](#)[\[Site Map\]](#)[\[Logout\]](#)[\[Save\]](#)[\[Frame Enable\]](#)[\[Disable\]](#)[\[TELNET\]](#)

NOTE: If the device already has OSPF areas, a table listing the areas is displayed. Click the Modify button to the right of the row describing an area to change its configuration, or click the [Add Area](#) link to display the OSPF Area configuration panel.

6. Enter the area ID in the Area ID field. The ID can be a number or an IP address.
7. Select NSSA by clicking on the radio button next to NSSA in the Type field.
8. Enter a cost in the Stub Cost field. This parameter is required. You can specify from 1 – 16777215. There is no default.
9. Click the Add button to add the area.
10. Select the [Save](#) link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Configuring an Address Range for the NSSA

If you want the ABR that connects the NSSA to other areas to summarize the routes in the NSSA before translating them into Type-5 LSAs and flooding them into the other areas, configure an address range. The ABR creates an aggregate value based on the address range. The aggregate value becomes the address that the ABR advertises instead of advertising the individual addresses represented by the aggregate. You can configure up to four ranges in an OSPF area.

USING THE CLI

To configure an address range in NSSA 1.1.1.1, enter the following commands. This example assumes that you have already configured NSSA 1.1.1.1.

```
HP9300(config)# router ospf
HP9300(config-ospf-router)# area 1.1.1.1 range 209.157.22.1 255.255.0.0
HP9300(config-ospf-router)# write memory
```

Syntax: area <num> | <ip-addr> range <ip-addr> <ip-mask>

The <num> | <ip-addr> parameter specifies the area number, which can be in IP address format.

The <ip-addr> parameter following **range** specifies the IP address portion of the range. The software compares the address with the significant bits in the mask. All network addresses that match this comparison are summarized in a single route advertised by the router.

The <ip-mask> parameter specifies the portions of the IP address that a route must contain to be summarized in the summary route. In the example above, all networks that begin with 209.157 are summarized into a single route.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-write access.
2. If you have not already enabled OSPF, enable it by clicking on the Enable radio button next to OSPF on the System configuration panel, then clicking Apply to apply the change.
3. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
4. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
5. Click on the [Area Range](#) link to display the OSPF Area Range configuration panel.
6. Click on the [Add Area Range](#) link to display the following panel.

Area Range

Area ID:	1.1.1.1
Network Address:	209.157.22.1
Mask:	255.255.0.0

Add Delete Reset

[\[Show\]](#)

Configurations: [\[Area\]](#) [\[Area Range\]](#) [\[Interface\]](#) [\[Virtual Link\]](#) [\[Trap\]](#)

Statistics: [\[Area\]](#) [\[Interface\]](#) [\[External Link State DB\]](#) [\[Link State DB\]](#) [\[Neighbor\]](#)
[\[ABR ASBR Routers\]](#) [\[Virtual Interface\]](#) [\[Virtual Neighbor\]](#)

[\[Home\]](#) [\[Site Map\]](#) [\[Logout\]](#) [\[Save\]](#) [\[Frame Enable\]](#) [\[Disable\]](#) [\[TELNET\]](#)

NOTE: If the device already has an OSPF area range, a table listing the ranges is displayed. Click the Modify button to the right of the row describing a range to change its configuration, or click the [Add Area Range](#) link to display the OSPF Area Range configuration panel.

7. Enter the area ID in the Area ID field.
8. Enter an IP address in the Network Address field.

9. Enter a network mask in the Mask field. The software compares the address with the significant bits in the mask. All network addresses that match this comparison are summarized in a single route advertised by the router.
10. Click the Add button to add the area.
11. Select the [Save](#) link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Assigning an Area Range (optional)

You can assign a **range** for an area, but it is not required. Ranges allow a specific IP address and mask to represent a range of IP addresses within an area, so that only that reference range address is advertised to the network, instead of all the addresses within that range. Each area can have up to four range addresses.

USING THE CLI

EXAMPLE:

To define an area range for sub-nets on 193.45.5.1 and 193.45.6.2, enter the following command:

```
HP9300(config)# router ospf
```

```
HP9300(config-ospf-router)# area 192.45.5.1 range 193.45.0.0 255.255.0.0
```

```
HP9300(config-ospf-router)# area 193.45.6.2 range 193.45.0.0 255.255.0.0
```

Syntax: area <num> | <ip-addr> range <ip-addr> <ip-mask>

The <num> | <ip-addr> parameter specifies the area number, which can be in IP address format.

The <ip-addr> parameter following **range** specifies the IP address portion of the range. The software compares the address with the significant bits in the mask. All network addresses that match this comparison are summarized in a single route advertised by the router.

The <ip-mask> parameter specifies the portions of the IP address that a route must contain to be summarized in the summary route. In the example above, all networks that begin with 209.157 are summarized into a single route.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-write access.
2. If you have not already enabled OSPF, enable it by clicking on the Enable radio button next to OSPF on the System configuration panel, then clicking Apply to apply the change.
3. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
4. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
5. Click on the [Area Range](#) link to display the OSPF Area Range configuration panel.
6. Click on the [Add Area Range](#) link to display the Area Range panel.

NOTE: If the device already has an OSPF area range, a table listing the ranges is displayed. Click the Modify button to the right of the row describing a range to change its configuration, or click the [Add Area Range](#) link to display the OSPF Area Range configuration panel.

7. Enter the area ID in the Area ID field.
8. Enter an IP address in the Network Address field.
9. Enter a network mask in the Mask field. The software compares the address with the significant bits in the mask. All network addresses that match this comparison are summarized in a single route advertised by the router.
10. Click the Add button to add the area.
11. Select the [Save](#) link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Assigning Interfaces to an Area

Once you define OSPF areas, you can assign interfaces the areas. All routing switch ports must be assigned to one of the defined areas on an OSPF routing switch. When a port is assigned to an area, all corresponding sub-nets on that port are automatically included in the assignment.

To assign interface 8 of Router A to area 192.5.0.0 and then save the changes, use one the following methods:

USING CLI

To assign interface 8 of Router A to area 192.5.0.0 and then save the changes, enter the following commands:

```
RouterA(config-ospf-router)# interface e8
RouterA(config-if-8)# ip ospf area 192.5.0.0
RouterA(config-if-8)# write memory
```

USING WEB MANAGEMENT INTERFACE

All routing switch ports must be assigned to one of the defined areas on an OSPF routing switch. When a port is assigned to an area, all corresponding sub-nets on that port are automatically included in the assignment.

To assign an interface to an area:

1. Log on to the device using a valid user name and password for read-write access.
2. If you have not already enabled OSPF, enable it by clicking on the Enable radio button next to OSPF on the System configuration panel, then clicking Apply to apply the change.
3. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
4. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
5. Click on the [Interface](#) link.
 - If the device does not have any OSPF interfaces, the OSPF Interface configuration panel is displayed, as shown in the following example.
 - If an OSPF interface is already configured and you are adding a new one, click on the [Add OSPF Interface](#) link to display the OSPF Interface configuration panel, as shown in the following example.

- If you are modifying an existing OSPF interface, click on the Modify button to the right of the row describing the interface to display the OSPF Interface configuration panel, as shown in the following example.

OSPF Interface

Slot:	1	Port:	1
Area ID:	50.50.50.50		
OSPF Mode:	<input type="radio"/> Disable <input checked="" type="radio"/> Enable		
Passive:	<input type="checkbox"/>		
Authentication:	None		
Simple Authentication Key:			
MD5 Authentication ID:	0		
MD5 Authentication Key:			
MD5 Key Activation Wait Time:	300		
Hello Interval:	10		
Retransmit Interval:	5		
Transmit Delay:	1		
Dead Interval:	40		
Priority:	1		
Cost:	1		

[\[Show\]](#)

[Configurations:\[Area\]\[Area Range\]\[Interface\]\[Virtual Link\]\[Trap\]](#)
[Statistics:\[Area\]\[Interface\]\[External Link State DB\]\[Link State DB\]\[Neighbor\]](#)
[\[ABR ASBR Routers\]\[Virtual Interface\]\[Virtual Neighbor\]](#)

- Select the port (and slot if applicable) to be assigned to the area from the Port and Slot pulldown menus.

NOTE: If you are configuring a Chassis device, a Slot Number pulldown menu will appear on the configuration panel in addition to the Port pulldown menu.

- Select the IP address of the area to which the interface is to be assigned from the Area ID pull down menu.

NOTE: You must configure the area before you can assign interfaces to it.

- Select the Enable option of the OSPF mode parameter to enable OSPF on the interface.
- Click the Add button to save the change to the device's running-config file.
- Select the [Save](#) link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Modify Interface Defaults

OSPF has interface parameters that you can configure. For simplicity, each of these parameters has a default value. No change to these default values is required except as needed for specific network configurations.

USING THE CLI

Port default values can be modified using the following CLI commands at the interface level of the CLI:

- **ip ospf area** <ip-addr>
- **ip ospf authentication-key** <password>
- **ip ospf cost** <num>
- **ip ospf dead-interval** <value>
- **ip ospf hello-interval** <value>
- **ip ospf md5-authentication key-activation-wait-time** <num> | **key-id** <num> **key** <string>
- **ip ospf passive**
- **ip ospf priority** <value>
- **ip ospf retransmit-interval** <value>
- **ip ospf transmit-delay** <value>

For a complete description of these parameters, see the summary of OSPF port parameters in the next section.

USING THE WEB MANAGEMENT INTERFACE

To modify OSPF port parameters when using the Web:

1. Log on to the device using a valid user name and password for read-write access.
2. If you have not already enabled OSPF, enable it by clicking on the Enable radio button next to OSPF on the System configuration panel, then clicking Apply to apply the change.
3. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
4. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
5. Click on the [Interface](#) link.

NOTE: If the device already has OSPF interfaces, a table listing the interfaces is displayed. Click the Modify button to the right of the row describing the interface to change its configuration, or click the [Add OSPF Interface](#) link to display the OSPF Interface configuration panel.

6. Select the port (and slot if applicable) from the pulldown menu(s).
7. Select the area ID from the Area ID pulldown menu.
8. Select the OSPF mode to enable or disable OSPF on the interface.
9. Click on the checkbox next to Passive if you do not want the interface to send or receive OSPF route updates. By default, all OSPF interfaces are active and thus can send and receive OSPF route information. Since a passive interface does not send or receive route information, the interface is in effect a stub network. OSPF interfaces are active by default.
10. Select the authentication method for the interface from the pulldown menu. Options are None, Simple, or MD5.

NOTE: If you select MD5 as the authentication method, enter a value for the MD5 authentication ID, key and key activation time in the associated fields. If you select Simple, enter an authentication key. If you select No Authentication as the authentication method, you do not need to specify anything in the Simple and MD5 fields.

11. Modify the default values of the following interface parameters as needed: hello interval, retransmit interval, transmit delay, dead interval, priority, and cost.
12. Click the Add button (if you are adding a new neighbor) or the Modify button (if you are modifying a neighbor that is already configured) to apply the changes to the device's running-config file.
13. Select the [Save](#) link at the bottom of the dialog, then select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

OSPF Interface Parameters

The following parameters apply to OSPF interfaces.

Area: Assigns an interface to a specific area. You can assign either an IP address or number to represent an OSPF Area ID. If you assign a number, it can be any value from 0 – 2,147,483,647.

Authentication-key: OSPF supports three methods of authentication for each interface—none, simple password, and MD5. Only one method of authentication can be active on an interface at a time. The default authentication value is none, meaning no authentication is performed.

- The simple password method of authentication requires you to configure an alphanumeric password on an interface. The simple password setting takes effect immediately. All OSPF packets transmitted on the interface contain this password. Any OSPF packet received on the interface is checked for this password. If the password is not present, then the packet is dropped. The password can be up to eight characters long.
- The MD5 method of authentication requires you to configure a key ID and an MD5 Key. The key ID is a number from 1 – 255 and identifies the MD5 key that is being used. The MD5 key can be up to sixteen characters long.

Cost: Indicates the overhead required to send a packet across an interface. You can modify the cost to differentiate between 100 Mbps and 1000 Mbps (1 Gbps) links. The default cost is calculated by dividing 100 million by the bandwidth. For 10 Mbps links, the cost is 10. The cost for both 100 Mbps and 1000 Mbps links is 1, because the speed of 1000 Mbps was not in use at the time the OSPF cost formula was devised.

Dead-interval: Indicates the number of seconds that a neighbor router waits for a hello packet from the routing switch before declaring the router down. The value can be from 1 – 65535 seconds. The default is 40 seconds.

Hello-interval: Represents the length of time between the transmission of hello packets. The value can be from 1 – 65535 seconds. The default is 10 seconds.

MD5-authentication activation wait time: The number of seconds the routing switch waits until placing a new MD5 key into effect. The wait time provides a way to gracefully transition from one MD5 key to another without disturbing the network. The wait time can be from 0 – 14400 seconds. The default is 300 seconds (5 minutes).

MD5-authentication key ID and key: A method of authentication that requires you to configure a key ID and an MD5 key. The key ID is a number from 1 – 255 and identifies the MD5 key that is being used. The MD5 key consists of up to 16 alphanumeric characters. The MD5 is encrypted and included in each OSPF packet transmitted.

Passive: When you configure an OSPF interface to be passive, that interface does not send or receive OSPF route updates. By default, all OSPF interfaces are active and thus can send and receive OSPF route information. Since a passive interface does not send or receive route information, the interface is in effect a stub network. OSPF interfaces are active by default.

Priority: Allows you to modify the priority of an OSPF router. The priority is used when selecting the designated router (DR) and backup designated routers (BDRs). The value can be from 0 – 255. The default is 1. If you set the priority to 0, the routing switch does not participate in DR and BDR election.

Retransmit-interval: The time between retransmissions of link-state advertisements (LSAs) to adjacent routers for this interface. The value can be from 0 – 3600 seconds. The default is 5 seconds.

Transit-delay: The time it takes to transmit Link State Update packets on this interface. The value can be from 0 – 3600 seconds. The default is 1 second.

Block Flooding of Outbound LSAs on Specific OSPF Interfaces

By default, the routing switch floods all outbound LSAs on all the OSPF interfaces within an area. You can configure a filter to block outbound LSAs on an OSPF interface. This feature is particularly useful when you want to block LSAs from some, but not all, of the interfaces attached to the area.

After you apply filters to block the outbound LSAs, the filtering occurs during the database synchronization and flooding.

If you remove the filters, the blocked LSAs are automatically re-flooded. You do not need to reset OSPF to re-flood the LSAs.

NOTE: You cannot block LSAs on virtual links.

USING THE CLI

To apply a filter to an OSPF interface to block flooding of outbound LSAs on the interface, enter the following command at the Interface configuration level for that interface.

```
HP9300(config-if-1/1)# ip ospf database-filter all out
```

The command in this example blocks all outbound LSAs on the OSPF interface configured on port 1/1.

Syntax: [no] ip ospf database-filter all out

To remove the filter, enter a command such as the following:

```
HP9300(config-if-1/1)# no ip ospf database-filter all out
```

USING THE WEB MANAGEMENT INTERFACE

You cannot configure filters to block flooding on OSPF interfaces using the Web management interface.

Assign Virtual Links

All ABRs (area border routers) must have either a direct or indirect link to the OSPF backbone area (0.0.0.0 or 0). If an ABR does not have a physical link to the area backbone, the ABR can configure a **virtual link** to another router within the same area, which has a physical connection to the area backbone.

The path for a virtual link is through an area shared by the neighbor ABR (router with a physical backbone connection), and the ABR requiring a logical connection to the backbone.

Two parameters fields must be defined for all virtual links—transit area ID and neighbor router.

- The **transit area ID** represents the shared area of the two ABRs and serves as the connection point between the two routers. This number should match the area ID value.
- The **neighbor router** field is the router ID (IP address) of the router that is physically connected to the backbone, when assigned from the router interface requiring a logical connection. When assigning the parameters from the router with the physical connection, the router ID is the IP address of the router requiring a logical connection to the backbone.

NOTE: By default, the HP router ID is the IP address configured on the lowest numbered loopback interface. If the routing switch does not have a loopback interface, the default router ID is the lowest numbered IP address configured on the device. For more information or to change the router ID, see “Changing the Router ID” on page 5-8.

NOTE: When you establish an area virtual link, you must configure it on both of the routers (both ends of the virtual link).

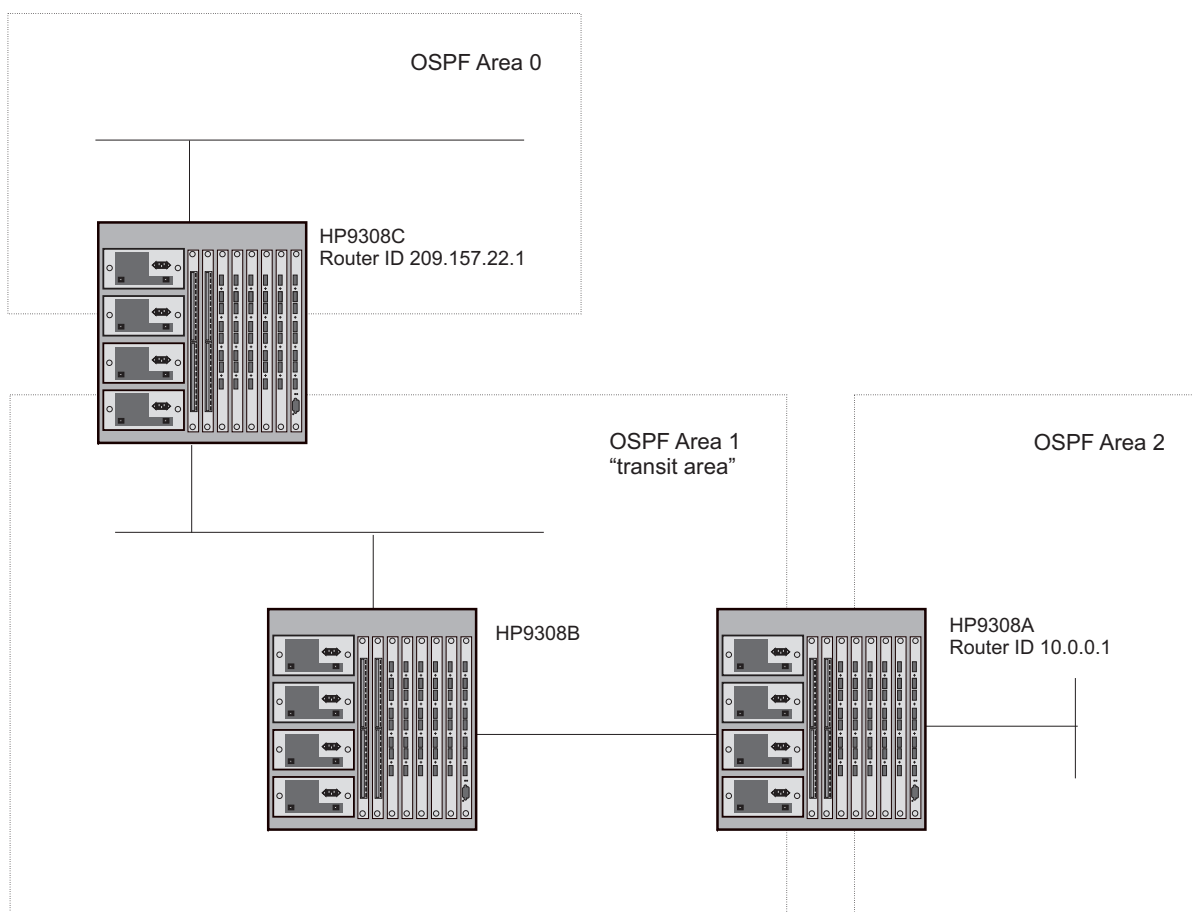


Figure 6.5 Defining OSPF virtual links within a network

USING THE CLI

Figure 6.5 shows an OSPF area border router, HP9308A, that is cut off from the backbone area (area 0). To provide backbone access to HP9308A, you can add a virtual link between HP9308A and HP9308C using area 1 as a transit area. To configure the virtual link, you define the link on the router that is at each end of the link. No configuration for the virtual link is required on the routers in the transit area.

To define the virtual link on HP9308A, enter the following commands:

```
HP9308A(config-ospf-router)# area 1 virtual-link 209.157.22.1
HP9308A(config-ospf-router)# write memory
```

Enter the following commands to configure the virtual link on HP9308C:

```
HP9308C(config-ospf-router)# area 1 virtual-link 10.0.0.1
HP9308C(config-ospf-router)# write memory
```

Syntax: area <ip-addr> | <num> virtual-link <router-id>
[authentication-key | dead-interval | hello-interval | retransmit-interval | transmit-delay <value>]

The **area** <ip-addr> | <num> parameter specifies the transit area.

The <router-id> parameter specifies the router ID of the OSPF router at the remote end of the virtual link. To display the router ID, enter the **show ip** command.

See "Modify Virtual Link Parameters" on page 6-21 for descriptions of the optional parameters.

USING THE WEB MANAGEMENT INTERFACE

To configure a virtual link:

1. Log on to the device using a valid user name and password for read-write access.
2. If you have not already enabled OSPF, enable it by clicking on the Enable radio button next to OSPF on the System configuration panel, then clicking Apply to apply the change.
3. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
4. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
5. Click on the [Virtual Link](#) link.
 - If the device does not have any OSPF virtual links, the OSPF Virtual Link Interface configuration panel is displayed, as shown in the following example.
 - If an OSPF virtual link is already configured and you are adding a new one, click on the [Add OSPF Virtual Link](#) link to display the OSPF Virtual Link Interface configuration panel, as shown in the following example.
 - If you are modifying an existing OSPF virtual link, click on the Modify button to the right of the row describing the virtual link to display the OSPF Virtual Link Interface configuration panel, as shown in the following example.

OSPF Virtual Link Interface

Transit Area ID:	111
Neighbor Router ID:	208.5.1.1
Authentication:	MD5
Simple Authentication Key:	
MD5 Authentication ID:	123
MD5 Authentication Key:	2345
MD5 Key Activation Wait Time:	300
Hello Interval:	10
Retransmit Interval:	5
Transmit Delay:	1
Dead Interval:	40

[\[Show\]](#)

Configurations: [\[Area\]](#)[\[Area Range\]](#)[\[Interface\]](#)[\[Virtual Link\]](#)[\[Trap\]](#)

Statistics: [\[Area\]](#)[\[Interface\]](#)[\[External Link State DB\]](#)[\[Link State DB\]](#)[\[Neighbor\]](#)
[\[ABR ASBR Routers\]](#)[\[Virtual Interface\]](#)[\[Virtual Neighbor\]](#)

[\[Home\]](#)[\[Site Map\]](#)[\[Logout\]](#)[\[Save\]](#)[\[Frame Enable/Disable\]](#)[\[TELNET\]](#)

6. Select the transit area ID from the pulldown menu. The transit area is the area ID of the area shared by both routers.
7. Select an authentication method from the pulldown menu. If you select Simple, enter the authentication key in the appropriate field. If you select MD5, enter the MD5 authentication ID, key, and wait time.

NOTE: For descriptions of the authentication parameters, see “Modify Virtual Link Parameters” on page 6-21.

8. Enter the router ID of the neighbor router.

- Modify the default settings of the following parameters if needed: hello interval, transit delay, retransmit interval and, dead interval.

NOTE: For a description of all virtual link parameters and their possible values, see “Modify Virtual Link Parameters” on page 6-21.

- Click Add to save the change to the device’s running-config file.
- Select the [Save](#) link at the bottom of the dialog, then select Yes when prompted to save the configuration change to the startup-config file on the device’s flash memory.
- Log onto the neighbor router and configure the other end of the virtual link.

Modify Virtual Link Parameters

OSPF has some parameters that you can modify for virtual links. Notice that these are the same parameters as the ones you can modify for physical interfaces.

USING THE CLI

You can modify default values for virtual links using the following CLI command at the OSPF router level of the CLI, as shown in the following syntax:

Syntax: area <num> | <ip-addr> virtual-link <ip-addr> [authentication-key <string>] [dead-interval <num>] [hello-interval <num>] [md5-authentication key-activation-wait-time <num> | key-id <num> key <string>] [retransmit-interval <num>] [transmit-delay <num>]

The parameters are described below. For syntax information, see the *Command Line Interface Reference*.

The syntax for this command is described in the next section. For additional command descriptions and value ranges, see the *Command Line Interface Reference*.

USING THE WEB MANAGEMENT INTERFACE

To modify virtual link default values:

- Log on to the device using a valid user name and password for read-write access.
- Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
- Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
- Click on the [Virtual Link](#) link to display a table listing the virtual links.
- Click on the Modify button to the right of the row describing the virtual link you want to modify. The OSPF Virtual Link Interface configuration panel is displayed.
- Modify the parameters as needed. (See the following section for descriptions of the parameters.)
- Click Add to save the change to the device’s running-config file.
- Select the [Save](#) link at the bottom of the dialog, then select Yes when prompted to save the configuration change to the startup-config file on the device’s flash memory.
- Log on to the neighbor router and configure parameter changes to match those configured for the local router.

Virtual Link Parameter Descriptions

You can modify the following virtual link interface parameters:

Authentication: This parameter allows you to assign different authentication methods on a port-by-port basis. OSPF supports three methods of authentication for each interface—none, simple password, and MD5. Only one method of authentication can be active on an interface at a time.

The simple password method of authentication requires you to configure an alphanumeric password on an interface. The password can be up to eight characters long. The simple password setting takes effect immediately. All OSPF packets transmitted on the interface contain this password. All OSPF packets received on the interface are checked for this password. If the password is not present, then the packet is dropped.

The MD5 method of authentication encrypts the authentication key you define. The authentication is included in each OSPF packet transmitted.

MD5 Authentication Key: When simple authentication is enabled, the key is an alphanumeric password of up to eight characters. When MD5 is enabled, the key is an alphanumeric password of up to 16 characters that is later encrypted and included in each OSPF packet transmitted. You must enter a password in this field when the system is configured to operate with either simple or MD5 authentication.

MD5 Authentication Key ID: The Key ID is a number from 1 – 255 and identifies the MD5 key that is being used. This parameter is required to differentiate among multiple keys defined on a router.

MD5 Authentication Wait Time: This parameter determines when a newly configured MD5 authentication key is valid. This parameter provides a graceful transition from one MD5 key to another without disturbing the network. All new packets transmitted after the key activation wait time interval use the newly configured MD5 Key. OSPF packets that contain the old MD5 key are accepted for up to five minutes after the new MD5 key is in operation.

The range for the key activation wait time is from 0 – 14400 seconds. The default value is 300 seconds.

Hello Interval: The length of time between the transmission of hello packets. The range is 1 – 65535 seconds. The default is 10 seconds.

Retransmit Interval: The interval between the re-transmission of link state advertisements to router adjacencies for this interface. The range is 0 – 3600 seconds. The default is 5 seconds.

Transmit Interval: The period of time it takes to transmit Link State Update packets on the interface. The range is 0 – 3600 seconds. The default is 1 second.

Dead Interval: The number of seconds that a neighbor router waits for a hello packet from the routing switch before declaring the router down. The range is 1 – 65535 seconds. The default is 40 seconds.

Define Redistribution Filters

Route redistribution imports and translates different protocol routes into a specified protocol type. On the HP 9308M, HP 9304M, and HP 6308M-SX routing switches, redistribution is supported for static routes, OSPF, RIP, and BGP4. When you configure redistribution for RIP, you can specify that static, OSPF, or BGP4 routes are imported into RIP routes. Likewise, OSPF redistribution supports the import of static, RIP, and BGP4 routes into OSPF routes. BGP4 supports redistribution of static, RIP, and OSPF routes into BGP4.

In Figure 6.6, an administrator wants to configure the routing switch acting as the ASBR (Autonomous System Boundary Router) between the RIP domain and the OSPF domain to redistribute routes between the two domains.

NOTE: The ASBR must be running both RIP and OSPF protocols to support this activity.

To configure for redistribution, define the redistribution tables with deny and permit redistribution filters.

- If you are using the CLI, use the **deny** and **permit redistribute** commands for OSPF at the OSPF router level.
- If you are using the Web management interface, click on the plus sign next to Configure in the tree view, click on the plus sign next to OSPF, then select the [Redistribution Filter](#) link from the OSPF configuration sheet.

NOTE: Do not enable redistribution until you have configured the redistribution filters. Otherwise, you might accidentally overload the network with routes you did not intend to redistribute.

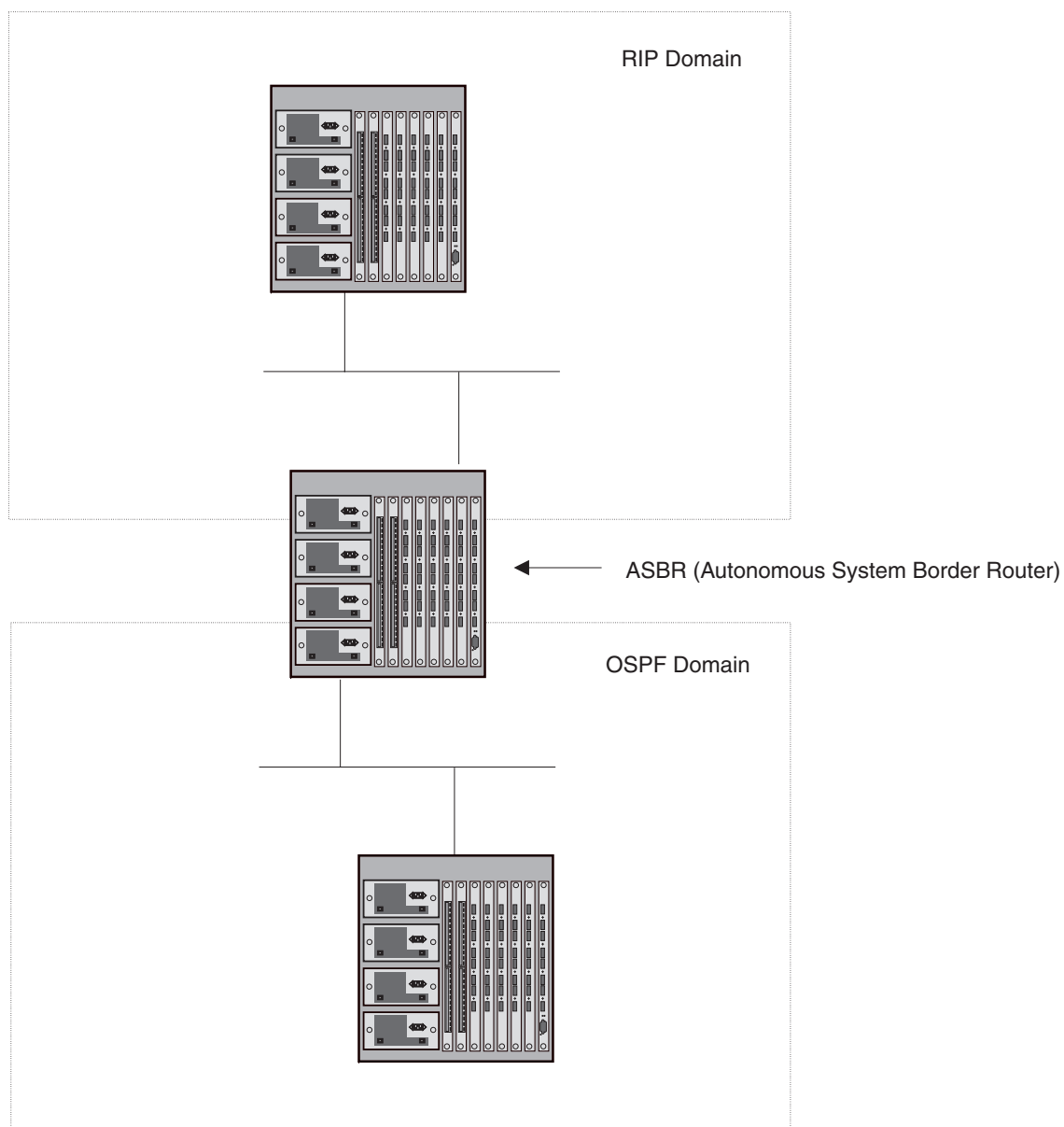


Figure 6.6 Redistributing OSPF and static routes to RIP routes

USING THE CLI

To configure the HP 9308M acting as an ASBR in Figure 6.6 to redistribute OSPF, BGP4, and static routes into RIP, enter the following commands:

```
HP9308ASBR(config)# router rip
HP9308ASBR(config-rip-router)# permit redistribute 1 all
HP9308ASBR(config-rip-router)# write memory
```

NOTE: Redistribution is permitted for all routes by default, so the **permit redistribute 1 all** command in the example above is shown for clarity but is not required.

You also have the option of specifying import of just OSPF, BGP4, or static routes, as well as specifying that only routes for a specific network or with a specific cost (metric) be imported, as shown in the command syntax below:

Syntax: deny | permit redistribute <index> all | bgp | ospf | static address <ip-addr> <ip-addr>
[match-metric <value> | set-metric <value>]

EXAMPLE:

To redistribute RIP, static, and BGP4 routes into OSPF, enter the following commands on the routing switch acting as an ASBR:

```
HP9308ASBR(config)# router ospf
HP9308ASBR(config-ospf-router)# permit redistribute 1 all
HP9308ASBR(config-ospf-router)# write memory
```

NOTE: Redistribution is permitted for all routes by default, so the **permit redistribute 1 all** command in the example above is shown for clarity but is not required.

You also have the option of specifying import of just OSPF, BGP4, or static routes, as well as specifying that only routes for a specific network or with a specific cost (metric) be imported, as shown in the command syntax below:

Syntax: deny | permit redistribute <filter-num> all | bgp | rip | static address <ip-addr> <ip-mask>
[match-metric <value> | set-metric <value>]

NOTE: Redistribution is permitted for all routes by default, so the **permit redistribute 1 all** command in the example above is shown for clarity but is not required.

You also have the option of specifying import of just OSPF, BGP4, or static routes, as well as specifying that only routes for a specific network or with a specific cost (metric) be imported, as shown in the command syntax below:

Syntax: [no] redistribution bgp | connected | rip | static

For example, to enable redistribution of RIP and static IP routes into OSPF, enter the following commands.

```
HP9300(config)# router ospf
HP9300(config-ospf-router)# redistribution rip
HP9300(config-ospf-router)# redistribution static
HP9300(config-ospf-router)# write memory
```

NOTE: The **redistribution** command does not perform the same function as the **permit redistribute** and **deny redistribute** commands. The **redistribute** commands allow you to control redistribution of routes by filtering on the IP address and network mask of a route. The **redistribution** commands enable redistribution for routes of specific types (static, directly connected, and so on). HP recommends that you configure all your redistribution filters before enabling redistribution.

USING THE WEB MANAGEMENT INTERFACE

To define which routes are imported into OSPF, you can define a redistribution filter.

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Redistribution Filter](#) link.
 - If the device does not have any OSPF redistribution filters, the OSPF Redistribution Filter configuration panel is displayed, as shown in the following example.

- If an OSPF redistribution filter is already configured and you are adding a new one, click on the [Add Redistribution Filter](#) link to display the OSPF Redistribution Filter configuration panel, as shown in the following example.
5. If you are modifying an existing OSPF redistribution filter, click on the Modify button to the right of the row describing the filter to display the OSPF Redistribution Filter configuration panel, as shown in the following example.

OSPF Redistribution Filter

IP Address:	<input type="text" value="0.0.0.0"/>
Mask:	<input type="text" value="0.0.0.0"/>
Filter Id:	<input type="text" value="1"/>
Action:	<input type="radio"/> Deny <input checked="" type="radio"/> Permit
Protocol:	<input checked="" type="radio"/> All <input type="radio"/> Static <input type="radio"/> RIP <input type="radio"/> BGP <input type="radio"/> Connected
Match RIP Metric:	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
Match Metric:	<input type="text" value="0"/>
Set OSPF Metric:	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
Set Metric:	<input type="text" value="0"/>

Configurations: [\[Area\]](#) [\[Area Range\]](#) [\[Interface\]](#) [\[Virtual Link\]](#) [\[Trap\]](#)
 Statistics: [\[Area\]](#) [\[Interface\]](#) [\[External Link State DB\]](#) [\[Link State DB\]](#) [\[Neighbor\]](#)
[\[ABR ASBR Routers\]](#) [\[Virtual Interface\]](#) [\[Virtual Neighbor\]](#)

6. Optionally, enter the IP address and mask if you want to filter the redistributed routes for a specific network range.
7. Optionally, enter the filter ID or accept the ID value in the Filter ID field.
8. Optionally, select the filter action, Deny or Permit. The default is Permit.
9. Optionally, select the types of routes the filter applies to in the Protocol section. You can select one of the following:
 - All (the default)
 - Static
 - RIP
 - BGP
 - Connected
10. Optionally, enable matching on RIP metric and enter the metric.
11. Optionally, enable setting the OSPF metric for the imported routes and specify the metric.
12. Click the Add button to apply the filter to the device's running-config file.
13. Select the [Save](#) link at the bottom of the dialog, then select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Modify Default Metric for Redistribution

The default metric is a global parameter that specifies the cost applied to all OSPF routes by default. The default value is 1. You can assign a cost from 1 – 15.

NOTE: You also can define the cost on individual interfaces. The interface cost overrides the default cost.

USING THE CLI

To assign a default metric of 4 to all routes imported into OSPF, enter the following commands:

```
HP9300(config)# router ospf
HP9300(config-ospf-router)# default-metric 4
```

Syntax: default-metric <value>

The <value> can be from 1 – 16,777,215. The default is 10.

USING THE WEB MANAGEMENT INTERFACE

To modify the cost that is assigned to redistributed routes:

1. Log on to the device using a valid user name and password for read-write access.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Redistribution Filter](#) link to display a table listing the redistribution filters.
5. Click on the Modify button to the right of the row describing the virtual link you want to modify. The OSPF Virtual Link Interface configuration panel is displayed.
6. Enter a value from 1 – 15 in the Default Metric field.
7. Click Add to save the change to the device's running-config file.
8. Select the [Save](#) link at the bottom of the dialog, then select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Enable Route Redistribution

To enable route redistribution, use one of the following methods.

NOTE: Do not enable redistribution until you have configured the redistribution filters. Otherwise, you might accidentally overload the network with routes you did not intend to redistribute.

USING THE CLI

To enable redistribution of RIP and static IP routes into OSPF, enter the following commands.

```
HP9300(config)# router ospf
HP9300(config-ospf-router)# redistribution rip
HP9300(config-ospf-router)# redistribution static
HP9300(config-ospf-router)# write memory
```

Syntax: [no] redistribution bgp | connected | rip | static

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of BGP option links.

4. Click on the [General](#) link to display the OSPF configuration panel, as shown in the following figure.

OSPF

RFC 1583:	<input type="radio"/> Disable	<input checked="" type="radio"/> Enable
Redistribution:	<input type="radio"/> Disable	<input checked="" type="radio"/> Enable [Redistribution Filter]
Redis. Metric Type:	<input type="radio"/> Type1	<input checked="" type="radio"/> Type2
Default Metric:	<input type="text" value="10"/>	
External LS DB Limit:	<input type="text" value="2000"/>	
Exit Overflow Interval:	<input type="text" value="0"/>	
Distance:	<input type="text" value="110"/>	

[Configurations:](#) [\[Area\]](#) [\[Area Range\]](#) [\[Interface\]](#) [\[Virtual Link\]](#) [\[Trap\]](#)
[Statistics:](#) [\[Area\]](#) [\[Interface\]](#) [\[External Link State DB\]](#) [\[Link State DB\]](#) [\[Neighbor\]](#)
[\[ABR ASBR Routers\]](#) [\[Virtual Interface\]](#) [\[Virtual Neighbor\]](#)
[\[Home\]](#) [\[Site Map\]](#) [\[Logout\]](#) [\[Save\]](#) [\[Frame Enable\]](#) [\[Disable\]](#) [\[TELNET\]](#)

5. Select the Enable radio button next to Redistribution.
6. Click the Apply button to apply the change to the device's running-config file.
7. Select the [Save](#) link at the bottom of the dialog, then select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Disable or Re-enable Load Sharing

The HP 9308M, HP 9304M, and HP 6308M-SX routing switches can load share among up to eight equal-cost routes to a destination. By default, load sharing is enabled. The default is 4 equal-cost paths but you can specify from 2 – 8 paths.

The routing switch software uses the route information it learns through OSPF to determine the paths and costs.

Figure 6.7 shows an example of an OSPF network containing multiple paths to a destination (in this case, R1).

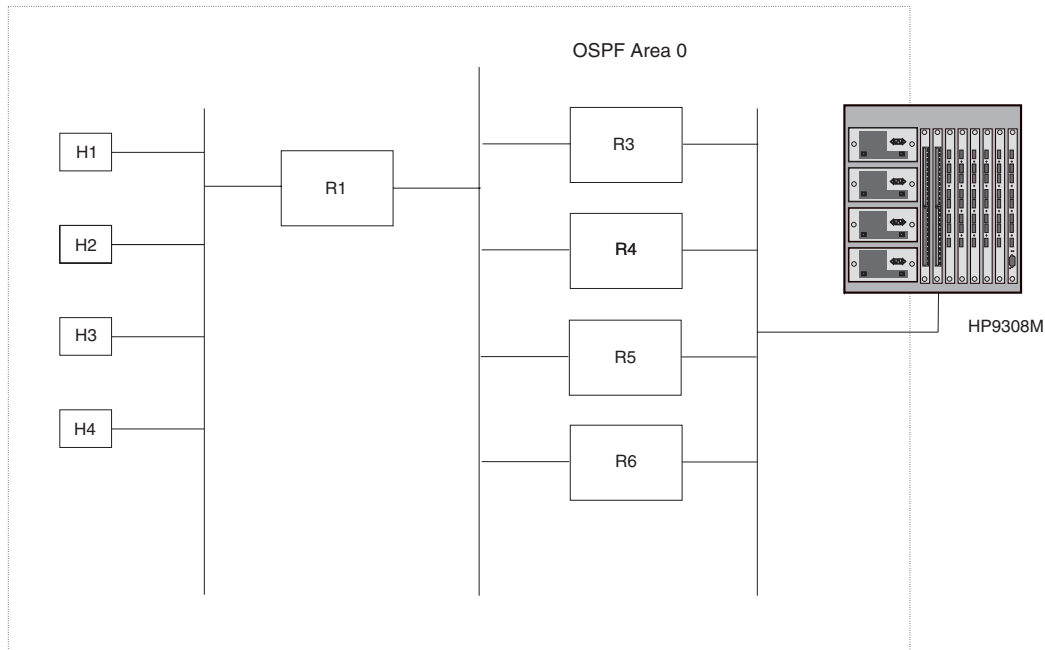


Figure 6.7 Example OSPF network with four equal-cost paths

In the example in Figure 6.7, the HP 9308M routing switch has four paths to R1:

- HP 9308M->R3
- HP 9308M->R4
- HP 9308M->R5
- HP 9308M->R6

Normally, the routing switch will choose the path to R1 that has the lower metric. For example, if R3's metric is 1400 and R4's metric is 600, the routing switch will always choose R4.

However, suppose the metric is the same for all four routing switches in this example. If the costs are the same, the routing switch now has four equal-cost paths to R1. To allow the routing switch to load share among the equal cost routes, enable IP load sharing. The software supports four equal-cost OSPF paths by default when you enable load sharing. You can specify from 2 – 8 paths.

Disabling Load Sharing

To disable load sharing, use either of the following methods.

NOTE: If you disable load sharing, load sharing is disabled for OSPF and for BGP4.

USING THE CLI

To disable IP load sharing, enter the following commands:

```
HP9300(config)# no ip load-sharing
HP9300(config)# write memory
```

Syntax: [no] ip load-sharing

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to IP in the tree view to expand the list of IP option links.
4. Click on the General link to display the IP configuration panel.
5. Click the Disable radio button next to Load Sharing.
6. Click the Apply button to save the change to the device's running-config file.
7. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Changing the Number of Paths

By default, IP load sharing allows IP traffic to be balanced across up to four equal paths. To change the number of paths, use either of the following methods.

USING THE CLI

To change the number of IP load sharing paths, enter a commands such as the following:

```
HP9300(config)# ip load-sharing 8
HP9300(config)# write memory
```

Syntax: [no] ip load-sharing [<num>]

The <num> parameter specifies the number of paths and can be from 2 – 8.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to IP in the tree view to expand the list of IP option links.
4. Click on the General link to display the IP configuration panel.
5. Edit the value in the # of Paths field. You can enter a number from 2 – 8.
6. Click the Apply button to save the change to the device's running-config file.
7. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

EXAMPLE:

Figure 6.8 shows an example of a network that has seven equal-cost routes. For this network, you need to enable IP load sharing for at least seven equal-cost paths.

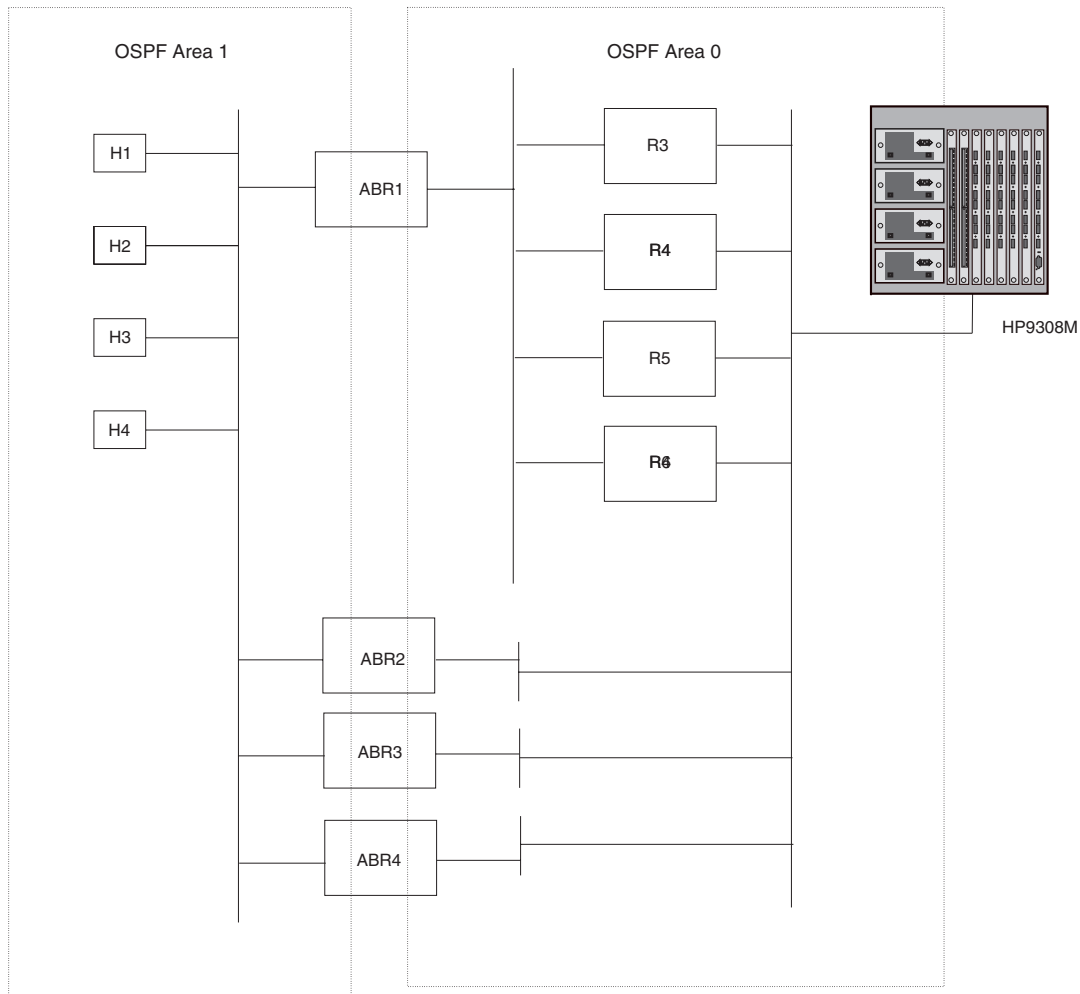


Figure 6.8 Example OSPF network with seven equal-cost paths

In this example, if you use the default value (4), the routing switch cannot load share among all seven paths. Instead, the routing switch load shares among four of the paths and does not support the other three.

The software supports the paths in the order in which it learns about them from OSPF. If the network configuration contains more equal-cost paths to a destination than the software is configured to support, not all the paths are supported. Because the path information arrives dynamically, you might not be able to predict the paths that will be supported.

How Load Sharing Works

Load sharing is performed in round-robin fashion and is based on the destination IP address only. The first time the routing switch receives a packet destined for a specific IP address, the routing switch uses a round-robin algorithm to select the path that was not used for the last newly learned destination IP address.

Once the routing switch associates a path with a particular destination IP address, the routing switch will always use that path as long as the routing switch contains the destination IP address in its cache. For example, if the routing switch selects the path HP9308M->R3 for the first packet the routing switch receives for H1, the routing switch will send all packets destined for H1 through the path HP9308M->R3. For the next packet that contains a destination IP address the routing switch does not yet have in its cache, the routing switch exercises the round-robin algorithm and selects the other path to route the packets to the new destination IP address. For example, for H2, the routing switch selects the path HP9308M->R4 and always uses that path for traffic destined to H2.

Once the routing switch uses round-robin to select a path for traffic to H1, the routing switch always uses that path (in this example, HP9308M->R3) for traffic to H1. Likewise, the first time the routing switch receives a packet destined for H2, the routing switch uses round-robin to select the path that the routing switch did not select to the last new destination IP address (in this example, H1). Thus, the routing switch always uses HP9308M->R4 for traffic destined to H2.

NOTE: The examples shown in the figures show all four hosts (H1 – H4) on the same sub-net. Because load sharing is based on destination IP address, load sharing occurs among hosts in the same sub-net but does not occur across sub-nets.

NOTE: The routing switch is not source routing in these examples. The routing switch is concerned only with the paths to the next-hop routers, not the entire paths to the destination hosts.

Configure External Route Summarization

When the routing switch is an OSPF Autonomous System Boundary Router (ASBR), you can configure it to advertise one external route as an aggregate for all redistributed routes that are covered by a specified address range.

When you configure an address range, the range takes effect immediately. All the imported routes are summarized according to the configured address range. Imported routes that have already been advertised and that fall within the range are flushed out of the AS and a single route corresponding to the range is advertised.

If a route that falls within a configured address range is imported by the routing switch, no action is taken if the routing switch has already advertised the aggregate route; otherwise the routing switch advertises the aggregate route. If an imported route that falls within a configured address range is removed by the routing switch, no action is taken if there are other imported route(s) that fall within the same address range; otherwise the aggregate route is flushed.

You can configure up to 32 address ranges. The routing switch sets the forwarding address of the aggregate route to zero and sets the tag to zero.

If you delete an address range, the advertised aggregate route is flushed and all imported routes that fall within the range are advertised individually.

If an external LSDB overflow condition occurs, all aggregate routes are flushed out of the AS, along with other external routes. When the routing switch exits the external LSDB overflow condition, all the imported routes are summarized according to the configured address ranges.

NOTE: If you use redistribution filters in addition to address ranges, the routing switch applies the redistribution filters to routes first, then applies them to the address ranges. If you disable redistribution, all the aggregate routes are flushed, along with other imported routes.

NOTE: This option affects only imported, type 5 external routes. A single type 5 LSA is generated and flooded throughout the AS for multiple external routes. Type 7-route redistribution is not affected by this feature. All type 7 routes will be imported (if redistribution is enabled). To summarize type 7 LSAs or exported routes, use NSSA address range summarization.

To configure route summarization, use the following CLI method.

USING THE CLI

To configure a summary address for OSPF routes, enter commands such as the following:

```
HP9300(config-ospf-router)# summary-address 10.1.0.0 255.255.0.0
```

The command in this example configures summary address 10.1.0.0, which includes addresses 10.1.1.0, 10.1.2.0, 10.1.3.0, and so on. For all of these networks, only the address 10.1.0.0 is advertised in external LSAs.

Syntax: summary-address <ip-addr> <ip-mask>

The <ip-addr> parameter specifies the network address.

The <ip-mask> parameter specifies the network mask.

To display the configured summary addresses, enter the following command at any level of the CLI:

```
HP9300(config-ospf-router)# show ip ospf config
OSPF Redistribution Address Ranges currently defined:
Range-Address      Subnetmask
1.0.0.0            255.0.0.0
1.0.1.0            255.255.255.0
1.0.2.0            255.255.255.0
```

Syntax: show ip ospf config

USING THE WEB MANAGEMENT INTERFACE

You cannot configure OSPF route summarization using the Web management interface.

Configure Default Route Origination

When the routing switch is an OSPF Autonomous System Boundary Router (ASBR), the routing switch automatically generates a default external route into an OSPF routing domain. This feature is called “default route origination” or “default information originate”.

This feature is enabled by default. With this feature enabled, the routing switch advertises a type 5 default route that is flooded throughout the AS (except stub areas and NSSAs). In addition, internal NSSA ASBRs advertise their default routes as translatable type 7 default routes.

If you disable default information origination, the default route originated by the routing switch is flushed. Default routes generated by other OSPF routers are not affected. If you re-enable the feature, the feature takes effect immediately and thus does not require you to reload the software.

The ASBR advertises its default route, if one is configured on the ASBR. You can use the “always” option when you enable the default route origination. The always option causes the ASBR to create and advertise a default route if it does not already have one configured.

If you want to disable default information originate, use the following CLI method.

USING THE CLI

To disable default information originate, enter the following command:

```
HP9300(config-ospf-router)# no default-information-originate
```

To re-enable the feature or change the feature’s parameters, enter a command such as the following:

```
HP9300(config-ospf-router)# default-information-originate always metric 2
metric-type 1
```

Syntax: [no] default-information-originate [always] [metric <value>] [metric-type <type>]

The **always** parameter advertises the default route regardless of whether the router has a default route. This option is disabled by default.

The **metric <value>** parameter specifies a metric for the default route. If this option is not used, the default metric is used for the route.

The **metric-type <type>** parameter specifies the external link type associated with the default route advertised into the OSPF routing domain. The <type> can be one of the following:

- 1 – Type 1 external route
- 2 – Type 2 external route

If you do not use this option, the default redistribution metric type is used for the route type.

NOTE: If you specify a metric and metric type, the values you specify are used only if the routing switch does not have a default route, but still wants to advertise one because the always option is configured.

USING THE WEB MANAGEMENT INTERFACE

You cannot configure OSPF default information origination using the Web management interface.

Modify SPF Timers

The routing switch uses the following timers when calculating the shortest path for OSPF routes:

- **SPF delay** - When the routing switch receives a topology change, the software waits before it starts a Shortest Path First (SPF) calculation. By default, the software waits five seconds. You can configure the SPF delay to a value from 0 – 65535 seconds. If you set the SPF delay to 0 seconds, the software immediately begins the SPF calculation after receiving a topology change.
- **SPF hold time** - The routing switch waits for a specific amount of time between consecutive SPF calculations. By default, the routing switch waits ten seconds. You can configure the SPF hold time to a value from 0 – 65535 seconds. If you set the SPF hold time to 0 seconds, the software does not wait between consecutive SPF calculations.

You can set the delay and hold time to lower values to cause the routing switch to change to alternate paths more quickly in the event of a route failure. Note that lower values require more CPU processing time.

You can change one or both of the timers. To do so, use the following CLI method.

USING THE CLI

To change the SPF delay and hold time, enter commands such as the following:

```
HP9300(config-ospf-router)# timers spf 10 20
```

The command in this example changes the SPF delay to 10 seconds and changes the SPF hold time to 20 seconds.

Syntax: timers spf <delay> <hold-time>

The <delay> parameter specifies the SPF delay.

The <hold-time> parameter specifies the SPF hold time.

To set the timers back to their default values, enter a command such as the following:

```
HP9300(config-ospf-router)# no timers spf 10 20
```

USING THE WEB MANAGEMENT INTERFACE

You cannot configure the SPF timers using the Web management interface.

Modify Redistribution Metric Type

The redistribution metric type is used by default for all routes imported into OSPF unless you specify different metrics for individual routes using redistribution filters. Type 2 specifies a big metric (three bytes). Type 1 specifies a small metric (two bytes). The default value is type 2.

USING THE CLI

To modify the default value to type 1, enter the following command:

```
HP9300(config-ospf-router)# metric-type type1
```

Syntax: metric-type type1 | type2

The default is **type2**.

USING THE WEB MANAGEMENT INTERFACE

To modify the default metric type:

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the General link to display the OSPF configuration panel.
5. Select either Type 1 or Type 2 for the redistribution metric type.
6. Click the Apply button to save the change to the device's running-config file.
7. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Modify the Maximum Number of Routes

The OSPF route table holds 16000 routes by default. You can change the maximum number of routes the routing switch's OSPF table can hold to a value from 4000 – 32000.

USING THE CLI

To change the maximum number of OSPF routes to 32000, enter the following command:

```
HP9300 (config-ospf-router) # max-routes 32000
HP9300 (config-ospf-router) # exit
HP9300# reload
```

Syntax: max-routes <num>

The <num> indicates the number of OSPF routes allowed and can be from 4000 – 32000. The change takes effect after the routing switch is rebooted.

USING THE WEB MANAGEMENT INTERFACE

You cannot modify the maximum number of OSPF routes using the Web management interface.

Modify LSDB Limits

On routing switches with 32MB or greater memory, you can modify the number of link-state advertisements (LSAs) that the routing switch allows before a database overflow condition is declared on the system. These parameters are part of the routing switch's compliance with RFC 1765.

The following table lists the types of LSAs for which you can configure the table sizes, the default number of entries the tables can hold, and the range of maximum values you can specify. You cannot configure the LSA tables globally; you must configure them for individual LSA types. Make sure you save the running-config file and reload after changing a table size. The change does not take effect until you reload or reboot.

Table 6.1: Configurable LSA Table Sizes

LSA Type	Default Maximum Number of Entries	Range of Values
External (type 5)	2000	500 – 8000
Network (type 2)	2000	200 – 2000
Router (type 1)	2200	200 – 2200
Summary (type 3 and type 4)	2000	500 – 18000

USING THE CLI

To change the maximum number of summary LSA entries from 2000 to 18000, enter the following commands:

```
HP9300 (config-ospf-router) # maximum-number-of-lsa summary 18000
HP9300 (config-ospf-router) # write memory
HP9300 (config-ospf-router) # exit
```

Syntax: maximum-number-of-lsa external | network | router | summary <value>

USING THE WEB MANAGEMENT INTERFACE

To modify the number of IP OSPF external link state advertisements:

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the General link to display the OSPF configuration panel.
5. Enter a value from 500 – 8000 in the External LSDB Limit field.
6. Click the Apply button to save the change to the device's running-config file.
7. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Modify Exit Overflow Interval

If a database overflow condition occurs on a routing switch, the routing switch eliminates the condition by removing entries that originated on the routing switch. The exit overflow interval allows you to set how often a routing switch checks to see if the overflow condition has been eliminated. The default value is 0. The range is 0 – 86400 seconds (24 hours). If the configured value of the database overflow interval is zero, then the routing switch never leaves the database overflow condition.

USING THE CLI

To modify the exit overflow interval to 60 seconds, enter the following command:

```
HP9300 (config-ospf-router) # data-base-overflow-interval 60
```

Syntax: database-overflow-interval <value>

The <value> can be from 0 – 86400 seconds. The default is 0 seconds.

USING THE WEB MANAGEMENT INTERFACE

To modify the exit overflow interval:

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the General link to display the OSPF configuration panel.
5. Enter a value from 0 – 86400 in the Exit Overflow Interval field.
6. Click the Apply button to save the change to the device's running-config file.
7. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Modify Administrative Distance

HP routing switches can learn about networks from various protocols, including Border Gateway Protocol version 4 (BGP4), IP/RIP, and OSPF. Consequently, the routes to a network may differ depending on the protocol from which the routes were learned. The default administrative distance for OSPF routes is 110. See “Changing Administrative Distances” on page 8-28 for a list of the default distances for all route sources.

The router selects one route over another based on the source of the route information. To do so, the router can use the administrative distances assigned to the sources. You can bias the routing switch’s decision by changing the default administrative distance for IP/RIP routes.

Configuring Administrative Distance Based on Route Type

You can configure a unique administrative distance for each type of OSPF route. For example, you can use this feature to prefer a static route over an OSPF inter-area route but you also want to prefer OSPF intra-area routes to static routes.

The distance you specify influences the choice of routes when the routing switch has multiple routes for the same network from different protocols. The routing switch prefers the route with the lower administrative distance.

You can specify unique default administrative distances for the following route types:

- Intra-area routes
- Inter-area routes
- External routes

The default for all these OSPF route types is 110.

NOTE: This feature does not influence the choice of routes within OSPF. For example, an OSPF intra-area route is always preferred over an OSPF inter-area route, even if the intra-area route’s distance is greater than the inter-area route’s distance.

To configure administrative distances for OSPF route types, use the following CLI method.

USING THE CLI

To change the default administrative distances for inter-area routes, intra-area routes, and external routes, enter the following command:

```
HP9300(config-ospf-router)# distance external 100
HP9300(config-ospf-router)# distance inter-area 90
HP9300(config-ospf-router)# distance intra-area 80
```

Syntax: distance external | inter-area | intra-area <distance>

The **external | inter-area | intra-area** parameter specifies the route type for which you are changing the default administrative distance.

The <distance> parameter specifies the new distance for the specified route type. Unless you change the distance for one of the route types using commands such as those shown above, the default is 110.

To reset the administrative distance to its system default (110), enter a command such as the following:

```
HP9300(config-ospf-router)# no distance external 100
```

Modify OSPF Traps Generated

OSPF traps as defined by RFC 1850 are supported on the HP 9308M, HP 9304M, and HP 6308M-SX routing switches. OSPF trap generation is enabled on the routing switch, by default.

USING THE CLI

When using the CLI, you can disable all or specific OSPF trap generation by entering the following CLI command:

```
HP9300(config-ospf-router)# no snmp-server trap ospf
```

To later re-enable the trap feature, enter **snmp-server trap ospf**.

To disable a specific OSPF trap, enter the command as **no snmp-server trap ospf** <ospf-trap>.

These commands are at the OSPF router Level of the CLI.

Here is a summary of OSPF traps supported on the HP 9308M, HP 9304M, and HP 6308M-SX routing switches, their corresponding CLI commands, and their associated MIB objects from RFC 1850:

- **interface-state-change-trap** [MIB object: OspfIfStateChange]
- **virtual-interface-state-change-trap** [MIB object: OspfVirtIfStateChange]
- **neighbor-state-change-trap** [MIB object: ospfNbrStateChange]
- **virtual-neighbor-state-change-trap** [MIB object: ospfVirtNbrStateChange]
- **interface-config-error-trap** [MIB object: ospfIfConfigError]
- **virtual-interface-config-error-trap** [MIB object: ospfVirtIfConfigError]
- **interface-authentication-failure-trap** [MIB object: ospfIfAuthFailure]
- **virtual-interface-authentication-failure-trap** [MIB object: ospfVirtIfAuthFailure]
- **interface-receive-bad-packet-trap** [MIB object: ospfIfRxBadPacket]
- **virtual-interface-receive-bad-packet-trap** [MIB object: ospfVirtIfRxBadPacket]
- **interface-retransmit-packet-trap** [MIB object: ospfTxRetransmit]
- **virtual-interface-retransmit-packet-trap** [MIB object: ospfVirtIfTxRetransmit]
- **originate-lsa-trap** [MIB object: ospfOriginateLsa]
- **originate-maxage-lsa-trap** [MIB object: ospfMaxAgeLsa]
- **link-state-database-overflow-trap** [MIB object: ospfLsdbOverflow]
- **link-state-database-approaching-overflow-trap** [MIB object: ospfLsdbApproachingOverflow]

EXAMPLE:

To stop an OSPF trap from being collected, use the CLI command: **no trap** <ospf-trap>, at the Router OSPF level of the CLI. To disable reporting of the neighbor-state-change-trap, enter the following command:

```
HP9300(config-ospf-router)# no trap neighbor-state-change-trap
```

EXAMPLE:

To reinstate the trap, enter the following command:

```
HP9300(config-ospf-router)# trap neighbor-state-change-trap
```

Syntax: [no] snmp-server trap ospf <ospf-trap>

USING THE WEB MANAGEMENT INTERFACE

To disable a specific OSPF trap or traps:

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the Trap link to display the OSPF Trap panel.
5. Select the Disable radio button beside each OSPF trap you want to disable.
6. Click the Apply button to save the change to the device's running-config file.
7. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Modify OSPF Standard Compliance Setting

The HP 9308M, HP 9304M, and HP 6308M-SX routing switches are configured, by default, to be compliant with the RFC 1583 OSPF V2 specification.

USING THE CLI

To configure a routing switch to operate with the latest OSPF standard, RFC 2178, enter the following commands:

```
HP9300 (config)# router ospf
```

```
HP9300 (config-ospf-router)# no rfc1583-compatibility
```

Syntax: [no] rfc1583-compatibility

USING THE WEB MANAGEMENT INTERFACE

To configure a routing switch to operate with the latest OPSF standard, RFC 2178:

1. Log on to the device using a valid user name and password for read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the General link to display the OSPF configuration panel.
5. Select Disable next to RFC 1583.
6. Click the Apply button to save the change to the device's running-config file.
7. Select the Save link at the bottom of the dialog. Select Yes when prompted to save the configuration change to the startup-config file on the device's flash memory.

Displaying OSPF Information

You can use CLI commands and Web management options to display the following OSPF information:

- Trap, area, and interface information – see “Displaying General OSPF Configuration Information” on page 6-38.
- Area information – see “Displaying OSPF Area Information” on page 6-40.
- Neighbor information – see “Displaying OSPF Neighbor Information” on page 6-41.
- Interface information – see “Displaying OSPF Interface Information” on page 6-42.
- Route information – see “Displaying OSPF Route Information” on page 6-43.
- External link state information – see “Displaying OSPF External Link State Information” on page 6-44.
- Link state information – see “Displaying OSPF Link State Information” on page 6-46.
- Virtual Neighbor information – see “Displaying OSPF Virtual Neighbor Information” on page 6-47.
- Virtual Link information – see “Displaying OSPF Virtual Link Information” on page 6-47.
- ABR and ASBR information – see “Displaying OSPF ABR and ASBR Information” on page 6-48.
- Trap state information – see “Displaying OSPF Trap Status” on page 6-48.

Displaying General OSPF Configuration Information

To display general OSPF configuration information, enter the following command at any CLI level:

```
HP9300> show ip ospf config
```

```
Router OSPF: Enabled  
Redistribution: Disabled  
Default OSPF Metric: 10
```

```

OSPF Redistribution Metric: Type2

OSPF External LSA Limit: 2000

OSPF Database Overflow Interval: 0

RFC 1583 Compatibility: Enabled

Router id: 207.95.11.128

Interface State Change Trap:           Enabled
Virtual Interface State Change Trap:    Enabled
Neighbor State Change Trap:           Enabled
Virtual Neighbor State Change Trap:     Enabled
Interface Configuration Error Trap:     Enabled
Virtual Interface Configuration Error Trap: Enabled
Interface Authentication Failure Trap:  Enabled
Virtual Interface Authentication Failure Trap: Enabled
Interface Receive Bad Packet Trap:     Enabled
Virtual Interface Receive Bad Packet Trap: Enabled
Interface Retransmit Packet Trap:      Enabled
Virtual Interface Retransmit Packet Trap: Enabled
Originate LSA Trap:                   Enabled
Originate MaxAge LSA Trap:             Enabled
Link State Database Overflow Trap:     Enabled
Link State Database Approaching Overflow Trap: Enabled

```

```

OSPF Area currently defined:
Area-ID      Area-Type Cost
0            normal  0

```

```

OSPF Interfaces currently defined:
Ethernet Interface: 3/1-3/2
ip ospf md5-authentication-key-activation-wait-time 300
ip ospf cost 0
ip ospf area 0

```

```

Ethernet Interface: v1
ip ospf md5-authentication-key-activation-wait-time 300
ip ospf cost 0
ip ospf area 0

```

Syntax: show ip ospf config

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the General link to display the OSPF configuration panel.

Displaying OSPF Area Information

To display global OSPF area information for the routing switch, use one of the following methods.

USING THE CLI

To display OSPF area information, enter the following command at any CLI level:

```
HP9300> show ip ospf area
```

```
Indx Area      Type Cost  SPFR ABR ASBR LSA Chksum(Hex)
1   0.0.0.0    normal 0     1    0   0   1   0000781f
2  192.147.60.0 normal 0     1    0   0   1   0000fee6
3  192.147.80.0 stub   1     1    0   0   2   000181cd
```

Syntax: show ip ospf area [<area-id>] | [<num>]

The <area-id> parameter shows information for the specified area.

The <num> parameter displays the entry that corresponds to the entry number you enter. The entry number identifies the entry's position in the area table.

This display shows the following information.

Table 6.2: CLI Display of OSPF Area Information

This Field...	Displays...
Indx	The row number of the entry in the routing switch's OSPF area table.
Area	The area number.
Type	The area type, which can be one of the following: <ul style="list-style-type: none"> normal stub
Cost	The area's cost.
SPFR	The SPFR value.
ABR	The ABR number.
ASBR	The ASBR number.
LSA	The LSA number.
Chksum(Hex)	The checksum for the LSA packet. The checksum is based on all the fields in the packet except the age field. The routing switch uses the checksum to verify that the packet is not corrupted.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Area](#) link.

Displaying OSPF Neighbor Information

To display OSPF neighbor information for the routing switch, use one of the following methods.

USING THE CLI

To display OSPF neighbor information, enter the following command at any CLI level:

```
HP9300> show ip ospf neighbor
```

```
Port Address          Pri State      Neigh Address  Neigh ID      Ev Opt Cnt
8   212.76.7.251      1  full      212.76.7.200  173.35.1.220  23 2   0
```

Syntax: show ip ospf neighbor [router-id <ip-addr>] | [<num>]

The **router-id** <ip-addr> parameter displays only the neighbor entries for the specified router.

The <num> parameter displays only the entry in the specified index position in the neighbor table. For example, if you enter “1”, only the first entry in the table is displayed.

This display shows the following information.

Table 6.3: CLI Display of OSPF Neighbor Information

Field	Description
Port	The port through which the routing switch is connected to the neighbor.
Address	The IP address of this routing switch's interface with the neighbor.
Pri	The OSPF priority of the neighbor. The priority is used during election of the Designated Router (DR) and Backup designated Router (BDR).
State	<p>The state of the conversation between the routing switch and the neighbor. This field can have one of the following values:</p> <ul style="list-style-type: none"> Down – The initial state of a neighbor conversation. This value indicates that there has been no recent information received from the neighbor. Attempt – This state is only valid for neighbors attached to non-broadcast networks. It indicates that no recent information has been received from the neighbor. Init – A Hello packet has recently been seen from the neighbor. However, bidirectional communication has not yet been established with the neighbor. (The router itself did not appear in the neighbor's Hello packet.) All neighbors in this state (or higher) are listed in the Hello packets sent from the associated interface. 2-Way – Communication between the two routers is bidirectional. This is the most advanced state before beginning adjacency establishment. The Designated Router and Backup Designated Router are selected from the set of neighbors in the 2-Way state or greater. ExStart – The first step in creating an adjacency between the two neighboring routers. The goal of this step is to decide which router is the master, and to decide upon the initial Database Description (DD) sequence number. Neighbor conversations in this state or greater are called adjacencies. Exchange – The router is describing its entire link state database by sending Database Description packets to the neighbor. Each Database Description packet has a DD sequence number, and is explicitly acknowledged. Only one Database Description packet can be outstanding at any time. In this state, Link State Request packets can also be sent asking for the neighbor's more recent advertisements. All adjacencies in Exchange state or greater are used by the flooding procedure. In fact, these adjacencies are fully capable of transmitting and receiving all types of OSPF routing protocol packets.

Table 6.3: CLI Display of OSPF Neighbor Information (Continued)

Field	Description
State, cont.	<ul style="list-style-type: none"> Loading – Link State Request packets are sent to the neighbor asking for the more recent advertisements that have been discovered (but not yet received) in the Exchange state. Full – The neighboring routers are fully adjacent. These adjacencies will now appear in router links and network link advertisements.
Neigh Address	The IP address of the neighbor.
Neigh ID	The OSPF router ID.
Ev	The number of times the neighbor's state changed.
Opt	The sum of the option bits in the Options field of the Hello packet. This information is used by HP technical support. See Section A.2 in RFC 2178 for information about the Options field in Hello packets.
Cnt	The number of LSAs that need to be retransmitted.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Neighbor](#) link.

Displaying OSPF Interface Information

To display OSPF interface information for the routing switch, use one of the following methods.

USING THE CLI

To display OSPF interface information, enter the following command at any CLI level:

```
HP9300> show ip ospf interface
```

Syntax: show ip ospf interface [<ip-addr>]

The <ip-addr> parameter displays the OSPF interface information for the specified IP address.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Interface](#) link.

Displaying OSPF Route Information

To display OSPF route information for the routing switch, use one of the following methods.

USING THE CLI

To display OSPF route information, enter the following command at any CLI level:

```
HP9300> show ip ospf routes
```

```

Index Destination      Mask           Path_Cost Type2_Cost Path_Type
1      212.95.7.0          255.255.255.0 1           0           Intra
  Adv_Router      Link_State     Dest_Type    State       Tag         Flags
  173.35.1.220    212.95.7.251  Network     Valid      00000000   7000
  Paths Out_Port  Next_Hop      Type         Arp_Index   State
  1      5/6           209.95.7.250 OSPF        8           84 00

Index Destination      Mask           Path_Cost Type2_Cost Path_Type
2      11.3.63.0           255.255.255.0 11          0           Inter
  Adv_Router      Link_State     Dest_Type    State       Tag         Flags
  209.95.7.250    11.3.63.0     Network     Valid      00000000   0000
  Paths Out_Port  Next_Hop      Type         Arp_Index   State
  1      5/6           209.95.7.250 OSPF        8           84 00

```

Syntax: show ip ospf routes [<ip-addr>]

The <ip-addr> parameter specifies a destination IP address. If you use this parameter, only the route entries for that destination are shown.

This display shows the following information.

Table 6.4: CLI Display of OSPF Route Information

This Field...	Displays...
Index	The row number of the entry in the routing switch's OSPF route table.
Destination	The IP address of the route's destination.
Mask	The network mask for the route.
Path_Cost	The cost of this route path. (A route can have multiple paths. Each path represents a different exit port for the routing switch.)
Type2_Cost	The type 2 cost of this path.
Path_Type	The type of path, which can be one of the following: <ul style="list-style-type: none"> • Inter – The path to the destination passes into another area. • Intra – The path to the destination is entirely within the local area. • External1 – The path to the destination is a type 1 external route. • External2 – The path to the destination is a type 2 external route.
Adv_Router	The OSPF router that advertised the route to this routing switch.
Link-State	The link state from which the route was calculated.

Table 6.4: CLI Display of OSPF Route Information (Continued)

This Field...	Displays...
Dest_Type	The destination type, which can be one of the following: <ul style="list-style-type: none"> • ABR – Area Border Router • ASBR – Autonomous System Boundary Router • Network – the network
State	The route state, which can be one of the following: <ul style="list-style-type: none"> • Changed • Invalid • Valid This information is used by HP technical support.
Tag	The external route tag.
Flags	State information for the route entry. This information is used by HP technical support.
Paths	The number of paths to the destination.
Out_Port	The port through which the routing switch reaches the next hop for this route path.
Next_Hop	The IP address of the next-hop router for this path.
Type	The route type, which can be one of the following: <ul style="list-style-type: none"> • OSPF • Static Replaced by OSPF
Arp_Index	The index position in the ARP table of the ARP entry for this path's IP address.
State	State information for the path. This information is used by HP technical support.

USING THE WEB MANAGEMENT INTERFACE

You cannot display the OSPF route table using the Web management interface.

Displaying OSPF External Link State Information

To display external link state information for the routing switch, use one of the following methods.

USING THE CLI

To display external link state information, enter the following command at any CLI level:

```
HP9300> show ip ospf database external-link-state
```

```
Ospf ext link-state by router ID 130.130.130.241 are in the following:
```

Area ID	Aging	LS ID	Router	Seq(hex)	Chksum	Type
0.0.0.0	279	130.132.75.48	130.130.130.241	80000004	00000ace	EXTR
0.0.0.0	278	130.132.88.112	130.130.130.241	80000004	0000f793	EXTR

```

0.0.0.0      279    130.132.81.208  130.130.130.241  80000004  000081b0  EXTR
0.0.0.0      284    130.132.46.224  130.130.130.241  80000004  000063e1  EXTR
0.0.0.0      285    130.132.40.64   140.140.140.243  80000004  0000ebff  EXTR
0.0.0.0      286    130.132.33.160  150.150.150.245  80000004  0000751d  EXTR
0.0.0.0      296    130.131.241.16  150.150.150.245  80000004  00002e25  EXTR

```

Syntax: show ip ospf database external-link-state [advertise <num>] | [link-state-id <ip-addr>] | [router-id <ip-addr>] | [sequence-number <num(Hex)>] | [status <num>]

The **advertise** <num> parameter displays the hexadecimal data in the specified LSA packet. The <num> parameter identifies the LSA packet by its position in the routing switch's External LSA table. To determine an LSA packet's position in the table, enter the **show ip ospf external-link-state** command to display the table. See "Displaying the Data in an LSA" on page 6-46 for an example.

The **link-state-id** <ip-addr> parameter displays the External LSAs for the LSA source specified by <IP-addr>.

The **router-id** <ip-addr> parameter shows the External LSAs for the specified OSPF router.

The **sequence-number** <num(Hex)> parameter displays the External LSA entries for the specified hexadecimal LSA sequence number.

This display shows the following information.

Table 6.5: CLI Display of OSPF External Link State Information

This Field...	Displays...
Area ID	The OSPF area the routing switch is in.
Aging	The age of the LSA, in seconds.
LS ID	The ID of the link-state advertisement from which the routing switch learned this route.
Router	The router IP address.
Seq(hex)	The sequence number of the LSA. The OSPF neighbor that sent the LSA stamps it with a sequence number to enable the routing switch and other OSPF routers to determine which LSA for a given route is the most recent.
Chksum	A checksum for the LSA packet. The checksum is based on all the fields in the packet except the age field. The routing switch uses the checksum to verify that the packet is not corrupted.
Type	The route type, which is always EXTR (external).

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [External Link State DB](#) link.

Displaying OSPF Link State Information

To display link state information for the routing switch, use one of the following methods.

USING THE CLI

To display link state information, enter the following command at any CLI level:

```
HP9300> show ip ospf database link-state
```

Syntax: show ip ospf database link-state [advertise <num>] | [link-state-id <ip-addr>] | [network] | [router] | [router-id <ip-addr>] | [sequence-number <num(Hex)>] | [status <num>] [summary]

The **advertise <num>** parameter displays the hexadecimal data in the specified LSA packet. The <num> parameter identifies the LSA packet by its position in the routing switch's External LSA table. To determine an LSA packet's position in the table, enter the **show ip ospf external-link-state** command to display the table. See "Displaying the Data in an LSA" on page 6-46 for an example.

The **link-state-id <ip-addr>** parameter displays the External LSAs for the LSA source specified by <IP-addr>.

The **router-id <ip-addr>** parameter shows the External LSAs for the specified OSPF router.

The **sequence-number <num(Hex)>** parameter displays the External LSA entries for the specified hexadecimal LSA sequence number.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Link State DB](#) link.

Displaying the Data in an LSA

You can use the CLI to display the data the routing switch received in a specific External LSA packet or other type of LSA packet. For example, to display the LSA data in entry 3 in the External LSA table, enter the following command:

```
HP9300> show ip ospf database external-link-state advertise 3
```

```
05 84 02 05 82 83 0d 60 82 82 82 f1 80 00 00 02 e4 05
00 24 ff ff ff f0 80 00 00 0a 00 00 00 00 00 00 00
```

Syntax: show ip ospf database external-link-state [advertise <num>] | [link-state-id <ip-addr>] | [router-id <ip-addr>] | [sequence-number <num(Hex)>] | [status <num>]

To determine an external LSA's or other type of LSA's index number, enter one of the following commands to display the appropriate LSA table:

- **show ip ospf database link-state advertise <num>** – This command displays the data in the packet for the specified LSA.
- **show ip ospf database external-link-state advertise <num>** – This command displays the data in the packet for the specified external LSA.

For example, to determine an external LSA's index number, enter the following command:

```
HP9300> show ip ospf external-link-state
```

Index	Aging	LS ID	Router	Seq(hex)	Chksum
1	1332	130.132.81.208	130.130.130.241	80000002	000085ae
2	1325	130.132.116.192	130.130.130.241	80000002	0000a37d

```
3      1330    130.132.88.112  130.130.130.241  80000002  0000fb91
4      1333    130.132.75.48    130.130.130.241  80000002  00000ecc
5      1338    130.132.46.224   130.130.130.241  80000002  000067df
```

USING THE WEB MANAGEMENT INTERFACE

You cannot display the contents of an LSA using the Web management interface.

Displaying OSPF Virtual Neighbor Information

To display OSPF virtual neighbor information for the routing switch, use one of the following methods.

USING THE CLI

To display OSPF virtual neighbor information, enter the following command at any CLI level:

```
HP9300> show ip ospf virtual-neighbor
```

Syntax: show ip ospf virtual-neighbor [<num>]

The <num> parameter displays the table beginning at the specified entry number.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Virtual Neighbor](#) link.

Displaying OSPF Virtual Link Information

To display OSPF virtual link information for the routing switch, use one of the following methods.

USING THE CLI

To display OSPF virtual link information, enter the following command at any CLI level:

```
HP9300> show ip ospf virtual-link
```

Syntax: show ip ospf virtual-link [<num>]

The <num> parameter displays the table beginning at the specified entry number.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [Virtual Interface](#) link.

Displaying OSPF ABR and ASBR Information

To display OSPF ABR and ASBR information for the routing switch, use one of the following methods.

USING THE CLI

To display OSPF ABR and ASBR information, enter the following command at any CLI level:

```
HP9300> show ip ospf border-routers
```

Syntax: show ip ospf border-routers [<ip-addr>]

The <ip-addr> parameter displays the ABR and ASBR entries for the specified IP address.

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Monitor in the tree view to expand the list of monitoring options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the [ABR ASBR Routers](#) link.

Displaying OSPF Trap Status

To display the state (enabled or disabled) of the OSPF traps, use one of the following methods.

All traps are enabled by default when you enable OSPF. To disable or re-enable an OSPF trap, see “Modify OSPF Traps Generated” on page 6-36.

USING THE CLI

To display the state of each OSPF trap, enter the following command at any CLI level:

```
HP9300> show ip ospf trap
```

```
Interface State Change Trap:           Enabled
Virtual Interface State Change Trap:    Enabled
Neighbor State Change Trap:            Enabled
Virtual Neighbor State Change Trap:     Enabled
Interface Configuration Error Trap:     Enabled
Virtual Interface Configuration Error Trap: Enabled
Interface Authentication Failure Trap:   Enabled
Virtual Interface Authentication Failure Trap: Enabled
Interface Receive Bad Packet Trap:      Enabled
Virtual Interface Receive Bad Packet Trap: Enabled
Interface Retransmit Packet Trap:       Enabled
Virtual Interface Retransmit Packet Trap: Enabled
Originate LSA Trap:                    Enabled
Originate MaxAge LSA Trap:              Enabled
Link State Database Overflow Trap:      Enabled
Link State Database Approaching Overflow Trap: Enabled
```

Syntax: show ip ospf trap

USING THE WEB MANAGEMENT INTERFACE

1. Log on to the device using a valid user name and password for read-only or read-write access. The System configuration panel is displayed.
2. Click on the plus sign next to Configure in the tree view to expand the list of configuration options.
3. Click on the plus sign next to OSPF in the tree view to expand the list of OSPF option links.
4. Click on the Trap link to display the OSPF Trap panel.

