OSPF Commands: A through Z

area nssa

To configure a not-so-stubby area (NSSA), use the **area nssa** command in router address family topology or router configuration mode. To remove the NSSA distinction from the area, use the **no** form of this command.

area nssa commandarea *area-id* **nssa [no-redistribution]** [**default-information-originate [metric] [metric-type]**] **[no-summary] [nssa-only]**

no area *area-id* **nssa [no-redistribution]** [**default-information-originate [metric] [metric-type]**] **[no-summary] [nssa-only]**

Syntax Description

area-id	Identifier for the stub area or NSSA. The identifier can be specified as either a decimal value or an IP address.
no-redistribution	(Optional) Used when the router is an NSSA Area Border Router (ABR) and you want the **redistribute** command to import routes only into the normal areas, but not into the NSSA area.
default-information- originate	(Optional) Used to generate a Type 7 default into the NSSA area. This keyword takes effect only on the NSSA ABR or the NSSA Autonomous System Boundary Router (ASBR).
metric	(Optional) Specifies the OSPF default metric.
metric-type	(Optional) Specifies the OSPF metric type for default routes.
no-summary	(Optional) Allows an area to be an NSSA but not have summary routes injected into it.
nssa-only	(Optional) Limits the default advertisement to this NSSA area by setting the propagate (P) bit in the type-7 LSA to zero.

Command Default

No NSSA area is defined.

Command Modes

Router address family topology configuration (config-router-af-topology) Router configuration (config-router)

Command History

Release	Modification
10.0	This command was introduced.

Release	Modification
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.0(1)M	This command was modified. The nssa-only keyword was added.
15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

To remove the specified area from the software configuration, use the **no area** *area-id*command (with no other keywords). That is, the **no area** *area-id* command removes all area options, including **area authentication**, **area default-cost**, **area nssa**, **area range**, **area stub**, and **area virtual-link**.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **area nssa**command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example makes area 1 an NSSA area:

```
router ospf 1
 redistribute rip subnets
 network 172.19.92.0 0.0.0.255 area 1
 area 1 nssa
```

Related Commands

Command	Description
redistribute	Redistributes routes from one routing domain into another routing domain.

area nssa translate

To configure a not-so-stubby area (NSSA) and to configure the OSPF Forwarding Address Suppression in Translated Type-5 LSAs feature, use the **area nssa translate**command in router address family topology or router configuration mode. To remove the NSSA distinction from the area, use the **no** form of this command.

area nssa translate commandarea *area-id* **nssa translate type7 [always] [suppress-fa]** [**default-information-originate** [**metric** *ospf-metric*] [**metric-type** *ospf-link-state-type*] **[nssa-only]**] **[no-ext-capability] [no-redistribution] [no-summary]**

no area *area-id* **nssa translate type7 [always] [suppress-fa]** [**default-information-originate** [**metric** *ospf-metric*] [**metric-type** *ospf-link-state-type*] **[nssa-only]**] **[no-ext-capability] [no-redistribution] [no-summary]**

Syntax Description

area-id	Identifier for the stub area or NSSA. The identifier can be specified as either a decimal value or an IP address.
translate	Translates one type of link-state advertisement (LSA) to another type of LSA. This keyword takes effect only on an NSSA Area Border Router (ABR) or an NSSA Autonomous System Boundary Router (ASBR).
type7	(Required) Translates a Type-7 LSA to a Type-5 LSA. This keyword takes effect only on an NSSA ABR or an NSSA ASBR.
always	(Optional) Configures an NSSA ABR router as a forced NSSA LSA translator. The NSSA ABR router unconditionally translates Type-7 LSAs to Type-5 LSAs. You can configure the **always** keyword only in router configuration mode, not in router address family topology configuration mode.
suppress-fa	(Optional) Suppresses the forwarding address of the Type-7 LSAs from being placed in the Type-5 LSAs. This keyword takes effect only on an NSSA ABR or an NSSA ASBR.
default-information-originate	(Optional) Used to generate a Type 7 default into the NSSA area. This keyword takes effect only on the NSSA ABR or the NSSA Autonomous System Boundary Router (ASBR).
metric	(Optional) Configures the OSPF default metric.

ospf-metric	Specifies the OSPF default metric in the range from 0 to 16777214.
metric-type	(Optional) Configures the OSPF metric type for default routes.
ospf-link-state-type	Specifies OSPF metric type in the range from 1 to 2.
nssa-only	(Optional) Limits the default advertisement to this NSSA area by setting the propagate (P) bit in the type-7 LSA to zero..
no-ext-capability	(Optional) Specifies that domain-specific capabilities are not sent to NSSA.
no-redistribution	(Optional) Specifies that the **redistribute** command will import routes only into the normal areas, not into the NSSA area. Used when the router is an NSSA ABR.
no-summary	(Optional) Allows an area to be an NSSA but not have summary routes injected into it.

Command Default

The ABRs connecting an NSSA and the backbone areas elect one of them to translate LSAs, which means that a router might be elected as translator.

Command Modes

Router address family topology configuration (config-router-af-topology) Router configuration (config-router)

Release	Modification
12.2(15)T	This command was introduced.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Release	Modification
15.1(2)S	This command was modified. Support for the **always** keyword was added.
15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

To configure the OSPF Forwarding Address Suppression in Translated Type-5 LSAs feature, configure the **translate type7 suppress-fa** keywords. Consider the following caution.

Caution Configuring the OSPF Forwarding Address Suppression in Translated Type-5 LSAs feature causes the router to be noncompliant with RFC 1587. Also, suboptimal routing might result because there might be better paths to reach the destination's forwarding address. This feature should not be configured without careful consideration and not until the network topology is understood.

If the the **no-redistribution** or **default-information-originate** keywords are used, two separate lines for the **area nssa** command appear in the configuration file for ease of readability. For example, if the **area 6 nssa translate type7 suppress-fa no-redistribution**command is configured, the following lines would appear in the configuration file:

```
router ospf 1
 area 6 nssa no-redistribution
 area 6 nssa translate type7 suppress-fa
```

Cisco IOS Release 15.1(2)S and later releases support RFC 3101 and include the **always** keyword, which allows you to configure an NSSA ABR router as a forced NSSA LSA translator. This means that the NSSA ABR router will unconditionally assume the role of LSA translator, preempting the default behavior, which would only include it among the candidates to be elected as translator.

Note Even a forced translator might not translate all LSAs; translation depends on the contents of each LSA.

You can configure the **always** keyword only in router configuration mode, not in router address family topology configuration mode.

To remove the specified area from the software configuration, use the **no area** *area-id*command (with no other keywords). That is, the **no area** *area-id* command removes all area options, such as **area authentication**, **area default-cost**, **area nssa**, **area range**, **area stub**, and **area virtual-link**.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature with this command, you you must do so in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example causes OSPF to translate Type-7 LSAs from area 1 to Type-5 LSAs, but not place the Type-7 forwarding address into the Type-5 LSAs. OSPF places 0.0.0.0 as the forwarding address in the Type-5 LSAs.

```
router ospf 2
 network 172.19.92.0 0.0.0.255 area 1
 area 1 nssa translate type7 suppress-fa
```

The following example configures an NSSA ABR as a forced LSA translator.

```
Router(config-router)# area 10 nssa translate type7 always
```

Related Commands

Command	Description
redistribute	Redistributes routes from one routing domain into another routing domain.

area virtual-link

To define an Open Shortest Path First (OSPF) virtual link, use the **area virtual-link** command in router address family topology, router configuration, or address family configuration mode. To remove a virtual link, use the **no** form of this command.

area *area-id* **virtual-link** *router-id* [**hello-interval** *seconds*] [**retransmit-interval** *seconds*] [**transmit-delay** *seconds*] [**dead-interval** *seconds*] [**ttl-security hops** *hop-count*]

no area *area-id* **virtual-link** *router-id*

Syntax Description

area-id	Area ID assigned to the virtual link. This can be either a decimal value or a valid IPv6 prefix. There is no default.
router-id	Router ID associated with the virtual link neighbor. The router ID appears in the **show ip ospf** or **show ipv6 display** command. There is no default.
hello-interval *seconds*	(Optional) Specifies the time (in seconds) between the hello packets that the Cisco IOS software sends on an interface. The hello interval is an unsigned integer value to be advertised in the hello packets. The value must be the same for all routers and access servers attached to a common network. The range is from 1 to 8192. The default is 10.
retransmit-interval *seconds*	(Optional) Specifies the time (in seconds) between link-state advertisement (LSA) retransmissions for adjacencies belonging to the interface. The retransmit interval is the expected round-trip delay between any two routers on the attached network. The value must be greater than the expected round-trip delay. The range is from 1 to 8192. The default is 5.
transmit-delay *seconds*	(Optional) Specifies the estimated time (in seconds) required to send a link-state update packet on the interface. The integer value that must be greater than zero. LSAs in the update packet have their age incremented by this amount before transmission. The range is from 1 to 8192. The default value is 1.

dead-interval *seconds*	(Optional) Specifies the time (in seconds) that hello packets are not seen before a neighbor declares the router down. The dead interval is an unsigned integer value. The default is four times the hello interval, or 40 seconds. As with the hello interval, this value must be the same for all routers and access servers attached to a common network.
ttl-security hops *hop-count*	(Optional) Configures Time-to-Live (TTL) security on a virtual link. The *hop-count* argument range is from 1 to 254.

Command Default

No OSPF virtual link is defined.

Command Modes

Router address family topology configuration (config-router-af-topology)

Router configuration (config-router)

Address family configuration (config-router-af)

Command History

Release	Modification
10.0	This command was introduced.
12.0(24)S	Support for IPv6 was added.
12.2(15)T	Support for IPv6 was added.
12.2(18)S	This command was integrated into Cisco IOS Release 12.2(18)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(33)SRC	The **ttl-security hops** *hop-count* keywords and argument were added.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.
15.2(4)S	This command was integrated into Cisco IOS Release 15.2(4)S. This command was made available in the address family configuration mode.

Release	Modification
Cisco IOS XE Release 3.7S	This command was integrated into Cisco IOS XE Release 3.7S. This command was made available in the OSPFv3 address family configuration mode.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY.

Usage Guidelines

In OSPF, all areas must be connected to a backbone area. A lost connection to the backbone can be repaired by establishing a virtual link.

The shorter the hello interval, the faster topological changes will be detected, but more routing traffic will ensue. The setting of the retransmit interval should be conservative, or needless retransmissions will result. The value should be larger for serial lines and virtual links.

You should choose a transmit delay value that considers the transmission and propagation delays for the interface.

To configure a virtual link in OSPF for IPv6, you must use a router ID instead of an address. In OSPF for IPv6, the virtual link takes the router ID rather than the IPv6 prefix of the remote router.

Use the **ttl-security hops** *hop-count* keywords and argument to enable checking of TTL values on OSPF packets from neighbors or to set TTL values sent to neighbors. This feature adds an extra layer of protection to OSPF.

Note In order for a virtual link to be properly configured, each virtual link neighbor must include the transit area ID and the corresponding virtual link neighbor router ID. To display the router ID, use the **show ip ospf** or the **show ipv6 ospf** command in privileged EXEC mode.

Note To remove the specified area from the software configuration, use the **no area** *area-id* command (with no other keywords). That is, the **no area** *area-id* command removes all area options, such as **area default-cost**, **area nssa**, **area range**, **area stub**, and **area virtual-link**.

Release 12.2(33)SRB

If you plan to configure the Multitopology Routing (MTR) feature, you need to enter the **area virtual-link** command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example establishes a virtual link with default values for all optional parameters:

```
ipv6 router ospf 1
 log-adjacency-changes
 area 1 virtual-link 192.168.255.1
```

The following example establishes a virtual link in OSPF for IPv6:

```
ipv6 router ospf 1
```

```
 log-adjacency-changes
 area 1 virtual-link 192.168.255.1 hello-interval 5
```

The following example shows how to configure TTL security for a virtual link in OSPFv3 for IPv6:

```
Device(config)# router ospfv3 1
Device(config-router)# address-family ipv6 unicast vrf vrf1
Device(config-router-af)# area 1 virtual-link 10.1.1.1 ttl-security hops 10
```

Related Commands

Command	Description
area	Configures OSPFv3 area parameters.
show ip ospf	Enables the display of general information about OSPF routing processes.
show ipv6 ospf	Enables the display of general information about OSPF routing processes.
ttl-security hops	Enables checking of TTL values on OSPF packets from neighbors or setting TTL values sent to neighbors.

capability vrf-lite

To suppress the provider edge (PE) specific checks on a router when the Open Shortest Path First (OSPF) process is associated with the VPN routing and forwarding instance (VRF), use the **capabilityvrf-lite** command in router configuration mode. To restore the checks, use the **no** form of this command.

capability vrf-lite

no capability vrf-lite

Syntax Description

This command has no arguments or keywords.

Command Default

Disabled. PE specific checks are performed if the process is associated with VRF command modes.

Command Modes

Router configuration

Command History

Release	Modification
12.0(21)ST	This command was introduced.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(8)B	This command was integrated into Cisco IOS Release 12.2(8)B.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command works only if the OSPF process is associated with the VRF.

When the OSPF process is associated with the VRF, several checks are performed when link-state advertisements (LSAs) are received. PE checks are needed to prevent loops when the PE is performing a mutual redistribution between OSPF and Border Gateway Protocol (BGP) interfaces.

The table below describes the PE checks performed when Type-3, Type-5, and Type-7 LSAs are received.

Table 1: PE Checks Performed

Type-3 LSA received	The DN bit is checked. If the DN bit is set, the Type-3 LSA is not considered during the shortest path first (SPF) calculation.
Type-5 or -7 LSA received	If the Tag in the LSA is equal to the VPN-tag, the Type-5 or-7 LSA is not considered during the SPF calculation.

In some situations, performing PE checks might not be desirable. The concept of VRFs can be used on a router that is not a PE router (that is, a router that is not running BGP). With the **capabilityvrf-lite** command, the checks can be turned off to allow correct population of the VRF routing table with routes to IP prefixes.

Examples

This example shows a router configured with multi-VRF:

```
router ospf 100 vrf grc
 capability vrf-lite
```

capability vrf-lite (OSPFv3)

To suppress the provider edge (PE)-specific checks on a router when the Open Shortest Path First version 3 (OSPFv3) process is associated with the VPN routing and forwarding (VRF) instance, use the **capability vrf-lite** command in address family configuration mode. To restore the checks, use the **no** form of this command.

capability vrf-lite

no capability vrf-lite

Syntax Description

This command has no arguments or keywords.

Command Default

Disabled. PE-specific checks are performed if the process is associated with VRF command modes.

Command Modes

Address family configuration (config-router-af)#

Command History

Release	Modification
15.2(2)S	This command was introduced.
Cisco IOS XE Release 3.6S	This command was integrated into Cisco IOS XE Release 3.6S.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY.
15.2(4)M	This command was integrated into Cisco IOS Release 15.2(4)M.
15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

This command works only if the OSPFv3 process is associated with the VRF.

When the OSPFv3 process is associated with the VRF, several checks are performed when link-state advertisements (LSAs) are received. PE checks are needed to prevent loops when the PE is performing a mutual redistribution between OSPF and Border Gateway Protocol (BGP) interfaces.

The table below describes the PE checks performed when inter-area-prefix LSAs, AS-External LSAs, or not-so-stubby area (NSSA) LSAs are received.

Table 2: PE Checks Performed

LSA Received	Check

Inter-area-prefix LSAs, AS-External LSAs or NSSA LSAs received	The down bit (DN) is checked. If the DN bit is set, the inter-area-prefix LSAs, AS-External LSAs or NSSA LSAs is not considered during the SPF calculation.
Inter-Area-Prefix-LSAs LSA received from nonbackbone area	The OSPFv3 VRF process acts as an Area Border Router (ABR) and the PE router does ABR-specific checks. Most noticeably, the router does not consider during shortest path first (SPF) calculation inter-area-prefix LSAs received from a nonbackbone (nonzero) area. The **capability vrf-lite** command disconnects the OSPFv3 process from the Multiprotocol Label Switching (MPLS) VPN super-backbone and the router loses ABR status (unless the OSPFv3 process is configured with active backbone and nonbackbone areas).

Examples

The following example shows a router in IPv6 address-family configuration mode reconfigured with multi-VRF:

```
router ospfv3 1
!
address-family ipv6 unicast vrf v2
 capability vrf-lite
exit-address-family
```

Related Commands

address-family ipv6	Enters address family configuration mode for configuring routing sessions, such as BGP, that use standard IPv6 address prefixes.
router ospfv3	Enters OSPFv3 router configuration mode for the IPv4 or IPv6 address family.

clear ip ospf

To clear redistribution based on the Open Shortest Path First (OSPF) routing process ID, use the **clear ip ospf** command in privileged EXEC mode.

clear ip ospf commandclear ip ospf [*pid*] {**process**| **redistribution**| **counters** [**neighbor** [*neighbor-interface*] [*neighbor-id*]]}

Syntax Description

pid	(Optional) Process ID.
process	Reset OSPF process.
redistribution	Clear OSPF route redistribution.
counters	OSPF counters.
neighbor	(Optional) Neighbor statistics per interface.
neighbor-interface	(Optional) Neighbor interface.
neighbor-id	(Optional) Neighbor ID.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Use the *pid*argument to clear only one OSPFprocess. If the *pid argument*is not specified,all OSPF processesare cleared.

Examples

The following example clears all OSPF processes:

```
Router# clear ip ospf process
```

compatible rfc1587

To replace RFC 3101 compatibility with RFC 1587 compatibility for route selection in not-so-stubby area (NSSA) Area Border Routers (ABRs), use the **compatible rfc1587**command in router configuration mode or address family configuration mode. To restore RFC 3101 compatibility, use the **no** form of this command.

compatible rfc1587

no compatible rfc1587

Syntax Description

This command has no arguments or keywords.

Command Default

Route selection is compatible with RFC 3101.

Command Modes

Router configuration (config-router) Address family configuration (config-router-af)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.2(4)S	This command was modified. Support for OSPFv3 was added.
Cisco IOS XE Release 3.7S	This command was integrated into Cisco IOS XE Release 3.7S.

Usage Guidelines

In Cisco IOS Release 15.1(2)S and later releases, RFC 3101 replaces RFC 1587, and RFC 3101 behavior is automatically enabled. You can choose the route selection behavior by configuring a router to run as RFC 3101 or RFC 1587 compatible.

See Appendix F of RFC3101 *The OSPF Not-So-Stubby Area (NSSA) Option* for a detailed list of differences between RFC1587 and RFC3101.

Examples

The following example specifies that the router process is compatible with RFC 1587:

```
Router> enable
Router# configure terminal
Router(config)# router ospfv3 1
Router(config-router)# compatible rfc1587
```

default-information originate (OSPF)

To generate a default external route into an Open Shortest Path First (OSPF) routing domain, use the **default-information originate** command in router configuration or router address family topology configuration mode. To disable this feature, use the **no** form of this command.

default-information originate [always] [**metric** *metric-value*] [**metric-type** *type-value*] [**route-map** *map-name*]

no default-information originate [always] [**metric** *metric-value*] [**metric-type** *type-value*] [**route-map** *map-name*]

Syntax Description

always	(Optional) Always advertises the default route regardless of whether the software has a default route. **Note** The **always** keyword includes the following exception when the route map is used. When a route map is used, the origination of the default route by OSPF is not bound to the existence of a default route in the routing table and the **always** keyword is ignored.
metric *metric-value*	(Optional) Metric used for generating the default route. If you omit a value and do not specify a value using the **default-metric** router configuration command, the default metric value is 10. The value used is specific to the protocol.
metric-type *type-value*	(Optional) External link type associated with the default route that is advertised into the OSPF routing domain. It can be one of the following values: • Type 1 external route. • Type 2 external route. The default is type 2 external route.
route-map *map-name*	(Optional) The routing process will generate the default route if the route map is satisfied.

Command Default

This command is disabled by default. No default external route is generated into the OSPF routing domain.

Command Modes

Router configuration (config-router) Router address family topology configuration (config-router-af-topology)

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Whenever you use the **redistribute** or the **default-information** router configuration command to redistribute routes into an OSPF routing domain, the Cisco IOS software automatically becomes an Autonomous System Boundary Router (ASBR). However, an ASBR does not, by default, generate a default route into the OSPF routing domain. The software must still have a default route for itself before it generates one, except when you have specified the **always** keyword.

When a route map is used, the origination of the default route by OSPF is not bound to the existence of a default route in the routing table.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **default-information originate**command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example specifies a metric of 100 for the default route that is redistributed into the OSPF routing domain and specifies an external metric type of 1:

```
router ospf 109
 redistribute eigrp 108 metric 100 subnets
 default-information originate metric 100 metric-type 1
```

Related Commands

Command	Description
default-information	Accepts exterior or default information into Enhanced Interior Gateway Routing Protocol (EIGRP) processes.
default-metric	Sets default metric values for routes.
redistribute (IP)	Redistributes routes from one routing domain into another routing domain.

default-metric (OSPF)

To set default metric values for the Open Shortest Path First (OSPF) routing protocol, use the **default-metric** command in router address family topology or router configuration mode. To r eturn to the default state, use the **no** form of this command.

default-metric *metric-value*

no default-metric *metric-value*

Syntax Description

metric-value	Default metric value appropriate for the specified routing protocol.

Command Default

Built-in, automatic metric translations, as appropriate for each routing protocol. The metric of redistributed connected and static routes is set to 0.

Command Modes

Router address family topology configuration (config-router-af-topology) Router configuration (config-router)

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

T he **default-metric** command is used in conjunction with the **redistribute** router configuration command to cause the current routing protocol to use the same metric value for all redistributed routes. A default metric helps solve the problem of redistributing routes with incompatible metrics. Whenever metrics do not convert, using a default metric provides a reasonable substitute and enables the redistribution to proceed.

Note When enabled, the **default-metric** command applies a metric value of 0 to redistributed connected routes. The **default-metric** command does not override metric values that are applied with the **redistribute** command.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **default-metric** command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example shows a router in autonomous system 109 using both the Routing Information Protocol (RIP) and the OSPF routing protocols. The example advertises OSPF-derived routes using RIP and assigns the OSPF-derived routes a RIP metric of 10.

```
router rip
 default-metric 10
 redistribute ospf 109
```

Related Commands

Command	Description
redistribute (IP)	Redistributes routes from one routing domain into another routing domain.

distance ospf

To define Open Shortest Path First (OSPF) route administrative distances based on route type, use the **distance ospf** command in router address family topology or router configuration mode. To restore the default value, use the **no** form of this command.

distance ospf commanddistance ospf {**external** *dist1*| **inter-area** *dist2*| **intra-area** *dist3*}

no distance ospf

Syntax Description

external *dist1*	(Optional) Sets the distance for routes from other routing domains, learned by redistribution. Range is 1 to 255. The default value is 110.
inter-area *dist2*	(Optional) Sets the distance for all routes from one area to another area. Range is 1 to 255. The default value is 110.
intra-area *dist3*	(Optional) Sets the distance for all routes within an area. Range is 1 to 255. The default value is 110.

Command Default

dist1 : 110

dist2 : 110

dist3 : 110

Command Modes

Router address family topology configuration (config-router-af-topology) Router configuration (config-router)

Command History

Release	Modification
11.1(14)	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

You must specify at least one of the keywords.

This command performs the same function as the **distance** command used with an access list. However, the **distance ospf**command allows you to set a distance for an entire group of routes, rather than a specific route that passes an access list.

A common reason to use the **distance ospf** command is when you have multiple OSPF processes with mutual redistribution, and you want to prefer internal routes from one over external routes from the other.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **distance ospf**command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example changes the external distance to 200, making the route less reliable:

Examples

```
router ospf 1
 redistribute ospf 2 subnet
 distance ospf external 200
!
router ospf 2
 redistribute ospf 1 subnet
 distance ospf external 200
```

Examples

```
router ospf 1
 redistribute ospf 2 subnet
 distance ospf external 200
!
router ospf 2
 redistribute ospf 1 subnet
 distance ospf external 200
```

Related Commands

Command	Description
distance (IP)	Defines an administrative distance.

domain-id (OSPFv3)

To configure the BGP/MPLS VPN domain ID, use the **domain-id** command in address-family configuration mode. To restore the default value, use the **no** form of this command.

domain-id type *type-value* **value** *hex-value*

no domain-id type *type-value* **value** *hex-value*

Syntax Description

type *type-value*	BGP extended community used to carry the domain-id.
value *hex-value*	An arbitrary 48-bit number encoded as 12 hexadecimal digits.

Command Default

The default value for the **domain-id** command is NULL.

Command Modes

address-family configuration

Command History

Release	Modification
Cisco IOS XE Release 3.6S	This command was introduced.
15.2(4)S	This command was integrated into Cisco IOS Release 15.2(4)S.
15.2(4)M	This command was integrated into Cisco IOS Release 15.2(4)M.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY .
15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

The value of the BGP extended community used to carry the domain-id can be one of 0005, 0105, 0205, or 8005. In OSPFv2, a default non-NULL domain-id is provided by using the process-id of the router instance. In OSPFv3, the default value is NULL.

ignore lsa mospf

To suppress the sending of syslog messages when the router receives link-state advertisement (LSA) Type 6 Multicast OSPF (MOSPF) packets, which are unsupported, use the **ignore lsa mospf**command in router configuration mode. To restore the sending of syslog messages, use the **no** form of this command.

ignore lsa mospf commandignore lsa mospf

no ignore lsa mospf

Syntax Description

This command has no arguments or keywords.

Command Default

This command is disabled by default. Each MOSPF packet causes the router to send a syslog message.

Command Modes

Router configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Cisco routers do not support LSA Type 6 MOSPF packets, and they generate syslog messages if they receive such packets. If the router is receiving many MOSPF packets, you might want to configure the router to ignore the packets and thus prevent a large number of syslog messages.

Examples

The following example configures the router to suppress the sending of syslog messages when it receives MOSPF packets:

```
router ospf 109
 ignore lsa mospf
```

ip ospf area

To enable Open Shortest Path First version 2 (OSPFv2) on an interface, use the **ip ospf area** command in interface configuration mode. To disable OSPFv2 on the interface, use the **no** form of this command.

ip ospf *process-id* **area** *area-id* [**secondaries none**]

no ip ospf *process-id* **area** [**secondaries none**]

Syntax Description

process-id	A decimal value in the range from 1 to 65535 that identifies the process ID.
area-id	A decimal value in the range from 0 to 4294967295, or an IP address.
secondaries none	(Optional) Prevents secondary IP addresses on the interface from being advertised.

Command Default

If the **secondaries none**keywords are entered in the **no** form of this command, the secondary IP addresses will be advertised. If the **secondaries none**keywords are not present, OSPFv2 will be disabled.

Command Modes

Interface configuration (config-if) Virtual network interface (config-if-vnet)

Command History

Release	Modification
12.0(29)S	This command was introduced.
12.3(11)T	This command was integrated into Cisco IOS Release 12.3(11)T.
12.2(1)SB	This command was integrated into Cisco IOS Release 12.2(1)SB.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
Cisco IOS XE Release 3.2S	This command was modified. Support was added for this command in virtual network interface configuration mode.
15.2(2)SNI	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.
15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

OSPF is enabled on an interface when the network address for the interface matches the range of addresses that is specified by the **network area** command that is entered in router configuration mode. You can enable OSPFv2 explicitly on an interface with the **ip ospf area** command that is entered in interface configuration mode. This capability simplifies the configuration of unnumbered interfaces with different areas.

The **ip ospf area**command that is entered in interface configuration mode will supersede the effects of the **network area**command. Therefore, an interface that is configured with the **ip ospf area** command in interface configuration mode will not be affected by the **network area**command.

Note If you later disable the **ip ospf area** command, the interface will still run OSPFv2 as long as its network address matches the range of addresses that is specified by the **network area**command.

Examples

The following example enables OSPFv2 on Ethernet interface 0/0/2 and prevents secondary IP addresses from being advertised:

```
Router(config)# interface Ethernet0/0/2
Router(config-if)# ip ospf 10 area 0 secondaries none
```

Related Commands

Command	Description
interface	Configures an interface type and enters interface configuration mode.
network area	Defines the interfaces on which OSPF runs and defines the area ID for those interfaces.
show ip ospf interface	Displays OSPF-related interface information.

ip ospf database-filter all out

To filter outgoing link-state advertisements (LSAs) to an Open Shortest Path First (OSPF) interface, use the **ip ospf database-filter all out** command in interface or virtual network interface configuration modes. To restore the forwarding of LSAs to the interface, use the **no** form of this command.

ip ospf database-filter all out [disable]

no ip ospf database-filter all out

Syntax Description

disable	(Optional) Disables the filtering of outgoing LSAs to an OSPF interface; all outgoing LSAs are flooded to the interface. **Note** This keyword is available only in virtual network interface mode.

Command Default

This command is disabled by default. All outgoing LSAs are flooded to the interface.

Command Modes

Interface configuration (config-if)

Virtual network interface (config-if-vnet)

Command History

Release	Modification
12.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 3.2S	This command was modified. The **disable** keyword was added. Support was added for this command in virtual network interface configuration mode.
15.0(1)SY	This command was modified. The **disable** keyword was added. Support was added for this command in virtual network interface configuration mode.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.

Usage Guidelines

This command performs the same function that the **neighbor database-filter** command performs on a neighbor basis.

If the **ip ospf database-filter all out** command is enabled for a virtual network and you want to disable it, use the **disable** keyword in virtual network interface configuration mode.

Examples

The following example prevents filtering of OSPF LSAs to broadcast, nonbroadcast, or point-to-point networks reachable through Ethernet interface 0:

```
interface ethernet 0
 ip ospf database-filter all out
```

Related Commands

Command	Description
neighbor database-filter	Filters outgoing LSAs to an OSPF neighbor.

ip ospf demand-circuit

To configure Open Shortest Path First (OSPF) to treat the interface as an OSPF demand circuit, use the **ip ospf demand-circuit** command in interface configuration mode or virtual network interface configuration mode. To remove the OSPF demand circuit functionality from the interface, use the **no** form of this command.

ip ospf demand-circuit[disable] [ignore]

no ip ospf demand-circuit

Syntax Description

disable	(Optional) Disables OSPF from treating the interface as an OSPF demand circuit. **Note** This keyword is available only in virtual network interface mode.
ignore	(Optional) Ignores requests from other routers to operate the link in demand-circuit mode.

Command Default

The circuit is not an OSPF demand circuit.

Command Modes

Interface configuration (config-if)

Virtual network interface (config-if-vnet)

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 3.2S	This command was modified. The **disable** and **ignore** keywords were added. Support was added for this command in virtual network interface configuration mode.
15.1(4)M	This command was integrated into Cisco IOS Release15.1(4)M.
15.0(1)SY	This command was modified. The **disable** and **ignore** keywords were added. Support was added for this command in virtual network interface configuration mode.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.

Release	Modification
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOSXE Release 3.3SG.

Usage Guidelines

On point-to-point interfaces, only one end of the demand circuit must be configured with the **ip ospf demand-circuit** command. Periodic hello messages are suppressed and periodic refreshes of link-state advertisements (LSAs) do not flood the demand circuit. This command allows the underlying data-link layer to be closed when the topology is stable. In point-to-multipoint topology, only the multipoint end must be configured with this command.

If the **ip ospf demand-circuit** command is enabled for a virtual network and you want to disable it, use the **disable** keyword in virtual network interface configuration mode.

Examples

The following example shows how to configure an OSPF demand circuit for an ISDN on-demand circuit:

```
Router# configure terminal
Router(config)# router ospf 1
Router(config-router)# network 10.0.3.0 255.255.255.0 area 0
Router(config-router)# exit
Router(config)# interface BRI0
Router(config-if)# ip ospf demand-circuit
```

The following example shows how to prevent OSPF demand circuit operation on a multipoint hub interface:

```
outer# configure terminal
Router(config)# interface Dialer0
Router(config-if)# ip ospf network point-to-multipoint
Router(config-if)# ip ospf demand-circuit ignore
```

Related Commands

Command	Description
ip ospf network point-to-multipoint	Configures the OSPF network type to point-to-multipoint.
network area	Defines the OSPF interfaces and area ID.
router ospf	Configures the OSPF routing process.
show ip ospf	Displays information about OSPF routing processes.

ip ospf flood-reduction

To suppress the unnecessary flooding of link-state advertisements (LSAs) in stable topologies, use the **ip ospf flood-reduction** command in interface configuration mode. To disable this feature, use the **no** form of this command.

ip ospf flood-reductionflood-reduction [disable]

no ip ospf flood-reduction

Syntax Description

disable	(Optional) Disables the suppressing of unnecessary flooding of LSAs in stable topologies. **Note** This keyword is available only in virtual network interface mode.

Command Default

This command is disabled by default.

Command Modes

Interface configuration (config-if)

Virtual network interface (config-if-vnet)

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 3.2S	This command was modified. The **disable** keyword was added. Support was added for this command in virtual network interface configuration mode.
15.0(1)SY	This command was modified. The **disable** keyword was added. Support was added for this command in virtual network interface configuration mode.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.

Usage Guidelines

All routers supporting the Open Shortest Path First (OSPF) demand circuit are compatible and can interact with routers supporting flooding reduction.

If the **ip ospf flood-reduction** command is enabled for a virtual network and you want to disable it, use the **disable** keyword in virtual network interface configuration mode.

Examples

The following example suppresses the flooding of unnecessary LSAs on serial interface 0:

```
interface serial 0
 ip ospf flood-reduction
```

Related Commands

Command	Description
show ip ospf interface	Displays OSPF-related interface information.
show ip ospf neighbor	Displays OSPF-neighbor information on a per-interface basis.

ip ospf name-lookup

To configure Open Shortest Path First (OSPF) to look up Domain Name System (DNS) names for use in all OSPF **show** EXEC command displays, use the **ip ospf name-lookup** command in global configuration mode. To disable this function, use the **no** form of this command.

ip ospf name-lookup

noipospfname-lookup

Syntax Description

This command has no arguments or keywords.

Command Default

This command is disabled by default.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command makes it easier to identify a router because the router is displayed by name rather than by its router ID or neighbor ID.

Examples

The following example configures OSPF to look up DNS names for use in all OSPF **show** EXEC command displays:

```
ip ospf name-lookup
```

ip ospf network

To configure the Open Shortest Path First (OSPF) network type to a type other than the default for a given medium, use the **ip ospf network** command in interface configuration mode. To return to the default value, use the **no** form of this command.

ip ospf network{**broadcast**| **non-broadcast**| {**point-to-multipoint [non-broadcast]**| **point-to-point**}}

no ip ospf network

Syntax Description

broadcast	Sets the network type to broadcast.
non-broadcast	Sets the network type to nonbroadcast multiaccess (NBMA).
point-to-multipoint non-broadcast	Sets the network type to point-to-multipoint. The optional **non-broadcast** keyword sets the point-to-multipoint network to be nonbroadcast. If you use the **non-broadcast** keyword, the **neighbor** command is required.
point-to-point	Sets the network type to point-to-point.

Command Default

Depends on the network type.

Command Modes

Interface configuration (config-if) Virtual network interface (config-if-vnet)

Command History

Release	Modification
10.0	This command was introduced.
10.3	The **point-to-multipoint** keyword was added.
11.3AA	The **non-broadcast** keyword used with the **point-to-multipoint** keyword was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 3.2S	This command was modified. Support was added for this command in virtual network interface configuration mode.

Usage Guidelines

Using this feature, you can configure broadcast networks as NBMA networks when, for example, routers in your network do not support multicast addressing. You can also configure nonbroadcast multiaccess networks (such as X.25, Frame Relay, and Switched Multimegabit Data Service (SMDS)) as broadcast networks. This feature saves you from needing to configure neighbors.

Configuring NBMA networks as either broadcast or nonbroadcast assumes that there are virtual circuits from every router to every router or fully meshed networks. However, there are other configurations where this assumption is not true. For example, a partially meshed network. In these cases, you can configure the OSPF network type as a point-to-multipoint network. Routing between two routers that are not directly connected will go through the router that has virtual circuits to both routers. You need not configure neighbors when using this feature.

If this command is issued on an interface that does not allow it, this command will be ignored.

OSPF has two features related to point-to-multipoint networks. One feature applies to broadcast networks; the other feature applies to nonbroadcast networks:

- On point-to-multipoint, broadcast networks, you can use the **neighbor** command, and you must specify a cost to that neighbor.
- On point-to-multipoint, nonbroadcast networks, you must use the **neighbor** command to identify neighbors. Assigning a cost to a neighbor is optional.

Examples

The following example sets your OSPF network as a broadcast network:

```
interface serial 0
 ip address 192.168.77.17 255.255.255.0
 ip ospf network broadcast
 encapsulation frame-relay
```

The following example illustrates a point-to-multipoint network with broadcast:

```
interface serial 0
 ip address 10.0.1.1 255.255.255.0
 encapsulation frame-relay
 ip ospf cost 100
 ip ospf network point-to-multipoint
 frame-relay map ip 10.0.1.3 202 broadcast
 frame-relay map ip 10.0.1.4 203 broadcast
 frame-relay map ip 10.0.1.5 204 broadcast
 frame-relay local-dlci 200
!
router ospf 1
 network 10.0.1.0 0.0.0.255 area 0
 neighbor 10.0.1.5 cost 5
 neighbor 10.0.1.4 cost 10
```

Related Commands

Command	Description
frame-relay map	Defines mapping between a destination protocol address and the DLCI used to connect to the destination address.

Command	Description
neighbor (OSPF)	Configures OSPF routers interconnecting to nonbroadcast networks.
x25 map	Sets up the LAN protocols-to-remote host mapping.

limit retransmissions

To modify the number of retransmissions of database exchange and update packets for both demand and non-demand circuits, use the **limit retransmissions** command in router configuration mode. To reset the maximum number of retransmissions back to the default value of 24, use the **no** form of this command.

limit retransmission {**dc** | {*max-retransmissions* **| disable**}| [**non-dc**]**| non-dc** | {*max-retransmissions* **| disable**}| [**dc**]}

no limit transmissions [**dc| non-dc**]

Syntax Description

dc	Demand circuit retransmissions.
max-retransmissions	Maximum number of retransmissions. Range from 1 to 255.
non-dc	Nondemand circuit retransmissions.
disable	Disables or removes the limit to the number of retransmissions.

Command Default

Maximum number of retransmissions is 24.

Command Modes

Router configuration (config-router)#

Address family configuration (config-router-af)#

Command History

Release	Modification
12.2(11)T	This command was introduced.
Cisco IOS XE 3.7S	This command was modified. This command was implemented on the Cisco ASR 1006 Series Device. This command is now supported in address-family configuration mode.
Cisco IOS Release 15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

There is a limit to the number of retransmissions of database exchange and update packets for both demand and nondemand circuits. The retransmission of these packets stops once this retry limit is reached, thus preventing unnecessary use of the link in continual retransmission of the packets if, for some reason, a neighbor is not responding during adjacency forming. The limit for both demand circuit and nondemand circuit retransmissions is 24.

The limit-retransmissions command allows you to either remove (disable) the limit or change the maximum number of retransmissions to be a number from 1 to 255. The configuration of this command provides for backward compatibility for previous or other releases of Cisco IOS Software or other routers that do not have this feature.

The limit to the number of retransmissions does not apply for update packets on nonbroadcast multiaccess (NBMA) point-to-multipoint direct circuits. In this situation, the dead timer is used to end communication with nonresponding neighbors and thus stop the retransmissions.

Note This command can be used in the router configuration mode and address-family mode. The command is also applicable for both OSPF and OSPFv3 protocols.

Examples

The following example shows how to set the maximum number of demand circuit retransmissions to 10 in the router configuration mode:

```
Device> enable
Device# configure terminal
Device(config)# router {ospf|ospfv3} 11
Device(config-router)# limit retransmissions dc 10
```

The following example shows how to set the maximum number of demand circuit retransmissions to 10 in the address-family configuration mode:

```
Device> enable
Device# configure terminal
Device(config)# router {ospf|ospfv3} 11
Device(config-router)# address-family ipv4 unicast
Device(config-router-af)# limit retransmissions dc 10
```

The following example shows how to remove the limit for the number of demand circuit retransmissions:

```
Device> enable
Device# configure terminal
Device(config)# router {ospf|ospfv3} 11
Device(config-router)# limit retransmissions dc disable
```

The following example shows how to set the maximum number of demand circuit retransmissions to 10 and to set the maximum number of nondemand circuit retransmissions to 20:

```
Device> enable
Device# configure terminal
Device(config)# router {ospf|ospfv3} 11
Device(config-router)# limit retransmissions dc 10 non-dc 20
```

The following example shows how to set the maximum number of demand circuit retransmissions to 10, and to remove the limit for the number of nondemand circuit retransmissions:

```
Device> enable
Device# configure terminal
Device(config)# router {ospf|ospfv3} 11
Device(config-router)# limit retransmissions dc 10 non-dc disable
```

The following example shows how to reset both the demand circuit and nondemand circuit maximum number of retransmissions back to the default of 24:

```
Device> enable
Device# configure terminal
Device(config)# router {ospf|ospfv3} 11
Device(config-router)# no limit retransmissions
```

Related Commands

Command	Description
router ospf	Configures an OSPF routing process.
address-family	Enters IPv4 or IPv6 address family configuration mode for OSPFv3.

log-adjacency-changes

To configure the router to send a syslog message when an Open Shortest Path First (OSPF) neighbor goes up or down, use the **log-adjacency-changes** command in router configuration mode. To turn off this function, use the **no** form of this command.

log-adjacency-changes [detail]

no log-adjacency-changes [detail]

Syntax Description

detail	(Optional) Sends a syslog message for each state change, not just when a neighbor goes up or down.

Command Default

Enabled

Command Modes

Router configuration (config-router)

Command History

Release	Modification
11.2	This command was introduced as **ospf log-adjacency-changes**.
12.1	The **ospf** keyword was omitted and the **detail** keyword was added.
12.2(15)T	Support for IPv6 was added.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.1(2)S	This command was integrated into Cisco IOS Release 15.1(2)S.

Usage Guidelines

This command allows you to know about OSPF neighbors going up or down without turning on the **debug ip ospf packet**command or the **debug ipv6 ospf adjacency** command. The **log-adjacency-changes** command provides a higher level view of those changes of the peer relationship with less output than the **debug** command provides. The **log-adjacency-changes** command is on by default but only up/down (full/down) events are reported, unless the **detail** keyword is also used.

Examples

The following example configures the router to send a syslog message when an OSPF neighbor state changes:

```
log-adjacency-changes detail
```

Related Commands

Command	Description
debug ip ospf packet	Displays information about each OSPF packet received for IPv4.
debug ipv6 ospf	Displays debugging information for OSPF for IPv6.

max-lsa

To limit the number of nonself-generated link-state advertisements (LSAs) that an Open Shortest Path First (OSPF) routing process can keep in the OSPF link-state database (LSDB), use the **max-lsa** command in router configuration mode. To remove the limit of non self-generated LSAs that an OSPF routing process can keep in the OSPF LSDB, use the **no** form of this command.

max-lsa *maximum-number* [*threshold-percentage*] **[warning-only]** [**ignore-time** *minutes*] [**ignore-count** *count-number*] [**reset-time** *minutes*]

no max-lsa *maximum-number* [*threshold-percentage*] **[warning-only]** [**ignore-time** *minutes*] [**ignore-count** *count-number*] [**reset-time** *minutes*]

Syntax Description

maximum-number	Maximum number of nonself-generated LSAs the OSPF process can keep in the OSPF LSBD.
threshold-percentage	(Optional) The percentage of the maximum LSA number, as specified by the *maximum-number* argument, at which a warning message is logged. The default is 75 percent.
warning-only	(Optional) Specifies that only a warning message is sent when the maximum limit for LSAs is exceeded. Disabled by default.
ignore-time *minutes*	(Optional) Specifies the time, in minutes, to ignore all neighbors after the maximum limit of LSAs has been exceeded. The default is 5 minutes.
ignore-count *count-number*	(Optional) Specifies the number of times the OSPF process can consecutively be placed into the ignore state. The default is 5 times.
reset-time *minutes*	(Optional) Specifies the time, in minutes, after which the ignore count is reset to zero. The default is 10 minutes.

Command Default

The number of nonself-generated LSAs that an OSPF routing process can keep in the OSPF LSDB is not limited.

threshold-percentage : 75 percent**warning-only** warning message: disabled**ignore-time** *minutes*: 5 minutes**ignore-count** *count-number*:5 times**reset-time** *minutes*: *10 minutes*

Command Modes

Router configuration

Command History

Release	Modification
12.0(27)S	This command was introduced.
12.3(7)T	This command was integrated into Cisco IOS Release 12.3(7)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

To prevent the OSPF process from endlessly changing from the normal state of operation to the ignore state as a result of the LSA count exceeding the maximum configured number immediately after it returns from the ignore state to the normal state of operation, the OSPF process keeps a counter on how many times the process went into the ignore state. This counter is called the ignore count. If the ignore count exceeds the maximum number of LSAs that is specified by the **ignore-count** keyword and *counter-number* argument, the OSPF process remains in the ignore state permanently. To return the OSPF process to the state of normal operation, enter the **clear ip ospf** command.

If the router is placed into a permanent ignore state, we recommend that you identify and correct the cause of the problem involving the router that is generating the LSAs, or, if possible, increase the limit that has been configured by the **max-lsa** command before you try to bring the router back into normal operation.

If the router that has generated large numbers of LSAs is not reachable, these LSAs cannot be removed from the OSPF area and domain. As a result, any other router leaving the ignore state and returning to normal operation may reach the ignore state again. We recommend that you take one of the following actions in order to bring the router back into the network:

- Temporarily increase the LSA limit to account for the stale LSAs.
- Wait until the stale LSAs are removed as a result of reaching their maximum age.
- Make sure that the router that has generated the large number of LSAs is connected to the network and is no longer generating large numbers of LSAs.

When the **warning-only** keyword is used, the OSPF process never enters the ignore state. When the LSA count exceeds the maximum limit that is specified by the *maximum-number* argument, only an error message is logged and the OSPF process continues in its normal operation.

When the **max-lsa** command is entered for the first time or when any of the parameters of the command are changed, the OSPF process undergoes a soft-reset procedure.

Examples

The following example sets a limit of 12,000 LSAs that can be received before the OSPF process enters the ignore state:

```
Router(config)# router ospf 100
Router(config-router)# router-id 209.165.201.0
```

```
Router(config-router)# log-adjacency-changes
Router(config-router)# max-lsa 12000
Router(config-router)# network 209.165.201.1 255.255.255.255
```

In the following example, an OSPF process has remained in the ignore state permanently. When the **clear ip ospf** command is entered the OSPF process returns to the state of normal operation and clears redistribution based on the OSPF routing process ID.

```
Router(config-router)# clear ip ospf 100 process
```

Related Commands

Command	Description
clear ip ospf	Clears redistribution based on the OSPF routing process ID.

max-metric router-lsa

To configure a router that is running the Open Shortest Path First (OSPF) protocol to advertise a maximum metric so that other routers do not prefer the router as an intermediate hop in their shortest path first (SPF) calculations, use the **max-metric router-lsa**command in router address family topology or router configuration mode. To disable the advertisement of a maximum metric, use the **no** form of this command.

max-metric router-lsa [**external-lsa** [*max-metric-value*]] **[include-stub]** [**on-startup** {*seconds*| **wait-for-bgp**}] [**summary-lsa** [*max-metric-value*]]

no max-metric router-lsa [**external-lsa** [*max-metric-value*]] **[include-stub]** [**on-startup** {*seconds*| **wait-for-bgp**}] [**summary-lsa** [*max-metric-value*]]

Syntax Description

external-lsa	(Optional) Configures the router to override the external LSA metric with the maximum metric value.
max-metric-value	(Optional) Maximum metric value for LSAs. The configurable range is from 1 to 16777215. The default value is 16711680.
include-stub	(Optional) Configures the router to advertise the maximum metric for stub links in router LSAs.
on-startup	(Optional) Configures the router to advertise a maximum metric at startup.
seconds	(Optional) Maximum metric value for the specified time interval. The configurable range is from 5 to 86400 seconds. There is no default timer value for this configuration option.
wait-for-bgp	(Optional) Configures the router to advertise a maximum metric until Border Gateway Protocol (BGP) routing tables have converged or the default timer has expired. The default timer is 600 seconds.
summary-lsa	(Optional) Configures the router to override the summary LSA metric with the maximum metric value.

Command Default

Router link-state advertisements (LSAs) are originated with normal link metrics.

Command Modes

Router address family topology configuration (config-router-af-topology) Router configuration (config-router)

Command History

Release	Modification
12.0(15)S	This command was introduced.
12.0(16)ST	This command was integrated into Cisco IOS Release 12.0(16)ST.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.4(10)	The **include-stub**, **summary-lsa**,and **external-lsa** keywords and the *max-metric-value* argument were made available under router configuration mode.
12.4(11)T	The **include-stub**, **summary-lsa**,and **external-lsa** keywords and the *max-metric-value* argument were made available under router configuration mode.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(31)SB2	The **include-stub**, **summary-lsa**,and **external-lsa** keywords and the *max-metric-value* argument were made available under router configuration mode.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode. The **include-stub**, **summary-lsa**,and **external-lsa** keywords and the *max-metric-value* argument were made available under router configuration mode.
15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

Enabling the max-metric router-lsa command will cause a router to originate LSAs with a maximum metric (LSInfinity: 0xFFFF) through all nonstub links, which allows BGP routing tables to converge without attracting transit traffic (if there are not alternate lower cost paths around the router). The router will advertise accurate (normal) metrics after the configured or default timers expire or after BGP sends a notification that routing tables have converged.

Note Directly connected links in a stub network are not affected by the configuration of a maximum or infinite metric because the cost of a stub link is always set to the output interface cost.

The max-metric router-lsa command is useful in the following situations:

- Reloading a router. After a router is reloaded, Interior Gateway Protocols (IGPs) converge very quickly, and other routers may try to forward traffic through the newly reloaded router. If the router is still building BGP routing tables, packets destined for other networks that the router has not learned through BGP may be dropped. In the case of an Internet backbone router, a large number of packets may be dropped.

- Introducing a router into a network without routing traffic through it. You may want to connect a router to an OSPF network but not want real traffic flowing through the router if there are better alternate paths. If there are no alternate paths, this router would still accept transit traffic as before.
- Gracefully removing a router from a network. This feature allows you to gracefully remove a router from the network by advertising a maximum metric through all links, which allows other routers to select alternate paths for transit traffic to follow before the router is shut down.

Note You should not save the running configuration of a router when it is configured for a graceful shutdown because the router will continue to advertise a maximum metric after it is reloaded.

Note In older OSPF implementations (RFC 1247 and earlier implementations), the router link costs in received LSAs with a metric of LSInfinity are not used during SPF calculations, which means that no transit traffic will be sent to the routers that originate these LSAs.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **max-metric router-lsa**command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example configures a router that is running OSPF to advertise a maximum metric for 100 seconds:

```
Router(config)# router ospf 100
Router(config-router)# max-metric router-lsa on-startup 100
```

The following example configures a router to advertise a maximum metric until BGP routing tables converge or until the default timer expires (600 seconds):

```
Router(config)# router ospf 100
Router(config-router)# max-metric router-lsa on-startup wait-for-bgp
```

The following example configures a router that is running OSPF to advertise a maximum metric, which causes neighbor routers to select alternate paths for transit traffic before the router shuts down:

```
Router(config)# router ospf 100
Router(config-router)# max-metric router-lsa
Router(config-router)# end
```

The following example configures stub links to be advertised with the maximum-metric in routers LSAs.

```
Router(config)# router ospf 1
Router(config-router)# router-id 10.1.1.1
Router(config-router)# max-metric router-lsa include-stub
Router(config-router)# end
```

Entering the **show ip ospf max-metric**command with the **include-stub** keyword displays output that confirms that stub links are advertised with the maximum metric.

```
Router# show ip ospf max-metric
Routing Process “ospf 1” with ID 10.1.1.1
 Start time: 00:00:03.524, Time elapsed: 01:02:28.292
 Originating router-LSAs with maximum metric
    Condition: always, State: active
    Advertise stub links with maximum metric in router-LSAs
```

Related Commands

Command	Description
show ip ospf	Displays general information about OSPF routing processes.
show ip ospf database	Displays lists of information related to the OSPF database for a specific router.

neighbor (OSPF)

To configure Open Shortest Path First (OSPF) routers interconnecting to nonbroadcast networks, use the **neighbor** command in router address family topology or router configuration mode. To remove a configuration, use the **no** form of this command.

neighbor *ip-address* [**priority** *number*] [**poll-interval** *seconds*] [**cost** *number*] [**database-filter all**]

no neighbor *ip-address* [**priority** *number*] [**poll-interval** *seconds*] [**cost** *number*] [**database-filter all**]

Syntax Description

ip-address	Interface IP address of the neighbor.
priority *number*	(Optional) A number that indicates the router priority value of the nonbroadcast neighbor associated with the IP address specified.The default is 0. This keyword does not apply to point-to-multipoint interfaces.
poll-interval *seconds*	(Optional) A number value that represents the poll interval time (in seconds). RFC 1247 recommends that this value be much larger than the hello interval. The default is 120 seconds (2 minutes). This keyword does not apply to point-to-multipoint interfaces. The range is from 0 to 4294967295 seconds.
cost *number*	(Optional) Assigns a cost to the neighbor, in the form of an integer from 1 to 65535. Neighbors with no specific cost configured will assume the cost of the interface, based on the **ip ospf cost**command. For point-to-multipoint interfaces, the cost keyword and the number argument are the only options that are applicable. This keyword does not apply to nonbroadcast multiaccess (NBMA) networks.
database-filter all	(Optional) Filters outgoing link-state advertisements (LSAs) to an OSPF neighbor.

Command Default

This command is disabled by default. No configuration is specified.

Command Modes

Router address family topology configuration (config-router-af-topology) Router configuration (config-router)

Command History

Release	Modification
10.0	This command was introduced.

Release	Modification
11.3AA	The **cost** keyword was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family topology configuration mode.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.1(2)SNG	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

X.25 and Frame Relay provide an optional broadcast capability that can be configured in the map to allow OSPF to run as a broadcast network. At the OSPF level you can configure the router as a broadcast network. Refer to the **x25 map** and **frame-relay map** commands in the "X.25 Commands" and "Frame Relay Commands" chapters, respectively, in the *Cisco IOSWide-Area Networking Command Reference*for more detail.

One neighbor entry must be included in the Cisco IOS software configuration for each known nonbroadcast network neighbor. The neighbor address must be on the primary address of the interface.

If a neighboring router has become inactive (hello packets have not been received for the Router Dead Interval period), it may still be necessary to send hello packets to the dead neighbor. These hello packets will be sent at a reduced rate called *Poll Interval*.

When the router first starts up, it sends only hello packets to those routers with nonzero priority, that is, routers that are eligible to become designated routers (DRs) and backup designated routers (BDRs). After the DR and BDR are selected, DR and BDR will then start sending hello packets to all neighbors in order to form adjacencies.

Note You cannot use the **neighbor (OSPF)** command to specify an Open Shortest Path First (OSPF) neighbor on non-broadcast networks within an OSPF Virtual Private Network (VPN) routing instance.

Prior to Cisco IOS Release 12.0, the **neighbor** command applied to NBMA networks only. With Release 12.0, the **neighbor** command applies to NBMA networks and point-to-multipoint networks. On NBMA networks, the **cost** keyword is not accepted.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **neighbor**command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example declares a router at address 192.168.3.4 on a nonbroadcast network, with a priority of 1 and a poll interval of 180 seconds:

```
router ospf
 neighbor 192.168.3.4 priority 1 poll-interval 180
```

The following example illustrates a point-to-multipoint network with nonbroadcast:

```
interface Serial0
ip address 10.0.1.1 255.255.255.0
ip ospf network point-to-multipoint non-broadcast
encapsulation frame-relay
no keepalive
frame-relay local-dlci 200
frame-relay map ip 10.0.1.3 202
frame-relay map ip 10.0.1.4 203
frame-relay map ip 10.0.1.5 204
no shut
!
router ospf 1
network 10.0.1.0 0.0.0.255 area 0
neighbor 10.0.1.3 cost 5
neighbor 10.0.1.4 cost 10
neighbor 10.0.1.5 cost 15
```

Related Commands

Command	Description
ip ospf priority	Sets the router priority, which helps determine the designated router for this network.

network area

To define the interfaces on which Open Shortest Path First (OSPF) runs and to define the area ID for those interfaces, use the **network area** command in router configuration mode. To disable OSPF routing for interfaces defined with the *ip-address wildcard-mask*pair, use the **no** form of this command.

network *ip-address wildcard-mask* **area** *area-id*

no network *ip-address wildcard-mask* **area** *area-id*

Syntax Description

ip-address	IP address.
wildcard-mask	IP-address-type mask that includes “don’t care” bits.
area-id	Area that is to be associated with the OSPF address range. It can be specified as either a decimal value or as an IP address. If you intend to associate areas with IP subnets, you can specify a subnet address as the value of the *area-id argument*.

Command Default

This command is disabled by default.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.2(2)SNI	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

The ip-address and wildcard-mask arguments together allow you to define one or multiple interfaces to be associated with a specific OSPF area using a single command. Using the *wildcard-mask* argument allows you to define one or multiple interfaces to be associated with a specific OSPF area using a single command. If you intend to associate areas with IP subnets, you can specify a subnet address as the value of the *area-id*argument.

For OSPF to operate on the interface, the primary address of the interface must be covered by the **network area**command. If the **network area**command covers only the secondary address, it will not enable OSPF over that interface.

The Cisco IOS software sequentially evaluates the *ip-address wildcard-mask* pair for each interface as follows:

1. The *wildcard-mask*argument is logically ORed with the interface IP address.
2. The *wildcard-mask*argument is logically ORed with the ip-*address*argument in the **network** command.
3. The software compares the two resulting values. If they match, OSPF is enabled on the associated interface and this interface is attached to the OSPF area specified.

There is no limit to the number of **network area** commands you can use on the router.

Note Any individual interface can only be attached to a single area. If the address ranges specified for different areas overlap, the software will adopt the first area in the **network** command list and ignore the subsequent overlapping portions. In general, we recommend that you configure address ranges that do not overlap in order to avoid inadvertent conflicts.

When a more specific OSPF network range is removed, interfaces belonging to that network range will be retained and remain active if and only if a less specific network range exists.

For example, consider the following configuration:

```
router ospf 1
 network 192.168.129.16 0.0.0.3 area 20
 network 192.168.129.40 0.0.0.3 area 20
 network 192.168.129.44 0.0.0.3 area 20
 network 192.168.129.96 0.0.0.3 area 20
 network 192.168.128.0  0.0.127.255 area 20
!
```

Enter the following:

```
no network 192.168.129.40 0.0.0.3 area 20
```

Interfaces falling into the network range 192.168.129.40/0.0.0.3 will still remain active because the superset, 192.168.128.0/0.0.127.255, exists for area 20. A more specific network statement will cause interfaces belonging to that range to be removed from a different area only if a less specific network statement (superset) exists.

Consider a configuration such as the following:

```
!
router ospf 1
 network 192.168.128.0 0.0.127.255 area 20
!
```

If the following network statement is entered:

```
network 192.168.129.96 0.0.0.3 area 40
```

then interfaces belonging to range 192.168.129.96/0.0.0.3, if any, are removed from area 20 and moved to area 40. Network statements with identical ranges but with different area IDs are considered as area changes. For example, the following network statements will cause interfaces belonging to network range 192.168.129.40/0.0.0.3 to move from area 20 to area 40:

```
network 192.168.129.40 0.0.0.3 area 20
network 192.168.129.40 0.0.0.3 area 40
```

Examples

The following partial example initializes OSPF routing process 109, and defines four OSPF areas: 10.9.50.0, 2, 3, and 0. Areas 10.9.50.0, 2, and 3 mask specific address ranges, and area 0 enables OSPF for all other networks.

```
interface ethernet 0
 ip address 10.108.20.1 255.255.255.0
router ospf 109
 network 10.108.20.0 0.0.0.255 area 10.9.50.0
 network 10.108.0.0 0.0.255.255 area 2
 network 10.109.10.0 0.0.0.255 area 3
 network 0.0.0.0 255.255.255.255 area 0
```

Related Commands

Command	Description
router ospf	Configures an OSPF routing process.

nsf cisco helper disable

To disable Cisco nonstop forwarding (NSF) helper mode on a Cisco router that is running Open Shortest Path First (OSPF), use the **nsf cisco helper disable**command in router configuration mode. To reenable Cisco NSF helper mode, use the **no** form of this command.

nsf cisco helper disable

no nsf cisco helper disable

Syntax Description

This command has no arguments or keywords.

Command Default

This command is enabled by default; therefore, NSF helper mode is disabled on a Cisco router that is running OSPF.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.0(32)S	This command was introduced.
12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.
Cisco IOS XE Release 2.6	This command was integrated into Cisco IOS XE Release 2.6

Usage Guidelines

When a router in an OSPF process has NSF enabled, the router is said to be NSF-capable and will operate in graceful restart mode--the OSPF router process performs nonstop forwarding recovery due to a Route Processor (RP) switchover. By default, the neighboring routers of the NSF-capable router will be NSF-aware and will operate in NSF helper mode. When the NSF-capable router is performing graceful restart, the helper routers assist in the nonstop forwarding recovery process. If you do not want the router to help the restarting neighbor with nonstop forwarding recovery, enter the **nsf cisco helper disable** command.

Examples

The following example disables NSF helper mode for the Cisco router on OSPF process 3:

```
router ospf 3
 nsf cisco helper disable
```

Related Commands

Command	Description
nsf cisco	Enables Cisco NSF on a Cisco router.
nsf ietf	Enables IETF nonstop forwarding operations on a router that is running OSPF.
nsf ietf helper disable	Disables IETF NSF helper mode on a router.
nsf ietf helper strict-lsa-checking	Enables strict LSA checking on a router.

nsf ietf helper disable

To disable Internet Engineering Task Force (IETF) nonstop forwarding (NSF) helper mode on a router that is running Open Shortest Path First (OSPF), use the **nsf ietf helper disable**command in router configuration mode. To reenable IETF NSF helper mode, use the **no** form of this command.

nsf ietf helper disable

no nsf ietf helper disable

Syntax Description

This command has no arguments or keywords.

Command Default

This command is disabled by default; therefore, IETF NSF helper mode is enabled on a router that is running OSPF.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.0(32)S	This command was introduced.
12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.
Cisco IOS XE Release 2.6	This command was integrated into Cisco IOS XE Release 2.6

Usage Guidelines

When a router in an OSPF process has NSF enabled, the router is said to be NSF-capable and will operate in graceful restart mode--the OSPF router process performs nonstop forwarding recovery due to a Route Processor (RP) switchover. By default, the neighboring routers of the NSF-capable router will be NSF-aware and will operate in NSF helper mode. When the NSF-capable router is performing graceful restart, the helper routers assist in the nonstop forwarding recovery process. If you do not want the router to help the restarting neighbor with nonstop forwarding recovery, enter the **nsf ietf helper disable** command.

Examples

The following example disables IETF NSF helper mode on a router on OSPF process 4:

```
router ospf 4
 nsf ietf helper disable
```

Related Commands

Command	Description
nsf cisco	Enables Cisco NSF on a router.
nsf cisco helper disable	Disables Cisco NSF helper mode on a router.
nsf ietf	Enables IETF nonstop forwarding operations on a router that is running OSPF.
nsf ietf helper strict-lsa-checking	Enables strict LSA checking on a router.

nsr

To enable nonstop routing (NSR) operations on a router that is running Open Shortest Path First (OSPF), use the **nsr**command in router configuration mode. To disable NSR and return to the default, use the **no** form of this command.

nsr

no nsr

Syntax Description

This command has no arguments or keywords.

Command Default

NSR is disabled.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
15.1(2)S	This command was introduced.
Cisco IOS XE Release 3.3S	This command was integrated into Cisco IOS XE Release 3.3S.
15.1(2)SY	This command was integrated into Cisco IOS Release 15.1(2)SY.
15.2(1)E	This command was integrated into Cisco IOS Release 15.2(1)E.

Usage Guidelines

This command enables NSR on an OSPF router. With NSR enabled, a router with redundant Route Processors (RPs) is allowed to maintain its OSPF state and adjacencies across planned and RP switchovers. It does this by checkpointing state information from OSPF on the active RP to the standby RP. Later, following a switchover to the standby RP, OSPF can use this checkpointed information to continue operation without interruption.

This command is present only in images for platforms that have a hardware or software redundancy capability.

Examples

The following example enables NSR on an OSPF router:

```
Router> enable
Router# configure terminal
Router(config)# router ospf 1
Router(config-router)# nsr
```

Related Commands

Command	Description
show ip ospf nsr	Displays OSPF NSR status information.

redistribute maximum-prefix

To limit the number of prefixes redistributed into Open Shortest Path First (OSPF) or to generate a warning when the number of prefixes redistributed into OSPF reaches a maximum, use the **redistribute maximum-prefix**command in router configuration mode. To remove the values, use the **no** form of this command.

redistribute maximum-prefix *maximum* [*percentage*] [**warning-only**| **withdraw**]

no redistribute maximum-prefix

Syntax Description

maximum	Integer from 1 to 4294967295 that specifies the maximum number of IP prefixes that can be redistributed into OSPF. When the **warning-only**keyword is configured, the *maximum* value specifies the number of prefixes that can be redistributed into OSPF before the system logs a warning message. Redistribution is not limited. The maximum number of IP prefixes that are allowed to be redistributed into OSPF, or the number of prefixes allowed to be redistributed into OSPF before the system logs a warning message, depends on whether the **warning-only**keyword is present. • There is no default value for the *maximum* argument. • If the **warning-only**keyword is also configured, this value does not limit redistribution; it is simply the number of redistributed prefixes that, when reached, causes a warning message to be logged.
percentage	(Optional) Integer from 1 to 100 that specifies the threshold value, as a percentage, at which a warning message should be generated. • The *percentage* default is 75.
warning-only	(Optional) Causes a warning message to be logged when the number of prefixes defined by the *maximum*argumenthas been exceeded. Additional redistribution is not prevented.

withdraw	(Optional) Prevents additional redistribution when the number of prefixes defined by the *maximum*argumenthas been exceeded. Also, IS-IS rebuilds link-state PDUs (LSPs) without the external (redistributed) IP prefixes.

Command Default

The percentage default is 75.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.0(25)S	This command was introduced.
12.2(18)S	This command was integrated into Cisco IOS Release 12.2(18)S.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
Cisco IOS XE Release 2.1	This command was introduced on Cisco ASR 1000 Series Aggregation Services Routers.

Usage Guidelines

If someone mistakenly injects a large number of IP prefixes into IS-IS, perhaps by redistributing Border Gateway Protocol (BGP) into IS-IS, the network can be severely flooded. Limiting the number of redistributed prefixes prevents this potential problem.

When the **redistribute maximum-prefix** command is configured and the number of redistributed prefixes reaches the maximum value configured, no more prefixes will be redistributed (unless the **warning-only** keyword was configured).

The redistribution limit applies only to external IP prefixes. Default prefixes and summarized prefixes are not limited.

The limit is tracked separately for each not-so-stubby-area (NSSA) because redistribution to NSSAs is done independently for each NSSA and independently of all other regular areas.

Select a *maximum* value based on your knowledge of how many prefixes are redistributed on the router to the OSPF process.

Examples

Examples

The following example shows how to set a maximum of 600 prefixes that can be redistributed into IS-IS. If the number of prefixes redistributed reaches 75 percent of 600 (450 prefixes), a warning message is logged.

```
router isis
 redistribute maximum-prefix 600
```

The following example shows how to set a maximum of 1200 prefixes that can be redistributed into IS-IS. If the number of prefixes redistributed reaches 80 percent of 1200 (960 prefixes), a warning message is logged.

```
router isis
 redistribute maximum-prefix 1200 80
```

The following example shows how to allow two warning messages to be logged. The first message is logged when the number of prefixes redistributed reaches 85 percent of 600 (510 prefixes), and the second message is logged when the number of redistributed prefixes reaches 600. However, the number of redistributed prefixes is not limited.

```
router isis
 redistribute maximum-prefix 600 85 warning-only
```

Examples

The following example shows how to set a maximum of 2000 prefixes that can be redistributed into OSPF process when the number of prefixes redistributed reaches 75 percent of 2000 (1500 prefixes), a warning message is logged. Another warning is logged when the limit is reached, and no more prefixes are redistributed.

```
router ospf 1
 network 10.0.0.0 0.0.0.255 area 0
 redistribute eigrp 10 subnets
 redistribute maximum-prefix 2000
```

The following example shows how to set a maximum of 1200 prefixes that can be redistributed into OSPF process when the number of prefixes redistributed reaches 80 percent of 1200 (960 prefixes), a warning message is logged. Another warning is logged when the limit is reached, and no more prefixes are redistributed.

```
router ospf 1
 network 10.0.0.0 0.0.0.255 area 0
 redistribute eigrp 10 subnets
 redistribute maximum-prefix 1200 80
```

The following example shows how to allow two warning messages to be logged. The first message is logged when the number of prefixes redistributed reaches 85 percent of 600 (510 prefixes), and the second message is logged when the number of redistributed prefixes reaches 600. However, the number of redistributed prefixes is not limited.

```
router ospf 1
 network 10.0.0.0 0.0.0.255 area 0
 redistribute eigrp 10 subnets
 redistribute maximum-prefix 600 85 warning-only
```

router ospf

To configure an Open Shortest Path First (OSPF) routing process, use the **router ospf** command in global configuration mode. To terminate an OSPF routing process, use the **no**form of this command.

router ospf *process-id* [**vrf** *vrf-name*]

no router ospf *process-id* [**vrf** *vrf-name*]

Syntax Description

process-id	Internally used identification parameter for an OSPF routing process. It is locally assigned and can be any positive integer. A unique value is assigned for each OSPF routing process.
vrf *vrf-name*	(Optional) Specifies the name of the VPN routing and forwarding (VRF) instance to associate with OSPF VRF processes.

Command Default

No OSPF routing process is defined.

Command Modes

Global configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(7)T	The **vrf** keyword and *vpn-name* arguments were added to identify a VPN.
12.0(9)ST	The **vrf** keyword and *vpn-name* arguments were added.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.1(2)SNG	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

You can specify multiple OSPF routing processes in each router.

After you enter the **router ospf** command, you can enter the maximum number of paths. There can be from 1 to 32 paths.

Examples

The following example configures an OSPF routing process and assign a process number of 109:

```
Router(config)# router ospf 109
```

This example shows a basic OSPF configuration using the **router ospf** command to configure OSPF VRF instance processes for the VRFs first, second, and third:

```
Router> enable
Router# configure terminal
Router(config)# router ospf 12 vrf first
Router(config)# router ospf 13 vrf second
Router(config)# router ospf 14 vrf third
Router(config)# exit
```

The following example shows usage of the **maximum-paths** option:

```
Router> enable
Router# configure terminal
Router(config)# router ospf

Router(config-router)# maximum-paths?
Router(config-router)# 20

Router(config-router)# exit
```

Related Commands

Command	Description
network area	Defines the interfaces on which OSPF runs and defines the area ID for those interfaces.

router-id

To use a fixed router ID, use the **router-id** command in router configuration mode. To force Open Shortest Path First (OSPF) to use the previous OSPF router ID behavior, use the **no** form of this command.

router-id *ip-address*

no router-id *ip-address*

Syntax Description

ip-address	Router ID in IP address format.

Command Default

No OSPF routing process is defined.

Command Modes

Router configuration

Command History

Release	Modification
12.0(1)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

You can configure an arbitrary value in the IP address format for each router. However, each router ID must be unique.

If this command is used on an OSPF router process which is already active (has neighbors), the new router-ID is used at the next reload or at a manual OSPF process restart. To manually restart the OSPF process, use the clear ip ospf command.

Examples

The following example specifies a fixed router-id:

```
router-id 10.1.1.1
```

Related Commands

Command	Description
clear ip ospf	Clears redistribution based on the OSPF routing process ID.

Command	Description
router ospf	Configures the OSPF routing process.

show ip ospf

To display general information about Open Shortest Path First (OSPF) routing processes, use the **showipospf** command in user EXEC or privileged EXEC mode.

show ip ospf [*process-id*]

Syntax Description

process-id	(Optional) Process ID. If this argument is included, only information for the specified routing process is included.

Command Modes

User EXEC Privileged EXEC

Command History

Mainline Release	Modification
10.0	This command was introduced.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.
0S Release	Modification
12.0(25)S	This command was integrated into Cisco IOS Release 12.0(25)S and the output was expanded to display link-state advertisement (LSA) throttling timers.
12.0(31)S	Support for the Bidirectional Forwarding Detection (BFD) feature was added.
S Release	Modification
12.2(14)S	Support for displaying packet pacing timers was added.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE and support for the BFD feature was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
T Release	Modification
12.2(4)T	This command was modified to show packet pacing timers in the displayed output.

Mainline Release	Modification
12.2(15)T	This command was modified to show additional information if the OSPF Forwarding Address Suppression in Type-5 LSAs feature is configured.
12.3(2)T	The output of this command was expanded to display LSA throttling timers and the limit on redistributed routes.
12.4(4)T	Support for the BFD feature was added.

Examples

The following is sample output from the **showipospf** command when entered without a specific OSPF process ID:

```
Router# show ip ospf

  Routing Process "ospf 201" with ID 10.0.0.1 and Domain ID 10.20.0.1
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
  Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
  LSA group pacing timer 100 secs
  Interface flood pacing timer 55 msecs
  Retransmission pacing timer 100 msecs
  Number of external LSA 0. Checksum Sum 0x0
  Number of opaque AS LSA 0. Checksum Sum 0x0
  Number of DCbitless external and opaque AS LSA 0
  Number of DoNotAge external and opaque AS LSA 0
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  External flood list length 0
     Area BACKBONE(0)
         Number of interfaces in this area is 2
         Area has message digest authentication
         SPF algorithm executed 4 times
         Area ranges are
         Number of LSA 4. Checksum Sum 0x29BEB
         Number of opaque link LSA 0. Checksum Sum 0x0
         Number of DCbitless LSA 3
         Number of indication LSA 0
         Number of DoNotAge LSA 0
         Flood list length 0
     Area 172.16.26.0
         Number of interfaces in this area is 0
         Area has no authentication
         SPF algorithm executed 1 times
         Area ranges are
            192.168.0.0/16 Passive Advertise
         Number of LSA 1. Checksum Sum 0x44FD
         Number of opaque link LSA 0. Checksum Sum 0x0
         Number of DCbitless LSA 1
         Number of indication LSA 1
         Number of DoNotAge LSA 0
         Flood list length 0
```

Examples

The following is sample output from the **showipospf**command to verify that the BFD feature has been enabled for OSPF process 123. The relevant command output is shown in bold in the output.

```
Router# show ip ospf

 Routing Process "ospf 123" with ID 172.16.10.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
```

```
Supports Link-local Signaling (LLS)
Initial SPF schedule delay 5000 msecs
Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
Incremental-SPF disabled
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msecs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  BFD is enabled
   Area BACKBONE(0)
       Number of interfaces in this area is 2
       Area has no authentication
       SPF algorithm last executed 00:00:03.708 ago
       SPF algorithm executed 27 times
       Area ranges are
       Number of LSA 3. Checksum Sum 0x00AEF1
       Number of opaque link LSA 0. Checksum Sum 0x000000
       Number of DCbitless LSA 0
       Number of indication LSA 0
       Number of DoNotAge LSA 0
       Flood list length 0
```

The table below describes the significant fields shown in the display.

Table 3: show ip ospf Field Descriptions

Field	Description
Routing process “ospf 201” with ID 10.0.0.1	Process ID and OSPF router ID.
Supports...	Number of types of service supported (Type 0 only).
SPF schedule delay	Delay time (in seconds) of SPF calculations.
Minimum LSA interval	Minimum interval (in seconds) between link-state advertisements.
LSA group pacing timer	Configured LSA group pacing timer (in seconds).
Interface flood pacing timer	Configured LSA flood pacing timer (in milliseconds).
Retransmission pacing timer	Configured LSA retransmission pacing timer (in milliseconds).
Number of external LSA	Number of external link-state advertisements.
Number of opaque AS LSA	Number of opaque link-state advertisements.
Number of DCbitless external and opaque AS LSA	Number of demand circuit external and opaque link-state advertisements.
Number of DoNotAge external and opaque AS LSA	Number of do not age external and opaque link-state advertisements.

Field	Description
Number of areas in this router is	Number of areas configured for the router.
External flood list length	External flood list length.
BFD is enabled	BFD has been enabled on the OSPF process.

The following is an excerpt of output from the **showipospf** command when the OSPF Forwarding Address Suppression in Type-5 LSAs feature is configured:

```
Router# show ip ospf
.
.
.
Area 2
   Number of interfaces in this area is 4
   It is a NSSA area
   Perform type-7/type-5 LSA translation, suppress forwarding address
.
.
.
Routing Process "ospf 1" with ID 192.168.0.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Number of external LSA 0. Checksum Sum 0x0
 Number of opaque AS LSA 0. Checksum Sum 0x0
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 0. 0 normal 0 stub 0 nssa
 External flood list length 0
```

The table below describes the significant fields shown in the display.

Table 4: show ip ospf Field Descriptions

Field	Description
Area	OSPF area and tag.
Number of interfaces...	Number of interfaces configured in the area.
It is...	Possible types are internal, area border, or autonomous system boundary.
Routing process “ospf 1” with ID 192.168.0.1	Process ID and OSPF router ID.
Supports...	Number of types of service supported (Type 0 only).

Field	Description
Initial SPF schedule delay	Delay time of SPF calculations at startup.
Minimum hold time	Minimum hold time (in milliseconds) between consecutive SPF calculations.
Maximum wait time	Maximum wait time (in milliseconds) between consecutive SPF calculations.
Incremental-SPF	Status of incremental SPF calculations.
Minimum LSA...	Minimum time interval (in seconds) between link-state advertisements, and minimum arrival time (in milliseconds) of link-state advertisements,
LSA group pacing timer	Configured LSA group pacing timer (in seconds).
Interface flood pacing timer	Configured LSA flood pacing timer (in milliseconds).
Retransmission pacing timer	Configured LSA retransmission pacing timer (in milliseconds).
Number of...	Number and type of link-state advertisements that have been received.
Number of external LSA	Number of external link-state advertisements.
Number of opaque AS LSA	Number of opaque link-state advertisements.
Number of DCbitless external and opaque AS LSA	Number of demand circuit external and opaque link-state advertisements.
Number of DoNotAge external and opaque AS LSA	Number of do not age external and opaque link-state advertisements.
Number of areas in this router is	Number of areas configured for the router listed by type.
External flood list length	External flood list length.

The following is sample output from the **showipospf** command. In this example, the user had configured the **redistributionmaximum-prefix** command to set a limit of 2000 redistributed routes. SPF throttling was configured with the **timersthrottlespf** command.

```
Router# show ip ospf 1
 Routing Process "ospf 1" with ID 10.0.0.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 It is an autonomous system boundary router
```

```
 Redistributing External Routes from,
    static, includes subnets in redistribution
    Maximum limit of redistributed prefixes 2000
    Threshold for warning message 75%
Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
```

The table below describes the significant fields shown in the display.

Table 5: show ip ospf Field Descriptions

Field	Description
Routing process “ospf 1” with ID 10.0.0.1	Process ID and OSPF router ID.
Supports ...	Number of Types of Service supported.
It is ...	Possible types are internal, area border, or autonomous system boundary router.
Redistributing External Routes from	Lists of redistributed routes, by protocol.
Maximum limit of redistributed prefixes	Value set in the **redistributionmaximum-prefix** command to set a limit on the number of redistributed routes.
Threshold for warning message	Percentage set in the **redistributionmaximum-prefix** command for the threshold number of redistributed routes needed to cause a warning message. The default is 75 percent of the maximum limit.
Initial SPF schedule delay	Delay (in milliseconds) before initial SPF schedule for SPF throttling. Configured with the **timersthrottlespf** command.
Minimum hold time between two consecutive SPFs	Minimum hold time (in milliseconds) between two consecutive SPF calculations for SPF throttling. Configured with the **timersthrottlespf** command.
Maximum wait time between two consecutive SPFs	Maximum wait time (in milliseconds) between two consecutive SPF calculations for SPF throttling. Configured with the **timersthrottlespf** command.
Number of areas	Number of areas in router, area addresses, and so on.

The following is sample output from the **showipospf** command. In this example, the user had configured LSA throttling, and those lines of output are displayed in bold.

```
Router# show ip ospf 1
Routing Process "ospf 4" with ID 10.10.24.4
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Initial SPF schedule delay 5000 msecs
```

```
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Initial LSA throttle delay 100 msecs
 Minimum hold time for LSA throttle 10000 msecs

Maximum wait time for LSA throttle 45000 msecs
Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Number of external LSA 0. Checksum Sum 0x0
 Number of opaque AS LSA 0. Checksum Sum 0x0
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 External flood list length 0
    Area 24
        Number of interfaces in this area is 2
        Area has no authentication
        SPF algorithm last executed 04:28:18.396 ago
        SPF algorithm executed 8 times
        Area ranges are
        Number of LSA 4. Checksum Sum 0x23EB9
        Number of opaque link LSA 0. Checksum Sum 0x0
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

The following is sample **showipospf**command. In this example, the user had configured the **redistributionmaximum-prefix** command to set a limit of 2000 redistributed routes. SPF throttling was configured with the **timersthrottlespf** command.

```
Router# show ip ospf 1
 Routing Process "ospf 1" with ID 192.168.0.0
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 It is an autonomous system boundary router
 Redistributing External Routes from,
    static, includes subnets in redistribution
    Maximum limit of redistributed prefixes 2000
    Threshold for warning message 75%
Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
```

The table below describes the significant fields shown in the display.

Table 6: show ip ospf Field Descriptions

Field	Description
Routing process “ospf 1” with ID 192.168.0.0.	Process ID and OSPF router ID.
Supports ...	Number of TOS supported.
It is ...	Possible types are internal, area border, or autonomous system boundary routers.
Redistributing External Routes from	Lists of redistributed routes, by protocol.

Field	Description
Maximum limit of redistributed prefixes	Value set in the **redistributionmaximum-prefix** command to set a limit on the number of redistributed routes.
Threshold for warning message	Percentage set in the **redistributionmaximum-prefix** command for the threshold number of redistributed routes needed to cause a warning message. The default is 75 percent of the maximum limit.
Initial SPF schedule delay	Delay (in milliseconds) before the initial SPF schedule for SPF throttling. Configured with the **timersthrottlespf** command.
Minimum hold time between two consecutive SPFs	Minimum hold time (in milliseconds) between two consecutive SPF calculations for SPF throttling. Configured with the **timersthrottlespf** command.
Maximum wait time between two consecutive SPFs	Maximum wait time (in milliseconds) between two consecutive SPF calculations for SPF throttling. Configured with the **timersthrottlespf** command.
Number of areas	Number of areas in router, area addresses, and so on.

The following is sample output from the **showipospf** command. In this example, the user had configured LSA throttling, and those lines of output are displayed in bold.

```
Router# show ip ospf 1
Routing Process "ospf 4" with ID 10.10.24.4
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Initial LSA throttle delay 100 msecs
 Minimum hold time for LSA throttle 10000 msecs
 Maximum wait time for LSA throttle 45000 msecs
Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Number of external LSA 0. Checksum Sum 0x0
 Number of opaque AS LSA 0. Checksum Sum 0x0
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 External flood list length 0
    Area 24
        Number of interfaces in this area is 2
        Area has no authentication
        SPF algorithm last executed 04:28:18.396 ago
        SPF algorithm executed 8 times
        Area ranges are
        Number of LSA 4. Checksum Sum 0x23EB9
        Number of opaque link LSA 0. Checksum Sum 0x0
        Number of DCbitless LSA 0
```

```
Number of indication LSA 0
Number of DoNotAge LSA 0
Flood list length 0
```

show ip ospf border-routers

To display the internal Open Shortest Path First (OSPF) routing table entries to an Area Border Router (ABR) and Autonomous System Boundary Router (ASBR), use the **showipospfborder-routers** command in privileged EXEC mode.

show ip ospf border-routers

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **showipospfborder-routers** command:

```
Router# show ip ospf border-routers
OSPF Process 109 internal Routing Table
Codes:  i - Intra-area route, I - Inter-area route
i 192.168.97.53   [10] via 172.16.1.53,   Serial0, ABR,  Area 0.0.0.3, SPF 3
i 192.168.103.51  [10] via 192.168.96.51, Serial0, ABR,  Area 0.0.0.3, SPF 3
I 192.168.103.52  [22] via 192.168.96.51, Serial0, ASBR, Area 0.0.0.3, SPF 3
I 192.168.103.52  [22] via 172.16.1.53,   Serial0, ASBR, Area 0.0.0.3, SPF 3
```

The table below describes the significant fields shown in the display.

Table 7: show ip ospf border-routers Field Descriptions

Field	Description
192.168.97.53	Router ID of the destination.
[10]	Cost of using this route.
via 172.16.1.53	Next hop toward the destination.
Serial0	Interface type for the outgoing interface.

Field	Description
ABR	The router type of the destination; it is either an ABR or ASBR or both.
Area	The area ID of the area from which this route is learned.
SPF 3	The internal number of the shortest path first (SPF) calculation that installs this route.

show ip ospf database

To display lists of information related to the Open Shortest Path First (OSPF) database for a specific router, use the **showipospfdatabase** command in EXEC mode.

show ip ospf [*process-id area-id*] **database**

show ip ospf [*process-id area-id*] **database** [**adv-router** [*ip-address*]]

show ip ospf [*process-id area-id*] **database [asbr-summary]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [asbr-summary]** [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id area-id*] **database [asbr-summary]** [*link-state-id*] **[self-originate]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [database-summary]**

show ip ospf [*process-id*] **database [external]** [*link-state-id*]

show ip ospf [*process-id*] **database [external]** [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id area-id*] **database [external]** [*link-state-id*] **[self-originate]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [network]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [network]** [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id area-id*] **database [network]** [*link-state-id*] **[self-originate]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [nssa-external]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [nssa-external]** [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id area-id*] **database [nssa-external]** [*link-state-id*] **[self-originate]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [router]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [router]** [**adv-router** [*ip-address*]]

show ip ospf [*process-id area-id*] **database [router] [self-originate]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [self-originate]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [summary]** [*link-state-id*]

show ip ospf [*process-id area-id*] **database [summary]** [*link-state-id*] [**adv-router** [*ip-address*]]

show ip ospf [*process-id area-id*] **database [summary]** [*link-state-id*] **[self-originate]** [*link-state-id*]

Syntax Description

process-id	(Optional) Internal identification. It is locally assigned and can be any positive integer. The number used here is the number assigned administratively when enabling the OSPF routing process.
area-id	(Optional) Area number associated with the OSPF address range defined in the **network** router configuration command used to define the particular area.

adv-router [*ip-address*	(Optional) Displays all the LSAs of the specified router. If no IP address is included, the information is about the local router itself (in this case, the same as **self-originate**).
link-state-id	(Optional) Portion of the Internet environment that is being described by the advertisement. The value entered depends on the advertisement's LS type. It must be entered in the form of an IP address. When the link state advertisement is describing a network, the *link-state-id* can take one of two forms: The network's IP address (as in type 3 summary link advertisements and in autonomous system external link advertisements). A derived address obtained from the link state ID. (Note that masking a network links advertisement's link state ID with the network's subnet mask yields the network's IP address.) When the link state advertisement is describing a router, the link state ID is always the described router's OSPF router ID. When an autonomous system external advertisement (LS Type = 5) is describing a default route, its link state ID is set to Default Destination (0.0.0.0).
asbr-summary	(Optional) Displays information only about the autonomous system boundary router summary LSAs.
database-summary	(Optional) Displays how many of each type of LSA for each area there are in the database, and the total.
external	(Optional) Displays information only about the external LSAs.
network	(Optional) Displays information only about the network LSAs.
nssa-external	(Optional) Displays information only about the NSSA external LSAs.
router	(Optional) Displays information only about the router LSAs.
self-originate	(Optional) Displays only self-originated LSAs (from the local router).
summary	(Optional) Displays information only about the summary LSAs.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
11.0	The **database-summary** keyword was added.
12.0	The following keywords were added: • **self-originate** • **adv-router**
12.0(25)S	The output of the **showipospfdatabasedatabase-summary**command was increased to include Self-originated Type-7 and Self-originated Type-5 output.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The various forms of this command deliver information about different OSPF link state advertisements.

Examples

The following is sample output from the **showipospfdatabase** command when no arguments or keywords are used:

```
Router# show ip ospf database
OSPF Router with id(192.168.239.66) (Process ID 300)
                Displaying Router Link States(Area 0.0.0.0)
  Link ID       ADV Router    Age        Seq#     Checksum  Link count
172.16.21.6   172.16.21.6    1731    0x80002CFB    0x69BC       8
172.16.21.5   172.16.21.5    1112    0x800009D2    0xA2B8       5
172.16.1.2    172.16.1.2     1662    0x80000A98    0x4CB6       9
172.16.1.1    172.16.1.1     1115    0x800009B6    0x5F2C       1
172.16.1.5    172.16.1.5     1691    0x80002BC     0x2A1A       5
172.16.65.6   172.16.65.6    1395    0x80001947    0xEEE1       4
172.16.241.5  172.16.241.5   1161    0x8000007C    0x7C70       1
172.16.27.6   172.16.27.6    1723    0x80000548    0x8641       4
172.16.70.6   172.16.70.6    1485    0x80000B97    0xEB84       6
              Displaying Net Link States(Area 0.0.0.0)
  Link ID       ADV Router      Age         Seq#         Checksum
172.16.1.3  192.168.239.66     1245    0x800000EC      0x82E
              Displaying Summary Net Link States(Area 0.0.0.0)
  Link ID       ADV Router       Age         Seq#        Checksum
172.16.240.0   172.16.241.5    1152      0x80000077      0x7A05
172.16.241.0   172.16.241.5    1152      0x80000070      0xAEB7
172.16.244.0   172.16.241.5    1152      0x80000071      0x95CB
```

The table below describes the significant fields shown in the display.

Table 8: show ip ospf Database Field Descriptions

Field	Description
Link ID	Router ID number.
ADV Router	Advertising router's ID.
Age	Link state age.
Seq#	Link state sequence number (detects old or duplicate link state advertisements).
Checksum	Fletcher checksum of the complete contents of the link state advertisement.
Link count	Number of interfaces detected for router.

The following is sample output from the **showipospfdatabase**command with the **asbr-summary**keyword:

```
Router# show ip ospf database asbr-summary
OSPF Router with id(192.168.239.66) (Process ID 300)
                Displaying Summary ASB Link States(Area 0.0.0.0)
 LS age: 1463
 Options: (No TOS-capability)
 LS Type: Summary Links(AS Boundary Router)
 Link State ID: 172.16.245.1 (AS Boundary Router address)
 Advertising Router: 172.16.241.5
 LS Seq Number: 80000072
 Checksum: 0x3548
 Length: 28
 Network Mask: 0.0.0.0 TOS: 0  Metric: 1
```

The table below describes the significant fields shown in the display.

Table 9: show ip ospf database asbr-summary Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID	OSPF process ID.
LS age	Link state age.
Options	Type of service options (Type 0 only).
LS Type	Link state type.
Link State ID	Link state ID (autonomous system boundary router).
Advertising Router	Advertising router's ID.

Field	Description
LS Seq Number	Link state sequence (detects old or duplicate link state advertisements).
Checksum	LS checksum (Fletcher checksum of the complete contents of the link state advertisement).
Length	Length in bytes of the link state advertisement.
Network Mask	Network mask implemented.
TOS	Type of service.
Metric	Link state metric.

The following is sample output from the **showipospfdatabase**command with the **external**keyword:

```
Router# show ip ospf database external
OSPF Router with id(192.168.239.66) (Autonomous system 300)
                  Displaying AS External Link States
LS age: 280
Options: (No TOS-capability)
LS Type: AS External Link
Link State ID: 10.105.0.0 (External Network Number)
Advertising Router: 172.16.70.6
LS Seq Number: 80000AFD
Checksum: 0xC3A
Length: 36
Network Mask: 255.255.0.0
       Metric Type: 2 (Larger than any link state path)
       TOS: 0
       Metric: 1
       Forward Address: 0.0.0.0
       External Route Tag: 0
```

The table below describes the significant fields shown in the display.

Table 10: show ip ospf database external Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Autonomous system	OSPF autonomous system number (OSPF process ID).
LS age	Link state age.
Options	Type of service options (Type 0 only).
LS Type	Link state type.
Link State ID	Link state ID (external network number).

Field	Description
Advertising Router	Advertising router's ID.
LS Seq Number	Link state sequence number (detects old or duplicate link state advertisements).
Checksum	LS checksum (Fletcher checksum of the complete contents of the LSA).
Length	Length in bytes of the link state advertisement.
Network Mask	Network mask implemented.
Metric Type	External Type.
TOS	Type of service.
Metric	Link state metric.
Forward Address	Forwarding address. Data traffic for the advertised destination will be forwarded to this address. If the forwarding address is set to 0.0.0.0, data traffic will be forwarded instead to the advertisement's originator.
External Route Tag	External route tag, a 32-bit field attached to each external route. This is not used by the OSPF protocol itself.

The following is sample output from the **showipospfdatabase**command with the **network**keyword:

```
Router# show ip ospf database network
 OSPF Router with id(192.168.239.66) (Process ID 300)
               Displaying Net Link States(Area 0.0.0.0)
LS age: 1367
Options: (No TOS-capability)
LS Type: Network Links
Link State ID: 172.16.1.3 (address of Designated Router)
Advertising Router: 192.168.239.66
LS Seq Number: 800000E7
Checksum: 0x1229
Length: 52
Network Mask: 255.255.255.0
        Attached Router: 192.168.239.66
        Attached Router: 172.16.241.5
        Attached Router: 172.16.1.1
        Attached Router: 172.16.54.5
        Attached Router: 172.16.1.5
```

The table below describes the significant fields shown in the display.

Table 11: show ip ospf database network Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID 300	OSPF process ID.
LS age	Link state age.
Options	Type of service options (Type 0 only).
LS Type:	Link state type.
Link State ID	Link state ID of designated router.
Advertising Router	Advertising router's ID.
LS Seq Number	Link state sequence (detects old or duplicate link state advertisements).
Checksum	LS checksum (Fletcher checksum of the complete contents of the link state advertisement).
Length	Length in bytes of the link state advertisement.
Network Mask	Network mask implemented.
AS Boundary Router	Definition of router type.
Attached Router	List of routers attached to the network, by IP address.

The following is sample output from the **showipospfdatabase**command with the **router**keyword:

```
Router# show ip ospf database router
OSPF Router with id(192.168.239.66) (Process ID 300)
Displaying Router Link States(Area 0.0.0.0)
LS age: 1176
Options: (No TOS-capability)
LS Type: Router Links
Link State ID: 172.16.21.6
Advertising Router: 172.16.21.6
LS Seq Number: 80002CF6
Checksum: 0x73B7
Length: 120
AS Boundary Router
155   Number of Links: 8
Link connected to: another Router (point-to-point)
(link ID) Neighboring Router ID: 172.16.21.5
(Link Data) Router Interface address: 172.16.21.6
Number of TOS metrics: 0
TOS 0 Metrics: 2
```

The table below describes the significant fields shown in the display.

Table 12: show ip ospf database router Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID	OSPF process ID.
LS age	Link state age.
Options	Type of service options (Type 0 only).
LS Type	Link state type.
Link State ID	Link state ID.
Advertising Router	Advertising router's ID.
LS Seq Number	Link state sequence (detects old or duplicate link state advertisements).
Checksum	LS checksum (Fletcher checksum of the complete contents of the link state advertisement).
Length	Length in bytes of the link state advertisement.
AS Boundary Router	Definition of router type.
Number of Links	Number of active links.
link ID	Link type.
Link Data	Router interface address.
TOS	Type of service metric (Type 0 only).

The following is sample output from **showipospfdatabase**command with the **summary**keyword:

```
Router# show ip ospf database summary
       OSPF Router with id(192.168.239.66) (Process ID 300)
                Displaying Summary Net Link States(Area 0.0.0.0)
LS age: 1401
Options: (No TOS-capability)
LS Type: Summary Links(Network)
Link State ID: 172.16.240.0 (summary Network Number)
Advertising Router: 172.16.241.5
LS Seq Number: 80000072
Checksum: 0x84FF
Length: 28
Network Mask: 255.255.255.0   TOS: 0  Metric: 1
```

The table below describes the significant fields shown in the display.

Table 13: show ip ospf database summary Field Descriptions

Field	Description
OSPF Router with id	Router ID number.
Process ID	OSPF process ID.
LS age	Link state age.
Options	Type of service options (Type 0 only).
LS Type	Link state type.
Link State ID	Link state ID (summary network number).
Advertising Router	Advertising router's ID.
LS Seq Number	Link state sequence (detects old or duplicate link state advertisements).
Checksum	LS checksum (Fletcher checksum of the complete contents of the link state advertisement).
Length	Length in bytes of the link state advertisement.
Network Mask	Network mask implemented.
TOS	Type of service.
Metric	Link state metric.

The following is sample output from **showipospfdatabase**command with the **database-summary**keyword:

```
Router# show ip ospf database database-summary
OSPF Router with ID (10.0.0.1) (Process ID 1)
Area 0 database summary
  LSA Type      Count    Delete   Maxage
  Router        3        0        0
  Network       0        0        0
  Summary Net   0        0        0
  Summary ASBR  0        0        0
  Type-7 Ext    0        0        0
    Self-originated Type-7  0
Opaque Link     0        0        0
  Opaque Area   0        0        0
  Subtotal      3        0        0
Process 1 database summary
  LSA Type      Count    Delete   Maxage
  Router        3        0        0
  Network       0        0        0
  Summary Net   0        0        0
  Summary ASBR  0        0        0
  Type-7 Ext    0        0        0
  Opaque Link   0        0        0
  Opaque Area   0        0        0
```

```
  Type-5 Ext    0        0        0
      Self-originated Type-5  200
Opaque AS       0        0        0
  Total       203        0        0
```

The table below describes the significant fields shown in the display.

Table 14: show ip ospf database database-summary Field Descriptions

Field	Description
Area 0 database summary	Area number.
Count	Count of LSAs of the type identified in the first column.
Router	Number of router link state advertisements in that area.
Network	Number of network link state advertisements in that area.
Summary Net	Number of summary link state advertisements in that area.
Summary ASBR	Number of summary autonomous system boundary router (ASBR) link state advertisements in that area.
Type-7 Ext	Type-7 LSA count.
Self-originated Type-7	Self-originated Type-7 LSA.
Opaque Link	Type-9 LSA count.
Opaque Area	Type-10 LSA count
Subtotal	Sum of LSAs for that area.
Delete	Number of link state advertisements that are marked “Deleted” in that area.
Maxage	Number of link state advertisements that are marked “Maxaged” in that area.
Process 1 database summary	Database summary for the process.
Count	Count of LSAs of the type identified in the first column.
Router	Number of router link state advertisements in that process.

Field	Description
Network	Number of network link state advertisements in that process.
Summary Net	Number of summary link state advertisements in that process.
Summary ASBR	Number of summary autonomous system boundary router (ASBR) link state advertisements in that process.
Type-7 Ext	Type-7 LSA count.
Opaque Link	Type-9 LSA count.
Opaque Area	Type-10 LSA count.
Type-5 Ext	Type-5 LSA count.
Self-Originated Type-5	Self-originated Type-5 LSA count.
Opaque AS	Type-11 LSA count.
Total	Sum of LSAs for that process.
Delete	Number of link state advertisements that are marked “Deleted” in that process.
Maxage	Number of link state advertisements that are marked “Maxaged” in that process.

show ip ospf flood-list

To display a list of Open Shortest Path First (OSPF) link-state advertisements (LSAs) waiting to be flooded over an interface, use the **showipospfflood-list**command in EXEC mode.

show ip ospf flood-list commandshow ip ospf flood-list *interface-type interface-number*

Syntax Description

interface-type	Interface type over which the LSAs will be flooded.
interface-number	Interface number over which the LSAs will be flooded.

Command Modes

EXEC

Command History

Release	Modification
12.0(1)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Use this command to observe OSPF packet pacing.

Examples

The following is sample output of the **showipospfflood-list** command:

```
Router# show ip ospf flood-list ethernet 1
 Interface Ethernet1, Queue length 20
 Link state flooding due in 12 msec

 Type  LS ID           ADV RTR          Seq NO      Age    Checksum
    5  10.2.195.0      192.168.0.163    0x80000009  0      0xFB61
    5  10.1.192.0      192.168.0.163    0x80000009  0      0x2938
    5  10.2.194.0      192.168.0.163    0x80000009  0      0x757
    5  10.1.193.0      192.168.0.163    0x80000009  0      0x1E42
    5  10.2.193.0      192.168.0.163    0x80000009  0      0x124D
    5  10.1.194.0      192.168.0.163    0x80000009  0      0x134C
```

The table below describes the significant fields shown in the display.

Table 15: show ip ospf flood-list Field Descriptions

Field	Description
Interface Ethernet1	Interface for which information is displayed.
Queue length	Number of LSAs waiting to be flooded.
Link state flooding due in	Length of time before next link-state transmission.
Type	Type of LSA.
LS ID	Link-state ID of the LSA.
ADV RTR	IP address of advertising router.
Seq NO	Sequence number of LSA.
Age	Age of LSA (in seconds).
Checksum	Checksum of LSA.

show ip ospf interface

To display interface information related to Open Shortest Path First (OSPF), use the **show ip ospf interface** command in user EXEC or privileged EXEC mode.

show ip [**ospf**] [*process-id*] **interface** [*type number*] **[brief] [multicast]** [**topology** {*topology-name*| **base**}]

Syntax Description

process-id	(Optional) Process ID number. If this argument is included, only information for the specified routing process is included. The range is 1 to 65535.
type	(Optional) Interface type. If the *type* argument is included, only information for the specified interface type is included.
number	(Optional) Interface number. If the *number* argument is included, only information for the specified interface number is included.
brief	(Optional) Displays brief overview information for OSPF interfaces, states, addresses and masks, and areas on the device.
multicast	(Optional) Displays multicast information.
topology *topology-name*	(Optional) Displays OSPF-related information about the named topology instance.
topology base	(Optional) Displays OSPF-related information about the base topology.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
10.0	This command was introduced.
12.0(25)S	This command was modified. The **brief** keyword was added.
12.2(15)T	This command was modified. The **brief** keyword was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2(33)SRB	The **multicast**, **topology**, **base**, and *topology-name* keywords and argument were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	Support for the OSPF TTL Security Check feature was added.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.
15.1(3)S	This command was modified to display output when loop-free alternate (LFA) Fast Reroute (FRR) is enabled on an interface and whether it can be a protected or a protecting interface.

Examples

The following is sample output from the **show ip ospf interface** command when Ethernet interface 0/0 is specified. It shows that LFA and FRR is enabled on the interface and that it can be both a protected and a protecting interface.

```
Device# show ip ospf interface ethernet 0/0

Ethernet0/0 is up, line protocol is up
  Internet Address 192.168.254.202/24, Area 0
  Process ID 1, Router ID 192.168.99.1, Network Type BROADCAST, Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 192.168.99.1, Interface address 192.168.254.202
  Backup Designated router (ID) 192.168.254.10, Interface address 192.168.254.10
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:05
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Can be protected by per-prefix Loop-free FastReroute
  Can be used for per-prefix Loop-free FastReroute repair paths
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 192.168.254.10  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
```

In Cisco IOS Release 12.2(33)SRB, the following sample output from the **show ip ospf interface brief topology VOICE** command shows a summary of information, including a confirmation that the Multitopology Routing (MTR) VOICE topology is configured in the interface configuration:

```
Device# show ip ospf interface brief topology VOICE

VOICE Topology (MTID 10)
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Lo0          1     0               10.0.0.2/32        1     LOOP  0/0
Se2/0        1     0               10.1.0.2/30        10    P2P   1/1
```

The following sample output from the **show ip ospf interface brief topology VOICE** command displays details of the MTR VOICE topology for the interface. When the command is entered without the **brief** keyword, more information is displayed.

```
Device# show ip ospf interface topology VOICE

                 VOICE Topology (MTID 10)
Loopback0 is up, line protocol is up
   Internet Address 10.0.0.2/32, Area 0
   Process ID 1, Router ID 10.0.0.2, Network Type LOOPBACK
   Topology-MTID    Cost    Disabled    Shutdown      Topology Name
         10          1         no          no            VOICE
   Loopback interface is treated as a stub Host Serial2/0 is up, line protocol is up
   Internet Address 10.1.0.2/30, Area 0
   Process ID 1, Router ID 10.0.0.2, Network Type POINT_TO_POINT
   Topology-MTID    Cost    Disabled    Shutdown      Topology Name
         10          10        no          no            VOICE
   Transmit Delay is 1 sec, State POINT_TO_POINT
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     oob-resync timeout 40
     Hello due in 00:00:03
   Supports Link-local Signaling (LLS)
   Cisco NSF helper support enabled
   IETF NSF helper support enabled
   Index 1/1, flood queue length 0
   Next 0x0(0)/0x0(0)
   Last flood scan length is 1, maximum is 1
   Last flood scan time is 0 msec, maximum is 0 msec
   Neighbor Count is 1, Adjacent neighbor count is 1
     Adjacent with neighbor 10.0.0.1
   Suppress hello for 0 neighbor(s)
```

In Cisco IOS Release 12.2(33)SRC, the following sample output from the **show ip ospf interface** command displays details about the configured Time-to-Live (TTL) limits:

```
Device# show ip ospf interface ethernet 0
.
.
.
Strict TTL checking enabled
! or a message similar to the following is displayed
Strict TTL checking enabled, up to 4 hops allowed
.
.
.
```

The table below describes the significant fields shown in the displays.

Table 16: show ip ospf interface Field Descriptions

Field	Description
Ethernet	Status of the physical link and operational status of the protocol.
Process ID	OSPF process ID.
Area	OSPF area.
Cost	Administrative cost assigned to the interface.
State	Operational state of the interface.
Nbrs F/C	OSPF neighbor count.

Field	Description
Internet Address	Interface IP address, subnet mask, and area address.
Topology-MTID	MTR topology Multitopology Identifier (MTID). A number assigned so that the protocol can identify the topology associated with information that it sends to its peers.
Transmit Delay	Transmit delay in seconds, interface state, and device priority.
Designated Router	Designated router ID and respective interface IP address.
Backup Designated router	Backup designated router ID and respective interface IP address.
Timer intervals configured	Configuration of timer intervals.
Hello	Number of seconds until the next hello packet is sent out this interface.
Strict TTL checking enabled	Only one hop is allowed.
Strict TTL checking enabled, up to 4 hops allowed	A set number of hops has been explicitly configured.
Neighbor Count	Count of network neighbors and list of adjacent neighbors.

show ip ospf neighbor

To display Open Shortest Path First (OSPF) neighbor information on a per-interface basis, use the **showipospfneighbor** command in privileged EXEC mode.

show ip ospf neighbor [*interface-type interface-number*] [*neighbor-id*] **[detail] [fast-reroute]**

Syntax Description

interface-type interface-number	(Optional) Type and number associated with a specific OSPF interface.
neighbor-id	(Optional) Neighbor hostname or IP address in A.B.C.D format.
detail	(Optional) Displays all neighbors given in detail (lists all neighbors).
fast-reroute	(Optional) Displays per-neighbor border router tables and SPF statistics.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
10.0	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	Support for the OSPF TTL Security Check feature was added.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.
15.1(3)S	This command was modified. The fast-reroute keyword was added.

Examples

The following sample output from the**showipospfneighbor** command shows a single line of summary information for each neighbor:

```
Router# show ip ospf neighbor
```

```
Neighbor ID   Pri   State         Dead Time     Address         Interface
10.199.199.137  1    FULL/DR       0:00:31    192.168.80.37      Ethernet0
172.16.48.1     1    FULL/DROTHER  0:00:33    172.16.48.1        Fddi0
172.16.48.200   1    FULL/DROTHER  0:00:33    172.16.48.200      Fddi0
10.199.199.137  5    FULL/DR       0:00:33    172.16.48.189      Fddi0
```

The following is sample output showing summary information about the neighbor that matches the neighbor ID:

```
Router# show ip ospf neighbor 10.199.199.137

Neighbor 10.199.199.137, interface address 192.168.80.37
    In the area 0.0.0.0 via interface Ethernet0
    Neighbor priority is 1, State is FULL
    Options 2
    Dead timer due in 0:00:32
    Link State retransmission due in 0:00:04
 Neighbor 10.199.199.137, interface address 172.16.48.189
    In the area 0.0.0.0 via interface Fddi0
    Neighbor priority is 5, State is FULL
    Options 2
    Dead timer due in 0:00:32
    Link State retransmission due in 0:00:03
```

If you specify the interface along with the neighbor ID, the system displays the neighbors that match the neighbor ID on the interface, as in the following sample display:

```
Router# show ip ospf neighbor ethernet 0 10.199.199.137

Neighbor 10.199.199.137, interface address 192.168.80.37
    In the area 0.0.0.0 via interface Ethernet0
    Neighbor priority is 1, State is FULL
    Options 2
    Dead timer due in 0:00:37
    Link State retransmission due in 0:00:04
```

You can also specify the interface without the neighbor ID to show all neighbors on the specified interface, as in the following sample display:

```
Router# show ip ospf neighbor fddi 0
   ID           Pri   State         Dead Time     Address         Interface
172.16.48.1     1    FULL/DROTHER  0:00:33    172.16.48.1        Fddi0
172.16.48.200   1    FULL/DROTHER  0:00:32    172.16.48.200      Fddi0
10.199.199.137  5    FULL/DR       0:00:32    172.16.48.189      Fddi0
```

The following is sample output from the**showipospfneighbordetail** command:

```
Router# show ip ospf neighbor detail

Neighbor 192.168.5.2, interface address 10.225.200.28
    In the area 0 via interface GigabitEthernet1/0/0
    Neighbor priority is 1, State is FULL, 6 state changes
    DR is 10.225.200.28 BDR is 10.225.200.30
    Options is 0x42
    LLS Options is 0x1 (LR), last OOB-Resync 00:03:08 ago
    Dead timer due in 00:00:36
    Neighbor is up for 00:09:46
   Index 1/1, retransmission queue length 0, number of retransmission 1
    First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
    Last retransmission scan length is 1, maximum is 1
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

The table below describes the significant fields shown in the displays.

Table 17: show ip ospf neighbor detail Field Descriptions

Field	Description
Neighbor	Neighbor router ID.

Field	Description
interface address	IP address of the interface.
In the area	Area and interface through which the OSPF neighbor is known.
Neighbor priority	Router priority of the neighbor and neighbor state.
State	OSPF state. If one OSPF neighbor has enabled TTL security, the other side of the connection will show the neighbor in the INIT state.
state changes	Number of state changes since the neighbor was created. This value can be reset using the **clearipospfcountersneighbor** command.
DR is	Router ID of the designated router for the interface.
BDR is	Router ID of the backup designated router for the interface.
Options	Hello packet options field contents. (E-bit only. Possible values are 0 and 2; 2 indicates area is not a stub; 0 indicates area is a stub.)
LLS Options..., last OOB-Resync	Link-Local Signaling and out-of-band (OOB) link-state database resynchronization performed hours:minutes:seconds ago. This is nonstop forwarding (NSF) information. The field indicates the last successful out-of-band resynchronization with the NSF-capable router.
Dead timer due in	Expected time in hours:minutes:seconds before Cisco IOS software will declare the neighbor dead.
Neighbor is up for	Number of hours:minutes:seconds since the neighbor went into the two-way state.
Index	Neighbor location in the area-wide and autonomous system-wide retransmission queue.
retransmission queue length	Number of elements in the retransmission queue.
number of retransmission	Number of times update packets have been re-sent during flooding.
First	Memory location of the flooding details.
Next	Memory location of the flooding details.

Field	Description
Last retransmission scan length	Number of link state advertisements (LSAs) in the last retransmission packet.
maximum	Maximum number of LSAs sent in any retransmission packet.
Last retransmission scan time	Time taken to build the last retransmission packet.
maximum	Maximum time, in milliseconds, taken to build any retransmission packet.

Examples

The following is sample output from the**showipospfneighbor** command showing a single line of summary information for each neighbor. If one OSPF neighbor has enabled TTL security, the other side of the connection will show the neighbor in the INIT state.

```
Router# show ip ospf neighbor
Neighbor ID     Pri   State           Dead Time     Address         Interface
10.199.199.137  1     FULL/DR         0:00:31     192.168.80.37     Ethernet0
172.16.48.1     1     FULL/DROTHER    0:00:33     172.16.48.1       Fddi0
172.16.48.200   1     FULL/DROTHER    0:00:33     172.16.48.200     Fddi0
10.199.199.137  5     FULL/DR         0:00:33     172.16.48.189     Fddi0
172.16.1.201  1 INIT/DROTHER   00.00.35  10.1.1.201   Ethernet0/0
```

The following sample output from the show ip ospf neighbor command shows the network from the neighbor's point of view:

```
Router# show ip ospf neighbor 192.0.2.1 fast-reroute
            OSPF Router with ID (192.1.1.1) (Process ID 1)

                    Area with ID (0)

Neighbor with Router ID 192.0.2.1:
  Reachable over:
    Ethernet0/0, IP address 192.0.2.1, cost 10

  SPF was executed 1 times, distance to computing router 10

  Router distance table:
           192.1.1.1   i  [10]
           192.0.2.1   i  [0]
           192.3.3.3   i  [10]
           192.4.4.4   i  [20]
           192.5.5.5   i  [20]

  Network LSA distance table:
      192.2.12.2   i  [10]
      192.2.13.3   i  [20]
      192.2.14.4   i  [20]
      192.2.15.5   i  [20]
```

show ip ospf nsr

To display IP Open Shortest Path First (OSPF) nonstop routing (NSR) status information, use the **show ip ospf nsr** command in privileged EXEC mode.

show ip ospf [*process-id*] **nsr** [**[objects]**| **[statistics]**]

Syntax Description

process-id	(Optional) Process ID. If this argument is used, only information for the specified OSPF routing process is included.
objects	(Optional) Displays information on the OSPF NSR objects in the different OSPF routing processes.
statistics	(Optional) Displays OSPF NSR statistical information for the different OSPF routing processes.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)S	This command was introduced.
Cisco IOS XE Release 3.3S	This command was integrated into Cisco IOS XE Release 3.3S.
15.2(1) E	This command was integrated into 15.2(1) E.

Examples

The following sample output from the **show ip ospf nsr**command shows that OSPF on the standby RP is fully synchronized and ready to continue operation if the active RP fails or if a manual switchover is performed. NSR is configured and enabled for the “ospf 1” OSPF routing process. The fields are self-explanatory.

```
Router# show ip ospf
 1 nsr
Active RP
Operating in duplex mode
Redundancy state: ACTIVE
Peer redundancy state: STANDBY HOT
Checkpoint peer ready
Checkpoint messages enabled
ISSU negotiation complete
ISSU versions compatible
Routing Process "ospf 1" with ID 10.1.1.100
NSR configured
Checkpoint message sequence number: 6360
Standby synchronization state: synchronized
Bulk sync operations:  1
```

```
Next sync check time:  18:48:27.097 PST Fri Dec 10 2010
LSA Count: 3301, Checksum Sum 0x06750217
```

Related Commands

Command	Description
nsr	Enables NSR on a router that is running OSPF.

show ip ospf request-list

To display a list of all link-state advertisements (LSAs) requested by a router, use the **showipospfrequest-list**command in EXEC mode.

show ip ospf request-list [*neighbor*] [*interface*] [*interface-neighbor*]

Syntax Description

neighbor	(Optional) Displays the list of all LSAs requested by the router from this neighbor.
interface	(Optional) Displays the list of all LSAs requested by the router from this interface.
interface-neighbor	(Optional) Displays the list of all LSAs requested by the router on this interface from this neighbor.

Command Modes

EXEC

Command History

Release	Modification
10.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The information displayed by the **showipospfrequest-list**command is useful in debugging Open Shortest Path First (OSPF) routing operations.

Examples

The following is sample output from the **showipospfrequest-list** command:

```
Router# show ip ospf request-list serial 0

             OSPF Router with ID (192.168.1.11) (Process ID 1)

  Neighbor 192.168.1.12, interface Serial0 address 172.16.1.12

  Type  LS ID           ADV RTR         Seq NO      Age    Checksum
     1  192.168.1.12      192.168.1.12      0x8000020D  8      0x6572
```

The table below describes the significant fields shown in the displays.

Table 18: show ip ospf request-list Field Descriptions

Field	Description
Type	LSA-type.
LS ID	IP address of the neighbor router.
ADV RTR	IP address of the advertising router.
Seq NO	Packet sequence number of the LSA.
Age	Age, in seconds, of the LSA.
Checksum	Checksum number of the LSA.

show ip ospf sham-links

To display information about all sham-links configured for a provider edge (PE) router in the Virtual Private Network (VPN) backbone, use the **show ip ospf sham-links** command in EXEC mode.

show ip ospf sham-links

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.2(8)T	This command was introduced.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST, and support for Cisco 12000 series Internet Router was added.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S, and support for Cisco 10000 series Internet Routers was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Use this command to display Open Shortest Path First (OSPF) information about the sham-links configured on a PE router.

Examples

The following example shows sample output from the **show ip ospf sham-links** command for a PE router in the VPN backbone:

```
Router1# show ip ospf sham-links
Sham Link OSPF_SL0 to address 10.44.0.1 is up
 Area 120 source address 10.0.0.1
   Run as demand circuit
   DoNotAge LSA allowed., Cost of using 1
   Transmit Delay is 1 sec, State POINT_TO_POINT,
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     Hello due in 00:00:09
     Adjacency State FULL (Hello suppressed)
     Index 2/2, retransmission queue length 0, number of retransmission 27
```

```
First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
Last retransmission scan length is 0, maximum is 2
Last retransmission scan time is 0 msec, maximum is 0 msec
```

show ip ospf statistics

To display Open Shortest Path First (OSPF) shortest path first (SPF) calculation statistics, use the **showipospfstatistics**command in user EXEC or privileged EXEC mode.

show ip ospf statistics [detail]

Syntax Description

detail	(Optional) Displays statistics separately for each OSPF area and includes additional, more detailed statistics.

Command Modes

User EXEC Privileged EXEC

Command History

Release	Modification
12.0(24)S	This command was introduced.
12.2(18)S	The command was integrated into Cisco IOS Release 12.2(18)S.
12.3(2)T	The command was integrated into Cisco IOS Release 12.3(2)T.

Usage Guidelines

The **showipospfstatistics** command provides important information about SPF calculations and the events that trigger them. This information can be meaningful for both OSPF network maintenance and troubleshooting. For example, entering the **showipospfstatistics** command is recommended as the first troubleshooting step for link-state advertisement (LSA) flapping.

Examples

The following is sample output from the **showipospfstatistics**command that shows a single line of information for each SPF calculation:

```
Router# show ip ospf statistics
OSPF process ID 200
----------------------------------------
  Area 0: SPF algorithm executed 10 times
  Area 200: SPF algorithm executed 8 times
  Summary OSPF SPF statistic
  SPF calculation time
Delta T    Intra   D-Intra   Summ   D-Summ   Ext   D-Ext   Total   Reason
08:17:16   0       0         0      0        0     0       0       R,
08:16:47   0       0         0      0        0     0       0       R, N,
08:16:37   0       0         0      0        0     0       0       R, X
00:04:40   208     40        208    44       220   0       720     R, N, SN, X
00:03:15   0       112       4      108      8     96      328     R, N, SN, X
00:02:55   164     40        176    44       188   0       612     R, N, SN, X
00:01:49   0       4         4      0        4     4       16      R, N, SN, X
00:01:48   0       0         4      0        4     0       12      R, N, SN, SA, X
```

```
00:01:43   0       0         4      0       4      0       8       R,
00:00:53   164     40        176    44      188    0       612     R, N, SN, X
```

The table below describes the significant fields shown in the display.

Table 19: show ip ospf statistics F ield Descriptions

Field	Description
OSPF process ID	A unique value assigned to the OSPF process in the configuration.
Area	OSPF area ID.
SPF algorithm executed	Number of times SPF algorithm has been executed for the particular area.
Delta T	Amount of time in milliseconds that has passed from when SPF started its calculation to the current time.
Intra	Time in milliseconds for the SPF algorithm to process intra-area LSAs and install intra-area routes in the routing table.
D-Intra	Time in milliseconds for the SPF algorithm to delete invalid intra-area routes from the routing table.
Summ	Time in milliseconds for the SPF algorithm to process interarea LSAs and install interarea routes in the routing table.
D-Summ	Time in milliseconds for the SPF algorithm to delete invalid interarea routes from the routing table.
Ext	Time in milliseconds for the SPF algorithm to process external and not so stubby area (NSSA) LSAs and install external and NSSA routes in the routing table.
D-Ext	Time in milliseconds for the SPF algorithm to delete invalid external and NSSA routes from the routing table.
Total	Total duration time, in milliseconds, for the SPF algorithm process.

Field	Description
Reason	Record of reasons causing SPF to be executed: • N--A change in a network LSA (type 2) has occurred. • R--A change in a router LSA (type 1) has occurred. • SA--A change in a Summary autonomous system boundary router (ASBR) (SA) LSA has occurred. • SN--A change in a Summary Network (SN) LSA has occurred. • X--A change in an External Type-7 (X7) LSA has occurred.

The following is sample output from the **showipospfstatistics**command with the **detail** keyword entered to show the statistics separately for a specific area:

```
Router# show ip ospf statistics detail
SPF 7 executed 2d17h ago, SPF type Full
  SPF calculation time (in msec):
  SPT   Intra   D-Intr   Summ   D-Summ   Ext7   D-Ext7   Total
  0     0       0        0      0        0      0        0
  LSIDs processed R:4 N:1 Stub:5 SN:17 SA:1 X7:0
  Change record R,
  LSIDs changed 1
  Last 10 LSIDs:
2.0.0.202(R)
```

The table below describes the significant fields shown in the display.

Table 20: show ip ospf statistics detail F ield Descriptions

Field	Description
SPF	Number of SPF algorithms executed in the OSPF area. The number increases by one for each SPF algorithm that is executed in the area.
Executed ago	Time in milliseconds that has passed between the start of the SPF algorithm execution and the current time.
SPF type	SPF type can be Full or Incremental.
SPT	Time in milliseconds requires to compute the first stage of the SPF algorithm (to build a short path tree). The SPT time plus the time required to process links to stub networks equals the Intra time.

Field	Description
Ext	Time in milliseconds for the SPF algorithm to process external and not so stubby area (NSSA) link-state advertisements (LSAs) and install external and NSSA routes in the routing table.
Total	Total duration time, in milliseconds, for the SPF algorithm process. **Note** Total time is the sum of previous times excluding the SPT time, which is already included in the Intra time.
LSIDs processed	Number of LSAs processed during the SPF calculation: • N--Network LSA. • R--Router LSA. • SA--Summary autonomous system boundary router (ASBR) (SA) LSA. • SN--Summary Network (SN) LSA. • Stub--Stub links. • X7--External Type-7 (X7) LSA.
LSIDs changed	Number of LSAs changed between this SPF calculation and the previous one. LSA changes force SPF to be scheduled.
Last 10 LSIDs	List of last ten Intra area LSAs that have changed between this SPF calculation and the previous one. LSID types: • R--Router LSA (type 1) • N--Network LSA (type 2)

show ip ospf summary-address

To display a list of all summary address redistribution information configured under an Open Shortest Path First (OSPF) process, use the **showipospfsummary-address**command in EXEC mode.

show ip ospf [*process-id*] **summary-address**

Syntax Description

process-id	(Optional) OSPF area ID.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The *process-id* argument can be entered as a decimal number or as an IP address format.

Examples

The following is sample output from the **showipospfsummary-address** command:

```
Router# show ip ospf summary-address

OSPF Process 2, Summary-address
10.2.0.0/255.255.0.0 Metric -1, Type 0, Tag 0
10.2.0.0/255.255.0.0 Metric -1, Type 0, Tag 10
```

The table below describes the significant fields shown in the displays.

Table 21: show ip ospf request-list Field Descriptions

Field	Description
10.2.0.0/255.255.0.0	IP address and mask of the router for the OSPF process.
Metric -1	OSPF metric type.
Type 0	Type of LSA.

Field	Description
Tag 0	OSPF process tag identifier.

show ip ospf virtual-links

To display parameters and the current state of Open Shortest Path First (OSPF) virtual links, use the **showipospfvirtual-links** command in EXEC mode.

show ip ospf virtual-links

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The information displayed by the **showipospfvirtual-links** command is useful in debugging OSPF routing operations.

Examples

The following is sample output from the **showipospfvirtual-links** command:

```
Router# show ip ospf virtual-links
Virtual Link to router 192.168.101.2 is up
Transit area 0.0.0.1, via interface Ethernet0, Cost of using 10
Transmit Delay is 1 sec, State POINT_TO_POINT
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 0:00:08
Adjacency State FULL
```

The table below describes the significant fields shown in the display.

Table 22: show ip ospf virtual-links Field Descriptions

Field	Description
Virtual Link to router 192.168.101.2 is up	Specifies the OSPF neighbor, and if the link to that neighbor is up or down.
Transit area 0.0.0.1	The transit area through which the virtual link is formed.

Field	Description
via interface Ethernet0	The interface through which the virtual link is formed.
Cost of using 10	The cost of reaching the OSPF neighbor through the virtual link.
Transmit Delay is 1 sec	The transmit delay (in seconds) on the virtual link.
State POINT_TO_POINT	The state of the OSPF neighbor.
Timer intervals...	The various timer intervals configured for the link.
Hello due in 0:00:08	When the next hello is expected from the neighbor.
Adjacency State FULL	The adjacency state between the neighbors.

show ipv6 ospf

To display general information about Open Shortest Path First (OSPF) routing processes, use the **show ipv6 ospf** command in user EXEC or privileged EXEC mode.

show ipv6 ospf [*process-id*] [*area-id*] **[rate-limit]**

Syntax Description

process-id	(Optional) Internal identification. It is locally assigned and can be any positive integer. The number used here is the number assigned administratively when the OSPF routing process is enabled.
area-id	(Optional) Area ID. This argument displays information about a specified area only.
rate-limit	(Optional) Rate-limited link-state advertisements (LSAs). This keyword displays LSAs that are currently being rate limited, together with the remaining time to the next generation.

Command Modes

User EXEC Privileged EXEC

Command History

Release	Modification
12.0(24)S	This command was introduced.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.2(18)S	This command was integrated into Cisco IOS Release 12.2(18)S.
12.3(4)T	Command output is changed when authentication is enabled.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(25)SG	This command was integrated into Cisco IOS Release 12.2(25)SG.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.4(9)T	Command output was updated to display OSPF for IPv6 encryption information.
12.4(15)XF	Command output was modified to include VMI PPPoE process-level values.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T

Release	Modification
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(33)SRC	The **rate-limit** keyword was added. Command output was modified to include the configuration values for SPF and LSA throttling timers.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
Cisco IOS XE Release 2.1	This command was integrated into Cisco IOS XE Release 2.1.
15.0(1)M	This command was integrated into Cisco IOS Release 12.5(1)M.
15.1(2)T	This command was modified. Support for IPv6 was added to Cisco IOS Release 15.1(2)T.
12.2(50)SY	This command was integrated into Cisco IOS Release 12.2(50)SY.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
15.0(1)SY	This command was integrated into Cisco IOS Release 15.0(1)SY.
15.2(2)SNG	This command was implemented on the Cisco ASR 901 Series Aggregation Services devices.

Examples

Examples

The following is sample output from the **show ipv6 ospf** command:

```
Device# show ipv6 ospf
Routing Process "ospfv3 1" with ID 10.10.10.1
 SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
 Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Number of external LSA 0. Checksum Sum 0x000000
 Number of areas in this device is 1. 1 normal 0 stub 0 nssa
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        MD5 Authentication, SPI 1000
        SPF algorithm executed 2 times
        Number of LSA 5. Checksum Sum 0x02A005
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

The table below describes the significant fields shown in the display.

Table 23: show ipv6 ospf Field Descriptions

Field	Description
Routing process "ospfv3 1" with ID 10.10.10.1	Process ID and OSPF device ID.

Field	Description
LSA group pacing timer	Configured LSA group pacing timer (in seconds).
Interface flood pacing timer	Configured LSA flood pacing timer (in milliseconds).
Retransmission pacing timer	Configured LSA retransmission pacing timer (in milliseconds).
Number of areas	Number of areas in device, area addresses, and so on.

Examples

The following sample output shows the **show ipv6 ospf** command with area encryption information:

```
Device# show ipv6 ospf
Routing Process "ospfv3 1" with ID 10.0.0.1
It is an area border device
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Number of external LSA 0. Checksum Sum 0x000000
Number of areas in this device is 2. 2 normal 0 stub 0 nssa
Reference bandwidth unit is 100 mbps
    Area BACKBONE(0)
        Number of interfaces in this area is 2
        SPF algorithm executed 3 times
        Number of LSA 31. Checksum Sum 0x107493
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 20
        Flood list length 0
    Area 1
        Number of interfaces in this area is 2
        NULL Encryption SHA-1 Auth, SPI 1001
        SPF algorithm executed 7 times
        Number of LSA 20. Checksum Sum 0x095E6A
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

The table below describes the significant fields shown in the display.

Table 24: show ipv6 ospf with Area Encryption Information Field Descriptions

Field	Description
Area 1	Subsequent fields describe area 1.
NULL Encryption SHA-1 Auth, SPI 1001	Displays the encryption algorithm (in this case, null, meaning no encryption algorithm is used), the authentication algorithm (SHA-1), and the security policy index (SPI) value (1001).

The following example displays the configuration values for SPF and LSA throttling timers:

```
Device# show ipv6 ospf
 Routing Process "ospfv3 1" with ID 10.9.4.1
 Event-log enabled, Maximum number of events: 1000, Mode: cyclic
 It is an autonomous system boundary device
 Redistributing External Routes from,
    ospf 2
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
```

The table below describes the significant fields shown in the display.

Table 25: show ipv6 ospf with SPF and LSA Throttling Timer Field Descriptions

Field	Description
Initial SPF schedule delay	Delay time of SPF calculations.
Minimum hold time between two consecutive SPFs	Minimum hold time between consecutive SPF calculations.
Maximum wait time between two consecutive SPFs 10000 msecs	Maximum hold time between consecutive SPF calculations.
Minimum LSA interval 5 secs	Minimum time interval (in seconds) between link-state advertisements.
Minimum LSA arrival 1000 msecs	Maximum arrival time (in milliseconds) of link-state advertisements.

The following example shows information about LSAs that are currently being rate limited:

```
Device# show ipv6 ospf rate-limit
List of LSAs that are in rate limit Queue
    LSAID: 0.0.0.0 Type: 0x2001 Adv Rtr: 10.55.55.55 Due in: 00:00:00.500
    LSAID: 0.0.0.0 Type: 0x2009 Adv Rtr: 10.55.55.55 Due in: 00:00:00.500
```

The table below describes the significant fields shown in the display.

Table 26: show ipv6 ospf rate-limit Field Descriptions

Field	Description
LSAID	Link-state ID of the LSA.
Type	Description of the LSA.
Adv Rtr	ID of the advertising device.
Due in:	Remaining time until the generation of the next event.

summary-address (OSPF)

To create aggregate addresses for Open Shortest Path First (OSPF), use the **summary-address** command in router configuration mode. To restore the default, use the no form of this command.

summary-address commandsummary-address {*ip-address mask*| *prefix mask*} **[not-advertise]** [**tag** *tag*] **[nssa-only]**

no summary-address {*ip-address mask*| *prefix mask*} **[not-advertise]** [**tag** *tag*] **[nssa-only]**

Syntax Description

ip-address	Summary address designated for a range of addresses.
mask	IP subnet mask used for the summary route.
prefix	IP route prefix for the destination.
not-advertise	(Optional) Suppresses routes that match the specified prefix/mask pair. This keyword applies to OSPF only.
tag *tag*	(Optional) Specifies the tag value that can be used as a "match" value for controlling redistribution via route maps. This keyword applies to OSPF only.
nssa-only	(Optional) Sets the nssa-only attribute for the summary route (if any) generated for the specified prefix, which limits the summary to not-so-stubby-area (NSSA) areas.

Command Default

This command behavior is disabled by default.

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
15.0(1)M	This command was modified. The nssa-only keyword was added.

Usage Guidelines

R outes learned from other routing protocols can be summarized. The metric used to advertise the summary is the lowest metric of all the more specific routes. This command helps reduce the size of the routing table.

Using this command for OSPF causes an OSPF Autonomous System Boundary Router (ASBR) to advertise one external route as an aggregate for all redistributed routes that are covered by the address. For OSPF, this command summarizes only routes from other routing protocols that are being redistributed into OSPF. Use the **area range** command for route summarization between OSPF areas.

OSPF does not support the **summary-address 0.0.0.0 0.0.0.0**command.

Examples

In the following example, the summary address 10.1.0.0 includes address 10.1.1.0, 10.1.2.0, 10.1.3.0, and so on. Only the address 10.1.0.0 is advertised in an external link-state advertisement.

```
summary-address 10.1.0.0 255.255.0.0
```

Related Commands

Command	Description
area range	Consolidates and summarizes routes at an area boundary.
ip ospf authentication-key	Assigns a password to be used by neighboring routers that are using the simple password authentication of OSPF.
ip ospf message-digest-key	Enables OSPF MD5 authentication.

timers lsa arrival

To set the minimum interval at which the software accepts the same link-state advertisement (LSA) from Open Shortest Path First (OSPF) neighbors, use the **timers lsa arrival**command in router configuration mode. To restore the default value, use the **no** form of this command.

timers lsa arrival *milliseconds*

no timers lsa arrival

Syntax Description

milliseconds	Minimum delay in milliseconds that must pass between acceptance of the same LSA arriving from neighbors. The range is from 0 to 600,000 milliseconds. The default is 1000 milliseconds.

Command Default

1000 milliseconds

Command Modes

OSPF for IPv6 router configuration (config-rtr) Router configuration (config-router)

Command History

Release	Modification
12.0(25)S	This command was introduced.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	Support for IPv6 was added.
12.2(33)SB	Support for IPv6 was added.
Cisco IOS XE Release 2.1	This command was introduced on Cisco ASR 1000 Series Routers.
15.0(1)M	This command was integrated into Cisco IOS Release 12.5(1)M.
12.2(33)XNE	This command was modified. It was integrated into Cisco IOS Release 12.2(33)XNE.

Usage Guidelines

The **timers lsa arrival** command controls the minimum interval for accepting the same LSA. The "same LSA" is defined as an LSA instance that contains the same LSA ID number, LSA type, and advertising router ID. If an instance of the same LSA arrives sooner than the interval that is set, the LSA is dropped.

We suggest you keep the *milliseconds*value of the **timers lsa arrival** command less than or equal to the neighbors' *hold-interval* value of the **timers throttle lsa all** command.

Examples

The following example sets the minimum interval for accepting the same LSA at 2000 milliseconds:

```
router ospf 1
 log-adjacency-changes
 timers throttle lsa all 200 10000 45000
 timers lsa arrival 2000
 network 10.10.4.0 0.0.0.255 area 24
 network 10.10.24.0 0.0.0.255 area 24
```

Related Commands

Command	Description
show ip ospf timers rate-limit	Displays all of the LSAs in the rate limit queue.
show ipv6 ospf timers rate-limit	Displays all of the LSAs in the IPv6 rate limit queue
timers throttle lsa	Sets rate-limiting values for OSPF for IPv6 LSA generation.
timers throttle lsa all	Sets rate-limiting values for LSAs being generated.

timers pacing flood

To configure link-state advertis ement (LSA) flood packet pacing, use the **timers pacing flood** command in router configuration mode. To restore the default flood packet pacing value, use the **no** form of this command.

timers pacing flood *milliseconds*

no timers pacing flood

Syntax Description

milliseconds	Time (in milliseconds) at which LSAs in the flooding queue are paced in between updates. The configurable range is from 5 milliseconds to 100 milliseconds. The default value is 33 milliseconds.

Command Default

33 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.2(4)T	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Configuring Open Shortest Path First (OSPF) flood pacing timers allows you to control interpacket spacing between consecutive link-state update packets in the OSPF transmission queue. This command allows you to control the rate at which LSA updates occur so that high CPU or buffer utilization that can occur when an area is flooded with a very large number of LSAs can be reduced.

The default settings for OSPF packet pacing timers are suitable for the majority of OSPF deployments. Do not change the packet pacing timers unless all other options to meet OSPF packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flood timers. Furthermore, there are no guidelines for changing timer values; each OSPF deployment is unique and should be considered on a case-by-case basis. The network operator assumes risks associated with changing the default flood timer values.

Examples

The following example configures LSA flood packet-pacing updates to occur in 55-millisecond intervals for Open Shortest Path First (OSPF) routing process 1:

```
Router(config)# router ospf 1
Router(config-router)# timers pacing flood 55
```

Related Commands

Command	Description
show ip ospf	Displays general information about OSPF routing processes.
timers pacing lsa-group	Changes the interval at which OSPF LSAs are collected into a group and refreshed, checksummed, or aged.
timers pacing retransmission	Configures LSA retransmission packet pacing.

timers pacing retransmission

To configure link-state adv ertisement (LSA) retransmission packet pacing, use the timers pacing retransmission command in router configuration mode. To restore the default retransmission packet pacing value, use the **no** form of this command.

timers pacing retransmission *milliseconds*

no timers pacing retransmission

Syntax Description

milliseconds	The time (in milliseconds) at which LSAs in the retransmission queue are paced. The configurable range is from 5 milliseconds to 200 milliseconds. The default value is 66 milliseconds.

Command Default

66 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.2(4)T	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Configuring Open Shortest Path First (OSPF) retransmission pacing timers allow you to control interpacket spacing between consecutive link-state update packets in the OSPF retransmission queue. This command allows you to control the rate at which LSA updates occur so that high CPU or buffer utilization that can occur when an area is flooded with a very large number of LSAs can be reduced. The default settings for OSPF packet retransmission pacing timers are suitable for the majority of OSPF deployments. Do not change the packet retransmission pacing timers unless all other options to meet OSPF packet flooding requirements have been exhausted. Specifically, network operators should prefer summarization, stub area usage, queue tuning, and buffer tuning before changing the default flooding timers. Furthermore, there are no guidelines for changing timer values; each OSPF deployment is unique and should be considered on a case-by-case basis. The network operator assumes risks associated with changing the default packet retransmission pacing timer values.

Examples

The following example configures LSA flood pacing updates to occur in 55-millisecond intervals for OSPF routing process 1:

```
Router(config)# router ospf 1
Router(config-router)# timers pacing retransmission 55
```

Related Commands

Command	Description
show ip ospf	Displays general information about OSPF routing processes.
timers pacing flood	Configures LSA flood packet pacing.
timers pacing lsa-group	Changes the interval at which OSPF LSAs are collected into a group and refreshed, checksummed, or aged.

timers throttle spf

To turn on Open Shortest Path First (OSPF) shortest path first (SPF) throttling, use the **timers throttle spf** command in the appropriate configuration mode. To turn off OSPF SPF throttling, use the **no** form of this command.

timers throttle spf *spf-start spf-hold spf-max-wait*

no timers throttle spf *spf-start spf-hold spf-max-wait*

Syntax Description

spf-start	Initial delay to schedule an SPF calculation after a change, in milliseconds. Range is from 1 to 600000. In OSPF for IPv6, the default value is 5000.
spf-hold	Minimum hold time between two consecutive SPF calculations, in milliseconds. Range is from 1 to 600000. In OSPF for IPv6, the default value is 10,000.
spf-max-wait	Maximum wait time between two consecutive SPF calculations, in milliseconds. Range is from 1 to 600000. In OSPF for IPv6, the default value is 10,000.

Command Default

SPF throttling is not set.

Command Modes

Address family configuration (config-router-af) Router address family topology configuration (config-router-af-topology) Router configuration (config-router) OSPF for IPv6 router configuration (config-rtr)

Command History

Release	Modification
12.2(14)S	This command was introduced. This command replaces the **timers spf-interval** command.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	This command was made available in router address family configuration mode.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Release	Modification
12.2(33)SRC	Support for IPv6 was added.
12.2(33)SB	Support for IPv6 was added and this command was integrated into Cisco IOS Release 12.2(33)SB.
Cisco IOS XE Release 2.1	This command was introduced on Cisco ASR 1000 Series Routers.
15.0(1)M	This command was integrated into Cisco IOS Release 12.5(1)M.
12.2(33)XNE	This command was modified. It was integrated into Cisco IOS Release 12.2(33)XNE.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY.

Usage Guidelines

The first wait interval between SPF calculations is the amount of time in milliseconds specified by the *spf-start*argument. Each consecutive wait interval is two times the current hold level in milliseconds until the wait time reaches the maximum time in milliseconds as specified by the *spf-max-wait* argument. Subsequent wait times remain at the maximum until the values are reset or a link-state advertisement (LSA) is received between SPF calculations.

Release 12.2(33)SRB

If you plan to configure the Multi-Topology Routing (MTR) feature, you need to enter the **timers throttle spf** command in router address family topology configuration mode in order to make this OSPF router configuration command become topology-aware.

Release 15.2(1)T

When you configure the **ospfv3 network manet** command on any interface attached to the OSPFv3 process, the default values for the *spf-start*, *spf-hold*, and the *spf-max-wait* arguments are reduced to 1000 milliseconds, 1000 milliseconds, and 2000 milliseconds respectively.

Examples

The following example shows how to configure a router with the delay, hold, and maximum interval values for the **timers throttle spf** command set at 5, 1000, and 90,000 milliseconds, respectively.

```
router ospf 1
 router-id 10.10.10.2
 log-adjacency-changes
 timers throttle spf 5 1000 90000
 redistribute static subnets
 network 10.21.21.0 0.0.0.255 area 0
 network 10.22.22.0 0.0.0.255 area 00
```

The following example shows how to configure a router using IPv6 with the delay, hold, and maximum interval values for the **timers throttle spf** command set at 500, 1000, and 10,000 milliseconds, respectively.

```
ipv6 router ospf 1
 event-log size 10000 one-shot
 log-adjacency-changes
 timers throttle spf 500 1000 10000
```

Related Commands

Command	Description
ospfv3 network manet	Sets the network type to Mobile Ad Hoc Network (MANET).