OSPF Commands

area authentication

To enable authentication for an Open Shortest Path First (OSPF) area, use the **area authentication** command in router configuration mode. To remove an authentication specification of an area or a specified area from the configuration, use the **no** form of this command.

area *area-id* **authentication** [**message-digest**]

no area *area-id* **authentication** [**message-digest**]

Syntax Description

area-id	Identifier of the area for which authentication is to be enabled. The identifier can be specified as either a decimal value or an IP address.
message-digest	(Optional) Enables Message Digest 5 (MD5) authentication on the area specified by the *area-id* argument.

Defaults

Type 0 authentication (no authentication)

Command Modes

Router configuration

Command History

Release	Modification
10.0	This command was introduced.
11.0	The **message-digest** 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.

Usage Guidelines

Specifying authentication for an area sets the authentication to Type 1 (simple password) as specified in RFC 1247. If this command is not included in the configuration file, authentication of Type 0 (no authentication) is assumed.

The authentication type must be the same for all routers and access servers in an area. The authentication password for all OSPF routers on a network must be the same if they are to communicate with each other via OSPF. Use the **ip ospf authentication-key** interface command to specify this password.

If you enable MD5 authentication with the **message-digest** keyword, you must configure a password with the **ip ospf message-digest-key** interface command.

To remove the authentication specification for an area, use the **no** form of this command with the **authentication** keyword.

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 authentication**, **area default-cost**, **area nssa**, **area range**, **area stub**, and **area virtual-link**.

Examples

The following example mandates authentication for areas 0 and 10.0.0.0 of OSPF routing process 201. Authentication keys are also provided.

```
interface ethernet 0
 ip address 192.168.251.201 255.255.255.0
 ip ospf authentication-key adcdefgh
!
interface ethernet 1
 ip address 10.56.0.201 255.255.0.0
 ip ospf authentication-key ijklmnop
!
router ospf 201
 network 10.0.0.0 0.255.255.255 area 10.0.0.0
 network 192.168.0.0 0.0.255.255 area 0
 area 10.0.0.0 authentication
 area 0 authentication
```

Related Commands

Command	Description
area default-cost	Specifies a cost for the default summary route sent into a stub area.
area stub	Defines an area as a stub area.
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.

area default-cost

To specify a cost for the default summary route that is sent into a stub area or not-so-stubby area (NSSA), use the **area default-cost** command in router address family topology or router configuration mode. To remove the assigned default route cost, use the **no** form of this command.

area *area-id* **default-cost** *cost*

no area *area-id* **default-cost** *cost*

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.
cost	Cost for the default summary route used for a stub or NSSA. The acceptable value is a 24-bit number.

Command Default

cost: 1

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

This command is used only on an Area Border Router (ABR) attached to a stub area or NSSA.

There are two stub area router configuration commands: the **stub** and **default-cost** options of the **area** command. In all routers and access servers attached to the stub area, the area should be configured as a stub area using the **stub** option of the **area** command. Use the **default-cost** option only on an ABR attached to the stub area. The **default-cost** option provides the metric for the summary default route generated by the ABR into the stub area.

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 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 default-cost** command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example assigns a default cost of 20 to stub network 10.0.0.0:

```
interface ethernet 0
 ip address 10.56.0.201 255.255.0.0
!
router ospf 201
 network 10.0.0.0 0.255.255.255 area 10.0.0.0
 area 10.0.0.0 stub
 area 10.0.0.0 default-cost 20
```

Related Commands

Command	Description
area authentication	Enables authentication for an OSPF area.
area stub	Defines an area as a stub area.

area filter-list

To filter prefixes advertised in type 3 link-state advertisements (LSAs) between Open Shortest Path First (OSPF) areas of an Area Border Router (ABR), use the **area filter-list** command in router address family topology or router configuration mode. To change or cancel the filter, use the **no** form of this command.

area *area-id* **filter-list prefix** *prefix-list-name* {**in** | **out**}

no area *area-id* **filter-list prefix** *prefix-list-name* {**in** | **out**}

Syntax Description

area-id	Identifier of the area for which filtering is configured. The identifier can be specified as either a decimal value or an IP address.
prefix	Indicates that a prefix list is used.
prefix-list-name	Name of a prefix list.
in	The prefix list is applied to prefixes advertised to the specified area from other areas.
out	The prefix list is applied to prefixes advertised out of the specified area to other areas.

Command Default

This command is disabled by default. The router will not filter prefixes.

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.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRB	This command was made available in router address family topology configuration mode.

Usage Guidelines

With this feature enabled in the “in” direction, all type 3 LSAs originated by the ABR to this area, based on information from all other areas, are filtered by the prefix list. Type 3 LSAs that were originated as a result of the **area range** command in another area are treated like any other type 3 LSA that was originated individually. Any prefix that does not match an entry in the prefix list is implicitly denied.

With this feature enabled in the “out” direction, all type 3 LSAs advertised by the ABR, based on information from this area to all other areas, are filtered by the prefix list. If the **area range** command has been configured for this area, type 3 LSAs that correspond to the area range are sent to all other areas, only if at least one prefix in the area range matches an entry in the prefix list.

If all specific prefixes are denied by the prefix list, type 3 LSAs that correspond to the **area range** command will not be sent to any other area. Prefixes that are not permitted by the prefix list are implicitly denied.

Release 12.2(33)SRB

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

Examples

The following example filters prefixes that are sent from all other areas to area 1:

```
area 1 filter-list prefix AREA_1 in
```

Related Commands

Command	Description
area range	Consolidates and summarizes routes at an area boundary.

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 *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.
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.
12.2(33)SRE	This command was modified. The **nssa-only** keyword was added.

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 *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.
15.1(2)S	This command was modified. Support for the **always** keyword was added.

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 range

To consolidate and summarize routes at an area boundary, use the **area range** command in router address family topology or router configuration mode. To disable this function, use the **no** form of this command.

area *area-id* **range** *ip-address ip-address-mask* [**advertise | not-advertise**] [**cost** *cost*]

no area *area-id* **range** *ip-address ip-address-mask* [**advertise | not-advertise**] [**cost** *cost*]

Syntax Description

area-id	Identifier of the area for which routes are to be summarized. It can be specified as either a decimal value or an IPv6 prefix.
ip-address	IP address.
ip-address-mask	IP address mask.
advertise	(Optional) Sets the address range status to advertise and generates a Type 3 summary link-state advertisement (LSA).
not-advertise	(Optional) Sets the address range status to DoNotAdvertise. The Type 3 summary LSA is suppressed, and the component networks remain hidden from other networks.
cost *cost*	(Optional) Metric or cost for this summary route, which is used during OSPF SPF calculation to determine the shortest paths to the destination. The value can be 0 to 16777215.

Command Default

This command is disabled by default.

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.
12.0(24)S	The **cost** keyword and *cost* argument were added.
12.2(15)T	The **cost** keyword and *cost* argument were 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.
12.2SX	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 **area range** command is used only with Area Border Routers (ABRs). It is used to consolidate or summarize routes for an area. The result is that a single summary route is advertised to other areas by the ABR. Routing information is condensed at area boundaries. External to the area, a single route is advertised for each address range. This behavior is called *route summarization*.

Multiple **area range** router configuration commands can be configured. Thus, OSPF can summarize addresses for many different sets of address ranges.

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 Multi-Topology Routing (MTR) feature, you need to enter the **area range** 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 one summary route to be advertised by the ABR to other areas for all subnets on network 10.0.0.0 and for all hosts on network 192.168.110.0:

```
interface ethernet 0
 ip address 192.168.110.201 255.255.255.0
!
interface ethernet 1
 ip address 192.168.120.201 255.255.255.0
!
router ospf 201
 network 192.168.110.0 0.0.0.255 area 0
 area 10.0.0.0 range 10.0.0.0 255.0.0.0
 area 0 range 192.168.110.0 255.255.0.0
```

Related Commands

Command	Description
area range (IPv6)	Consolidates and summarizes routes at an area boundary in an IPv6 network.

area sham-link

To configure a sham-link interface on a provider edge (PE) router in a Multiprotocol Label Switching (MPLS) Virtual Private Network (VPN) backbone, use the **area sham-link** command in router configuration mode. To remove the sham-link, use the **no** form of this command.

area *area-id* **sham-link** *source-address destination-address* [**cost** *number*] [**ttl-security hops** *hop-count*]

no area *area-id* **sham-link** *source-address destination-address*

Syntax Description

area-id	ID number of the Open Shortest Path First (OSPF) area assigned to the sham link. Valid values: numeric value from 1 to 4294967295 or valid IP address, in A.B.C.D format. There is no default.
source-address	IP address of the source PE router in the format: *ip-address* [*mask*].
destination-address	IP address of the destination PE route in the format: *ip-address* [*mask*].
cost *number*	(Optional) Specifies the OSPF cost to send IP packets over the sham-link interface. The *number* argument range is from 1 to 65535.
ttl-security hops *hop-count*	(Optional) Configures Time-to-Live (TTL) security on a sham link. The *hop-count* argument range is from 1 to 254.

Command Default

No default behavior or values

Command Modes

Router configuration (config-router)

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 routers 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.
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.

Usage Guidelines

In the MPLS VPN environment, several VPN client sites can be connected in the same OSPF area. If these sites are connected over a backdoor link in addition to the VPN backbone, all traffic passes over the backdoor link instead of over the VPN backbone. OSPF always selects intra-area routes over interarea (external) routes.

To correct this default OSPF behavior in an MPLS VPN, use the **area sham-link** command to configure a sham link between two PEs to connect the sites through the MPLS VPN backbone. A sham link represents an intra-area (unnumbered point-to-point) connection between PEs. All other routers in the area use the sham link to calculate intra-area shortest path first (SPF) routes to the remote site.

Configure the source and destination addresses of the sham link as a host route mask (255.255.255.255) on the PE routers that serve as the endpoints of the sham link. The source and destination IP addresses must belong to the VPN routing and forwarding instance (VRF) and be advertised by Border Gateway Protocol (BGP) to remote PE routers. The sham link endpoint addresses should not be advertised by OSPF.

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

Examples

The following example shows how to configure a sham link between two PE routers in an MPLS VPN backbone by using the **area sham-link** command on each router:

```
Router1(config)# interface loopback 55
Router1(config-if)# ip vrf forwarding v1
Router1(config-if)# ip address 10.0.0.1 255.255.255.255
!
Router1(config)# router ospf 2 vrf v1
Router1(config-router)# log-adjacency-changes
Router1(config-router)# area 120 sham-link 10.0.0.1 172.16.0.1 cost 1
Router1(config-router)# redistribute bgp 1 subnets
Router1(config-router)# network 10.2.0.1 255.255.255.255 area 1
Router1(config-router)# network 10.120.0.0 0.255.255.255 area 120
Router1(config-router)# network 10.140.0.0 0.255.255.255 area 120
!
Router2(config)# interface loopback 44
Router2(config-if)# ip vrf forwarding v1
Router2(config-if)# ip address 172.16.0.1 255.255.255.255
!
Router2(config)# router ospf 2 vrf v1
Router2(config-router)# log-adjacency-changes
Router2(config-router)# area 120 sham-link 172.16.0.1 10.0.0.1 cost 1
Router2(config-router)# redistribute bgp 1 subnets
Router2(config-router)# network 10.2.0.1 255.255.255.255 area 1
Router2(config-router)# network 10.120.0.0 0.255.255.255 area 120
Router2(config-router)# network 10.140.0.0 0.255.255.255 area 120
!
```

Related Commands

Command	Description
ttl-security hops	Enables checking of TTL values on OSPF packets from neighbors or setting TTL values sent to neighbors.

area stub

To define an area as a stub area, use the **area stub** command in router address family topology or router configuration mode. To disable this function, use the **no** form of this command.

area *area-id* **stub** [**no-summary**]

no area *area-id* **stub** [**no-summary**]

Syntax Description

area-id	Identifier for the stub area; either a decimal value or an IP address.
no-summary	(Optional) Prevents an Area Border Router (ABR) from sending summary link advertisements into the stub area.

Defaults

No stub 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.
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 configure the **area stub** command on all routers and access servers in the stub area. Use the **area** router configuration command with the **default-cost** keyword to specify the cost of a default internal route sent into a stub area by an ABR.

There are two stub area router configuration commands: the **stub** and **default-cost** options of the **area** router configuration command. In all routers attached to the stub area, the area should be configured as a stub area using the **stub** keyword of the **area** command. Use the **default-cost** keyword only on an ABR attached to the stub area. The **default-cost** keyword provides the metric for the summary default route generated by the ABR into the stub area.

To further reduce the number of link-state advertisements (LSAs) sent into a stub area, you can configure the **no-summary** keyword on the ABR to prevent it from sending summary LSAs (LSA type 3) into the stub area.

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 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 stub** command in router address family topology configuration mode in order for this OSPF router configuration command to become topology-aware.

Examples

The following example assigns a default cost of 20 to stub network 10.0.0.0:

```
interface ethernet 0
 ip address 10.56.0.201 255.255.0.0
!
router ospf 201
 network 10.0.0.0 0.255.255.255 area 10.0.0.0
 area 10.0.0.0 stub
 area 10.0.0.0 default-cost 20
```

Related Commands

Command	Description
area authentication	Enables authentication for an OSPF area.
area default-cost	Specifies a cost for the default summary route sent into a stub area.

area virtual-link

To define an Open Shortest Path First (OSPF) virtual link, use the **area virtual-link** command in router address family topology or router 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. 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. 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. 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)

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.

Usage Guidelines

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

The smaller 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.

The transmit delay value should take into account 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 see 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 Multi-Topology 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
```

Related Commands

Command	Description
ttl-security hops	Enables checking of TTL values on OSPF packets from neighbors or setting TTL values sent to neighbors.
show ip ospf	Enables the display of general information about Open Shortest Path First (OSPF) routing processes.
show ipv6 ospf	Enables the display of general information about Open Shortest Path First (OSPF) routing processes.

auto-cost

To control how Open Shortest Path First (OSPF) calculates default metrics for the interface, use the **auto-cost** command in router configuration mode. To assign cost based only on the interface type, use the **no** form of this command.

auto-cost reference-bandwidth *mbps*

no auto-cost reference-bandwidth

Syntax Description

reference-bandwidth *mbps*	Rate in Mbps (bandwidth). The range is from 1 to 4294967; the default is 100.

Defaults

100 Mbps

Command Modes

Router configuration

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.

Usage Guidelines

In Cisco IOS Release 10.3 and later releases, by default OSPF will calculate the OSPF metric for an interface according to the bandwidth of the interface. For example, a 64K link will get a metric of 1562, and a T1 link will have a metric of 64.

The OSPF metric is calculated as the *ref-bw* value divided by the *bandwidth*, with *mbps* equal to 10^8 by default, and *bandwidth* determined by the **bandwidth** (interface) command. The calculation gives FDDI a metric of 1.

If you have multiple links with high bandwidth (such as FDDI or ATM), you might want to use a larger number to differentiate the cost on those links.

The value set by the **ip ospf cost** command overrides the cost resulting from the **auto-cost** command.

Examples

The following example changes the cost of the FDDI link to 10, while the gigabit Ethernet link remains at a cost of 1. Thus, the link costs are differentiated.

```
router ospf 1
 auto-cost reference-bandwidth 1000
```

Related Commands

Command	Description
ip ospf cost	Explicitly specifies the cost of sending a packet on an interface.

capability lls

To enable the use of the Link-Local Signalling (LLS) data block in originated Open Shortest Path First (OSPF) packets and reenable OSPF nonstop forwarding (NSF) awareness, use the **capability lls** command in router configuration mode. To disable LLS and OSPF NSF awareness, use the **no** form of this command.

capability lls

no capability lls

Syntax Description

This command has no arguments or keywords.

Command Default

LLS is enabled.

Command Modes

Router configuration

Command History

Release	Modification
12.2(15)T	This command was introduced.
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(31)SXH.

Usage Guidelines

You might want to disable NSF awareness by disabling the use of the LLS data block in originated OSPF packets. You might want to disable NSF awareness if the router has no applications using LLS.

If NSF is configured and you try to disable LLS, you will receive the error message, "OSPF Non-Stop Forwarding (NSF) must be disabled first."

If LLS is disabled and you try to configure NSF, you will receive the error message, "OSPF Link-Local Signaling (LLS) capability must be enabled first."

Examples

The following example disables LLS support and OSPF NSF awareness:

```
router ospf 2
 no capability lls
```

capability transit

To reenable Open Shortest Path First (OSPF) area capability transit after it has been disabled, use the **capability transit** command in router configuration mode. To disable OSPF area capability transit on all areas for a router process, use the **no** form of this command.

capability transit

no capability transit

Syntax Description

This command has no arguments or keywords.

Defaults

OSPF area capability transit is enabled.

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(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)SXH	This command was integrated into Cisco IOS Release 12.2(33) SXH.

Usage Guidelines

OSPF area capability transit is enabled by default, allowing the OSPF Area Border Router to install better-cost routes to the backbone area through the transit area instead of the virtual links. If you want to retain a traffic pattern through the virtual-link path, you can disable capability transit by entering the **no capability transit** command. If paths through the transit area are discovered, they are most likely to be more optimal paths, or at least equal to, the virtual-link path. To reenable capability transit, enter the **capability transit** command.

If you need to verify whether OSPF area capability transit is enabled for a specific routing process, enter the **show ip ospf** command.

Examples

The following example shows how to disable OSPF area capability transit on all areas for a router process named ospf 1. A **show ip ospf** command is issued first to display the current areas that have area capability transit enabled. The **no capability transit** command is then entered to disable OSPF area capability transit on all areas for the router process ospf 1.

```
Router# show ip ospf

 Routing Process "ospf 1" with ID 10.1.1.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
```

```
 Supports Link-local Signaling (LLS)
!Supports area transit capability
It is an area border router
 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 1 secs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Number of external LSA 8. Checksum Sum 0x02853F
 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 2. 2 normal 0 stub 0 nssa
!Number of areas transit capable is 1
External flood list length 0
    Area BACKBONE(0)
        Number of interfaces in this area is 3
        Area has no authentication
        SPF algorithm last executed 00:02:21.524 ago
        SPF algorithm executed 11 times
        Area ranges are
        Number of LSA 49. Checksum Sum 0x19B5FA
        Number of opaque link LSA 0. Checksum Sum 0x000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 38
        Flood list length 0
    Area 1
        Number of interfaces in this area is 3
       !This area has transit capability: Virtual Link Endpoint
        Area has no authentication
        SPF algorithm last executed 00:02:36.544 ago
        SPF algorithm executed 9 times
        Area ranges are
        Number of LSA 42. Checksum Sum 0x1756D5
        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

Router(config)# router ospf 1
Router(router-config)# no capability transit
```

Related Commands

Command	Description
show ip ospf	Displays general information about OSPF routing processes.

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 **capability vrf-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.

Defaults

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.

Table 1 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 **capability vrf-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
```

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 [*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 OSPF process. If the *pid argument* is not specified, all OSPF processes are cleared.

Prior to Cisco IOS Release 12.2(33)SXH, when the **clear ip ospf process** command is executed, even if a local address is no longer available, the default router ID remains the same. In Cisco IOS Release 12.2(33)SXH, that behavior changed so that when the **clear ip ospf process** command is executed OSPF checks if the currently in-use router ID is still available as a local address. If it is not, OSPF runs a re-election and changes its router ID.

Examples

The following example shows how to clear all OSPF processes:

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

clear ip ospf force-spf

To start the shortest path first (SPF) algorithm without clearing the Open Shortest Path First (OSPF) database, use the **clear ip ospf force-spf** command in privileged EXEC mode.

clear ip ospf [*process-id*] **force-spf**

Syntax Description

process-id	(Optional) Process identifier (ID). The range is from 1 to 65535.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.0(1)M	This command was introduced.
12.2(33)SRE	The command was integrated into Cisco IOS Release 12.2(33)SRE.
12.2(33)XNE	The command was integrated into Cisco IOS Release 12.2(33)XNE.

Usage Guidelines

The **clear ip ospf force-spf** command is used in troubleshooting and for testing purposes. This command is used to verify if the currently computed routes are correct, to generate debug messages, and so on.

Examples

The following example shows how to start the SPF algorithm without first clearing the OSPF database:

```
Router# clear ip ospf 1000 force-spf
```

Related Commands

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

clear ip ospf traffic

To clear Open Shortest Path First (OSPF) traffic statistics, use the **clear ip ospf traffic** command in user EXEC or privileged EXEC mode.

clear ip ospf [*process-id*] **traffic** [*interface-type interface-number*]

Syntax Description

process-id	(Optional) Process ID. If the *process-id* argument is included, only traffic statistics for the specified routing process are cleared.
interface-type	(Optional) Interface type.
interface-number	(Optional) interface number.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.3(11)T	This command was introduced.
12.0(28)S	This command was integrated into Cisco IOS Release 12.0(28)S.

Examples

The following example clears OSPF traffic statistics for the OSPF process 100:

```
Router# clear ip ospf 100 traffic
```

Related Commands

Command	Description
show ip ospf traffic statistics	Displays OSPF traffic statistics.

clear ipv6 ospf traffic

To reset counters and clear IPv6 OSPFv3 traffic statistics, use the **clear ipv6 ospf traffic** command privileged EXEC mode.

clear ipv6 ospf traffic

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(6)T	This command was introduced.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

Examples

The following example resets the counters and clears the OSPFv3 traffics statistics:

```
Router# clear ipv6 ospf traffic
```

Related Commands

Command	Description
clear ip ospf traffic	Clears OSPFv2 traffic statistics.
show ip ospf traffic	Displays OSPFv2 traffic statistics.
show ipv6 ospf traffic	Displays OSPFv3 traffic statistics.

compatible rfc1583

To restore the method used to calculate summary route costs per RFC 1583, use the **compatible rfc1583** command in router configuration mode. To disable RFC 1583 compatibility, use the **no** form of this command.

compatible rfc1583

no compatible rfc1583

Syntax Description

This command has no arguments or keywords.

Defaults

Compatible with RFC 1583.

Command Modes

Router configuration

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.

Usage Guidelines

This command is backward compatible with Cisco IOS Release 12.0.

To minimize the chance of routing loops, all Open Shortest Path First (OSPF) routers in an OSPF routing domain should have RFC compatibility set identically.

Because of the introduction of RFC 2328, OSPF Version 2, the method used to calculate summary route costs has changed. Use the **no compatible rfc1583** command to enable the calculation method used per RFC 2328.

Examples

The following example specifies that the router process is compatible with RFC 1583:

```
router ospf 1
 compatible rfc1583
 !
```

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. 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)

Command History

Release	Modification
15.1(2)S	This command was introduced.

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.

Examples

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

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

Release	Modification
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 still must 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 an external metric type of Type 1:

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

Related Commands

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

Defaults

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

The **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 Internal Gateway Protocol (IGP)-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.

discard-route

To reinstall an external or internal discard route that was previously removed, use the **discard-route** command in router address family topology configuration or router configuration mode. To remove an external or internal discard route, use the **no** form of this command.

discard-route [**external** [*distance*]] [**internal** [*distance*]]

no discard-route [**external** [*distance*]] [**internal** [*distance*]]

Syntax Description

external	(Optional) Specifies the discard-route entry for redistributed summarized routes on an Autonomous System Boundary Router (ASBR).
internal	(Optional) Specifies the discard-route entry for summarized internal routes on the Area Border Router (ABR).
distance	(Optional) Administrative distance. A value between 1 and 254. The default administrative distance for external and internal discard routes is 254 and 110, respectively.

Defaults

External and internal discard-route entries are installed.

Command Modes

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

Command History

Release	Modification
12.1(1)T	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.
12.4(15)T	The *distance* argument was added.
12.2(33)SRC	The *distance* argument was integrated into Cisco IOS Release 12.2(33)SRC.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.

Usage Guidelines

External and internal discard-route entries are installed in routing tables by default. During route summarization, routing loops may occur when data is sent to a nonexisting network that appears to be a part of the summary, and the router that is performing the summarization has a less specific route (pointing back to the sending router) for this network in its routing table. To prevent the routing loop, a discard route entry is installed in the routing table of the ABR or ASBR.

If for any reason you do not want to use the external or internal discard route, remove the discard route by entering the **no discard-route** command with the **external** or **internal** keyword.

Release 12.2(33)SRB

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

Release 12.4(15)T

Prior to Cisco IOS Release 12.4(15)T, both external and internal discard routes were installed using the default OSPF intra-area administrative distance 110. You can now modify this default distance for discard routes by entering a new administrative distance for the *distance* argument of the **discard-route** command.

Examples

The following display shows the discard-route functionality installed by default. When external or internal routes are summarized, a summary route to Null0 will appear in the router output from the **show ip route** command. See the router output that refers to Null0:

```
Router# show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

      172.16.0.0/24 is variably subnetted, 3 subnets, 2 masks
C        172.16.0.128/25 is directly connected, Loopback1
O        172.16.0.0/24 is a summary, 00:00:14, Null0
C        172.16.0.0/25 is directly connected, Loopback0
      172.31.0.0/24 is variably subnetted, 3 subnets, 2 masks
C        172.31.0.128/25 is directly connected, Loopback3
O        172.31.0.0/24 is a summary, 00:00:02, Null0
C        172.31.0.0/25 is directly connected, Loopback2
C     192.168.0.0/24 is directly connected, Ethernet0/0

Router# show ip route ospf

      172.16.0.0/24 is variably subnetted, 3 subnets, 2 masks
O        172.16.0.0/24 is a summary, 00:00:29, Null0
      172.16.0.0/24 is variably subnetted, 3 subnets, 2 masks
O        172.16.0.0/24 is a summary, 00:00:17, Null0
```

When the **no discard-route** command with the **internal** keyword is entered, notice the following route change, indicated by the router output that refers to Null0:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# router ospf 1
Router(config-router)# no discard-route internal
Router(config-router)# end

Router# show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
```

```
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

      172.16.0.0/24 is variably subnetted, 3 subnets, 2 masks
C        172.16.0.128/25 is directly connected, Loopback1
C        172.16.0.0/25 is directly connected, Loopback0
      172.31.0.0/24 is variably subnetted, 3 subnets, 2 masks
C        172.31.0.128/25 is directly connected, Loopback3
O        172.31.0.0/24 is a summary, 00:00:02, Null0
C        172.31.0.0/25 is directly connected, Loopback2
C     192.168.0.0/24 is directly connected, Ethernet0/0

Router# show ip route ospf

      172.31.0.0/24 is variably subnetted, 3 subnets, 2 masks
O        172.16.0.0/24 is a summary, 00:04:14, Null0
```

Next, the **no discard-route** command with the **external** keyword is entered to remove the external discard route entry:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# router ospf 1
Router(config-router)# no discard-route external
Router(config-router)# end
```

The following router output from the **show running-config** command confirms that both the external and internal discard routes have been removed from the routing table of the router. See the router output that refers to discard routes.

```
Router# show running-config

Building configuration...

Current configuration : 1114 bytes
!
version 12.2
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router
.
.
.
router ospf 1
 log-adjacency-changes
 no discard-route external
 no discard-route internal
 area 1 range 172.16.0.0 255.255.255.0
 summary-address 172.31.0.0 255.255.255.0
 redistribute rip subnets
 network 192.168.0.0 0.0.0.255 area 0
 network 172.16.0.0 0.0.0.255 area 1
!
```

Related Commands

Command	Description
show ip route	Displays the current state of the routing table.
show running-config	Displays the contents of the currently running configuration file, the configuration for a specific interface, or map class information.

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 {**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:

Router A Configuration

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

Router B Configuration

```
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 (OSPF)

To change the OSPF domain ID that is used during the redistribution of BGP VPNv4 routes to OSPF, use the **domain-id** command in router configuration mode. To restore the default value, use the **no** form of this command.

domain-id {*ip-address* [**secondary**] | **null** | **type** *type-value* **value** *hex-value* [**secondary**]}

no domain-id [*ip-address* [**secondary**] | **null** | **type** *type-value* **value** *hex-value* [**secondary**]]

Syntax Description

ip-address	OSPF domain ID in IP address format.
secondary	(Optional) Specifies the secondary domain ID in IP address format.
null	No domain ID is associated with the process.
type *type-value*	OSPF domain ID type in hexadecimal format.
value *hex-value*	OSPF domain ID value in hexadecimal format.
secondary	(Optional) Specifies the secondary domain ID type in hexadecimal format.

Command Default

The default value for the **domain-id** command is equal to the OSPF process ID.

Command Modes

Router configuration

Command History

Release	Modification
12.3(2)	This command was introduced.

Usage Guidelines

The domain ID is an 8-byte value that identifies the OSPF domain of the prefix. When the OSPF route is redistributed to the BGP VPNv4 route in the MPLS VPN context, the domain ID extended community is attached to the BGP update. The domain ID is used on the egress provider-edge (PE) router, when the BGP VPNv4 route is redistributed to OSPF to decide what type of link-state advertisement (LSA) to generate as a result of the redistribution of the BGP VPNv4 route.

Examples

The following example shows how to change the OSPF domain ID using the **domain-id** command where the primary domain ID is a valid IP address and the secondary domain ID is a valid hexadecimal value:

```
Router(config)# router ospf 100 vrf abcd
Router(config-router)# domain-id 10.2.3.4
Router(config-router)# domain-id type 0005 value CAFECAFECAFE secondary
```

domain-tag

To set the Open Shortest Path First (OSPF) domain tag value for Type-5 or Type-7 link-state advertisements (LSAs) when OSPF is used as a protocol between a provider edge (PE) router and customer edge (CE) router, use the **domain-tag** command in router configuration mode. To reinstate the default tag value, use the **no** form of this command.

domain-tag *tag-value*

no domain-tag *tag-value*

Syntax Description

tag-value	Tag value. A 32-bit value entered in decimal format. The default value is calculated based on the Border Gateway Protocol (BGP) autonomous system number of the Multiprotocol Label Switching (MPLS) Virtual Private Network (VPN) backbone. The four highest bits are set to 1101 according to RFC 1745. The lowest 16 bits map the BGP autonomous system (AS) number of the MPLS VPN backbone. If a user specifies the *tag-value*, the value does not have to follow any particular format.

Defaults

The default value is calculated based on the BGP autonomous system number of the MPLS VPN backbone. The four highest bits are set to 1101 according to RFC 1745. The lowest 16 bits map the BGP autonomous system number of the MPLS VPN backbone.

Command Modes

Router configuration

Command History

Release	Modification
12.1(7)	This command was introduced.
12.1(7)E	This command was integrated into Cisco IOS Release 12.1(7)E.
12.1(7)EC	This command was integrated into Cisco IOS Release 12.1(7)EC.
12.0(17)ST	This command was integrated into Cisco IOS Release 12.0(17)ST.
12.2(2)B	This command was integrated into Cisco IOS Release 12.2(4)B.
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

When OSPF is used between a PE router and a CE router, BGP routes that come from the MPLS backbone are redistributed to OSPF. These redistributed routes can be announced in Type-3, Type-5, or Type-7 LSAs. If the redistribution of the BGP routes results in Type-5 or Type-7 LSAs, the External Route Tag will be set to the value of the tag. If another PE router receives a Type-5 or Type-7 LSA with

an External Route Tag equal to the set tag value, it will ignore the LSA, therefore preventing the redistributed routes that originated from the MPLS backbone from returning via some other location on the MPLS backbone.

Examples

The following example configures the tag value 777:

```
Router(config)# router ospf 10 vrf grc
Router(config-router)# domain-tag 777
```

The **show ip ospf database** command is entered to verify that the tag value 777 has been applied to the External Route Tag:

```
Router# show ospf database external 192.168.50.1

            OSPF Router with ID (192.168.239.66) (Process ID 10)

               Type-5 AS External Link States

  LS age: 18
  Options: (No TOS-capability, DC)
  S Type: AS External Link
  Link State ID: 192.168.238.1 (External Network Number)
  Advertising Router: 192.168.239.66
  LS Seq Number: 80000002
  Checksum: 0xDAB0
  Length: 36
  Network Mask: /32
        Metric Type: 2 (Larger than any link state path)
        TOS: 0
        Metric: 1
        Forward Address: 0.0.0.0
        External Route Tag: 777
.
.
.
              OSPF Router with ID (198.168.237.56) (Process ID 1)
```

Related Commands

Command	Description
show ospf database	Displays lists of information related to the OSPF database for a specific router.

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

no ignore lsa mospf

Syntax Description

This command has no arguments or keywords.

Defaults

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
```

interface-id snmp-if-index

To configure Open Shortest Path First (OSPF) interfaces with Simple Network Management Protocol (SNMP) MIB-II interface Index (ifIndex) identification numbers, use the **interface-id snmp-if-index** command in router configuration mode. To revert to the original interface numbering, use the **no** form of this command.

interface-id snmp-if-index

no interface-id snmp-if-index

Syntax Description

This command has no arguments or keywords.

Command Default

SNMP MIB-II ifIndex numbering for interfaces is disabled.

Command Modes

Router configuration

Command History

Release	Modification
12.4(6)T	This command was introduced.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
Cisco IOS XE Release 2.6	This command was integrated into Cisco IOS XE Release 2.6

Usage Guidelines

The advantage to using SNMP MIB-II ifIndex numbers to identify OSPF interfaces is that the ifIndex number corresponds to the number that a user will see reported by SNMP. Using the SNMP MIB-II ifIndex is also suggested, but not required, by RFC 2328 for OSPFv2 and by RFC 2740 for OSPFv3.

If you want to use the SNMP MIB-II ifIndex numbers, all interfaces that have OSPF enabled must have an SNMP ifIndex number assigned or else OSPF will not be enabled on those interfaces.

Note A user may choose not to configure SNMP MIB-II ifIndex numbers in order to maintain consistent behavior across upgrades and among routers that may not have the functionality offered with Cisco IOS Release 12.4(6)T and later releases.

Examples

The following example configures the OSPF interfaces to use SNMP MIB-II ifIndex ID numbers. The output from the **show snmp mib ifmib ifindex** command verifies the configuration.

```
Router> enable
Router# configure terminal
Router(config)# router ospf 1
Router(config-router)# interface-id snmp-if-index
Router(config-router)# end
```

```
Router# show snmp mib ifmib ifindex serial13/0

Serial13/0: Ifindex = 53
Router# show ip ospf 1 1 data router self-originate

            OSPF Router with ID (192.168.3.1) (Process ID 1)

                 Router Link States (Area 1)

  LS age: 66
  Options: (No TOS-capability, DC)
  LS Type: Router Links
  Link State ID: 192.168.3.1
  Advertising Router: 192.168.3.1
  LS Seq Number: 80000003
  Checksum: 0xE38F
  Length: 36
  Number of Links: 1

    Link connected to: another Router (point-to-point)
     (Link ID) Neighboring Router ID: 192.168.3.7
     (Link Data) Router Interface address: 0.0.0.49
      Number of MTID metrics: 0
       TOS 0 Metrics: 64
```

Related Commands

Command	Description
show snmp mib ifmib ifindex	Displays SNMP interface index identification numbers (ifIndex values) for all the system interfaces or the specified system interface.

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.

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 authentication

To specify the authentication type for an interface, use the **ip ospf authentication** command in interface configuration mode. To remove the authentication type for an interface, use the **no** form of this command.

ip ospf authentication [**message-digest** | **null**]

no ip ospf authentication

Syntax Description

message-digest	(Optional) Specifies that message-digest authentication will be used.
null	(Optional) No authentication is used. Useful for overriding password or message-digest authentication if configured for an area.

Defaults

The area default is no authentication (null authentication).

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. Support was added for this command in virtual network interface configuration mode.

Usage Guidelines

Before using the **ip ospf authentication** command, configure a password for the interface using the **ip ospf authentication-key** command. If you use the **ip ospf authentication message-digest** command, configure the message-digest key for the interface with the **ip ospf message-digest-key** command.

For backward compatibility, authentication type for an area is still supported. If the authentication type is not specified for an interface, the authentication type for the area will be used (the area default is null authentication).

Examples

The following example enables message-digest authentication:

```
ip ospf authentication message-digest
```

Related Commands

Command	Description
area authentication	Enables authentication for an OSPF area.
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.

ip ospf authentication-key

To assign a password to be used by neighboring routers that are using the Open Shortest Path First (OSPF) simple password authentication, use the **ip ospf authentication-key** command in interface configuration mode. To remove a previously assigned OSPF password, use the **no** form of this command.

ip ospf authentication-key *password*

no ip ospf authentication-key

Syntax Description

password	Any continuous string of characters that can be entered from the keyboard up to 8 bytes in length.

Defaults

No password is specified.

Command Modes

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

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.
Cisco IOS XE Release 3.2S	This command was modified. Support was added for this command in virtual network interface configuration mode.

Usage Guidelines

The password created by this command is used as a "key" that is inserted directly into the OSPF header when the Cisco IOS software originates routing protocol packets. A separate password can be assigned to each network on a per-interface basis. All neighboring routers on the same network must have the same password to be able to exchange OSPF information.

Note The Cisco IOS software will use this key only when authentication is enabled for an area with the **area authentication** router configuration command.

Examples

The following example enables the authentication key with the string yourpass:

```
ip ospf authentication-key yourpass
```

Related Commands

Command	Description
area authentication	Enables authentication for an OSPF area.
ip ospf authentication	Specifies authentication type for an interface.

ip ospf bfd

To enable Bidirectional Forwarding Detection (BFD) on a specific interface configured for Open Shortest Path First (OSPF), use the **ip ospf bfd** command in interface configuration mode. To disable BFD on the OSPF interface, use the **disable** keyword. To remove the **ospf bfd** command, use the **no** form of this command.

ip ospf bfd [**disable**]

no ip ospf bfd

Syntax Description

disable	(Optional) Disables BFD for OSPF on a specified interface.

Defaults

When the **disable** keyword is not used, the default behavior is to enable BFD support for OSPF on the interface.

Command Modes

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

Command History

Release	Modification
12.2(18)SXE	This command was introduced.
12.0(31)S	This command was integrated into Cisco IOS Release 12.0(31)S.
12.4(4)T	This command was integrated into Cisco IOS Release 12.4(4)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
Cisco IOS XE Release 3.2S	This command was modified. Support was added for this command in virtual network interface configuration mode.

Usage Guidelines

Enter the **ip ospf bfd** command to configure an OSPF interface to use BFD for failure detection. If you have used the **bfd-all interfaces** command in router configuration mode to globally configure all OSPF interfaces for an OSPF process to use BFD, you can enter the **ip ospf bfd** command in interface configuration mode with the **disable** keyword to disable BFD for a specific OSPF interface.

Examples

In the following example, the interface associated with OSPF, Fast Ethernet interface 3/0, is configured for BFD:

```
Router> enable
Router# configure terminal
Router(config)# interface fastethernet 3/0
Router(config-if)# ip ospf bfd
Router(config-if)# end
```

Related Commands

Command	Description
bfd all-interfaces	Enables BFD for all interfaces for a BFD peer.

ip ospf cost

To explicitly specify the cost of sending a packet on an interface, use the **ip ospf cost** command in interface configuration mode. To reset the path cost to the default value, use the **no** form of this command.

ip ospf cost *interface-cost*

no ip ospf cost *interface-cost*

Syntax Description

interface-cost	Unsigned integer value expressed as the link-state metric. It can be a value in the range from 1 to 65535.

Defaults

No default cost is predefined.

Command Modes

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

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.
Cisco IOS XE Release 3.2S	This command was modified. Support was added for this command in virtual network interface configuration mode.

Usage Guidelines

You can set the metric manually using this command, if you need to change the default. Using the **bandwidth** command changes the link cost as long as this command is not used.

The link-state metric is advertised as the link cost in the router link advertisement. We do not support type of service (ToS), so you can assign only one cost per interface.

In general, the path cost is calculated using the following formula:

10^8 / bandwidth

Using this formula, the default path costs were calculated as noted in the following list. If these values do not suit your network, you can use your own method of calculating path costs.

- 56-kbps serial link—Default cost is 1785
- 64-kbps serial link—Default cost is 1562
- T1 (1.544-Mbps serial link)—Default cost is 64
- E1 (2.048-Mbps serial link)—Default cost is 48
- 4-Mbps Token Ring—Default cost is 25

- Ethernet—Default cost is 10
- 16-Mbps Token Ring—Default cost is 6
- FDDI—Default cost is 1
- X25—Default cost is 5208
- Asynchronous—Default cost is 10,000
- ATM— Default cost is 1

Examples

The following example sets the interface cost value to 65:

```
ip ospf cost 65
```

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 configuration mode. 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.

Defaults

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.

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 flooding 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 dead-interval

To set the interval during which at least one hello packet must be received from a neighbor before the router declares that neighbor down, use the **ip ospf dead-interval** command in interface configuration mode. To restore the default value, use the **no** form of this command.

ip ospf dead-interval {*seconds* | **minimal hello-multiplier** *multiplier*}

no ip ospf dead-interval

Syntax Description

seconds	Interval (in seconds) during which the router must receive at least one hello packet from a neighbor or else that neighbor is removed from the peer list and does not participate in routing. The range is 1 to 65535. The value must be the same for all nodes on the network.
minimal	Sets the dead interval to 1 second. Using this keyword requires that the **hello-multiplier** keyword and *multiplier* argument are also configured.
hello-multiplier *multiplier*	Integer value in the range from 3 to 20, representing the number of hello packets sent during 1 second.

Defaults

seconds: Four times the interval set by the **ip ospf hello-interval** command.

Command Modes

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

Command History

Release	Modification
10.0	This command was introduced.
12.0(23)S	The **minimal** keyword, **hello-multiplier** keyword and *multiplier* argument were added to allow Open Shortest Path First (OSPF) support for fast hello packets.
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 3.2S	This command was modified. Support was added for this command in virtual network interface configuration mode.

Usage Guidelines

The dead interval is advertised in OSPF hello packets. This value must be the same for all networking devices on a specific network.

Specifying a smaller dead interval (*seconds*) will give faster detection of a neighbor being down and improve convergence, but might cause more routing instability.

OSPF Support for Fast Hello Packets

By specifying the **minimal** and **hello-multiplier** keywords with a *multiplier* argument, you are enabling OSPF fast hello packets. The **minimal** keyword sets the dead interval to 1 second, and the hello-multiplier value sets the number of hello packets sent during that 1 second, thus providing subsecond or "fast" hello packets.

When fast hello packets are configured on the interface, the hello interval advertised in the hello packets that are sent out this interface is set to 0. The hello interval in the hello packets received over this interface is ignored.

The dead interval must be consistent on a segment, whether it is set to 1 second (for fast hello packets) or set to any other value. The hello multiplier need not be the same for the entire segment as long as at least one hello packet is sent within the dead interval.

Use the **show ip ospf interface** command to verify the dead interval and fast hello interval.

Examples

The following example sets the OSPF dead interval to 20 seconds:

```
interface ethernet 1
 ip ospf dead-interval 20
```

The following example configures OSPF fast hello packets; the dead interval is 1 second and there are five hello packets sent every second:

```
interface ethernet 1
 ip ospf dead-interval minimal hello-multiplier 5
```

Related Commands

Command	Description
ip ospf hello-interval	Interval between hello packets that the Cisco IOS software sends on the interface.
show ip ospf interface	Displays OSPF-related information.

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 theOSPF 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.

Defaults

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.

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(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:

```
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 interfaces and the area ID for the interfaces on which the OSPF runs.
router ospf	Configures the OSPF routing process.
show ip ospf	Displays information about OSPF routing processes.