1 OSPFv2 Commands

Command	Function
area	Configure a specified open shortest path first (OSPF) area.
area authentication	Enable OSPF area authentication.
area default-cost	Configure the cost advertised to the default route of a stub area or not-so-stubby area (NSSA).
area filter-list	Configure the filtering conditions of inter-area route learning.
area nssa	Configure an OSPF area as NSSA.
area range	Configure route summarization between OSPF areas.
area stub	Set an OSPF area to a stub or totally stub area.
area sham-link	Configure a sham link.
area virtual-link	Configure an OSPF virtual link.
asbr enable	Enable a device as an ASBR.
auto-cost	Configure the reference value of interface cost.
bfd all-interfaces	Configure link detection through bidirectional forwarding detection (BFD) for all the interfaces running OSPF.
capability opaque	Enable the opaque LSA processing capability.
capability vrf-lite	Forcibly disable the automatic judging function of support to loop detection for OSPF processes.
clear ip ospf process	Clear and restart an OSPF process.
compatible rfc1583	Enable the RFC1583 rules.
default-information originate	Generate a default route to be injected to the OSPF routing domain.
default-metric	Configure the default metric for an OSPF redistributed route.
disable-dn-bit-check	Disable the DN bit loop detection function of LSA.

disable-tag-check	Disable loop detection using the route tag of LSA.
discard-route	Allow adding a discard route to the core routing table.
distance	Configure the management distances corresponding to different types of OSPF routes.
distribute-list in	Configure filtering routes that are calculated based on the received LSA.
distribute-list out	Configure filtering of redistributed routes.
domain-id	Configure the domain ID of an OSPF process.
domain-tag	Configure the VPN route tag of an OSPF process associated with VRF.
enable mib-binding	Bind the MIB to a specified OSPFv2 process.
enable traps	Enable sending of the specified trap message.
extcommunity-type	Configure the Router-ID or Route-Type of an OSPF process associated with VRF.
fast-reroute	Configure the OSPF fast reroute function of a device.
graceful-restart	Enable the OSPF GR capability and set the GR period.
graceful-restart helper	Enable the OSPF GR helper function and configure the relevant topology change detection mode.
ip ospf authentication	Configure the authentication mode of an interface.
ip ospf authentication-key	Configure the plain text authentication key of OSPF.
ip ospf area	Configure an OSPF routing process in which an interface participates.
ip ospf bfd	Configure an OSPF-enabled interface to enable or disable the BFD function.
ip ospf cost	Configure the cost value for an OSPF interface to send a packet.
ip ospf cost-fallback	Configure the cost fallback of an aggregation port (AP).
ip ospf database-filter all out	Prevent an interface from diffusing LSA packets to the outside, that is, LSA update packets are not sent from the interface.

ip ospf dead-interval	Configure the interval for OSPF to determine the failure of a specified interface neighbor.
ip ospf disable all	Prevent a specified interface from generating OSPF packets.
ip ospf fast-reroute protection	Enable the loop-free alternate (LFA) protection mode of a specified interface.
ip ospf fast-reroute no-eligible-backup	Exclude an OSPF interface that cannot be used as a backup interface in the OSPF fast reroute calculation.
ip ospf hello-interval	Configure the interval for OSPF to send hello packets.
ip ospf message-digest-key	Configure a cipher text authentication key of OSPF packets.
ip ospf mtu-ignore	Disable MTU verification when an interface receives database description packets.
ip ospf network	Configure the OSPF network type of an interface.
ip ospf priority	Configure the OSPF priority value of an interface.
ip ospf retransmit-interval	Configure the retransmission interval of LSU packets on an interface.
ip ospf source-check-ignore	Disable the source address verification function for the packets received on a P2P link.
ip ospf subvlan	Enable the OSPF function on a super VLAN.
ip ospf transmit-delay	Configure the delay for an OSPF interface to transmit LSU packets.
ispf enable	Enable the incremental shortest path first (iSPF) feature and run the iSPF algorithm to calculate the network topology.
log-adj-changes	Record the log of adjacency state changes.
max-concurrent-dd	Configure the maximum number of neighbors with which the current OSPF process can concurrently initiate or accept interaction.
max-metric router-lsa	Configure the maximum advertisement metric of an OSPF-enabled device so that other routers will not preferably regard this router as a transmission node in SPF calculation.
neighbor	Configure an OSPF neighbor.

network area	Configure which interfaces will run OSPF and which OSPF area they belong to.
nsr	Configure the current OSPF process to support the non-stop routing (NSR) function.
overflow database	Configure the maximum number of LSAs supported by the current OSPF process.
overflow database external	Configure the maximum number of external LSAs and the waiting time for recovery from the overflow state to the normal state.
overflow memory-lack	Allow the OSPF process to enter the overflow state when the memory is insufficient.
passive-interface	Configure a network interface specified for the local router as a passive interface.
redistribute	Enable the function of redistributing the external routing information.
router ospf	Create an OSPF routing process and enter routing configuration mode of OSPF.
router ospf max-concurrent-dd	Configure the maximum number of neighbors with which all the OSPF routing processes can concurrently initiate or accept interaction.
router-id	Configure the ID of a router.
show ip ospf	Display the summary of an OSPF process.
show ip ospf border-routers	Display the OSPF internal routing table to an ABR/ASBR.
show ip ospf database	Display the information of an OSPF LSDB.
show ip ospf interface	Display the information about an interface associated with an OSPF process.
show ip ospf ispf	Display the times of route computation through iSPF in the OSPF area.
show ip ospf neighbor	Display the neighbor table of an OSPF process.
show ip ospf route	Display an OSPF route.
show ip ospf sham-links	Display the sham link information of an OSPF process.
show ip ospf spf	Display the times of route computation in the OSPF area.

show ip ospf summary-address	Display the summarized route of all the redistributed routes of an OSPF process.
show ip ospf topology	Display the topology information of SPF computation of an OSPF process.
show ip ospf virtual-links	Display the information about a virtual link of an OSPF process.
show running-config router ospf	Display the configuration of an OSPF process.
summary-address	Configure a summarized route for the external routes of the OSPF routing domain.
timers lsa arrival	Configure the delay for receiving a duplicate LSA.
timers pacing lsa-group	Configure a group pacing interval of LSA.
timers pacing lsa-transmit	Configure an interval for sending LSA group and a number of LS-UPD packets in each group.
timers spf	Configure the delay time for SPF computation after an OSPF process receives the topology change information and the time interval between two SPF computations.
timers throttle lsa all	Configure an exponential backoff algorithm of LSA packet generation.
timers throttle route	Configure the delay time for route computation when an OSPF process receives changed inter-area and external LSAs.
timers throttle spf	Configure the delay time for SPF computation, and the minimum interval and maximum interval for two SPF computations after an OSPF process receives the topology change information.
two-way-maintain	Enable the two-way maintenance function of an OSPF process.

1.1 area

Function

Run the **area** command to configure a specified open shortest path first (OSPF) area.

Run the **no** form of this command to delete a specified OSPF area.

No OSPF area is configured by default.

Syntax

area *area-id*

no area *area-id*

Parameter Description

area-id: OSPF area ID. The parameter can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

You can run the **no** form of this command to clear the configuration of a specified OSPF area and delete this area, including the configurations of the area-based commands such as **area authentication**, **area default-cost**, **area filter-list**, and **area nssa**.

You cannot clear the configuration of the OSPF area in the following cases:

- All the configuration of the backbone area needs to be cleared, but there is a virtual link configuration. In this case, the virtual link configuration must be cleared before the backbone area can be deleted.
- There is a corresponding **network area** command in all the areas. In this case, you must clear all the network segment commands that are added to the area before deleting the area.

Examples

The following example deletes the related configuration of OSPF area 2.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 2
Hostname(config-router)# no area 2
```

Notifications

When you delete the **area** configuration without deleting the **network** command, the following notification will be displayed.

```
% Error: Area 1 cannot be deleted before its network command is removed
```

Common Errors

You want to delete the **area** configuration without deleting the **network** command.

Platform Description

N/A

1.2 area authentication

Function

Run the **area authentication** command to enable OSPF area authentication.

Run the **no** form of this command to disable OSPF area authentication.

The OSPF area authentication function is disabled by default.

Syntax

area *area-id* **authentication** [**message-digest** | **keychain** *name*]

no area *area-id* **authentication**

Parameter Description

Area-id:-id: ID of the area with OSPF authentication to be enabled. The area ID can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

message-digest: Enables cipher text authentication mode.

keychain *name*: Name of the adopted keychain authentication. If **Keychain** specifies that the authentication type is **SM3**, the key ID value range is from 0 to 255.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

The device supports three authentication types:

- Type 0: No authentication is required. When the **area authentication** command is not used to enable OSPF authentication, the authentication type in OSPF data packets is type 0.
- Type 1: The authentication type is plain text authentication mode. In this mode, the **message-digest** parameter is not contained.
- Type 2: The authentication type is cipher text authentication mode. In this mode, the **message-digest** parameter is contained.

All routers in the same OSPF area must run the same authentication type. If authentication is enabled, the authentication key must be configured on interfaces that are connected to neighbors.

- You can run the **ip ospf authentication-key** command on an interface to configure a plain text authentication key.
- You can run the **ip ospf message-digest-key** command on an interface to configure a cipher text

authentication key.

- If keychain authentication is configured, the key and authentication type configured for keychain are used. Currently, keychain supports plain text authentication, Message-Digest 5 (MD5) authentication, and SM3 authentication.

Examples

The following example configures MD5 authentication for Area 0 (backbone area) of the OSPF routing process, and sets the authentication key for the interface GigabitEthernet 0/1 connected to neighbors to **backbone**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 192.168.12.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf message-digest-key 1 md5
backbone
Hostname(config-if-GigabitEthernet 0/1)# exit
Hostname(config)# router ospf 1
Hostname(config-router)# network 192.168.12.0 0.0.0.255 area 0
Hostname(config-router)# area 0 authentication message-digest
```

The following example configures keychain authentication for Area 0 (backbone area) of the OSPF routing process, and sets the keychain name to **ospf**. The configured authentication key for keychain ospf is **hello**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# area 1 authentication keychain ospf
Hostname(config-router)# exit
Hostname(config)# key chain ospf
Hostname(config-keychain)# key 1
Hostname(config-keychain-key)# key-string hello
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**
- **ip ospf authentication-key**
- **ip ospf message-digest-key**

1.3 area default-cost

Function

Run the **area default-cost** command to configure the cost advertised to the default route of a stub area or not-so-stubby area (NSSA).

Run the **no** form of this command to restore the default configuration.

By default, the cost value of a route is 1.

Syntax

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

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

Parameter Description

area-id: ID of a stub area or NSSA. The area ID can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

cost: Cost of the default route injected to the stub area or NSSA. The value range is from 0 to 16777215.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command takes effect only on an area border router (ABR) in a stub area or on an ABR/autonomous system boundary router (ASBR) in an NSSA.

An ABR in a stub area or an ABR/ASBR in an NSSA is allowed to advertise a link-state advertisement (LSA) indicating the default route in the stub or NSSA. You can run the **area default-cost** command to modify the cost of the advertised LSA.

Examples

The following example configures the cost value of the OSPF advertised to a stub area as **50**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.0.0 0.0.255.255 area 0
Hostname(config-router)# network 192.168.12.0 0.0.0.255 area 1
Hostname(config-router)# area 1 stub
Hostname(config-router)# area 1 default-cost 50
```

Notifications

When this command is configured in an area other than the stub area or NSSA, the following notification will be displayed:

```
% The area is neither stub, nor NSSA
```

When this command is configured in a backbone area, the following notification will be displayed:

```
% You can't configure default-cost to backbone
```

Common Errors

This command is configured in an area other than the stub area or NSSA.

This command is configured in a backbone area.

Platform Description

N/A

Related Commands

N/A

1.4 area filter-list

Function

Run the **area filter-list** command to configure the filtering conditions of inter-area route learning.

Run the **no** form of this command to cancel this configuration.

By default, the filtering conditions of inter-area route learning are not configured.

Syntax

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

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

Parameter Description

area-id: Area ID, which can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

access *acl-number*: Associated standard ACL. The value range is from 1 to 99.

prefix *prefix-name*: Name of the associated prefix list. The value is a case-sensitive string of 1 to 99 characters.

in: Filters the routes that are received by the area.

out: Filters the routes that are sent from the area.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command can be configured only on an ABR.

Run this command when it is required to configure filtering conditions for inter-area routes on the ABR.

Examples

The following example configures OSPF Area 1 that is allowed to learn only the inter-area routes within the range of 172.22.0.0/8.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# access-list 1 permit 172.22.0.0 0.255.255.255
Hostname(config)# router ospf 100
Hostname(config-router)# area 1 filter-list access 1 in
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.5 area nssa

Function

Run the **area nssa** command to configure an OSPF area as NSSA.

Run the **no** form of this command to delete this configuration.

The NSSA function is disabled by default.

Syntax

area *area-id* **nssa** [**default-information-originate** [**metric** *metric* | **metric-type** *metric-type*] * | **no-redistribution** | **no-summary** | **translator** [**always** | **stability-interval** *stability-interval*] *] *

no area *area-id* **nssa** [**default-information-originate** [**metric** *value* | **metric-type** *type*] * | **no-redistribution** | **no-summary** | **translator** [**always** | **stability-interval**] *] *

Parameter Description

area-id: ID of the NSSA, which can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

default-information-originate: Indicates that a default Type-7 LSA is generated and introduced to the NSSA. This option takes effect only on an NSSA ABR or ASBR.

metric *metric*: Indicates the metric of the generated default LSA. The value range is from 0 to 16777214, and the default value is **1**.

metric-type *metric-type*: Indicates the route type of the generated default LSA. The value is 1 or 2. Here, 1 represents N-1, and 2 represents N-2. The default value is 2.

no-redistribution: When the router is an NSSA ABR and you want to use only the route redistribution command to introduce the routing information into a common area instead of an NSSA, select this option.

no-summary: Prohibits the ABR in the NSSA from sending Summary LSAs (Type-3 LSA).

translator: Indicates that the NSSA ABR is a translator.

always: Indicates that the current NSSA ABR always acts as a translator. The default value is the standby translator.

stability-interval *stability-interval*: Indicates the stability interval after the NSSA ABR is changed from a translator to a non-translator, in seconds. The value range is 0 to 2147483647, and the default value is **40**.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

- The **default-information-originate** parameter is used to generate a default Type-7 LSA. This option is different for the NSSA ABR and ASBR. On ABR, a Type-7 LSA default route is generated regardless of whether there is a default route in the routing table. On ASBR (which is not an ABR at the same time), a Type-7 LSA default route is generated only when there is a default route in the routing table.
- If the **no-redistribution** parameter is configured on the ASBR, other external routes introduced by OSPF through the **redistribute** command cannot be distributed to the NSSA. This parameter is generally used when a router in the NSSA acts both as an ASBR and an ABR. It prevents external routing information from entering the NSSA.
- To further reduce the number of LSAs sent to the NSSA, you can configure the **no-summary** parameter on the ABR to prevent the ABR from sending the Summary LSAs (Type-3 LSA) to the NSSA.
- When the **translator always** parameter is configured, if an NSSA has two or more area border routers (ABRs), the ABR with the largest router ID is selected by default as the translator for converting Type-7 LSAs into Type-5 LSAs. If the current device is expected to be always the translator ABR for converting Type-7 LSAs into Type-5 LSAs, run the **translator always** parameter. In the same NSSA, it is recommended that this parameter be configured on only one ABR.
- When the **stability-interval** parameter is configured, if the translator role of the current device is replaced by another ABR, the conversion capability is retained during the time specified by *stability-interval*. If the router does not become a translator again within the above time, LSAs that are converted from Type 7 to Type 5 will be deleted from the AS after *stability-interval* expires. To prevent a routing loop, LSAs that are converted from Type 7 to Type 5 are deleted from the AS immediately after the current device loses the translator role even if *stability-interval* does not expire.

Examples

The following example sets Area 1 to NSSA.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
```

```
Hostname(config-router)# network 172.16.0.0 0.0.255.255 area 0
Hostname(config-router)# network 192.168.12.0 0.0.0.255 area 1
Hostname(config-router)# area 1 nssa
```

Notifications

When the backbone area is set to NSSA, the following notification will be displayed:

```
% You can't configure NSSA to backbone
```

Common Errors

The backbone area is set to NSSA.

Platform Description

N/A

Related Commands

- **show ip ospf**
- **area default-cost**

1.6 area range

Function

Run the **area range** command to configure route summarization between OSPF areas.

Run the **no** form of this command to delete this configuration.

By default, no route summarization is configured between OSPF areas.

Syntax

area *area-id* **range** *ipv4-address mask* [**advertise** | **not-advertise**] [**cost** *cost* | **inherit-minimum**]

no area *area-id* **range** *ipv4-address mask* [**cost** | **inherit-minimum**]

Parameter Description

area-id: ID of the OSPF area to which the summarized route will be injected. The parameter can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

ipv4-address mask: Network segment of the summarized route.

advertise: Advertises the summarized route.

not-advertise: Not advertises the summarized route.

cost *cost*: Indicates the metric of the summarized route. The value range is from 0 to 16777215. The default metric of a summarized route is related to compatibility with RFC1583. If the RFC1583 compatibility mode is configured, the default metric is the minimum value of the metric of the summarized route; otherwise, the default metric is the maximum value of the metric of the summarized route. The combination of the **no** prefix and **cost** parameter can restore the default metric of a summarized route, but will not delete route summarization.

inherit-minimum: Sets the minimum value of all the route metrics before summarization to the route metric after summarization.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command can be executed only on the ABR. It is used to combine or summarize multiple routes of an area into one route, and advertise the route to other areas. Combination of the routing information occurs only on the boundary of an area. Although the routers inside the area can learn specific routing information, the routers in other areas can learn only one summarized route. You can set **advertise** or **not-advertise** to determine whether to advertise the summarized route to shield and filter routes. By default, the summarized route is advertised. You can run the **cost** parameter to set the metric of the summarized route.

You can configure route summarization commands for multiple areas. This simplifies routes in the entire OSPF routing domain, and improves the network forwarding performance especially for a large-sized network.

When multiple routes for summarization are configured and have the inclusive relationship with each other, the range of routes to be summarized is determined based on the longest match principle.

Examples

The following example summarizes the routes of OSPF Area 1 into 172.16.16.0/20.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.0.0 0.0.15.255 area 0
Hostname(config-router)# network 172.16.17.0 0.0.15.255 area 1
Hostname(config-router)# area 1 range 172.16.16.0 255.255.240.0
```

Notifications

When the summarized route has been configured for different areas, the following notification will be displayed:

```
% OSPF: This range in different area 1
```

Common Errors

The summarized route has been configured for different areas.

Platform Description

N/A

Related Commands

N/A

1.7 area stub

Function

Run the **area stub** command to set an OSPF area to a stub or totally stub area.

Run the **no** form of this command to delete this configuration.

The stub area function is disabled by default.

Syntax

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

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

Parameter Description

area-id: ID of a stub area. The area ID can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

no-summary: Prohibits the ABR from sending network summary LSAs to the stub. In this case, the stub area can be called a totally stub area. This parameter is configured only when the router is an ABR.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

You must run the **area stub** command on all routers in the OSPF stub area. ABR sends only three kinds of LSAs to the stub area:

- Type 1, router LSA.
- Type 2, network LSA.
- Type 3, network summary LSA.

From the perspective of the routing table, a router in the stub area can learn only the internal routes of the OSPF routing domain, including the internal default route generated by an ABR. A router in the stub area cannot learn external routes of the OSPF routing domain.

To configure a totally stub area, add the **no-summary** keyword when running the **area stub** command on the ABR. A router in the totally stub area can learn only the internal routes of the local area, including the internal default route generated by an ABR.

You can run either the **area stub** or **area default-cost** command to configure an OSPF area as a stub area. If **area stub** is used, you must configure this command on all routers connected to the stub area. If **area default-cost** is used, run this command only on the ABR in the stub area. The **area default-cost** command defines the initial cost of the internal default route.

Examples

The following example sets Area 1 to stub area.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.0.0 0.0.255.255 area 0
Hostname(config-router)# network 192.168.12.0 0.0.0.255 area 1
Hostname(config-router)# area 1 stub
```

Notifications

When you attempt to configure the backbone area as a stub area, the following notification will be displayed:

```
% You can't configure stub to backbone
```

When you attempt to configure an NSSA as a stub area, the following notification will be displayed:

```
% The area is configured as NSSA area already
```

Common Errors

The backbone area is configured as a stub area.

An NSSA is configure as a stub area.

Platform Description

N/A

Related Commands

- **show ip ospf**
- **area default-cost**

1.8 area sham-link

Function

Run the **area sham-link** command to configure a sham link.

Run the **no** form of this command to delete this configuration.

Run the **default** form of this command to restore the default configuration.

A sham link is disabled by default. No authentication is set for a sham link by default.

Syntax

area *area-id* **sham-link** *source-ipv4-address destination-ipv4-address* [[**authentication** [**keychain** *kechain-name* | **message-digest** | **null**] | **cost** *number* | **dead-interval** *dead-interval* | **hello-interval** *hello-interval* | **retransmit-interval** *retransmit-interval* | **transmit-delay** *transmit-delay*] * | **authentication-key** [**0** | **7**] *key* | **message-digest-key** *key-id* **md5** [**0** | **7**] *key*]

no area *area-id* **sham-link** *source-ipv4-address destination-ipv4-address* [**authentication** | **authentication-key** | **cost** | **dead-interval** | **hello-interval** | **message-digest-key** *key-id* | **retransmit-interval** | **transmit-delay**] *

default area *area-id* **sham-link** *source-ipv4-address destination-ipv4-address* [**authentication** | **authentication-key** | **cost** | **dead-interval** | **hello-interval** | **message-digest-key** *key-id* | **retransmit-interval** | **transmit-delay**] *

Parameter Description

area-id: ID of the OSPF area where the sham link is. The area ID can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

source-ipv4-address: Source address of the sham link.

destination-ipv4-address: Destination address of the sham link.

authentication: Sets the authentication type to plain text authentication.

keychain *keychain-name*: Sets keychain authentication. If **Keychain** specifies that the authentication type is **SM3**, the key ID value range is from 0 to 255.

message-digest: Sets the authentication type to cipher text authentication.

null: Indicates that authentication is disabled.

cost *number*: Indicates the cost value of the OSPF protocol for sending packets on the sham link. The value range is from 0 to 65535, and the default value is **1**.

dead-interval *dead-interval*: Indicates the dead interval of sham link neighbors, in seconds. The value range is 0 to 2147483647, and the default value is **40**.

hello-interval *hello-interval*: Indicates the time interval of sending hello packets on the sham link, in seconds. The value range is 1 to 65535, and the default value is **10**.

retransmit-interval *retransmit-interval*: Indicates the time interval of packets retransmission on the sham link, in seconds. The value range is 0 to 65535, and the default value is **5**.

transmit-delay *transmit-delay*: Indicates the delay of transmitting link state update (LSU) packets on the sham link, in seconds. The value range is 0 to 65535, and the default value is **1**.

authentication-key [**0** | **7**] *key*: Defines the key for OSPF plain text authentication. The key of plain text authentication must be consistent between neighbors.

0: Indicates that the key is displayed in plain text.

7: Indicates that the key is displayed in cipher text.

key: Key value. The value is a string containing 1–8 characters.

message-digest-key *key-id* [**md5**] [**0** | **7**] *key*: Defines the key ID and key for OSPF cipher text authentication. The key ID and key for cipher text authentication must be consistent between neighbors.

key-id: ID of the authentication key. The value range is from 1 to 255.

md5: Uses the MD5 cipher text authentication.

0: Indicates that the key is displayed in plain text.

7: Indicates that the key is displayed in cipher text.

key: Key value. The value is a string containing 1–8 characters.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command takes effect only for the OSPF process associated with VPN routing and forwarding (VRF).

A sham link needs to be configured on two provider edges (PEs) for establishing a sham link at the same time. Only one PE cannot establish a sham link.

The **service password-encryption** command makes the key in the command displayed in a way of encryption.

To establish a sham link between two PEs, you must meet the following configuration conditions:

- The *area-id* value of sham link configured for the two PEs must be consistent.
- The combination of source address and destination address of a sham link configured on one PE must be equal to the combination of destination address and source address of a sham link configured on the other PE.
- The source address used to establish a sham link on the PE must be a 32-bit loopback address, and must be bound to the corresponding VRF instance.

Caution

- Since the OSPF route advertised through a sham link has no VPN label, the route cannot be used for forwarding. Actually packets are still forwarded through the Border Gateway Protocol (BGP) VPNv4 route. Therefore, in the actual configuration, you must ensure that the route advertised through the sham link will also be advertised to the corresponding BGP neighbor through Multiprotocol Extensions for BGP (MP-BGP) in the form of VPNv4 route.
- The source address for establishing the sham link must participate in the BGP VPNv4 route advertisement, but cannot join the calculation of VRF OSPF process.

Examples

The following example configures a sham link in OSPF Area 0, with source address 1.1.1.1 and destination address 2.2.2.2, and sets the metric of the packet sent by OSPF on the sham link to **10**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10 vrf vpn1
Hostname(config-router)# area 0 sham-link 1.1.1.1 2.2.2.2 cost 10
```

Notifications

N/A

Common Errors

The source address for establishing a sham link joins the calculation of VRF OSPF process.

Only the private route is advertised through the sham link, but the VPNv4 route is not advertised through MP-BGP.

Platform Description

N/A

Related Commands

- **show ip ospf sham-links**

1.9 area virtual-link

Function

Run the **area virtual-link** command to configure an OSPF virtual link.

Run the **no** form of this command to delete this configuration.

No virtual link is configured by default.

Syntax

area *area-id* **virtual-link** *router-id* [**authentication** [**keychain** *kechain-name* | **message-digest** | **null**] | **dead-interval** { *dead-interval* | **minimal hello-multiplier** *multiplier-time* } | **hello-interval** *hello-interval* | **retransmit-interval** *retransmit-interval* | **transmit-delay** *transmit-delay*] * [**authentication-key** [**0** | **7**] *key* | **message-digest-key** *key-id* **md5** [**0** | **7**] *key*]

no area *area-id* **virtual-link** *router-id* [**authentication** | **authentication-key** | **dead-interval** | **hello-interval** | **message-digest-key** *key-id* | **retransmit-interval** | **transmit-delay**] *

Parameter Description

area-id: ID of the OSPF transit area. The parameter can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

router-id: Router ID for the neighbor of the virtual link. The router ID can be displayed using the **show ip ospf** command.

authentication: Sets the authentication type to plain text authentication.

keychain *keychain-name*: Sets keychain authentication. If **Keychain** specifies that the authentication type is **SM3**, the key ID value range is from 0 to 255.

message-digest: Sets the authentication type to cipher text authentication.

null: Indicates that authentication is disabled.

dead-interval *dead-interval*: Indicates the time that the neighbor is declared lost, in seconds. The value range is 0 to 2147483647, and the default value is **40**. The setting of this parameter must be consistent with that on a neighbor.

minimal hello-multiplier *multiplier-time*: Indicates that the fast hello function is enabled to set the dead interval to 1s. Here, *multiplier-time* indicates the number of hello packets sent per second in the fast hello function. The value range is from 3 to 20. The fast hello function is not enabled by default.

hello-interval *hello-interval*: Indicates the time interval for OSPF to send hello packets on the virtual link, in seconds. The value range is 1 to 65535, and the default value is **10**. The setting of this parameter must be consistent with that on a neighbor.

retransmit-interval *retransmit-interval*: Indicates the OSPF LSA retransmission interval, in seconds. The setting of the time interval should take into account the round trip time of packets on the link. The value range is 0 to 65535, and the default value is **5**.

transmit-delay *transmit-delay*: Indicates the delay after which OSPF sends the LSA, in seconds. This value increases the time to live (TTL) of LSA. When the TTL of LSA reaches the fixed time, the LSA will be refreshed. The value range is 0 to 65535, and the default value is **1**.

authentication-key [**0** | **7**] *key*: Defines the key for OSPF plain text authentication. The key of plain text authentication must be consistent between neighbors.

0: Indicates that the key is displayed in plain text.

7: Indicates that the key is displayed in cipher text.

key: Key value. The value is a string containing 1–8 characters.

message-digest-key *key-id* [**md5**] [**0** | **7**] *key*: Defines the key ID and key for OSPF cipher text authentication.

key-id: ID of the authentication key. The value range is from 1 to 255.

md5: Uses the MD5 cipher text authentication.

The **service password-encryption** command makes the key displayed in a way of encryption.

0: Indicates that the key is displayed in plain text.

7: Indicates that the key is displayed in cipher text.

key: Key value. The value is a string containing 1–8 characters.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

In the OSPF routing domain, all the areas must be connected to the backbone area. If the backbone area is disconnected, a virtual link must be configured to connect to the backbone area; otherwise, network communication problems will occur. A virtual link must be created between two ABRs, and the area to which both ABRs belong is the transit area. A stub area or an NSSA area cannot be used as a transit area. A virtual link can also be used to connect other non-backbone areas.

Here, *router-id* is the ID of an OSPF neighbor router. If you are sure about the value of *router-id*, run the **show ip ospf neighbor** command to confirm the value. You can configure the loopback address as the router ID.

The **area virtual-link** command defines only the authentication key of the virtual link. To enable OSPF packet authentication in the areas connected to the virtual link, you must run the **area authentication** command. The **service password-encryption** command makes the key in the command displayed in a way of encryption.

OSPF supports the fast hello function.

- After the OSPF fast hello function is enabled, OSPF finds neighbors and detects neighbor failures faster. You can enable the OSPF fast hello function by specifying the **minimal** and **hello-multiplier** keywords and the *multiplier* parameter. The **minimal** keyword indicates that the dead interval is set to 1s, and **hello-multiplier** indicates the number of hello packets sent per second. In this way, the interval at which the hello packet is sent decreases to less than 1s.
- If the fast hello function is configured for a virtual link, the hello interval field of the hello packet advertised on the virtual link is set to 0, and the hello interval field of the hello packet received on this virtual link is ignored.
- No matter whether the fast hello function is enabled, the dead interval must be consistent and the **hello-multiplier** value can be inconsistent on routers at both ends of the virtual link. Ensure that at least one hello packet can be received within the dead interval.
- Run the **show ip ospf virtual-links** command to monitor the dead interval and the fast hello interval configured for the virtual link.
- The **dead-interval minimal hello-multiplier** and **hello-interval** parameters introduced for the fast hello function cannot be configured simultaneously.

Examples

The following example configures Area 1 as a transit area, and establishes a virtual link with neighbor 2.2.2.2.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.0.0 0.0.15.255 area 0
Hostname(config-router)# network 172.16.17.0 0.0.15.255 area 1
Hostname(config-router)# area 1 virtual-link 2.2.2.2
```

The following example configures Area 1 as a transit area, and establishes a virtual link with neighbor 1.1.1.1. The virtual link connects Area 10 to the backbone area. The virtual link adopts OSPF packet authentication in authentication mode MD5.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.17.0 0.0.15.255 area 1
Hostname(config-router)# network 172.16.252.0 0.0.0.255 area 10
Hostname(config-router)# area 0 authentication message-digest
Hostname(config-router)# area 1 virtual-link 1.1.1.1 message-digest-key 1 md5
hello
```

The following example configures Area 1 as a transit area, establishes a virtual link with neighbor 1.1.1.1, enables the fast hello function on the virtual link, and sets the multiplier to **3**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.17.0 0.0.15.255 area 1
Hostname(config-router)# network 172.16.252.0 0.0.0.255 area 10
Hostname(config-router)# area 1 virtual-link 1.1.1.1 dead-interval minimal hello-
multiplier 3
```

Notifications

When a virtual link is configured in the backbone area, the following notification will be displayed:

```
% You can't configure virtual-link transit to backbone
```

When a virtual link is configured in a stub area or NSSA, the following notification will be displayed:

```
% Area is a stub or nssa so virtual links are not allowed
```

Common Errors

A virtual link is configured in the backbone area.

A virtual link is configured in a stub area or NSSA area.

Platform Description

N/A

Related Commands

- **area authentication**
- **show ip ospf neighbor**
- **show ip ospf virtual-links**

1.10 asbr enable

Function

Run the **asbr enable** command to enable a device as an ASBR.

Run the **no** form of this command to restore the default value.

ASBR is disabled by default.

Syntax

asbr enable

no asbr enable

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

After the **redistribute** or **default-information** command is executed, the OSPF router automatically becomes an ASBR. If you want the device to become an ASBR without configuring the above command, configure the **asbr enable** command. If the **asbr enable** command is deleted, but the **redistribute** or **default-information** command is still configured, the device is still ASBR**.**

Examples

The following example enables a device as an ASBR.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# asbr enable
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf database**

1.11 auto-cost

Function

Run the **auto-cost** command to configure the reference value of interface cost.

Run the **no** form of this command to restore the default value.

By default, the reference bandwidth value of interface cost calculation is 100 Mbps.

Syntax

auto-cost reference-bandwidth *ref-bw*

no auto-cost reference-bandwidth

Parameter Description

ref-bw: Reference bandwidth value, in mega-bytes per second. The value range is from 1 to 4294967.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

By default, the cost of an OSPF interface is equal to the reference value of the interface bandwidth divided by the actual interface bandwidth. When OSPF is allowed on a link above 100 Mbps, you are advised to increase the *ref-bw* value.

Run the **bandwidth** command to set the interface bandwidth.

The default costs of OSPF interfaces on several typical lines are as follows:

- For the 64 Kbps serial line, the cost is 1562.
- For the E1 line, the cost is 48.
- For the 10 Mbps Ethernet, the cost is 10.
- For the 100 Mbps Ethernet, the cost is 1.

If an interface cost is set using the **ip ospf cost** command, the automatically calculated interface cost will be overwritten.

Examples

The following example configures the reference value of interface bandwidth for the automatically calculated interface cost as 10 Mbps.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.10.0 0.0.0.255 area 0
Hostname(config-router)# auto-cost reference-bandwidth 10
```

Notifications

When the interface cost is changed, the following notification will be displayed:

```
% OSPF: Reference bandwidth is changed.
        Please ensure reference bandwidth is consistent across all routers
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.12 bfd all-interfaces

Function

Run the **bfd all-interfaces** command to configure link detection through bidirectional forwarding detection (BFD) for all the interfaces running OSPF.

Run the **no** form of this command to restore the default configuration.

By default, the BFD function is disabled on all the interfaces.

Syntax

bfd all-interfaces

no bfd all-interfaces

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

The OSPF protocol dynamically discovers a neighbor by using hello packets. After BFD is enabled, OSPF establishes a BFD session with a neighbor in the full neighbor relationship to detect the neighbor status through the BFD mechanism. When the BFD neighbor fails, OSFP immediately performs network convergence.

You can also configure the **ip ospf bfd** [**disable**] command in interface configuration mode to enable or disable the BFD function on a specified interface, and this configuration takes precedence over the **bfd all-interfaces** command used in OSPF process configuration mode.

Examples

The following example configures all interfaces running OSPF to conduct BFD link detection.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# bfd all-interfaces
```

Notifications

When the neighbor device also needs to be configured with BFD to prevent route learning from being affected, the following notification will be displayed:

```
% Warning: The BFD for OSPF neighbor shall be enabled, or it would affect the
route learning.
```

Common Errors

BFD is not enabled on the interconnected devices at the same time.

Platform Description

N/A

Related Commands

- **show ip ospf**

1.13 capability opaque

Function

Run the **capability opaque** command to enable the opaque LSA processing capability.

Run the **no** form of this command to disable the opaque LSA processing capability.

The opaque LSA processing capability is enabled by default.

Syntax

capability opaque

no capability opaque

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

N/A

Examples

The following example disables the opaque LSA processing capability.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# no capability opaque
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.14 capability vrf-lite

Function

Run the **capability vrf-lite** command to forcibly disable the automatic judging function of support to loop detection for OSPF processes.

Run the **no** form of this command to remove this configuration.

Run the **default** form of this command to restore the default configuration.

By default, the automatic judging function of support to loop detection is enabled for the OSPF processes associated with VRF.

Syntax

capability vrf-lite [**auto**]

no capability vrf-lite [**auto**]

default capability vrf-lite [**auto**]

Parameter Description

auto: Automatically judges whether loop detection is supported for the OSPF processes associated with VRF.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command takes effect only for the OSPF process associated with VRF.

By default, support to loop detection and PE-CE OSPF feature is automatically judged for the OSPF processes associated with VRF.

- The **capability vrf-lite** command can be used to forcedly disable the above function.
- The **no capability vrf-lite** command can be used to forcedly enable the above function.
- The **capability vrf-lite auto** command is configured to enable the OSPF process associated with VRF to automatically judge whether the above function is enabled.
- The **capability vrf-lite auto** command is used to restore the default configuration.

Loop detection of OSPF processes aims to prevent possible loop of VPN routes in propagation. When an OSPF process associated with VRF receives LSA, it will process the LSA according to the following principle:

- After the loop detection function is disabled, the OSPF protocol will not check the DN bit (down bit) and VPN route tag in the LSA packet after receiving the LSA packet, and allow the LSA to participate in the calculation of OSPF.
- For type-3, 5 and 7 LSAs, the DN bit is detected. If the received LSA contains a DN bit, the LSA does not participate in OSPF calculation.
- For type-5 and 7 LSAs, the VPN route tag (Domain-tag) is detected. If the VPN route tag of the received LSA is the same as that of the local OSPF process, the LSA does not participate in the OSPF calculation.

The so-called PE-CE OSPF feature converts different OSPF LSAs for advertising to CE according to the BGP extended attribute of route. After the OSPF feature of PE-CE is disabled, different OSPF LSAs are not converted according to BGP attributes.

By default, support to loop detection is automatically judged for the OSPF processes associated with VRF. The purpose of this function is as follows:

In some application scenarios, you may need to disable the loop detection function of VRF OSPF processes. For example, VPN users use MCE devices to exchange VPN routes with PEs. If the OSPF protocol runs between MCEs and PEs to exchange VPN routes, to enable the MCE to learn the VPN route advertised by the PE and advertise it to the downlink VPN site, you need to disable the loop detection function of VRF OSPF processes of the MCE device. For the general MCE scenario, currently the device can automatically judge and disable the loop detection feature of OSPF processes. If the automatic judgment result is incorrect, you need to run the [**no**] **capability vrf-lite** command to forcibly enable or disable the loop detection feature of OSPF processes.

Examples

The following example disables the loop detection capability for OSPF processes.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10 vrf vpn1
Hostname(config-router)# capability vrf-lite
```

Notifications

If the OSPF process is not bound to VRF, the following notification will be displayed:

```
% The command CAN NOT apply to ospf instance bound to VRF default.
```

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.15 clear ip ospf process

Function

Run the **clear ip ospf process** command to clear and restart an OSPF process.

Syntax

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

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535. When this parameter is specified, the specified OSPF process will be cleared and reset. When this parameter is not specified, all the running OSPF processes will be cleared and reset.

Command Modes

Privileged EXEC mode

Default Level

14

Usage Guidelines

Resetting the whole OSPF process will reestablish all the neighbors, which has a great impact on the entire protocol.

When running this command, you need to make confirmation.

Examples

The following example clears and resets OSPF Process 1.

```
Hostname> enable
Hostname# clear ip ospf 1 process
Reset OSPF process! [yes/no]:
```

Notifications

When an OSPF process not existing is reset, the following notification will be displayed:

```
%OSPF: No router process 1
```

Platform Description

N/A

1.16 compatible rfc1583

Function

Run the **compatible rfc1583** command to enable the RFC1583 rules.

Run the **no** form of this command to disable the RFC1583 rules.

The RFC1583 rules are enabled by default.

Syntax

compatible rfc1583

no compatible rfc1583

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

When multiple paths reach the same external destination of AS, the optimum path must be determined. This command determines to run the priority rule used in the RFC1583 rules.

Examples

The following example configures the RFC1583 rules to determine the optimum route.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# no compatible rfc1583
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- show ip ospf

1.17 default-information originate

Function

Run the **default-information originate** command to generate a default route to be injected to the OSPF routing domain.

Run the **no** form of this command to disable the default route.

No default route is generated by default.

Syntax

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

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

Parameter Description

always: Enables OSPF to generate a default route no matter whether the local router has a default route.

metric *metric*: Indicates the initial metric of the default route. The value range is from 0 to 16777214, and the default value is **1**.

metric-type *type*: Indicates the type of the default route. The default value is 2. OSPF external routes are classified into two types. Type 1: The metric varies with routers. Type 2: The metric is the same for all the routers. Type 1 external routes are more trustworthy than Type 2 external routes.

route-map *map-name*: Indicates the name of the associated route map. No route map is associated by default.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

After the **redistribute** or **default-information** command is executed, the OSPF router automatically becomes an ASBR. The ASBR, however, does not automatically generate or advertise a default route to all routers in the OSPF routing domain. To enable the ASBR to generate a default route, configure the **default-information originate** command.

If the **always** parameter is specified, the OSPF routing process advertises an external default route to neighbors regardless of whether a default route exists. This default route, however, is not displayed on the local router. To confirm whether a default route is generated, run the **show ip ospf database** command to display the OSPF link state database (LSDB). The external link with ID 0.0.0.0 describes the default route. On an OSPF neighbor, you can run the **show ip route** command to see the default route.

The metric of the external default route can be set only by running the **default-information originate** command, instead of the **default-metric** command.

OSPF has two types of external routes. The metric of the Type-1 external route changes, but the metric of the Type-2 external route is fixed. If two parallel paths to the same destination have the same route metric, the

priority of the Type 1 route is higher than that of the Type 2 route. Therefore, the **show ip route** command displays only the Type 1 route.

This command generates a default route of Type-5 LSA, which will not be flooded to the NSSA. If you want to generate a default route in the NSSA, run the **area nssa default-information-originate** command.

A router in the stub area cannot generate an external default route.

The metric value range configured for the associated route map is 0 to 16777214. If the value exceeds this range, routes cannot be introduced.

Examples

The following example configures an external default route for the OSPF routing domain with type set to **1** and metric set to **50**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.24.0 0.0.0.255 area 0
Hostname(config-router)# default-information originate always metric 50 metric-type 1
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf database**
- **show ip route** (route management)

1.18 default-metric

Function

Run the **default-metric** command to configure the default metric for an OSPF redistributed route.

Run the **no** form of this command to restore the default configuration.

By default, the metric of a redistributed route is 20.

Syntax

default-metric *metric*

no default-metric

Parameter Description

metric: Default metric of the OSPF redistributed route. The value range is from 1 to 16777214.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

The **default-metric** command must be used together with the **redistribute** command to modify the initial metrics of all redistributed routes.

Setting the **default-metric** command does not take effect on the external routes that are configured and injected to the OSPF routing domain using the **default-information originate** command.

Examples

The following example sets the default metric value of an OSPF redistributed route to **50**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router rip
Hostname(config-router)# network 192.168.12.0
Hostname(config-router)# version 2
Hostname(config-router)# exit
Hostname(config)# router ospf 1
Hostname(config-router)# network 172.16.10.0 0.0.0.255 area 0
Hostname(config-router)# default-metric 50
Hostname(config-router)# redistribute rip subnets
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **redistribute**
- **show ip ospf database**

1.19 disable-dn-bit-check

Function

Run the **disable-dn-bit-check** command to disable the DN bit loop detection function of LSA.

Run the **no** form of this command to enable the function.

Run the **default** form of this command to restore the default configuration.

The DN bit loop detection function of LSA is enabled by default.

Syntax

disable-dn-bit-check [**summary** | **ase** | **nssa**]

no disable-dn-bit-check [**summary** | **ase** | **nssa**]

default disable-dn-bit-check [**summary** | **ase** | **nssa**]

Parameter Description

summary: Disables DN bit check of the summary LSA.

ase: Disables DN bit check of the AS-External LSA.

nssa: Disables DN bit check of the NSSA LSA.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

In the CE dual-homing scenario of L3VPN, loop is avoided by suppressing the route computation of DN bit between PEs. However, in a specific scenario, PEs may be allowed to learn routes from each other without generating any loops. In this case, check of the DN bit can be cancelled using this command.

When a PE device is connected to an MCE device, the MCE device needs to calculate the route advertised by the PE and the DN bit will not be checked.

Type-3, Type-5, and Type-7 LSAs of OSPF can all carry a DN bit.

Examples

The following example disables loop detection using the DN bit of summary LSA under the VRF OSPF process VPN 1.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10 vrf vpn1
Hostname(config-router)# disable-dn-bit-check summary
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.20 disable-tag-check

Function

Run the **disable-tag-check** command to disable loop detection using the route tag of LSA.

Run the **no** form of this command to remove this configuration.

Run the **default** form of this command to restore the default configuration.

The loop detection function using the route tag of LSA is enabled by default.

Syntax

disable-tag-check

no disable-tag-check

default disable-tag-check

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

In the CE dual-homing scenario of L3VPN, when the LSA route tag received by a PE is the same as its route tag, the route is not calculated, thus avoiding loop.

In a specific scenario, PEs are allowed to learn routes from each other without generating any loops. In this case, you can configure different route tags for multiple PEs, or configure to disable route tag check.

When a PE device is connected to an MCE device, the MCE device needs to calculate the route advertised by the PE and the route tag will not be checked.

Type-5 and Type-7 LSAs of OSPF can carry a route tag.

Examples

The following example disables loop detection using the route tag of LSA under the VRF OSPF process VPN 1.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10 vrf vpn1
Hostname(config-router)# disable-tag-check
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.21 discard-route

Function

Run the **discard-route** command to allow adding a discard route to the core routing table.

Run the **no** form of this command to remove this configuration.

The discard route adding function is enabled by default.

Syntax

discard-route { **internal** | **external** }

no discard-route { **internal** | **external** }

Parameter Description

internal: Allows adding the inter-area route summarization command, namely, the discard route generated by the **area range** command.

external: Allows adding the external route summarization command, namely, the discard route generated by the **summary-address** command.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

During route summarization, the range after summarization may exceed the actual network scope in the routing table. If the data is sent to a network beyond the summarization range, a routing loop may be formed and the router processing load may increase. To prevent these problems, a discard route must be added to the routing table on the ABR or ASBR. This route is automatically generated, and is not advertised.

Examples

The following example prohibits adding a discard route to the core routing table.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# no discard-route internal
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip route** (route management)

1.22 distance

Function

Run the **distance** command to configure the management distances corresponding to different types of OSPF routes.

Run the **no** form of this command to restore the default configuration.

By default, the management distance is **110** for all the OSPF routes.

Syntax

distance { *distance* [**route-map** *map-name*] | **ospf** { [**intra-area** *distance* [**route-map** *map-name*]] [**inter-area** *distance* [**route-map** *map-name*]] [**external** *distance* [**route-map** *map-name*]] } }

no distance [**ospf**]

Parameter Description

distance: Management distance of a route. The value range is from 1 to 255.

intra-area *distance*: Indicates the management distance of an intra-area route. The value range is from 1 to 255.

inter-area *distance*: Indicates the management distance of an inter-area route. The value range is from 1 to 255.

external *distance*: Indicates the management distance of an external route. The value range is from 1 to 255.

route-map *map-name*: Indicates the name of the associated route map. No route map is associated by default.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

To compare the priorities of routes generated by different OSPF processes, you need to run this command to specify the management distances corresponding to different types of OSPF routes.

The management distance allows different routing protocols to compare route priorities. A smaller management distance indicates a higher route priority.

If the management distance of a route entry is set to 255, the route entry is not trustworthy and does not participate in packet forwarding.

Configure the **route-map** parameter and set a management distance for the specific route through a policy. If **route-map** is configured with **set distance**, then:

- For a matched route, the management distance is set by the **set distance** command.
- For an unmatched route, the management distance is set by the **distance** command.

Examples

The following example sets the management distance of an OSPF external route to **160**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# distance ospf external 160
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip route** (route management)

1.23 distribute-list in

Function

Run the **distribute-list in** command to configure filtering routes that are calculated based on the received LSA.

Run the **no** form of this command to remove this configuration.

By default, the filtering function of the routes calculated based on the received LSA is disabled, that is, all these routes get past.

Syntax

istribute-list { *acl-name* | *acl-number* | **gateway** *prefix-list-name* | **prefix** *prefix-list-name* [**gateway** *prefix-list-name*] | **route-map** *route-map-name* } **in** [*interface-type interface-number*]

no distribute-list { *acl-name* | *acl-number* | **gateway** *prefix-list-name* | **prefix** *prefix-list-name* [**gateway** *prefix-list-name*] | **route-map** *route-map-name* } **in** [*interface-type interface-number*]

Parameter Description

acl-name: ACL name. The value is a case-sensitive string of 1 to 99 characters.

acl-number: ACL No. The following value ranges are supported. The value range of IP standard ACL is 1 to 99 or 1300 to 1999; the value range of IP extended ACL is 100 to 199 or 2000 to 2699.

gateway *prefix-list-name*: Uses the gateway for filtering.

prefix *prefix-list-name*: Uses a prefix list for filtering.

route-map *route-map-name*: Uses a route map for filtering.

interface-type interface-number: interface for which LSA routes are filtered.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This function filters the routes that are computed based on received LSAs. Only the routes meeting the filtering conditions can be forwarded. The command does not affect the LSDB or the routing tables of neighbors. The ACL, prefix list, and route map filtering rules are mutually exclusive in the configuration. In other words, if an ACL is used for filtering routes of a specified interface, prefix list or router map cannot be configured for filtering routes of the same interface.

The route map used in this command supports the following **match** commands:

- **match interface**
- **match ip address**
- **match ip address prefix-list**
- **match ip next-hop**
- **match ip next-hop prefix-list**
- **match metric**
- **match route-type**
- **match tag**

⚠ Caution

Filtering routes by running the **distribute-list in** command affects forwarding of local routes, but does not affect route computation based on LSAs. Therefore, if route filtering is configured on the ABR, Type-3 LSAs will still be generated and advertised to other areas because routes can still be computed based on LSAs. As a result, black hole routes are generated. In this case, you can run the **area filter-list** or **area range** (containing the **not-advertise** parameter) command on the ABR to prevent generation of black hole routes.

Examples

The following example configures ACL 3 to filter the routes received by GigabitEthernet 0/1 and calculated based on the received LSA.

```
Hostname> enable
Hostname# configure terminal
```

```
Hostname(config)# access-list 3 permit 172.16.0.0 0.0.127.255
Hostname(config)# router ospf 25
Hostname(config-router)# distribute-list 3 in GigabitEthernet 0/1
```

Notifications

When an invalid interface is configured, the following notification will be displayed:

```
% Interface is invalid.
```

When an invalid ACL name is configured, the following notification will be displayed:

```
% ACL name abc-acl is invalid
```

When routes imported by this instance are filtered, the following notification will be displayed:

```
% Distribute-list of "ospf 1" via "ospf 1" not allowed
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip route** (route management)

1.24 distribute-list out

Function

Run the **distribute-list out** command to configure filtering of redistributed routes.

Run the **no** form of this command to disable filtering of redistributed routes.

By default, the filtering function of redistributed routes is disabled, that is, all the redistributed routes get past.

Syntax

distribute-list { *acl-number* | *acl-name* | **prefix** *prefix-list-name* } **out** [**arp-host** | **bgp** | **connected** | **isis** [*area-tag*] | **ospf** *process-id* | **rip** | **static**]

no distribute-list { *acl-number* | *acl-name* | **prefix** *prefix-list-name* } **out** [**arp-host** | **bgp** | **connected** | **isis** [*area-tag*] | **ospf** *process-id* | **rip** | **static**]

Parameter Description

acl-number: ACL No. The following value ranges are supported. The value range of IP standard ACL is 1 to 99 or 1300 to 1999; the value range of IP extended ACL is 100 to 199 or 2000 to 2699.

acl-name: ACL name. The value is a case-sensitive string of 1 to 99 characters.

prefix *prefix-list-name*: Uses a prefix list for filtering.

arp-host: Filters host routes converted by Address Resolution Protocol (ARP).

bgp: Filters BGP routes.

connected: Filters direct routes.

isis [*area-tag*]: Filters IS-IS routes.

ospf *process-id*: Filters OSPF routes.

rip: Filters RIP routes.

static: Filters static routes.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

The **distribute-list out** command is similar to the **redistribute route-map** command, and is used to filter routes that are redistributed from other protocols to OSPF. The **distribute-list out** command itself does not redistribute routes, and is generally used together with the **redistribute** command. The ACL and prefix list filtering rules are mutually exclusive in the configuration. In other words, if an ACL is used for filtering routes coming from a certain source, the prefix list cannot be configured to filter the same routes.

Examples

The following example filters the redistributed static routes according to the prefix list jjj.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# redistribute static subnets
Hostname(config-router)# distribute-list prefix jjj out static
```

Notifications

When the **gateway** parameter is carried for filtering of redistributed routes, the following notification will be displayed:

```
% Gateway not allowed with OUT in distribute-list cmd
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf database**

1.25 domain-id

Function

Run the **domain-id** command to configure the domain ID of an OSPF process.

Run the **no** form of this command to remove this configuration.

Run the **default** form of this command to restore the default configuration.

By default, the domain ID value of an OSPF process is **null**, and the type value is **0005**.

Syntax

domain-id { *ipv4-address* [**secondary**] | **null** | **type** { **0005** | **0105** | **0205** | **8005** } **value** *hex-value* [**secondary**] }

no domain-id [*ipv4-address* [**secondary**] | **null** | **type** { **0005** | **0105** | **0205** | **8005** } **value** *hex-value* [**secondary**]]

default domain-id

Parameter Description

ipv4-address: IPv4 address as the domain ID.

secondary: Uses the configured domain ID as a secondary identifier.

null: Indicates that the OSPF process has no domain ID.

type { **0005** | **0105** | **0205** | **8005** }: Sets the domain ID type of an OSPF process. Its value can be one of the following four types: 0x0005, 0x0105, 0x0205, and 0x8005. The default value is 0x0005.

value *hex-value*: Sets the domain ID value of an OSPF process, a hexadecimal value indicating a 6-byte number.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command takes effect only on the OSPF process associated with VRF.

If an OSPF process is configured with a domain ID, when an OSPF route is redistributed to BGP and becomes a VPN route, the domain ID will be redistributed to BGP together, and finally will be advertised to other PEs as one part of the extcommunity attribute in the VPN route.

You can run the **domain-id secondary** command to configure multiple domain IDs of an OSPF process. However, there can be only one primary domain ID, and the remaining ones are secondary domain IDs. When the OSPF route is converted to a VPN route for advertising, the corresponding extcommunity attribute will carry the primary domain ID information only.

In general, the OSPF protocol runs between the PE and CE for VPN route interaction. After the PE receives a VPN route and redistributes it to the OSPF process, the route will be advertised to the VPN site as a Type-5 LSA. However, for different sites belonging to the same OSPF domain, the route should be advertised as a Type-3 LSA. Therefore, the same domain ID can be configured for the corresponding VRF OSPF process on the PE so as to advertise the route within the domain as a Type-3 LSA.

The domain IDs of different VRF OSPF processes on the same PE do not influence each other, and can be configured the same or different. However, the VRF OSPF processes that belong to the same VPN must be configured with the same domain ID to ensure the correctness of route advertising.

Examples

The following example configures the domain ID type under VRF OSPF process VPN 1 as 0005 and the domain ID value as 000000000001.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10 vrf vpn1
Hostname(config-router)# domain-id type 0005 value 000000000001
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.26 domain-tag

Function

Run the **domain-tag** command to configure the VPN route tag of an OSPF process associated with VRF.

Run the **no** form of this command to restore the default value.

Run the **default** form of this command to restore the default configuration.

By default, the default value of a VRF OSPF process is the AS number of the local BGP protocol.

Syntax

domain-tag *tag*

no domain-tag

default domain-tag

Parameter Description

tag: VPN route tag value of an OSPF process. The value range is from 1 to 4294967295.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command takes effect only for the OSPF process associated with VRF and BGP redistributed routes.

If a VPN site is connected to multiple PEs, the VPN route will be learned from the PE through MP-BGP. If the route is advertised to the VPN site through a Type- 5 or Type-7 LSA, it may be learned and advertised by other PEs connected to the VPN site, which may cause a loop. To prevent loops, the VRF OSPF processes connected to the same VPN site on the PEs are configured with the same VPN route tag. When a VRF OSPF process sends a Type-5 or Type-7 LSA to a VPN site, the VPN route tag information will also be attached to the LSA. When other PE sites receive such a Type-5 or Type-7 LSA, if they detect that the VPN route tag in the LSA is consistent with that of the local OSPF process, the LSA will not participate in the OSPF computation.

Generally, the OSPF processes belonging to the same VPN site are configured with the same VPN route tag value.

The VPN route tag occupies four bytes in an OSPF packet. If a VRF OSPF process is not configured with this command, when the OSPF process advertises a Type-5 or Type-7 LSA, the first two bytes of the VPN route tag are set to 0xD000 by default, and the last two bytes are the AS number of the local BGP. For example, if the AS number of the local BGP is 1, the hexadecimal form of the VPN route tag is: 0xD0000001.

Examples

The following example configures the route tag of the OSPF process VPN1 associated with VRF as **10**.

```
Hostname(config)# router ospf 10 vrf vpn1
Hostname(config-router)# domain-tag 10
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.27 enable mib-binding

Function

Run the **enable mib-binding** command to bind the MIB to a specified OSPFv2 process.

Run the **no** form of this command to restore the default binding.

By default, the MIB is bound to the OSPFv2 process with the minimum process ID.

Syntax

enable mib-binding

no enable mib-binding

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

The OSPFv2 MIB does not have the OSPFv2 process information. Therefore, you must perform operations on a single OSPFv2 process through SNMP.

If you wish to perform operations on a specified OSPFv2 through SNMP, run this command to bind the MIB with the process.

Examples

The following example configures to bind the MIB to the specified OSPFv2 process 100.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 100
Hostname(config-router)# enable mib-binding
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.28 enable traps

Function

Run the **enable traps** command to enable sending of the specified trap message.

Run the **no** form of this command to disable sending of the specified trap message.

The trap message sending function is disabled by default.

Syntax

enable traps [**error** [**IfAuthFailure** | **IfConfigError** | **IfRxBadPacket** | **VirtIfAuthFailure** | **VirtIfConfigError** | **VirtIfRxBadPacket**] | **lsa** [**LsdbApproachOverflow** | **LsdbOverflow** | **MaxAgeLsa** | **OriginateLsa**] | **retransmit** [**IfTxRetransmit** | **VirtIfTxRetransmit**] | **state-change** [**IfStateChange** | **NbrRestartHelperStatusChange** | **NbrStateChange** | **NssaTranslatorStatusChange** | **RestartStatusChange** | **VirtIfStateChange** | **VirtNbrRestartHelperStatusChange** | **VirtNbrStateChange**]]

no enable traps [**error** [**IfAuthFailure** | **IfConfigError** | **IfRxBadPacket** | **VirtIfAuthFailure** | **VirtIfConfigError** | **VirtIfRxBadPacket**] | **lsa** [**LsdbApproachOverflow** | **LsdbOverflow** | **MaxAgeLsa** | **OriginateLsa**] | **retransmit** [**IfTxRetransmit** | **VirtIfTxRetransmit**] | **state-change** [**IfStateChange** | **NbrRestartHelperStatusChange** | **NbrStateChange** | **NssaTranslatorStatusChange** | **RestartStatusChange** | **VirtIfStateChange** | **VirtNbrRestartHelperStatusChange** | **VirtNbrStateChange**]]

Parameter Description

error: Configures all the trap switches related to Error. This parameter can also configure the following specific error trap switches:

IfAuthFailure: Indicates interface authentication error.

IfConfigError: Indicates interface parameter configuration error.

IfRxBadPacket: Indicates that the interface receives an error packet.

VirtIfAuthFailure: Indicates virtual interface authentication error.

VirtIfConfigError: Indicates virtual interface parameter configuration error.

VirtIfRxBadPacket: Indicates that the virtual interface receives an error packet.

lsa: Configures all the trap switches related to LSA. This parameter can also configure the following specific LSA trap switches:

LsdbApproachOverflow: Indicates that the number of external LSAs has reached 90% of the upper limit.

LsdbOverflow: Indicates that the number of external LSAs has reached the upper limit.

MaxAgeLsa: Indicates that the LSA aging timer expires.

OriginateLsa: Indicates that a new LSA is generated.

retransmit: Configures all the trap switches related to Retransmit. This parameter can also configure the following specific retransmit trap switches:

IfTxRetransmit: Indicates that a packet is retransmitted on the interface.

VirtIfTxRetransmit: Indicates that a packet is retransmitted on the virtual interface.

state-change: Configures all the trap switches related to State-change. This parameter can also configure the following specific state-change trap switches:

IfStateChange: Indicates that the interface state changes.

NbrRestartHelperStatusChange: Indicates that the status of the neighbor GR process changes.

NbrStateChange: Indicates that the neighbor state changes.

NssaTranslatorStatusChange: Indicates that the NSSA translator state changes.

RestartStatusChange: Indicates that the GR status of the local device changes.

VirtIfStateChange: Indicates that the virtual interface state changes.

VirtNbrRestartHelperStatusChange: Indicates that the status of the virtual neighbor GR process changes.

VirtNbrStateChange: Indicates that the virtual neighbor state changes.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

Currently the OSPFv2 process supports sending of 16 kinds of trap messages, which are classified into four types.

The function configured by this command is restricted by the **snmp-server** command. You can must configure the **snmp-server enable traps ospf** command and then the **enable traps** command before the corresponding OSPF trap message can be correctly sent out.

This command is not restricted by the MIB bound to the process. The trap switch can be enabled concurrently for different processes.

Examples

The following example enables sending of the specified trap message.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 100
Hostname(config-router)# enable traps
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **snmp-server enable traps ospf** (network management and monitoring/SNMP)

1.29 extcommunity-type

Function

Run the **extcommunity-type** command to configure the Router-ID or Route-Type of an OSPF process associated with VRF.

Run the **no** form of this command to restore the default type value.

Run the **defaulttype** form of this command to restore the default configuration.

By default, the type of Router-ID is 0107, and the type of Route-Type is 0306.

Syntax

extcommunity-type { **router-id** { **0107** | **8001** } | **route-type** { **0306** | **8000** } } *

no extcommunity-type { **router-id** | **route-type** } *

default extcommunity-type { **router-id** | **route-type** } *

Parameter Description

router-id { **0107** | **8001** }: Sets the Router-ID of an OSPF process. Its value is **0107** or **8001**.

route-type { **0306** | **8000** }: Sets the Router-Type of an OSPF process. Its value is **0306** or **8000**.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command takes effect only for the OSPF process associated with VRF, but is invalid for the global VRF instance configuration.

When an OSPF route of VRF forms a VPN route, the Router-ID information of the OSPF process will also be carried in the extcommunity attribute of the VPN route. You can run the **extcommunity-type router-id** command to specify the value of the type field in the extcommunity attribute as **0x0107** or **0x8001**.

When an OSPF route of VRF forms a VPN route, the Route-Type information of the OSPF process will also be carried in the extcommunity attribute of the VPN route. You can run the **extcommunity-type roue-type** command to specify the value of the type field in the extcommunity attribute as **0x0306** or **0x8000**.

Examples

The following example configures the Router-ID of the OSPF process VPN1 associated with VRF as **8001**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10 vrf vpn1
Hostname(config-router)# extcommunity-type router-id 8001
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.30 fast-reroute

Function

Run the **fast-reroute** command to configure the OSPF fast reroute function of a device.

Run the **no** form of this command to restore the default configuration.

The fast reroute function is disabled by default.

Syntax

fast-reroute { **lfa** [**downstream-paths**] | **route-map** *route-map-name* }

no fast-reroute { **lfa** [**downstream-paths**] | **route-map**] }

Parameter Description

lfa: Enables computation of the loop-free backup path.

downstream-paths: Enables computation of the downstream path.

route-map *route-map-name*: Specifies a backup path through the route map.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

If the **lfa** parameter is configured, computation of the loop-free backup path is enabled. Now, you can run the interface mode command to specify the path protection mode of the interface.

It is recommended that automatic computation of LFA for the backup path be disabled if any of the following cases exists on the network:

- Virtual links exist.
- Alternative ABRs exist.
- An ASBR is also an ABR.
- Multiple ABSRs advertise the same external route.

If both **lfa** and **downstream-paths** are configured, computation of the downstream path is enabled.

If **route-map** is configured, a backup path can be specified for a matched route through the route map.

When the OSPF fast reroute function is used, it is recommended that BFD be enabled at the same time, so that the device can quickly detect any link failure and therefore shorten the forwarding interruption time. If the interface is up or down, to shorten the forwarding interruption time during OSPF fast reroute, you can configure **carrier-delay 0** on a Layer-3 interface to achieve the fastest switchover speed.

Note

- Currently, the OSPF fast reroute function is subject to the following constraints:
- Only one backup next hop can be generated for one route.
- No backup next hop can be generated for equal-cost multi-path routing (ECMP).

Examples

The following example configures the FRR function of OSPF process 1 and associates it with fast-reroute of the route map.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# route-map fast-reroute
```

```
Hostname(config-route-map)# match ip address 1
Hostname(config-route-map)# set fast-reroute backup-interface GigabitEthernet 0/1
backup-nexthop 192.168.1.2
Hostname(config)# router ospf 1
Hostname(config-router)# fast-reroute route-map fast-reroute
```

Notifications

When the route map name exceeds 32 characters, the following notification will be displayed:

```
% Route-map name string length can not exceed 32
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **carrier-delay** (interface/Ethernet interface)
- **show ip route** (route management)

1.31 graceful-restart

Function

Run the **graceful-restart** command to enable the OSPF GR capability and set the GR period.

Run the **no** form of this command to disable the OSPF GR capability or restore the default value of the GR period.

The OSPF GR capability is enabled by default.

Syntax

graceful-restart [**grace-period** *grace-period* | **inconsistent-lsa-checking**]

no graceful-restart [*grace-period*]

Parameter Description

grace-period *grace-period*: Sets the GR period, in seconds, which is the maximum time from occurrence of an OSPF failure to restart of OSPF and completion of the OSPF GR. The value range is 1 to 1800, and the default value is **120**.

inconsistent-lsa-checking: Enables topology change detection. If any topology change is detected, OSPF exits the GR process to complete convergence.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

When a GR-enabled device is restarted on the control plane, data forwarding can be guided on the forwarding plane. In addition, actions such as neighbor relationship re-forming and route computation performed on the control plane do not affect functions of the forwarding plane. In this way, service interruption caused by route flapping can be avoided, thus enhancing reliability of the entire network.

The GR function is configured based on the OSPF process. You can configure different parameters for different OSPF processes based on the actual conditions.

This command is used to configure the GR restarter capability of a device. The grace period is the maximum time of the entire GR process, during which link state is rebuilt so that the original state of the OSPF process is restored. After the GR period expires, OSPF exits the GR state and performs common OSPF operations.

Run the **graceful-restart** command to set the GR period to 120s. The **graceful-restart grace-period** command allows you to modify the GR period explicitly.

If the Fast Hello function is enabled, the GR function cannot be enabled.

The precondition for successful execution of GR and uninterrupted forwarding is that the topology remains stable. If the topology changes, OSPF quickly converges without waiting for further execution of GR, thus avoiding long-time forwarding black-hole.

- Disabling topology detection: If OSPF cannot converge in time when the topology changes during the hot standby process, forwarding black-hole may appear in a long time.
- Configuring topology detection: Forwarding may be interrupted when topology detection is enabled, but the interruption time is far shorter than that when topology detection is disabled.

In most cases, it is recommended that topology detection be enabled. In special scenarios, topology detection can be disabled if the topology changes after the hot standby process, but it can be ensured that the forwarding black-hole will not appear in a long time. This can minimize the forwarding interruption time during the hot standby process.

Examples

The following example enables the OSPF restarter capability and sets the GR period to 60s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# graceful-restart grace-period 60
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.32 graceful-restart helper

Function

Run the **graceful-restart helper** command to enable the OSPF GR helper function and configure the relevant topology change detection mode.

Run the **no** form of this command to remove this configuration.

The GR helper capability is enabled by default. After the GR helper is enabled on the device, LSA changes are not checked.

Syntax

graceful-restart helper { **disable** | **strict-lsa-checking** | **internal-lsa-checking** }

no graceful-restart helper { **disable** | **strict-lsa-checking** | **internal-lsa-checking** }

Parameter Description

disable: Prohibits a device from acting as a GR helper for another device.

strict-lsa-checking: Indicates that changes in Type-1 to Type-5 and Type-7 LSAs will be checked during the period that the device acts as a GR helper to determine whether the network changes. If the network changes, the device will stop acting as a GR helper.

internal-lsa-checking: Indicates that changes in Type-1 to Type-3 LSAs will be checked during the period that the device acts as a GR helper to determine whether the network changes. If the network changes, the device will stop acting as a GR helper.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

This command is used to configure the GR helper capability of a device. When a neighbor device implements GR, it sends a Grace-LSA to notify all neighbor devices. If the GR helper function is configured on the local device, the local device becomes the GR helper on receiving the Grace-LSA, and helps the neighbor to complete GR. The **disable** option indicates that the GR helper is not provided for any device that implements GR.

After a device becomes a GR helper, the network changes are not detected by default. If any change takes place on the network, the network topology converges after GR is completed. If you wish that network changes can be quickly detected during the GR process, you can configure **strict-lsa-checking** to check Type 1 to 5 and Type 7 LSAs that indicate the network information or configure **internal-lsa-checking** to check Type 1 to 3 LSAs that indicate internal routes of the AS domain. When the network scale is large, it is recommended that you disable the LSA checking options (strict-lsa-checking and internal-lsa-checking) because regional network changes may trigger termination of GR and consequently reduce the convergence of the entire network.

Examples

The following example disables the OSPF GR helper function and configures the relevant topology change detection mode as **strict-lsa-checking**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# graceful-restart helper disable
Hostname(config-router)# no graceful-restart helper disable
Hostname(config-router)# graceful-restart Helper strict-lsa-checking
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.33 ip ospf authentication

Function

Run the **ip ospf authentication** command to configure the authentication mode of an interface.

Run the **no** form of this command to restore the default authentication mode.

By default, no authentication mode is set on an interface. In this case, the authentication type of the related area is used on the interface.

Syntax

ip ospf authentication [**message-digest** | **null** | **keychain** *kc-name*]

no ip ospf authentication

Parameter Description

message-digest: Indicates that MD5 encryption authentication is enabled on the current interface.

null: Indicates that authentication is disabled.

keychain *kc-name*: Indicates that keychain authentication is configured. If **Keychain** specifies that the authentication type is **SM3**, the key ID value range is from 0 to 255.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

If the **ip ospf authentication** command does not contain any option, plain text authentication is enabled. If you run the **no** form of this command to restore the default authentication mode, whether authentication is enabled is determined by the authentication type that is configured in the area to which the interface belongs. If the authentication type is set to **null**, authentication is disabled forcibly. When authentication is configured for both an interface and the area to which the interface belongs, the authentication type configured for the interface is used preferentially.

If keychain authentication is configured, the key and authentication type configured for keychain are used. Currently, keychain supports plain text authentication, MD5 authentication, and SM3 authentication.

Examples

The following example configures the OSPF authentication type of GigabitEthernet 0/1 interface as MD5 authentication.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.1.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf authentication message-digest
```

The following example configures the OSPF authentication type of the GigabitEthernet 0/1 interface as keychain authentication and the key chain as hello.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf authentication keychain ospf
Hostname(config-if-GigabitEthernet 0/1)# exit
Hostname(config)# key chain ospf
Hostname(config-keychain)# key 1
Hostname(config-keychain-key)# key-string hello
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.34 ip ospf authentication-key

Function

Run the **ip ospf authentication-key** command to configure the plain text authentication key of OSPF.

Run the **no** form of this command to delete the plain text authentication key.

The authentication key is disabled by default.

Syntax

ip ospf authentication-key [**0** | **7**] *key*

no ip ospf authentication-key

Parameter Description

0: Indicates that the key is displayed in plain text.

7: Indicates that the key is displayed in cipher text.

key: The key, a string of up to eight characters.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

The key configured by the **ip ospf authentication-key** command is inserted to the headers of all OSPF packets. If the keys are inconsistent, two directly connected devices cannot set up the OSPF neighbor relationship and therefore cannot exchange the routing information.

Different keys can be configured for different interfaces, but all routers connected to the same physical network segment must be configured with the same key.

You can enable or disable authentication in an OSPF area by running the **area authentication** command.

You can enable authentication on an individual interface by running **ip ospf authentication** in interface configuration mode. When authentication is configured for both an interface and the area to which the interface belongs, the authentication type configured for the interface is used preferentially.

Examples

The following example configures the OSPF authentication mode of the GigabitEthernet 0/1 interface as **ospfauth**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.1.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf authentication-key ospfauth
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- area authentication
- ip ospf authentication

1.35 ip ospf area

Function

Run the **ip ospf area** command to configure an OSPF routing process in which an interface participates.

Run the **no** form of this command to prevent an interface from participating in the OSPF routing process.

The OSPF routing process is disabled on an interface by default.

Syntax

ip ospf *process-id* **area** *area-id*

no ip ospf *process-id* **area** *area-id*

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

area-id: ID of the OSPF area in which the interface participates, which can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

Running this command will add all IP addresses on the interface to the OSPF process.

You can also add an interface to OSPF process using the **network** command on the instance. If two commands are run at the same time, the configuration on the interface takes effect first.

Examples

The following example enables the GigabitEthernet 0/1 interface to participate in Area 0 of OSPF Routing Process 1.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.1.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf 1 area 0
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.36 ip ospf bfd

Function

Run the **ip ospf bfd** command to configure an OSPF-enabled interface to enable or disable the BFD function.

Run the **no** form of this command to configure an OSPF-enabled interface to disable the BFD function.

The BFD function is disabled on an interface by default.

Syntax

ip ospf bfd [**disable**]

no ip ospf bfd

Parameter Description

disable: Disables BFD link detection on the OSPF-enabled interface.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

Once a link is faulty, OSPF can quickly detect the failure of the route. Configuring this command helps shorten the traffic interruption time.

The **ip ospf bfd** command configured on an interface takes precedence over the **bfd all-interfaces** command used in process configuration mode.

In light of the actual environment, you can run the **ip ospf bfd** command to configure BFD link detection on the specified interface, or run the **bfd all-interfaces** command in OSPF process configuration mode to configure BFD for link detection on all the interfaces of the OSPF process. You can run the **ip ospf bfd disable** command to disable BFD for link detection on the specified interface.

Examples

The following example configures the OSPF-enabled GigabitEthernet 0/1 interface to conduct BFD link detection.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.1.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf bfd
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.37 ip ospf cost

Function

Run the **ip ospf cost** command to configure the cost value for an OSPF interface to send a packet.

Run the **no** form of this command to restore the default value.

By default, the cost value of an OSPF interface is automatically calculated.

Syntax

ip ospf cost *cost*

no ip ospf cost

Parameter Description

cost: Cost value of an OSPF interface. The value range is from 0 to 65535.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

By default, the cost of an OSPF interface is equal to the reference value of the interface bandwidth divided by the actual interface bandwidth.

You can run the **auto-cost** command to configure the bandwidth reference value of an interface. The default value is 100 Mbps.

Run the **bandwidth** command to set the interface bandwidth.

The default costs of OSPF interfaces on several typical lines are as follows:

- For the 64 Kbps serial line, the cost is 1562.
- For the E1 line, the cost is 48.
- For the 10 Mbps Ethernet, the cost is 10.
- For the 100 Mbps Ethernet, the cost is 1.

Configuring the cost value of an OSPF interface through the **ip ospf cost** command will overwrite the default configuration.

Examples

The following command configures the cost for the OSPF-enabled GigabitEthernet 0/1 interface to send a packet as **100**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf cost 100
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.38 ip ospf cost-fallback

Function

Run the **ip ospf cost-fallback** command to configure the cost fallback of an aggregation port (AP).

Run the **no** form of this command to disable the cost fallback of an AP.

The cost fallback function is disabled on an AP by default.

Syntax

ip ospf cost-fallback *cost* **threshold** *bandwith*

no ip ospf cost-fallback

Parameter Description

cost: Cost fallback value. The value range is from 1 to 65535.

threshold *bandwith*: Indicates the bandwidth threshold, in bytes per second. When the AP bandwidth is smaller than this value, the cost fallback value takes effect. The value range is from 1 to 4294967.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

The bandwidth of an AP is equal to the sum of the bandwidths of all the valid member ports. When a member port fails, the bandwidth of the AP will be reduced. You can set a cost fallback value for the AP to enable OSPF to select other paths preferably. When the failed member port recovers, the cost fallback value becomes invalid, and the metric of the AP returns to normal.

Examples

The following example configures the cost fallback value for an AP, and sets the metric to 100 when the bandwidth is smaller than 1,000 Mbps.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface AggregatePort 1
Hostname(config-if-AggregatePort 1)# ip ospf cost-fallback 100 threshold 1000
```

Notifications

When a cost fallback value is configured for a non-AP, the following notification will be displayed:

```
%OSPF: Warning: Only aggregate ports are suitable for this command
```

Common Errors

Cost fallback is enabled on a non-AP.

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.39 ip ospf database-filter all out

Function

Run the **ip ospf database-filter all out** command to prevent an interface from diffusing LSA packets to the outside, that is, LSA update packets are not sent from the interface.

Run the **no** form of this command to restore the default value.

By default, the function of not diffusing LSA packets to the outside is disabled on an interface, that is, any LSA update packet can be sent from the interface.

Syntax

ip ospf database-filter all out

no ip ospf database-filter

Parameter Description

N/A

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

To prevent an interface from sending LSA update packets, you can enable this function on the interface. After this function is enabled, the local device does not advertise the LSA update packet to neighbors, but still sets up a neighbor relationship with neighbors and receives LSAs from neighbors.

Examples

The following example prevents the GigabitEthernet 0/1 interface from diffusing LSA packets to the outside.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.10.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf database-filter all out
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.40 ip ospf dead-interval

Function

Run the **ip ospf dead-interval** command to configure the interval for OSPF to determine the failure of a specified interface neighbor.

Run the **no** form of this command to restore the default configuration.

By default, the fast hello function is disabled, and the neighbor dead interval is four times the sending interval of hello packet.

Syntax

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

no ip ospf dead-interval

Parameter Description

Dead-interval: Interval for determining failure of a neighbor, in seconds. The value range is from 0 to 2147483647.

minimal: Enables the fast hello function and sets the interval for determining failure of a neighbor to 1s.

hello-multiplier *multiplier*: Specifies the number of hello packets sent per second in the fast hello function. The value range is from 3 to 20.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

The failure determining interval of an OSPF neighbor is contained in the hello packet. If OSPF does not receive a hello packet from a neighbor within the neighbor dead interval, it declares that the neighbor is invalid and deletes this neighbor record from the neighbor list. The neighbor dead interval is four times the sending interval of hello packet. If the hello interval is modified, the neighbor dead interval is modified automatically.

You can run this command to manually modify the interval for OSPF to judge failure of a neighbor. However, note the following points:

(1) The neighbor dead interval cannot be smaller than the hello packet sending interval.

(2) The neighbor dead interval must be the same on all routers in the same network segment.

After the OSPF fast hello function is enabled, OSPF finds neighbors and detects neighbor failures faster. You can enable the OSPF fast hello function by specifying the **minimal** and **hello-multiplier** keywords and the *multiplier* parameter. The **minimal** keyword indicates that the neighbor dead interval is set to 1s, and **hello-multiplier** indicates the number of hello packets sent per second. In this way, the interval at which the hello packet is sent decreases to less than 1s.

If the fast hello function is configured for an interface, the hello interval field of the hello packet advertised on the interface is set to 0, and the hello interval field of the hello packet received on this interface is ignored.

No matter whether the fast hello function is enabled, the neighbor dead interval must be always consistent in the same network segment. The **hello-multiplier** value can be inconsistent provided that at least one hello packet can be received within the neighbor dead interval. The **dead-interval minimal hello-multiplier** and **hello-interval** parameters introduced for the fast hello function cannot be configured simultaneously.

Run the **show ip ospf interface** command to monitor the neighbor dead interval and the fast hello interval configured for an interface.

Examples

The following example configures the interval for OSPF to judge failure of a neighbor on the GigabitEthernet 0/1 interface as **30**.

```
Hostname> enable
Hostname# configure terminal
```

```
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.10.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf dead-interval 30
```

The following example enables the fast hello function of the GigabitEthernet 0/1 interface and configures Hello-multiplier as **3**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.10.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf dead-interval minimal hello-
multiplier 3
```

Notifications

N/A

Common Errors

The neighbor dead intervals configured on different devices in the same area are inconsistent.

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.41 ip ospf disable all

Function

Run the **ip ospf disable all** command to prevent a specified interface from generating OSPF packets.

Run the **no** form of this command to restore the default state.

By default, an interface is allowed to generate OSPF packets.

Syntax

ip ospf disable all

no ip ospf disable all

Parameter Description

N/A

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

The interface configured with this command ignores whether **network area** is matched. After this command is configured, even if the interface belongs to the network segment range advertised by the **network** command, it will not generate OSPF packets any more. Therefore, the interface will neither send/receive any OSPF packet, nor participate in OSPF computation.

Examples

The following example prevents the GigabitEthernet 0/1 interface from generating LSA packets any more.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.10.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf disable all
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.42 ip ospf fast-reroute protection

Function

Run the **ip ospf fast-reroute protection** command to enable the loop-free alternate (LFA) protection mode of a specified interface.

Run the **no** form of this command to restore the default configuration.

The LFA link protection function is enabled by default.

Syntax

ip ospf fast-reroute protection { **node** | **link-node** | **disable** }

no ip ospf fast-reroute protection

Parameter Description

node: Enables the LFA node protection.

link-node: Enables the LFA link node protection.

disable: Disables LFA protection.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

After you run the **fast-reroute lfa** command in OSPF routing process configuration mode, OSPF fast reroute calculation will be enabled, and a standby route will be generated for the primary route based on the LFA protection mode specified in interface configuration mode. By default, LFA protection is enabled on each OSPF interface, and the failure of the active link does not affect data forwarding on the standby route.

- Run the **node** parameter to enable node protection for the interface, that is, data forwarding on the standby route will not be affected by the failure of a neighbor node corresponding to the active link.
- Run the **link-node** parameter to protect both the link and neighbor node corresponding to the primary route.
- Run the **disable** parameter to disable the LFA protection function of the interface, that is, no backup entry will be generated for the route whose next hop is the interface.

This command does not take effect if **fast-rerotue route-map** is configured.

Examples

The following example enables LFA link node protection on the GigabitEthernet 0/1 interface.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.10.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf fast-reroute protection link-
node
```

Notifications

N/A

Common Errors

N/A

Related Commands

- **show ip route** (route management)

1.43 ip ospf fast-reroute no-eligible-backup

Function

Run the **ip ospf fast-reroute no-eligible-backup** command to exclude an OSPF interface that cannot be used as a backup interface in the OSPF fast reroute calculation.

Run the **no** form of this command to restore the default configuration.

By default, an interface can be used as a backup interface of OSPF fast reroute.

Syntax

ip ospf fast-reroute no-eligible-backup

no ip ospf fast-reroute no-eligible-backup

Parameter Description

N/A

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

If the remaining bandwidth of an interface is small or an interface may fail with the primary interface at the same time, the interface is not suitable for a backup interface. This command needs to be enabled in interface configuration mode of this interface. In the fast reroute calculation of OSPF, this interface is excluded and cannot be used as a backup interface, and a backup interface is selected from other interfaces. This command does not take effect if **fast-rerotue route-map** is configured.

Examples

The following example excludes GigabitEthernet 0/1 from being a backup interface in the fast reroute calculation of OSPF.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.10.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf fast-reroute no-eligible-backup
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip route** (route management)

1.44 ip ospf hello-interval

Function

Run the **ip ospf hello-interval** command to configure the interval for OSPF to send hello packets.

Run the **no** form of this command to restore the default configuration.

By default, the hello packet interval is 10s for Ethernet, PPP, HDLC encapsulation interface, and frame relay point-to-point sub-interface. The hello packet interval is 30s for non-frame relay point-to-point sub-interface and X.25 interface.

Syntax

ip ospf hello-interval *hello-interval*

no ip ospf hello-interval

Parameter Description

hello-interval: Interval for OSPF to send hello packets, in seconds. The value range is from 1 to 65535.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

The hello packet interval is contained in the hello packet. A shorter hello interval indicates that OSPF can detect topology changes more quickly, but the network traffic increases. The hello packet interval must be the same on all routers in the same network segment. If you want to manually modify the neighbor dead interval, ensure that the neighbor dead interval is longer than the hello packet interval.

Examples

The following example sets the interval for OSPF to send hello packets to 15s on the GigabitEthernet 0/1 interface.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip address 172.16.10.1 255.255.255.0
Hostname(config-if-GigabitEthernet 0/1)# ip ospf hello-interval 15
```

Notifications

N/A

Common Errors

The hello packet intervals configured on different interfaces in the same area are inconsistent.

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.45 ip ospf message-digest-key

Function

Run the **ip ospf message-digest-key** command to configure a cipher text authentication key of OSPF packets.

Run the **no** form of this command to delete a configured cipher text authentication key of OSPF packets.

By default, no cipher text authentication key is configured.

Syntax

ip ospf message-digest-key *key-id* **md5** [**0** | **7**] *key*

no ip ospf message-digest-key *key-id*

Parameter Description

key-id: ID of the authentication key. The value range is from 1 to 255.

md5: Uses the MD5 cipher text authentication.

0: Indicates that the key is displayed in plain text.

7: Indicates that the key is displayed in cipher text.

key: The key, a string of up to 16 characters.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

This command configures a key of cipher text authentication, which takes effect only after the **area authentication** or **ip ospf authentication** command is used to configure the authentication type as **message-digest**. Authentication succeeds only when both *key-id* and key are matched.

Multiple *key-id* values are configured for the same interface, and the last *key-id* configured takes effect when packets are sent, but all *key-id* values can participate in the authentication when packets are received.

Examples

The following example configures the cipher text authentication of OSPF packets on the GigabitEthernet 0/1 interface as MD5, and key as hello.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf message-digest-key 10 md5 hello
```

Notifications

When a key not configured is deleted, the following notification will be displayed:

```
OSPF: Key 1 does not exist
```

When a configured key is configured again, the following notification will be displayed:

```
OSPF: Key 1 already exists
```

When a key is too long and will be truncated to 16 characters, the following notification will be displayed:

```
%OSPF: Warning: The password/key will be truncated to 16 characters
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **area authentication**
- **ip ospf authentication**

1.46 ip ospf mtu-ignore

Function

Run the **ip ospf mtu-ignore** command to disable MTU verification when an interface receives database description packets.

Run the **no** form of this command to enable MTU verification when an interface receives database description packets.

The MTU verification function is disabled by default.

Syntax

ip ospf mtu-ignore

no ip ospf mtu-ignore

Parameter Description

N/A

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

When receiving a database description packet, OSPF verifies whether the MTU of the neighbor's interface is the same as that of its own interface. If the interface MTU specified in the received database description packet is greater than the MTU of the local interface, the neighbor relationship cannot be set up. To resolve this problem, you can disable MTU verification.

Examples

The following example disables MTU verification when the GigabitEthernet 0/1 interface receives database description packets.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf mtu-ignore
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.47 ip ospf network

Function

Run the **ip ospf network** command to configure the OSPF network type of an interface.

Run the **no** form of this command to restore the default configuration.

By default, the interface type of OSPF is not configured. No interface is set to P2MP type by default.

Syntax

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

no ip ospf network

Parameter Description

broadcast: Sets the interface network type to **broadcast**.

non-broadcast: Sets the interface network type to non-broadcast multiple access (NBMA).

point-to-multipoint [**non-broadcast**]: Sets the interface network type to P2MP. If the interface does not have the broadcast capability, the **non-broadcast** parameter must be set.

point-to-point: Sets the interface network type to P2P.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

The command is used to set a network type of OSPF according to the network topology. Ethernet and fiber distributed data interface (FDDI) fall into the broadcast type, X.25, frame relay, and ATM fall into the NBMA type, and PPP, HDLC, and LAPB fall into the P2P type. Each network type is restricted as follows:

- The broadcast type requires that the interface must have the broadcast capability.
- The P2P type requires that the interfaces are interconnected in one-to-one manner.
- The NBMA type requires full-meshed connections, and all interconnected routers can directly communicate with each other.
- The P2MP type does not raise any requirement.

Examples

The following example configures the OSPF network type of the GigabitEthernet 0/1 interface as P2P type.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-GigabitEthernet 0/1)#ip address 172.16.24.4 255.255.255.0
Hostname(config-GigabitEthernet 0/1)# encapsulation frame-relay
Hostname(config-GigabitEthernet 0/1)# ip ospf network point-to-point
```

The following example configures the OSPF network type of the GigabitEthernet 0/1 interface as NBMA.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-GigabitEthernet 0/1)# ip address 172.16.24.4 255.255.255.0
Hostname(config-GigabitEthernet 0/1)# encapsulation frame-relay
Hostname(config-GigabitEthernet 0/1)# ip ospf network non-broadcast
Hostname(config-GigabitEthernet 0/1)# exit
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.48 ip ospf priority

Function

Run the **ip ospf priority** command to configure the OSPF priority value of an interface.

Run the **no** form of this command to restore the default configuration.

The priority value is 1 by default.

Syntax

ip ospf priority *priority*

no ip ospf priority

Parameter Description

priority: OSPF priority value of an interface. The value range is from 0 to 255. A device with the priority 0 does not participate in the designated router (DR)/backup designated router (BDR) election.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

The priority value of an OSPF interface is contained in the hello packet. When the DR/BDR election occurs on the OSPF broadcast network, the router with the highest priority becomes the DR or BDR. If the priorities are the same, the router with the largest router ID becomes the DR or BDR. A router with the priority set to 0 does not participate in the DR/BDR election. This command is applicable only to the OSPF broadcast and NBMA interfaces.

Examples

The following example configures the priority value of the GigabitEthernet 0/1 interface as **0**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf priority 0
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.49 ip ospf retransmit-interval

Function

Run the **ip ospf retransmit-interval** command to configure the retransmission interval of LSU packets on an interface.

Run the **no** form of this command to restore the default configuration.

The retransmission interval of LSU packets on an interface is 5s by default.

Syntax

ip ospf retransmit-interval *retransmit-interval*

no ip ospf retransmit-interval

Parameter Description

retransmit-interval: Retransmission interval of LSU packets, in seconds. This interval must be longer than the round-trip transmission delay of data packets between two neighbors. The value range is from 1 to 65535.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

After a router finishes sending an LSU packet, this packet is still kept in the transmit buffer queue. If an acknowledgment from the neighbor is not received within the time defined by the **ip ospf retransmit-interval** command, the router retransmits the LSU packet.

The retransmission interval can be set to a greater value on a serial line or virtual link to prevent unwanted retransmission. The LSU packet retransmission interval of a virtual link is defined using the **retransmit-interval** keyword in the **area virtual-link** command.

Examples

The following example sets the LSU packet retransmission interval on the GigabitEthernet 0/1 interface to 10s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf retransmit-interval 10
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- show ip ospf interface

1.50 ip ospf source-check-ignore

Function

Run the **ip ospf source-check-ignore** command to disable the source address verification function for the packets received on a P2P link.

Run the **no** form of this command to restore the default configuration.

The source address verification function for the packets received on a P2P link is enabled by default.

Syntax

ip ospf source-check-ignore

no ip ospf source-check-ignore

Parameter Description

N/A

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

Generally, the source address of a packet received by OSPF is in the same network segment as the receiving interface. The addresses at both ends of a P2P link are configured separately and are not necessarily in the same network segment. In this scenario, as the peer address information is notified during the P2P link negotiation, OSPF checks whether the source address of the packet is the address advertised by the peer end during negotiation. If not, OSPF determines that the packet is invalid and discards it. OSPF never verifies the address of an interface not configured with an IP address.

In some scenarios, the source address of a packet received by OSPF may not be in the same network segment as the receiving interface, and therefore OSPF address verification fails. For example, the negotiated peer address cannot be obtained on a P2P link. In this scenario, source address verification must be disabled to ensure that the OSPF adjacency can be properly set up.

Examples

The following example configures that the Gigabit Ethernet 0/1 interface on the P2P link does not verify the source address of the received packet.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf source-check-ignore
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.51 ip ospf subvlan

Function

Run the **ip ospf subvlan** command to enable the OSPF function on a super VLAN.

Run the **no** form of this command to restore the default configuration.

By default, the OSPF function is disabled on a super VLAN.

Syntax

ip ospf subvlan [**all** | *vid*]

no ip ospf subvlan

Parameter Description

all: Allows sending packets to all sub VLANs.

vid: ID of the sub VLAN. The value range is from 1 to 4094.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

In normal cases, a super VLAN contains multiple sub VLANs. The corresponding OSPF multicast packets of a super VLAN are also sent to its sub VLANs. In this case, when OSPF multicast packets are sent over a super VLAN containing multiple sub VLANs, the OSPF multicast packets are replicated multiple times, and the device processing capability is insufficient. As a result, a large number of packets are discarded, causing protocol flapping.

In most scenarios, the OSPF function does not need to be enabled on a super VLAN. However, in some scenarios, the OSPF function must be run on the super VLAN, but packets only need to be sent to one sub VLAN. In this case, you can decide to send multicast packets to a certain sub VLAN or to all sub VLANs as actually needed. Usually packets need to be sent to only one sub VLAN. In this case, run this command to specify a particular sub VLAN. You must be cautious when configuring packet transmission to all sub VLANs,

as the large number of sub VLANs may cause a device processing bottleneck, which will lead to the neighbor flapping.

Examples

The following example enables the OSPF function on Super VLAN 300 and allows sending packets to Sub VLAN 1024.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface vlan 300
Hostname(config-if-VLAN 300)# ip ospf subvlan 1024
```

Notifications

N/A

Common Errors

The function is configured on a non-super VLAN.

The specified sub VLAN on the super VLAN cannot implement interworking with its neighbors.

Platform Description

N/A

Related Commands

N/A

1.52 ip ospf transmit-delay

Function

Run the **ip ospf transmit-delay** command to configure the delay for an OSPF interface to transmit LSU packets.

Run the **no** form of this command to restore the default configuration.

The LSU packet transmission delay is 1s by default.

Syntax

ip ospf transmit-delay *transmit-delay*

no ip ospf transmit-delay

Parameter Description

transmit-delay: Delay for an OSPF interface to transmit LSU packets, in seconds. The value range is from 1 to 65535.

Command Modes

Interface configuration mode

Default Level

14

Usage Guidelines

Before an LSU packet is transmitted, the **Age** fields in all LSAs in this packet will increase based on the amount specified by the **ip ospf transmit-delay** command. Considering the transmission delay and line propagation delay on the interface, you need to set the LSU transmission delay to a greater value for a low-speed line or interface. The LSU packet transmission delay of a virtual link is configured through the **transmit-delay** option in the **area virtual-link** command.

If the value of the **Age** field of an LSA reaches 3600, the packet will be retransmitted or a retransmission will be requested. If the LSA is not updated in time, the expired LSA will be deleted from the LSDB.

Examples

The following example sets the LSU packet transmission delay on the GigabitEthernet 0/1 interface to 10s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# interface GigabitEthernet 0/1
Hostname(config-if-GigabitEthernet 0/1)# ip ospf transmit-delay 10
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.53 ispf enable

Function

Run the **ispf enable** command to enable the incremental shortest path first (iSPF) feature and run the iSPF algorithm to calculate the network topology.

Run the **no** form of this command to disable the iSPF feature.

The iSPF feature is disabled by default.

Syntax

ispf enable

no ispf enable

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

OSPF uses the classic shortest path first (SPF) algorithm to calculate the network topology information and routing information. Calculation of the topology information is based on the area, and the SPF algorithm runs independently in each area.

The iSPF algorithm is improved and optimized on the basis of SPF algorithm, and its calculation is still based on the area. However, after the network topology changes, the iSPF algorithm corrects only the nodes affected by the topology change, instead of re-building the entire shortest path tree (SPT). This accelerates OSPF convergence to a certain extent, and effectively relieves the load pressure of the device processor. Normally a larger network scale and a more complex structure show more significant advantages brought by the iSPF algorithm.

The iSPF algorithm does not involve interoperability with other devices, and devices on the same network can be configured differently. To speed up convergence of the entire network as much as possible, enable the iSPF feature for the devices throughout the network.

Enabling the iSPF feature influences only OSPF's selection of a network topology calculation algorithm. Therefore, the backoff time of route computation configured using the **timers spf** command and **timers throttle spf** command also takes effect for the iSPF algorithm.

Examples

The following example enables the iSPF feature.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# ispf enable
```

The following example enables the iSPF feature under VRF.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1 vrf vpn1
Hostname(config-router)# ispf enable
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.54 log-adj-changes

Function

Run the **log-adj-changes** command to record the log of adjacency state changes.

Run the **no** form of this command to remove this configuration.

The log recording function is enabled by default, without the **detail** parameter.

Syntax

log-adj-changes [**detail**]

no log-adj-changes [**detail**]

Parameter Description

detail: Records all the state change information.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

The log records the log information of the following four types of events only:

- The adjacency reaches the full state;
- The adjacency leaves the full state;
- The adjacency reaches the down state;
- The adjacency leaves the down state.

Examples

The following example records the log of adjacency state changes.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# log-adj-changes detail
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.55 max-concurrent-dd

Function

Run the **max-concurrent-dd** command to configure the maximum number of neighbors with which the current OSPF process can concurrently initiate or accept interaction.

Run the **no** form of this command to restore the default configuration.

The maximum number of neighbors is 5 by default.

Syntax

max-concurrent-dd *neighbor-num*

no max-concurrent-dd

Parameter Description

neighbor-num: Maximum number of neighbors that concurrently interact with the OSPF process. The value range is from 1 to 65535.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

When the performance of a router is affected because the router exchanges data with multiple neighbors, you can configure this command to restrict the maximum of neighbors with which each OSPF process can concurrently initiate or accept interaction.

Examples

The following example configures the maximum number of neighbors with which the current OSPF process can concurrently initiate or accept interaction as 4.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10
Hostname(config-router)# max-concurrent-dd 4
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.56 max-metric router-lsa

Function

Run the **max-metric router-lsa** command to configure the maximum advertisement metric of an OSPF-enabled device so that other routers will not preferably regard this router as a transmission node in SPF calculation.

Run the **no** form of this command to cancel the maximum advertisement metric.

By default, the LSAs of normal metric are advertised.

Syntax

max-metric router-lsa [**external-lsa** [*max-metric-value*] | **include-stub** | **on-neighborup** [*full-interval-time*] | **on-startup** [*startup-interval-time*] | **summary-lsa** [*max-metric-value*]] *

no max-metric router-lsa [**external-lsa** [*max-metric-value*] | **include-stub** | **on-neighborup** [*full-interval-time*] | **on-startup** [*startup-interval-time*] | **summary-lsa** [*max-metric-value*]] *

Parameter Description

router-lsa: Sets the metric of non-stub links in the router LSA to the maximum value (0xFFFF).

external-lsa: Allows a router to replace the metrics of external LSAs (including Type-5 and Type-7 LSAs) with the maximum metric.

max-metric-value: Maximum metric of the external LSA. The value range is from 1 to 16777215, and the default value is **16711680**.

include-stub: Sets the metrics of stub links in the router LSA advertised by the router to the maximum value.

on-startup: Allows a router to advertise the maximum metric when started.

startup-interval-time: The interval at which the maximum metric is advertised, in seconds. The value range is 5 to 86400, and the default value is **600**.

on-neighborup: Allows a router to advertise the maximum routing when its neighbor enters the full state.

full-interval-time: Interval at which the maximum metric is advertised, in seconds. The value range is 5 to 1800, and the default value is **120**.

summary-lsa: Allows a router to replace the metrics of summary LSAs (including Type-3 and Type-4 LSAs) with the maximum metric.

max-metric-value: Maximum metric of the summary LSA. The value range is from 1 to 16777215, and the default value is **16711680**.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

After the **max-metric router-lsa** command is executed, the metrics of the non-stub links in the router LSAs generated by the router will be set to the maximum value (0xFFFF). If you cancel this configuration or the timer expires, the normal metrics of the links are restored.

By default, if this command is configured, the stub links still advertise the common metrics, that is, the costs of outbound interfaces. If the **include-stub** parameter is configured, the stub links will advertise the maximum metric.

- If an ABR does not wish to transfer inter-area traffic, run the **summary-lsa** parameter to set the metric of the summary LSA to the maximum metric.
- If an ASBR does not wish to transfer external traffic, run the **external-lsa** parameter to set the metric of the external LSA to the maximum metric.

The **max-metric router-lsa** command is generally used in the following scenarios:

- Restart a device. After the device is restarted, IGP generally converges faster, and other devices attempt to forward traffic through the restarted device. If the current device is still building the BGP routing table and some BGP routes are not learned yet, packets sent to these networks are discarded. In this case, you can use the **on-startup** parameter to set a delay after which the restarted device acts as the transmission mode.
- Add a device to the network but the device is not used to transfer traffic. The device is added to the network. If a candidate path exists, the current device is not used to transfer traffic. If a candidate path does not exist, the current device is still used to transfer traffic.
- Delete a device gracefully from the network. After the **max-metric router-lsa** command is configured, the current device advertises the maximum metric among all the routes. In this way, other devices on the network can select the backup path for data transmission before the device is shut down.
- In the earlier OSPF version (RFC1247 or earlier), the links with the maximum metric (0xFFFF) in the LSAs do not participate in the SPF computation, that is, no traffic is sent to routers that generate these LSAs.

Examples

The following example configures the maximum metric of non-stub links in the router LSAs as 100s when an OSPF-enabled router starts.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 20
Hostname(config-router)# max-metric router-lsa on-startup 100
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.57 neighbor

Function

Run the **neighbor** command to configure an OSPF neighbor.

Run the **no** form of this command to delete a specified neighbor.

An OSPF neighbor is disabled by default.

Syntax

neighbor *ipv4-address* [**cost** *cost* | [**poll-interval** *poll-interval* | **priority** *priority*] *]

no neighbor *ipv4-address* [**cost** | [**poll-interval** | **priority**] *]

Parameter Description

ipv4-address: IP address of an interface on the neighbor.

cost *cost*: Indicates the cost required to reach each neighbor. This parameter is applicable only to the P2MP interface. The value range is from 0 to 65535.

poll-interval *poll-interval*: Indicates the neighbor polling interval, in seconds. This parameter is applicable only to the NBMA interface. The value range is 0 to 2147483647, and the default value is **120**.

priority *priority*: Indicates the neighbor priority value. This parameter is applicable only to the NBMA interface. The value range is from 0 to 255, and the default value is **0**.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

Neighbors must be specified for the NBMA or P2MP (non-broadcast) interfaces. The neighbor IP address must be the primary IP address of this neighbor interface.

If a neighbor router becomes inactive on the NBMA network, OSPF still sends hello packets to this neighbor even if no hello packet is received within the router failure time. The interval at which the hello packet is sent is called polling interval. When running for the first time, OSPF sends hello packets only to neighbors whose priorities are not 0. In this way, neighbors with priorities set to 0 do not participate in the DR/BDR election. After a DR/BDR is elected, the DR/BDR sends the hello packets to all neighbors to set up a neighbor relationship.

The P2MP (non-broadcast) network cannot dynamically discover neighbors because it does not have the broadcast capability. Therefore, you must run this command to manually configure neighbors for the P2MP (non-broadcast) network. In addition, you can use the **cost** parameter to specify the cost to reach each neighbor on the P2MP network.

Examples

The following example configures the IP address of an OSPF neighbor as 172.16.24.2, priority value as 1, and polling interval as 150s.

```
Hostname> enable
```

```
Hostname# configure terminal
Hostname(config)# router ospf 20
Hostname(config-router)# network 172.16.24.0 0.0.0.255 area 0
Hostname(config-router)# neighbor 172.16.24.2 priority 1 poll-interval 150
```

Notifications

When the configured neighbor address is the local address, the following notification will be displayed:

```
%OSPF: Warning: OSPF neighbor address 192.168.1.1 is our address
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf neighbor**

1.58 network area

Function

Run the **network area** command to configure which interfaces will run OSPF and which OSPF area they belong to.

Run the **no** form of this command to delete the OSPF area definition of an interface.

No interface IP address is configured to join the OSPF area by default.

Syntax

network *ipv4-address wildcard* **area** *area-id*

no network *ipv4-address wildcard* **area** *area-id*

Parameter Description

ipv4-address: IP address corresponding to the interface.

wildcard: IP address comparison bit. 0 indicates accurate matching, and 1 indicates that no comparison is performed.

area-id: ID of the OSPF area. The parameter can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

To run OSPF on an interface, you can include the primary IP address of the interface in the IP address range defined by the **network area** command. By defining the *ipv4-address* and *wildcard* parameters, you can use one command to associate multiple interfaces with one OSPF area. If the interface address matches the IP address ranges defined in the **network area** command of multiple OSPF processes, the OSPF process that the interface is associated with is determined based on the optimal matching method.

If the IP address range defined by the **network area** command contains only the secondary IP address of the interface, OSPF does not run on this interface. You can also add an interface to an OSPF process using the **ip ospf area** command on the interface. If the **network area** command for the instance and the **ip ospf area** command on the interface are configured at the same time, the configuration on the interface takes effect first.

Examples

The following example configures three areas: 0, 1, and 172.16.16.0. The interface with an IP address in the range of 192.168.12.0/24 is defined to area 1, the interface with an IP address in the range of 172.16.16.0/20 is defined to Area 172.16.16.0, and the remaining interfaces are defined to Area 0.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 20
Hostname(config-router)# network 172.16.16.0 0.0.15.255 area 172.16.16.0
Hostname(config-router)# network 192.168.12.0 0.0.0.255 area 1
Hostname(config-router)# network 0.0.0.0 255.255.255.255 area 0
```

Notifications

When an invalid address/mask combination is detected, the following notification will be displayed:

```
OSPF: Invalid address/mask combination
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**
- **show ip ospf database**

1.59 nsr

Function

Run the **nsr** command to configure the current OSPF process to support the non-stop routing (NSR) function.

Run the **no** form of this command to restore the default configuration.

The NSR function is disabled by default.

Syntax

nsr

no nsr

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

During NSR, OSPF-related information is backed up from the active supervisor module of a distributed device to the standby supervisor module, or from the active host of a virtual switching unit (VSU) to the standby host. In this way, the device can automatically recover the link state and re-generate routes without the help of the neighbor devices during the active/standby switchover. Information that should be backed up includes the neighbor relationship and link state.

For the same OSPF process, either NSR or GR is enabled because they are mutually exclusive. Nevertheless, when NSR is enabled, the GR helper capability is still supported.

The switchover of devices in distributed or VSU mode takes a period of time. If the OSPF neighbor keepalive duration is shorter than the switchover duration, the OSPF neighbor relationship with the neighbor device is removed, and services are interrupted during the switchover. Therefore, you are advised to set the OSPF neighbor keepalive duration not less than the default value. When fast hello is enabled, the OSPF neighbor keepalive duration is less than 1s and the OSPF neighbor relationship times out during the switchover, causing NSR failures. Therefore, you are advised to disable fast hello when NSR is enabled.

Examples

The following example configures the current OSPF process 1 to support the NSR function.

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

Notifications

N/A

Common Errors

The neighbor keepalive duration is short. When fast hello is enabled, the OSPF neighbor relationship is removed during a switchover, causing forwarding interruption.

Platform Description

N/A

Related Commands

- show ip ospf

1.60 overflow database

Function

Run the **overflow database** command to configure the maximum number of LSAs supported by the current OSPF process.

Run the **no** form of this command to restore the default configuration.

The maximum number of LSAs is not configured by default.

Syntax

overflow database *max-lsa* [**hard** | **soft**]

no overflow database

Parameter Description

max-lsa: Maximum number of LSAs. The value range is from 1 to 4294967294.

hard: Indicates that the OSPF process will be stopped if the number of LSAs exceeds the limit.

soft: Indicates that a warning is generated when the number of LSAs exceeds the limit.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

You can configure the maximum number of LSAs supported by an OSPF process on a low performance device.

Examples

The following example configures the maximum number of LSAs supported by the current OSPF process as **10**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10
Hostname(config-router)# overflow database 10 hard
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.61 overflow database external

Function

Run the **overflow database external** command to configure the maximum number of external LSAs and the waiting time for recovery from the overflow state to the normal state.

Run the **no** form of this command to restore the default configuration.

The maximum number of external LSAs is not configured by default.

If the maximum number of external LSAs is set, when the number of external LSAs exceeds the maximum, the normal state will not be restored.

Syntax

overflow database external *max-dbsize wait-time*

no overflow database external

Parameter Description

max-dbsize: Maximum number of external LSAs. This value must be the same on all the routers in the same AS. The value range is from 0 to 2147483647.

wait-time: Waiting time for a router in the overflow state to attempt to restore the normal state. The value range is from 0 to 2147483647.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

You can configure the maximum number of external LSAs on a low performance device. When the number of external LSAs of a device exceeds the configured *max-dbsize* value, the device enters the overflow state. In this state, the router no longer loads external LSAs and deletes external LSAs that are generated locally. After the set time of *wait-time* elapses, the device restores the normal state, and loads external LSAs again.

When using the **overflow database external** command, ensure that the same *max-dbsize* value is configured on all devices in the OSPF backbone area and common areas; otherwise, the following problems may occur:

- The LSDBs throughout the network are inconsistent, and the neighbor relationship fails to reach the full state.
- Routes are incorrect, including routing loops.
- AS external LSAs are frequently retransmitted.

Examples

The following example configures the maximum number of external LSAs as 10 and the waiting time for recovery from the overflow state to the normal state as 3s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10
Hostname(config-router)# overflow database external 10 3
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.62 overflow memory-lack

Function

Run the **overflow memory-lack** command to allow the OSPF process to enter the overflow state when the memory is insufficient.

Run the **no** form of this command to prevent the OSPF process from entering the overflow state when the memory is insufficient.

By default, the OSPF process is allowed to enter the overflow state when the memory is insufficient.

Syntax

overflow memory-lack

no overflow memory-lack

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

The OSPF process enters the overflow state to discard newly-learned external routes. This behavior can effectively prevent the memory usage from increasing.

After the overflow function is enabled, the OSPF process enters the overflow state and discards newly-learned external routes, which may cause a routing loop on the entire network. To reduce the occurrence probability of this problem, the OSPF process generates a default route to the null interface, and this route always exists in the overflow state.

You can run the **clear ip ospf process** command to reset the OSPF process so that the OSPF process can exit the overflow state.

You can run the **no** form of the command to prevent the OSPF process from entering the overflow state when the memory is insufficient. This, however, may lead to over-consumption of the memory resource, after which the OSPF process will stop and delete all the learned routes.

Examples

The following example prevents the OSPF process from entering the overflow state when the memory is insufficient.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# no overflow memory-lack
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.63 passive-interface

Function

Run the **passive-interface** command to configure a network interface specified for the local router as a passive interface.

Run the **no** form of this command to restore the default configuration.

By default, the passive modes of all interfaces are disabled, and all interfaces are allowed to send and receive OSPF packets.

Syntax

passive-interface { **default** | *interface-type interface-number* | *interface-type interface-number ipv4-address* }

no passive-interface { **default** | *interface-type interface-number* | *interface-type interface-number ipv4-address* }

Parameter Description

interface-type interface-number: Interface to be configured as a passive interface.

Default: Configures all interfaces as passive interfaces.

interface-type interface-number ipv4-address: Address of an interface as passive address.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

To prevent other routers on the network from learning the routing information of the local router, you can configure a specified network interface of the local router as the passive interface, or the specified IP address of a network interface as a passive address. The loopback interface and the interface of the unconnected OSPF neighbor can be set to passive interfaces.

Examples

The following example configures the GigabitEthernet 0/1 interface as a passive interface, and specifies the IP address 1.1.1.1 under the interface as a passive IP address.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 30
Hostname(config-router)# passive-interface GigabitEthernet 0/1
Hostname(config-router)# passive-interface GigabitEthernet 0/1 1.1.1.1
```

Notifications

When an invalid interface is specified, the following notification will be displayed:

```
% Interface is invalid.
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf interface**

1.64 redistribute

Function

Run the **redistribute** command to enable the function of redistributing the external routing information.

Run the **no** form of this command to disable the redistributing function.

The route redistribution function is not configured by default.

Syntax

redistribute { **arp-host** | **bgp** | **connected** | **isis** [*area-tag*] [**level-1** | **level-1-2** | **level-2**] | **ospf** *process-id* [**match** { **external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**] } *] | **rip** | **static** } [**metric** *metric-value* | **metric-type** { **1** | **2** } | **route-map** *route-map-name* | **subnets** | **tag** *tag-value*] *

no redistribute { **arp-host** | **bgp** | **connected** | **isis** [*area-tag*] [**level-1** | **level-1-2** | **level-2**] | **ospf** *process-id* [**match** { **external** [**1** | **2**] | **internal** | **nssa-external** [**1** | **2**] } *] | **rip** | **static** } [**metric** | **metric-type** | **route-map** | **subnets** | **tag**] *

Parameter Description

arp-host: Indicates redistribution from host routes converted by ARP.

bgp: Indicates redistribution from BGP.

connected: Indicates redistribution from direct routes.

isis [*area-tag*]: Indicates redistribution from IS-IS. Here, *area-tag* specifies an IS-IS instance.

level-1 | **level-2** | **level-1-2**: Used only when IS-IS routes are redistributed. Only the routes of the specified level are redistributed. By default, only Level-2 IS-IS routes can be redistributed.

ospf *process-id*: Indicates redistribution from OSPF. Here, *process-id* specifies an OSPF process. The value range is from 1 to 65535.

match: Used only when OSPF routes are redistributed. Only the routes that match the specified criteria are redistributed. By default, all OSPF routes can be redistributed.

external [**1** | **2**]: Redistributes E1, E2, or all external routes.

internal: Redistributes internal routes and inter-area routes.

nssa-external [**1** | **2**]: Redistributes N1, N2, or all external routes of all NSSAs.

rip: Indicates redistribution from RIP.

static: Indicates redistribution from static routes.

metric *metric-value*: Sets the metric of an OSPF external LSA. The value range is from 0 to 16777214.

metric-type { **1** | **2** }: Sets the external route type to **E-1** or **E-2**.

route-map *route-map-name*: Sets the redistribution filtering rules. Here, the value of *route-map-name* cannot exceed 32 characters.

subnets: Specifies the non-standard networks for redistribution.

tag *tag-value*: Specifies the tag value of the route that is redistributed into the OSPF routing domain. The value range is from 0 to 4294967295.

Command Modes

Routing configuration mode

Default Level

14

Usage Guidelines

After this command is configured, the router becomes an ASBR, imports related routing information to the OSPF domain, and advertises the routing information as Type 5 LSAs to other OSPF routers in the domain.

If the **level** parameter is not carried when IS-IS route redistribution is configured, only Level-2 routes can be redistributed by default. The **level** parameter is carried during initial configuration of redistribution, the routes configured with the **level** parameter can be redistributed. If both **level 1** and **level 2** are configured, the two levels are combined and saved as **level-1-2**.

If you configure redistribution of OSPF routes without specifying the **match** parameter, OSPF routes of all sub-types can be distributed by default. The latest setting of the **match** parameter is used as the initial **match** parameter. Only routes that match the sub-types can be redistributed. You can run the **no** form of the command to restore the default value of **match**.

If **route-map** is specified, the **match** filtering rules specified in **route-map** are applicable to the original parameters of redistribution. For redistribution of OSPF or IS-IS routes, **route-map** is used for filtering only when the redistributed routes meet the criteria specified by **match** or **level**.

The **set metric** value of the associated **route-map** should fall into the range of 0 to 16777214. If the value exceeds this range, routes cannot be introduced.

The configuration rules for the **no** form of the **redistribute** command are as follows:

- If some parameters are specified in the **no** form of this command, default values of these parameters will be restored.
- If no parameter is specified in the **no** form of this command, the entire command will be deleted.

For example, if **redistribute isis 112 level-2** is configured, you can run the **no redistribute isis 112 level-2** command to restore the default value of level 2. As **level-2** itself is the default value of the parameter, the configuration saved is still **redistribute isis 112 level-2** after the preceding **no** form of the command is executed. To delete the entire command, run the **no redistribute isis 112** command.

Examples

The following example configures to redistribute OSPF 2 and IS-IS isis-001 to OSPF1.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# redistribute ospf 2 subnets
Hostname(config-router)# redistribute ospf 2 match external 1 internal
Hostname(config-router)# redistribute isis isis-001
Hostname(config-router)# redistribute isis isis-001 level-1
```

Notifications

When redistribution of this instance's routes is not allowed, the following notification will be displayed:

```
% Redistribution of "ospf 1" via "ospf 1" not allowed
```

When only classful network segments are redistributed, the following notification will be displayed:

```
% Only classful networks will be redistributed
```

Common Errors

The routes of the same OSPF process are redistributed.

Platform Description

N/A

Related Commands

- show ip ospf database

1.65 router ospf

Function

Run the **router ospf** command to create an OSPF routing process and enter routing configuration mode of OSPF.

Run the **no** form of this command to delete a created OSPF routing process.

The OSPF routing process is disabled by default.

Syntax

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

no router ospf *process-id*

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535, and the default value is **1**.

vrf-name: VRF to which the OSPF process belongs.

Command Modes

Global configuration mode

Default Level

14

Usage Guidelines

Based on the original implementation, the process ID parameter is added to the device software to realize expansion to a multi-instance OSPF process. Different OSPF processes are independent of each other, and can be treated as different routing protocols that run independently.

Examples

The following example creates an OSPF routing process in vrf vpn_1 and enters routing configuration mode of OSPF.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 10 vrf vpn_1
Hostname(config-router)#
```

Notifications

When no router ID can be allocated and the corresponding OSPF process cannot be started, the following notification will be displayed:

```
%OSPF-NORTRID: OSPF process 1 failed to allocate unique router-id and cannot
start.
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.66 router ospf max-concurrent-dd

Function

Run the **router ospf max-concurrent-dd** command to configure the maximum number of neighbors with which all the OSPF routing processes can concurrently initiate or accept interaction.

Run the **no** form of this command to restore the default configuration.

The maximum number of neighbors is **10** by default.

Syntax

router ospf max-concurrent-dd *max-neighbor*

no router ospf max-concurrent-dd

Parameter Description

max-neighbor: Maximum number of neighbors that concurrently interact with the OSPF process. The value range is from 1 to 65535.

Command Modes

Global configuration mode

Default Level

14

Usage Guidelines

When the performance of a router is affected because the router exchanges data with multiple neighbors, you can configure this command to restrict the maximum number of neighbors with which all OSPF processes can concurrently initiate or accept interaction.

Examples

The following example configures the maximum number of neighbors with which all OSPF processes can concurrently initiate or accept interaction as **4**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf max-concurrent-dd 4
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.67 router-id

Function

Run the **router-id** command to configure the ID of a router.

Run the **no** form of this command to delete the configured router ID and restore the default router ID.

By default, the OSPF routing process elects the largest IP address among the IP addresses of all the loopback interfaces as the router ID. If the loopback interfaces configured with IP addresses are not available, the OSPF process elects the largest one among the IP addresses of all its physical interfaces as the router ID.

Syntax

router-id *router-id*

no router-id

Parameter Description

router-id: Router ID to be configured, expressed in the form of an IP address.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

You can configure any IP address as the ID of the router, and ensure that the router ID is unique in an AS. After the router ID changes, OSPF performs a lot of internal processing. Therefore, you are advised to set the router ID before generating an LSA. When an attempt is made to modify the router ID, a prompt is displayed, requesting you to confirm the modification.

Examples

The following example configures the router ID as **0.0.0.36**.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 20
Hostname(config-router)# router-id 0.0.0.36
```

Notifications

When you configure the router ID as **0.0.0.0** and this operation will stop the OSPF process, the following notification will be displayed:

```
% OSPF: router-id set to 0.0.0.0, process will not run.
```

When the configured router ID is duplicate with that of another process, the following notification will be displayed:

```
% OSPF: router-id 192.168.1.1 is in use by process 1
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.68 show ip ospf

Function

Run the **show ip ospf** command to display the summary of an OSPF process.

Syntax

show ip ospf [*process-id*]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

N/A

Examples

The following example displays the summary of an OSPF process.

```
Hostname> enable
Hostname# show ip ospf
Routing Process "ospf 1" with ID 1.1.1.1
  Domain ID type 0x0105, value 0x010101010101
Process uptime is 4 minutes
Process bound to VRF default
```

```
Memory Overflow is enabled.
Router is not in overflow state now.
Conforms to RFC2328, and RFC1583Compatibility flag isenabled
Supports only single TOS(TOS0) routes
Enable two-way-maintain
Enable ispf
Supports opaque LSA
Supports Graceful Restart
This router is an ASBR (injecting external routing information)
Originating router-LSAs with maximum metric
    Condition: on startup for 100 seconds, State: inactive
    Advertise stub links with maximum metric in router-LSAs
    Advertise summary-LSAs with metric 16711680
    Advertise external-LSAs with metric 16711680
    Unset reason: timer expired, Originated for 100 seconds
    Unset time: 00:02:02.080, Time elapsed: 00:23:54.656
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Initial LSA throttle delay 0 msecs
Minimum hold time for LSA throttle 5000 msecs
Maximum wait time for LSA throttle 5000 msecs
Lsa Transmit Pacing timer 40 msecs, 1 LS-Upd
Minimum LSA arrival 1000 msecs
Pacing lsa-group: 30 secs
Number of incomming current DD exchange neighbors 0/5
Number of outgoing current DD exchange neighbors 0/5
Number of external LSA 4. Checksum 0x0278E0
Number of opaque AS LSA 0. Checksum 0x000000
Number of non-default external LSA 4
External LSA database is unlimited.
Number of LSA originated 6
Number of LSA received 2
Log Neighbor Adjency Changes : Enabled
Graceful-restart disabled
Graceful-restart helper support enabled
Number of areas attached to this router: 1
BFD enabled
Area 0 (BACKBONE)
Number of interfaces in this area is 1(1)
Number of fully adjacent neighbors in this area is 1
Area has no authentication
SPF algorithm last executed 00:01:26.640 ago
SPF algorithm executed 4 times
iSPF algorithm executed 0 timesNumber of LSA 3. Checksum 0x0204bf
Area 1 (NSSA)
Number of interfaces in this area is 1(1)
Number of fully adjacent neighbors in this area is 0
```

```
Number of fully adjacent virtual neighbors through this area is 0
Area has no authentication
SPF algorithm last executed 02:09:23.040 ago
SPF algorithm executed 4 times
iSPF algorithm executed 0 times
Number of LSA 6. Checksum 0x028638
NSSA Translator State is disabled, Stability Interval expired in 00:00:03
```

Table 1-1Output Fields of the show ip ospf Command

Field	Description
Router ID	Indicates the ID of a router.
Process uptime	Indicates the time when this OSPF process takes effect (the process is invalid when the router ID is 0.0.0.0).
Bound to VRF	Indicates the VRF to which the OSPF process belongs.
Conforms to RFC2328	Indicates conformity to RFC2328.
RFC1583Compatibility flag	Indicates whether the RFC1583 rule or RFC2328 rule is used in the external route computation; this rule will be used during selection of the optimal ASBR and route comparison.
Support Tos	Indicates that only TOS0 is supported.
Supports opaque LSA	Indicates that Opaque-LSA is supported.
Graceful-restart	Indicates the GR capability described by RFC3623 Graceful Restart.
Graceful-restart Helper	Indicates the GR helper capability described by RFC3623 Graceful Restart.
Router Type	Indicates that the OSPF router type is Normal, ABR, or ASBR.
SPF Delay	Indicates the required delay time before calling the SPF computation when a topology change is received.
SPF-holdtime	Indicates the minimum time of holding between two SPF calculations.
LsaGroupPacing	Indicates the interval between the LSA update, verification, computation, and aging operations.
Incomming current DD exchange neighbors	Indicates the number of neighbors in interaction. Incomming means that the neighbor enters the Exstart state for the first time.
Outgoing current DD exchange neighbors	Indicates the number of neighbors in interaction. Outgoing means that the neighbor returns from a higher state to the Exstart state for re-interaction.
Number of external LSA	Indicates the number of external LSAs stored in the database.
External LSA Checksum Sum	Indicates the sum of checksums of external LSAs stored in the

Field	Description
	database.
Number of opaque LSA	Indicates the number of Opaque-LSAs stored in the database.
Opaque LSA Checksum Sum	Indicates the sum of checksums of Opaque-LSAs stored in the database.
Number of non-default external LSA	Indicates the number of external LSAs of non-default routes.
External LSA database limit	Indicates the quantity limit of external LSAs.
Exit database overflow state interval	Judges the waiting time for a router to attempt to return to normal state from the overflow state.
Database overflow state	Indicates whether the current OSPF process is in the overflow state.
Number of LSA originated	Indicates the number of generated LSAs.
Number of LSA received	Indicates the number of received LSAs.
Log Neighbor Adjency Changes	Indicates whether the neighbor state change recording switch is enabled.
Number of areas attached to this router	Indicates the number of areas on this router.
Area type	Indicates the area type. The value can be Default, Stub, or NSSA.
Number of interfaces in this area	Indicates the number of interfaces in this area.
Number of fully adjacent neighbors in this area	Indicates the number of neighbors in full neighbor relationship in this area.
Number of fully adjacent virtual neighbors through this area	Indicates the number of neighbors of virtual links with two neighbors already in the full state in this area. This field is valid only for the non-backbone area of default type.
Area authentication	Indicates the area authentication method.
SPF algorithm last executed	Indicates the duration from the last SPF computation to the present time.
SPF algorithm executed times	Indicates the SPF computation times.
Number of LSA	Indicates the total number of LSAs in this area.
Checksum Sum	Indicates the sum of the checksums of LSAs in this area.
NSSA Translator State	Indicates whether the NSSA LSA is converted to an external LSA. This field is valid only for the OSPF process that is an ABR in the NSSA.
BFD enabled	Indicates that correlating OSPF with BFD is enabled.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.69 show ip ospf border-routers

Function

Run the **show ip ospf border-routers** command to display the OSPF internal routing table to an ABR/ASBR.

Syntax

show ip ospf [*process-id*] **border-routers**

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

This command can be used to display the OSPF internal route to an ABR or ASBR. The OSPF internal routing table is different from the routing table displayed using the **show ip route** command. The target address of the OSPF internal routing table is the OSPF router ID, not the target network.

Examples

The following example displays the OSPF internal routing table to an ABR/ASBR.

```
Hostname> enable
Hostname# show ip ospf border-routers
OSPF internal Routing Table
Codes: i - Intra-area route, I - Inter-area route
i 1.1.1.1 [2] via 10.0.0.1, GigabitEthernet 0/1, ABR, ASBR, Area 0.0.0.1 select
```

Table 1-1Output Fields of the show ip ospf border-routers Command

Field	Description
Codes	Indicates the route type code definition. Here, i indicates an internal route of the area, and I indicates a route between areas.
i	Indicates that this route is an internal route of the area.

Field	Description
1.1.1.1	Displays the OSPF ID of the boundary router.
[2]	Displays the cost value to the boundary router.
via 10.0.0.1	Displays the next hop gateway to the boundary router.
GigabitEthernet 0/1	Displays the interface to the boundary router.
ABR, ASBR	Displays the type of the boundary router: ABR or ASBR, or both.
Area 0.0.0.1	Displays the area where the route is learned.
select	Indicates the optimum path currently selected when multiple paths are available to the ASBR.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.70 show ip ospf database

Function

Run the **show ip ospf database** command to display the information of an OSPF LSDB.

Syntax

show ip ospf [*process-id* [*area-id* [*ipv4-address*]]] **database** [{ **asbr-summary** | **external** | **network** | **nssa-external** | **opaque-area** | **opaque-as** | **opaque-link** | **router** | **summary** }] [{ **adv-router** *ipv4-address* | **self-originate** } | *link-state-id* | **brief**] [**database-summary** | **max-age** | **detail**]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

area-id: ID of the OSPF area, which can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

ipv4-address: ID of the OSPF area, which is an IP address, for example, 0.0.0.1.

adv-router: Displays the link state description information generated by the specified adverting router.

link-state-id: Link state description information of the specified OSPF link state ID to be displayed.

self-originate: Displays the link state description information generated by the local router.

max-age: Displays the LSA whose aging time expires.

router: Displays the link state description information of the OSPF router.

network: Displays the link state description information of the OSPF network.

summary: Displays the link state description summary of the OSPF link.

asbr-summary: Displays the link state description summary of the ASBR.

external: Displays the external link state description of the OSPF process.

nssa-external: Displays the Type-7 external link state description of the OSPF process.

opaque-area: Displays the Type-10 LSA.

opaque-as: Displays the Type-11 LSA.

opaque-link: Displays the Type-9 LSA.

database-summary: Displays the statistical summary of each type of LSA in the OSPF LSDB.

detail: Displays the details about all LSAs of the OSPF process.

brief: Displays the summary of the specified type of LSA.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

When the OSPF LSDB is large, itemized display is necessary. Correct use of these commands is helpful to the troubleshooting of OSPF faults.

Examples

The following example displays the information about the OSPF LSDB.

```
Hostname> enable
Hostname# show ip ospf database
OSPF Router with ID (1.1.1.1) (Process ID 1)
Router Link States (Area 0.0.0.0)
Link ID         ADV Router      Age  Seq#       CkSum  Link count
1.1.1.1         1.1.1.1         2    0x80000011 0x6f39 2
3.3.3.3         3.3.3.3         120  0x80000002 0x26ac 1
Network Link States (Area 0.0.0.0)
Link ID         ADV Router      Age  Seq#       CkSum
192.88.88.27    1.1.1.1         120  0x80000001 0x5366
Summary Link States (Area 0.0.0.0)
Link ID         ADV Router      Age  Seq#       CkSum  Route
10.0.0.0        1.1.1.1         2    0x80000003 0x350d 10.0.0.0/24
100.0.0.0       1.1.1.1         2    0x8000000c 0x1ecb 100.0.0.0/16
Router Link States (Area 0.0.0.1 [NSSA])
Link ID         ADV Router      Age  Seq#       CkSum  Link count
1.1.1.1         1.1.1.1         2    0x80000001 0x91a2 1
Summary Link States (Area 0.0.0.1 [NSSA])
Link ID         ADV Router      Age  Seq#       CkSum  Route
```

```
100.0.0.0       1.1.1.1         2    0x80000001 0x52a4 100.0.0.0/16
192.88.88.0    1.1.1.1          2    0x80000001 0xbb2d 192.88.88.0/24
NSSA-external Link States (Area 0.0.0.1 [NSSA])
Link ID    ADV Router    Age  Seq#       CkSum  Route           Tag
20.0.0.0     1.1.1.1     1    0x80000001 0x033c E2 20.0.0.0/24  0
100.0.0.0   1.1.1.1      1    0x80000001 0x9469 E2 100.0.0.0/28 0
AS External Link States
Link ID   ADV Router     Age  Seq#       CkSum  Route           Tag
20.0.0.0   1.1.1.1       380  0x8000000a 0x7627 E2 20.0.0.0/24  0
100.0.0.0    1.1.1.1     620  0x8000000a 0x0854 E2 100.0.0.0/28 0
```

Table 1-1Output Fields of the show ip ospf database Command

Field	Description
OSPF Router with ID	Displays the process ID of the OSPF LSDB's router ID that corresponds to this OSPF process.
Router Link States	Indicates that the following content is the link state description of the router.
Net Link States	Indicates that the following content is the network link state description.
Summary Net Link States	Indicates that the following content is the network link state description summary.
NSSA-external Link States	Indicates that the following content is the external link state description of Type-7 AS.
AS External Link States	Indicates that the following content is the external link state description of Type-5 AS.
Link ID	Indicates the link ID.
ADV Router	Indicates the ID of the router that advertises the link state description.
Age	Displays the keeping time of the link state description.
Seq#	Displays the sequence number of the link state description, used to detect the old or duplicate LSA.
Cksum	Displays the checksum of the link state description.
Link-Count	Displays the number of links in the link state description information of the router.
Route	Displays the route information contained in the LSA.
Tag	Displays the tag of the link state description.

The following example displays the link state description summary of an ASBR.

```
Hostname> enable
Hostname# show ip ospf database asbr-summary
OSPF Router with ID (1.1.1.35) (Process ID 1)
```

```
ASBR-Summary Link States (Area 0.0.0.1)
LS age: 47
Options: 0x2 (*|-|-|-|E|-)
LS Type: ASBR-summary-LSA
Link State ID: 3.3.3.3 (AS Boundary Router address)
Advertising Router: 1.1.1.1
LS Seq Number: 80000001
Checksum: 0xbe8c
Length: 28
Network Mask: /0
TOS: 0  Metric: 1
```

Table 1-2Output Fields of the show ip ospf database asbr-summary Command

Field	Description
OSPF Router with ID	Indicates the router ID corresponding to the following information and the corresponding ID of this OSPF process.
AS Summary Link States	Indicates that the following content displays the link description summary of the AS.
LS age	Displays the keeping time of the link state description.
Options	Indicates the options.
LS Type	Displays the type of the link state description.
Link State ID	Displays the link ID of the link state description.
Advertising Router	Indicates the advertising router of the link state description.
LS Seq Number	Displays the sequence number of the link state description.
Checksum	Displays the checksum of the link state description.
Length	Displays the length of the link state description, in bytes.
Network Mask	Displays the subnet mask of the route corresponding to the link state description.
TOS	Indicates the TOS value, which can only be 0 at present.
Metric	Displays the metric value of the route corresponding to the link state description.

The following example displays the external link state description of the OSPF process.

```
Hostname> enable
Hostname# show ip ospf database external
OSPF Router with ID (1.1.1.35) (Process ID 1)
AS External Link States
LS age: 752
Options: 0x2 (*|-|-|-|E|-)
LS Type: AS-external-LSA
```

```
Link State ID: 20.0.0.0 (External Network Number)
Advertising Router: 1.1.1.1
LS Seq Number: 8000000a
Checksum: 0x7627
Length: 36
Network Mask: /24
Metric Type: 2 (Larger than any link state path)
TOS: 0
Metric: 20
Forward Address: 0.0.0.0
External Route Tag: 0
```

Table 1-3Output Fields of the show ip ospf database external Command

Field	Description
OSPF Router with ID	Indicates the router ID corresponding to the following information and the corresponding ID of this OSPF process.
Type-5 AS External Link States	Indicates that the following content is the external link state description of the AS.
LS age	Displays the keeping time of the link state description.
Options	Indicates the options.
LS Type	Displays the type of the link state description.
Link State ID	Displays the link ID of the link state description.
Advertising Router	Indicates the advertising router of the link state description.
LS Seq Number	Displays the sequence number of the link state description.
Checksum	Displays the checksum of the link state description.
Length	Displays the length of the link state description, in bytes.
Network Mask	Displays the subnet mask of the route corresponding to the link state description.
Metric Type	Indicates the external link type.
TOS	Indicates the TOS value, which can only be 0 at present.
Metric	Displays the metric value of the route corresponding to the link state description.
Forward Address	Indicates that the data traffic to the target network will be forwarded to this IP address. If the address is 0.0.0.0, the data traffic will be forwarded to the router that generates this link state.
External Route Tag	Indicates the external route tag. Every external route has a 32-bit route tag. The OSPF process does not use this route tag, which will be used when other

Field	Description
	routing processes redistribute OSPF routes.

The following example displays the link state description of the OSPF network.

```
Hostname> enable
Hostname# show ip ospf database network
OSPF Router with ID (1.1.1.1) (Process ID 1)
Network Link States (Area 0.0.0.0)
LS age: 572
Options: 0x2 (*|-|-|-|E|-)
LS Type: network-LSA
Link State ID: 192.88.88.27 (address of Designated Router)
Advertising Router: 1.1.1.1
LS Seq Number: 80000001
Checksum: 0x5366
Length: 32
Network Mask: /24
Attached Router: 1.1.1.1
Attached Router: 3.3.3.3
```

Table 1-4Output Fields of the show ip ospf database network Command

Field	Description
OSPF Router with ID	Indicates the router ID corresponding to the following information and the corresponding ID of this OSPF process.
Network Link States	Indicates that the following content is the network link state description.
LS age	Displays the keeping time of the link state description.
Options	Indicates the options.
LS Type	Displays the type of the link state description.
Link State ID	Displays the link ID of the link state description.
Advertising Router	Indicates the advertising router of the link state description.
LS Seq Number	Displays the sequence number of the link state description.
Checksum	Displays the checksum of the link state description.
Length	Displays the length of the link state description, in bytes.
Network Mask	Displays the subnet mask of the network corresponding to the link state description.
Attached Router	Displays the routers connected on the network.

The following example displays the link state description of the OSPF router.

```
Hostname> enable
Hostname# show ip ospf database router
OSPF Router with ID (1.1.1.1) (Process ID 1)
Router Link States (Area 0.0.0.0)
LS age: 322
Options: 0x2 (*|-|-|-|E|-)
Flags: 0x3 : ABR ASBR
LS Type: router-LSA
Link State ID: 1.1.1.1
Advertising Router: 1.1.1.1
LS Seq Number: 80000012
Checksum: 0x6d3a
Length: 48
Number of Links: 2
Link connected to: Stub Network
(Link ID) Network/subnet number: 100.0.1.1
(Link Data) Network Mask: 255.255.255.255
Number of TOS metrics: 0
TOS 0 Metric: 0
```

Table 1-5Output Fields of the show ip ospf database router Command

Field	Description
OSPF Router with ID	Indicates the router ID corresponding to the following information and the corresponding ID of this OSPF process.
Router Link States	Indicates that the following content is the link state description of the router.
LS age	Displays the keeping time of the link state description.
Options	Indicates the options.
Flag	Indicates the router flag.
LS Type	Displays the type of the link state description.
Link State ID	Displays the link ID of the link state description.
Advertising Router	Indicates the advertising router of the link state description.
LS Seq Number	Displays the sequence number of the link state description.
Checksum	Displays the checksum of the link state description.
Length	Displays the length of the link state description, in bytes.
Number of Links	Displays the number of links associated with the router.
Link connected to	Displays the device to which the link is connected and the type of the network.

Field	Description
(Link ID)	Indicates the link ID.
(Link Data)	Indicates the link data.
Number of TOS metrics	Indicates the TOS value, which is 0.
TOS 0 Metrics	Indicates the metric value of TOS 0.

The following example displays the link state description summary of the OSPF process.

```
Hostname> enable
Hostname# show ip ospf database summary
OSPF Router with ID (1.1.1.1) (Process ID 1)
Summary Link States (Area 0.0.0.0)
LS age: 499
Options: 0x2 (*|-|-|-|E|-)
LS Type: summary-LSA
Link State ID: 10.0.0.0 (summary Network Number)
Advertising Router: 1.1.1.1
LS Seq Number: 80000004
Checksum: 0x330e
Length: 28
Network Mask: /24
TOS: 0  Metric: 11
```

Table 1-6Output Fields of the show ip ospf database summary Command

Field	Description
OSPF Router with ID	Indicates the router ID corresponding to the following information and the corresponding ID of this OSPF process.
Summary Net Link States	Indicates that the following content is the network link state description summary.
LS age	Displays the keeping time of the link state description.
Options	Indicates the options.
LS Type	Displays the type of the link state description.
Link State ID	Displays the link ID of the link state description.
Advertising Router	Indicates the advertising router of the link state description.
LS Seq Number	Displays the sequence number of the link state description.
Checksum	Displays the checksum of the link state description.
Length	Displays the length of the link state description, in bytes.

Field	Description
Network Mask	Displays the subnet mask of the route corresponding to the link state description.
TOS	Indicates the TOS value, which can only be 0 at present.
Metric	Displays the metric value of the route corresponding to the link state description.

The following example displays the Type-7 external link state description of the OSPF process.

```
Hostname> enable
Hostname# show ip ospf database nssa-external
OSPF Router with ID (1.1.1.1) (Process ID 1)
NSSA-external Link States (Area 0.0.0.1 [NSSA])
LS age: 1
Options: 0x0 (*|-|-|-|-)
LS Type: AS-NSSA-LSA
Link State ID: 20.0.0.0 (External Network Number For NSSA)
Advertising Router: 1.1.1.1
LS Seq Number: 80000001
Checksum: 0x033c
Length: 36
Network Mask: /24
Metric Type: 2 (Larger than any link state path)
TOS: 0
Metric: 20
NSSA: Forward Address: 100.0.2.1
External Route Tag: 0
```

Table 1-7Output Fields of the show ip ospf database nssa-external Command

Field	Description
OSPF Router with ID	Indicates the router ID corresponding to the following information and the corresponding ID of this OSPF process.
NSSA-external Link States	Indicates that the following content is the external link state description of the Type-7 AS.
LS age	Displays the keeping time of the link state description.
Options	Indicates the options.
LS Type	Displays the type of the link state description.
Link State ID	Displays the link ID of the link state description.
Advertising Router	Indicates the advertising router of the link state description.
LS Seq Number	Displays the sequence number of the link state description.
Checksum	Displays the checksum of the link state description.

Field	Description
Length	Displays the length of the link state description, in bytes.
Network Mask	Displays the subnet mask of the route corresponding to the link state description.
Metric Type	Indicates the external link type.
TOS	Indicates the TOS value, which can only be 0 at present.
Metric	Displays the metric value of the route corresponding to the link state description.
NSSA:Forward Address	Indicates that the data traffic to the target network will be forwarded to this IP address. If the address is 0.0.0.0, the data traffic will be forwarded to the router that generates this link state.
External Route Tag	Indicates the external route tag. Every external route has a 32-bit route tag. The OSPF process does not use this route tag, which will be used when other routing processes redistribute OSPF routes.

The following example displays the statistical summary of each type of LSA in the OSPF LSDB.

```
Hostname> enable
Hostname# show ip ospf database database-summary
OSPF process 1:
Router Link States       : 4
Network Link States      : 2
Summary Link States      : 4
ASBR-Summary Link States : 0
AS External Link States  : 4
NSSA-external Link States: 2
```

Table 1-8Output Fields of the show ip ospf database database-summary Command

Field	Description
OSPF Process	Displays the routing process ID corresponding to the following information.
Router Link	Indicates the number of OSPF router LSAs in this area.
Network Link	Indicates the number of OSPF network LSAs in this area.
Summary Link	Indicates the number of OSPF network summary LSAs in this area.
ASBR-Summary Link	Indicates the number of OSPF ASBR summary LSAs in this area.
AS External Link	Indicates the number of OSPF external LSAs in this area.
NSSA-external Link	Indicates the number of OSPF NSSA LSAs in the router.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.71 show ip ospf interface

Function

Run the **show ip ospf interface** command to display the information about an interface associated with an OSPF process.

Syntax

show ip ospf [*process-id*] **interface** [*interface-type interface-number* | **brief**]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

interface-type interface-number: Specified interface.

brief: Displays the brief information of the interface.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

This command can display the interfaces where OSPF runs, and the configuration information of these interfaces that related to the OSPF process.

Examples

The following example displays the information about the interface associated with the OSPF process.

```
Hostname> enable
Hostname# show ip ospf interface GigabitEthernet 0/1
GigabitEthernet 0/1 is up, line protocol is up
Internet Address 192.88.88.27/24, Ifindex 4, Area 0.0.0.0, MTU 1500
Matching network config: 192.88.88.0/24
Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1,
BFD enabled
Designated Router (ID) 1.1.1.1, Interface Address 192.88.88.27
Backup Designated Router (ID) 3.3.3.3, Interface Address 192.88.88.72
```

```
Timer intervals configured,Hello 10,Dead 40,Wait 40,Retransmit 5
Hello due in 00:00:03
Neighbor Count is 1, Adjacent neighbor count is 1
Crypt Sequence Number is 70784
Hello received 1786 sent 1787, DD received 13 sent 8
LS-Req received 2 sent 2, LS-Upd received 29 sent 53
LS-Ack received 46 sent 23, Discarded 1
```

Table 1-1Output Fields of the show ip ospf interface GigabitEthernet 0/1 Command

Field	Description
GigabitEthernet 0/1 State	Indicates the state of the network interface: Up indicates normal operation, and Down indicates a fault.
Internet Address	Indicates the IP address of the interface.
Area	Indicates the OSPF area to which the interface belongs.
MTU	Indicates the corresponding MTU.
Matching network config	Indicates the configuration for the **network area** command corresponding to the OSPF process.
Process ID	Indicates the corresponding process ID.
Router ID	Indicates the ID of the OSPF router.
Network Type	Indicates the OSPF network type.
Cost	Indicates the cost of the OSPF interface.
Transmit Delay is	Indicates the transmission delay of the OSPF interface.
State	Indicates the DR/BDR state ID.
Priority	Indicates the priority of this interface.
Designated Router(ID)	Indicates the ID for the DR of this interface.
DR's Interface address	Indicates the interface address for the DR of this interface.
Backup designated router(ID)	Indicates the ID for the BDR of this interface.
BDR's Interface address	Indicates the interface address for the BDR of this interface.
Time intervals configured	Indicates the Hello, Dead, Wait, and Retransmit time corresponding to this interface.
Hello due in	Indicates the last time of sending a hello packet.
Neighbor count	Indicates the total number of neighbors.
Adjacent neighbor count	Indicates the number of neighbors in full neighbor relationship.

Field	Description
Crypt Sequence Number	Indicates the sequence number of MD5 authentication corresponding to this interface.
Hello received send	Indicates the statistics of the received and sent hello packets.
DD received send	Indicates the statistics of the received and sent DD packets.
LS-Req received send	Indicates the statistics of the received and sent LS request packets.
LS-Upd received send	Indicates the statistics of the received and sent LS update packets.
LS-Ack received send	Indicates the statistics of the received and sent LS response packets.
Discard	Indicates the statistics of the discarded OSPF packets.
BFD enabled	Indicates that correlating OSPF with BFD is enabled.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.72 show ip ospf ispf

Function

Run the **show ip ospf ispf** command to display the times of route computation through iSPF in the OSPF area.

Syntax

show ip ospf [*process-id*] **ispf**

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

This command is used to display the times of route computation through iSPF in the OSPF area in the last 30 minutes, as well as the total times of computation using the iSPF algorithm up to now.

Examples

The following example displays the times of iSPF computation in the OSPF area.

```
Hostname> enable
Hostname# show ip ospf 1 ispf
OSPF process 1:
Area_id      30min_counts   Total_counts
0            32             1235
1            6              356
```

Table 1-1Output Fields of the show ip ospf 1 ispf Command

Field	Description
Area_id	Indicates the OSPF area ID.
30min_counts	Indicates the times of iSPF computation in the last 30 minutes.
Total_counts	Indicates the total times of iSPF computation up to now.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.73 show ip ospf neighbor

Function

Run the **show ip ospf neighbor** command to display the neighbor table of an OSPF process.

Syntax

show ip ospf [*process-id*] **neighbor** [[*interface-type interface-number* | *neighbor-id*] * [**detail**] | **statistics**]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

interface-type interface-number: Neighbor information of a specified interface.

neighbor-id: Information about a specified neighbor.

detail: Displays the neighbor details.

statistics: Displays the statistics of neighbors.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

This command can be used to display the neighbor information and confirm whether the OSPF process is running normally.

Examples

The following example displays the neighbor list of an OSPF process.

```
Hostname> enable
Hostname# show ip ospf neighbor
OSPF process 1, 1 Neighbors, 1 is Full:
Neighbor ID   Pri   State     BFD State   Dead Time   Address         Interface
3.3.3.3       1     Full/BDR  Up          00:00:32    192.88.88.72
GigabitEthernet 0/1
Hostname# show ip ospf neighbor detail
Neighbor 3.3.3.3, interface address 192.88.88.72
In the area 0.0.0.0 via interface GigabitEthernet 0/1
Neighbor priority is 1, State is Full, 11 state changes
DR is 192.88.88.27, BDR is 192.88.88.72
Options is 0x52 (*|O|-|EA|-|E|-)
Dead timer due in 00:00:32
Neighbor is up for 05:11:27
Database Summary List 0
Link State Request List 0
Link State Retransmission List 0
Crypt Sequence Number is 0
Thread Inactivity Timer on
Thread Database Description Retransmission off
Thread Link State Request Retransmission off
Thread Link State Update Retransmission off
Thread Poll Timer on
Graceful-restart helper disabled
BFD session state up
```

Table 1-1Output Fields of the show ip ospf neighbor Command

Field	Description
Neighbor ID	Indicates the ID of the neighbor router.
Pri	Indicates the priority (used to elect a DR) of the neighbor.
State	Indicates the state of the neighbor.
Dead Time	Indicates the time before the neighbor enters the dead state.

Field	Description
Address	Indicates the IP address of the interface corresponding to the neighbor.
Interface	Indicates the interface corresponding to the neighbor.
interface address	Indicates the interface address of the neighbor router.
In the area	Displays the area where the neighbor is learned.
via interface	Displays the interface where the neighbor is learned.
Neighbor priority	Indicates the priority value of the neighbor.
State	Indicates the connection state of the OSPF neighbor. DR or BDR is unavailable for the point-to-point network type. ● **Full** indicates the stable state. ● **DR** indicates that the neighbor is the specified router. ● **BDR** indicates that the neighbor is the specified router for backup. ● **DROTHER** indicates that the neighbor is not a DR/BDR.
State changes times	Indicates the change times of the neighbor state.
Dead Time	Displays the time when the dead state of this neighbor is declared.
DR	Indicates the interface address (namely, the DR field of the hello packet) of the DR elected by the neighbor router.
BDR	Indicates the interface address (namely, the BDR field of the hello packet) of the BDR elected by the neighbor router.
Options	Indicates the option for the E bit of the hello packet: ● **0** indicates that the area is a stub area. ● **2** indicates that the area is not a stub area.
Dead timer due in	Indicates the time before the neighbor router enters the dead state.
Neighbor up time	Indicates the duration from the time of discovering the neighbor router to the current time.
Database Summary List	Indicates the DD packet statistics of the neighbor.
Link State Request List	Indicates the LS request packet statistics of the neighbor.
Link State Retransmission List	Indicates the retransmitted packet statistics of the neighbor.
Crypt Sequence Number	Indicates the MD5 authentication code of the area.
Thread Inactivity Timer	Indicates the inactivity timer state of the neighbor.
Thread Database Description Retransmission	Indicates the DD packet timer state of the interface.

Field	Description
Thread Link State Request Retransmission	Indicates the LS request packet timer state of the interface.
Thread Link State Update Retransmission	Indicates the LS update packet timer state of the interface.
Thread Poll Timer	Indicates the poll timer startup state of the statically configured neighbor.
Graceful-restart Helper	Indicates whether the local router can become a GR helper for the specified neighbor.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.74 show ip ospf route

Function

Run the **show ip ospf route** command to display an OSPF route.

Syntax

show ip ospf [*process-id*] **route** [**count** | *ipv4-address mask*]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

count: Displays the statistics of all kinds of OSPF routes.

ipv4-address mask: Routing information of the specified prefix and mask.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

N/A

Examples

The following example displays an OSPF route.

```
Hostname> enable
Hostname# show ip ospf route
OSPF process 1:
Codes: C - connected, D - Discard, B – Backup, 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
E2 100.0.0.0/24 [1/20] via 192.88.88.126, GigabitEthernet 0/1
B                      via 192.88.89.126, GigabitEthernet 0/2
C  192.88.88.0/24 [1] is directly connected,GigabitEthernet 0/1,Area 0.0.0.1
```

Table 1-1Output Fields of the show ip ospf neighbor Command

Field	Description
codes	Indicates the route type and corresponding abbreviation description.
100.0.0.0/24	Indicates the corresponding prefix of the route.
[1/20]	Indicates the management distance and cost value corresponding to the route.
via	Indicates the next hop and interlace of the route.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.75 show ip ospf sham-links

Function

Run the **show ip ospf sham-links** command to display the sham link information of an OSPF process.

Syntax

show ip ospf [*process-id*] **sham-links** [**area** *area-id*]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

area *area-id*: Indicates the ID of the OSPF area where the sham link is, which can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

N/A

Examples

The following example displays the sham link information of an OSPF process.

```
Hostname> enable
Hostname# show ip ospf sham-links
Sham Link SLINK1 to address 8.8.8.8 is up
  Area 0.0.0.0 source address 7.7.7.7, Cost: 10
  Output interface is GigabitEthernet 0/8
  Nexthop address 192.168.1.2
  Transmit Delay is 1 sec, State Point-To-Point,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:07
    Adjacency state Full
```

Table 1-1Output Fields of the show ip ospf sham-links Command

Field	Description
Area	Indicates the domain ID.
source address	Indicates the source IP address of the sham link.
Cost	Indicates the cost value of the sham link.
Output interface	Indicates the actual outbound interface of the sham link.
Nexthop address	Indicates the actual next-hop address of the sham link.
Transmit Delay	Indicates the transmission delay of the sham link.
State	Indicates the state of the sham link.
Time intervals configured	Indicates the Hello, Dead, Wait, and Retransmit time corresponding to the sham link.
Adjacency State	Indicates the adjacency state. **Full** indicates the stable state.

Notifications

If the specified OSPF process does not exist (for example, when the sham link information of OSPF 1 is checked), the following notification will be displayed:

```
%OSPF: No router process 1
```

Platform Description

N/A

Related Commands

N/A

1.76 show ip ospf spf

Function

Run the **show ip ospf spf** command to display the times of route computation in the OSPF area.

Syntax

show ip ospf [*process-id*] **spf**

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

This command is used to display the times of route computation in the OSPF area in the last 30 minutes, as well as the total times of route computation up to now.

Examples

The following example displays the times of route computation in the OSPF area.

```
Hostname> enable
Hostname# show ip ospf 1 spf
OSPF process 1:
Area_id      30min_counts   Total_counts
0            32             1235
1            6              356
```

Table 1-1Output Fields of the show ip ospf 1 spf Command

Field	Description
Area_id	Indicates the OSPF area ID.
30min_counts	Indicates the times of route computation in the OSPF area in the last 30 minutes.
Total_counts	Indicates the total times of route computation in the OSPF area up to now.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.77 show ip ospf summary-address

Function

Run the **show ip ospf summary-address** command to display the summarized route of all the redistributed routes of an OSPF process.

Syntax

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

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

Currently this command takes effect only on an ABR of NSSA, and it displays only the route that is summarized on the local device.

Examples

The following example displays the summarized route of all the redistributed routes of an OSPF process.

```
Hostname> enable
Hostname# show ip ospf summary-address
OSPF Process 1, Summary-address:
172.16.0.0/16, Metric 20, Type 2, Tag 0, Match count 3, advertise
```

Table 1-1Output Fields of the show ip ospf summary-address Command

Field	Description
Summary Address	Indicates the address of the route to be summarized.
Summary Mask	Indicates the subnet mask of the route to be summarized.
Advertise	Indicates whether to advertise the summarized route.
Status	Indicates whether the range of the route to be summarized takes effect.
Aggregated subnets	Indicates how many external routes are summarized in this range.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.78 show ip ospf topology

Function

Run the **show ip ospf topology** command to display the topology information of SPF computation of an OSPF process.

Syntax

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

[**adv-router** *adv-router-id* [*router-id*] | **self-originate** [*router-id*]]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

area-id: Area ID, which can be a decimal integer or an IP address. The value range is from 0 to 4294967295.

topology: Displays the topology summary of a specified OSPF process and area.

adv-router: Displays the topology information of a specified device, which must be a direct neighbor of the current device.

adv-router-id: Root node router ID of the shortest path tree.

router-id: Information about a specified node on the shortest path tree.

self-originate: Displays the topology information of the current device.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

This command helps users to learn the topology information of OSPF SPF computation, and locate the faults caused by topology planning. If a user has enabled fast reroute calculation, the command displays the information about fast reroute calculation.

Examples

The following example displays the topology summary of a specified OSPF process and area.

```
Hostname> enable
Hostname# show ip ospf topology
```

```
OSPF Router with ID (1.1.1.1) (Process ID 1)
Router Topology States (Area 0.0.0.0)
+1.1.1.1
  +2.2.2.2
    +4.4.4.4
  +3.3.3.3
    +4.4.4.4
+2.2.2.2
  +1.1.1.1
    +3.3.3.3
  +4.4.4.4
    +3.3.3.3
+3.3.3.3
  +1.1.1.1
    +2.2.2.2
  +4.4.4.4
    +2.2.2.2
```

The following example displays the topology information of the current device.

```
Hostname> enable
Hostname# show ip ospf topology self-originate
OSPF Router with ID (1.1.1.1) (Process ID 1)
Router Topology States (Area 0.0.0.0)
1.1.1.1
  Self to Destination Metric: 0
Parent Node:
Child Node:2.2.2.2
  Primary next-hop:
  Backup next-hop:
  Backup Neighbor:
2.2.2.2
  Self to Destination Metric: 1
Parent Node: 1.1.1.1
Child Node:
  Primary next-hop: GigabitEthernet 0/1 via 10.0.0.1
  Backup next-hop: GigabitEthernet 0/2 via 10.0.1.1
  Backup Neighbor: 2.2.2.2
Neighbor to Destination Metric: 0
Neighbor to Self Metric: 10
Neighbor to Primary Neighbor: 0
Self to Neighbor Metric: 1
```

Table 1-1Output Fields of the show ip ospf topology Command

Field	Description
Self to Destination Metric	Indicates the metric from the root node to the current destination node.
Parent Node	Indicates the parent node of the current destination node.

Field	Description
Child Node	Indicates the child node of the current destination node.
Primary next-hop	Reaches the primary next hop of the current destination node.
Backup next-hop	Reaches the backup next hop of the current destination node.
Backup Neighbor	Reaches the backup neighbor of the current destination node.
Neighbor to Destination Metric	Indicates the metric from the backup neighbor to the current destination node.
Neighbor to Self Metric	Indicates the metric from the backup neighbor to the root node.
Neighbor to Primary Neighbor	Indicates the metric from the backup neighbor to the primary neighbor.
Self to Neighbor Metric	Indicates the metric from the root node to the backup neighbor.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.79 show ip ospf virtual-links

Function

Run the **show ip ospf virtual-links** command to display the information about a virtual link of an OSPF process.

Syntax

show ip ospf [*process-id*] **virtual-links** [*ipv4-address*]

Parameter Description

process-id: OSPF process ID. The value range is from 1 to 65535.

ipv4-address: Router ID of the neighbor of a virtual link.

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

If a virtual link is configured, the neighbor state and other related information can be displayed only by running this command. The **show ip ospf neighbor** command does not display the neighbors of the virtual link.

Examples

The following example displays the information about a virtual link of an OSPF process.

```
Hostname> enable
Hostname# show ip ospf virtual-links
Virtual Link VLINK0 to router 1.1.1.1 is up
Transit area 0.0.0.1 via interface GigabitEthernet 0/1
Local address 10.0.0.37/32
Remote address 10.0.0.27/32
Transmit Delay is 1 sec, State Point-To-Point,
Timer intervals configured,Hello 10,Dead 40,Wait 40,Retransmit 5
Hello due in 00:00:05
Adjacency state Full
```

Field description:

Field	Description
Virtual Link VLINK0 to router	Displays the neighbor and neighbor state of the virtual link.
Virtual Link state	Displays the state of the virtual link.
Transit area	Displays the transit area of the virtual link.
via interface	Displays the interface associated with the virtual link.
Local address	Indicates the address of the local interface.
Remote Address	Indicates the address of the peer interface.
Transmit Delay	Displays the transit delay of the virtual link.
State	Indicates the link state.
Time intervals configured	Indicates the Hello, Dead, Wait, and Retransmit time corresponding to this interface.
Adjacency State	Indicates the adjacency state. **Full** indicates the stable state.

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.80 show running-config router ospf

Function

Run the **show running-config router ospf** command to display the configuration of an OSPF process.

Syntax

show running-config router ospf

Parameter Description

N/A

Command Modes

All modes except the user EXEC mode

Default Level

14

Usage Guidelines

N/A

Examples

The following example displays the configuration of an OSPF process.

```
Hostname> enable
Hostname# show running-config router ospf
router ospf 1
 router-id 1.1.1.1
 graceful-restart
 network 10.1.1.0 0.0.0.255 area 0
```

Notifications

N/A

Platform Description

N/A

Related Commands

N/A

1.81 summary-address

Function

Run the **summary-address** command to configure a summarized route for the external routes of the OSPF routing domain.

Run the **no** form of this command to delete the definition of summarized route.

The route summarization function is disabled by default.

Syntax

summary-address *ipv4-address mask* [[**cost** *cost* | **distribute-delay** *interval* | **nssa-only** | **tag** *tag-value*] * | **not-advertise**]

no summary-address *ipv4-address mask* [[**cost** | **distribute-delay** | **nssa-only** | **tag**] * | **not-advertise**]

Parameter Description

ipv4-address: IP address of the summarized route.

mask: Subnet mask of the summarized route.

cost *cost*: Set the cost value of the summarized route. The value range is from 0 to 16777214. If no cost value is configured, the default metric of the summarized route is related to compatibility with RFC1583. If the RFC1583 compatibility mode is configured, the default metric is the minimum cost value of the summarized route; otherwise, the default metric is the maximum cost value of the summarized route.

distribute-delay *interval*: Specifies the delay time after which the summarized route is advertised, in seconds. The value range is 1 to 65535, and the default value is **2**.

nssa-only: Specifies that the summarized route cannot be converted to a Type-5 route. By default, the summarized route can be converted to a Type-5 route.

tag *tag-value*: Sets the tag value of the summarized route. The value range is from 0 to 4294967295.

not-advertise: Indicates that the summarized route is not advertised. If this parameter is not specified, the summarized route is advertised.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

When routes are redistributed from other routing processes and injected to the OSPF routing process, each route is advertised to the OSPF routers using an external LSA. If the injected routes are a continuous address space, the ABR can advertise only one summarized route to reduce the size of the routing table.

When configured on the NSSA ABR translator, the **summary-address** command summarizes the redistributed routes and routes obtained based on the LSAs that are converted from Type 7 to Type 5. When configured on the ASBR (not an NSSA ABR translator), this command summarizes only the redistributed routes. The **area range** command summarizes the routes between OSPF areas, while the **summary-address** command summarizes the external routes of the OSPF routing domain.

Examples

The following example configures a summarized route for the external routes of the OSPF routing domain as 100.100.0.0/16.

```
Hostname> enable
```

```
Hostname# configure terminal
Hostname(config)# router ospf 20
Hostname(config-router)# summary-address 100.100.0.0 255.255.0.0
Hostname(config-router)# redistribute static subnets
Hostname(config-router)# network 200.2.2.0 0.0.0.255 area 1
Hostname(config-router)# network 172.16.24.0 0.0.0.255 area 0
Hostname(config-router)# area 1 nssa
```

Notifications

When an invalid mask is configured, the following notification will be displayed:

```
OSPF: Invalid mask input
```

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf summary-address**

1.82 timers lsa arrival

Function

Run the **timers lsa arrival** command to configure the delay for receiving a duplicate LSA.

Run the **no** form of this command to restore the default configuration.

By default, the delay for receiving a duplicate LSA is 1000 ms.

Syntax

timers lsa arrival *arrival-time*

no timers lsa arrival

Parameter Description

arrival-time: Delay after which a duplicate LSA is received, in milliseconds. The value range is from 0 to 600000.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

Using this command can avoid consuming the device resource and the duplicate LSA received within a specified time does not need to be processed.

Examples

The following example configures the delay after which a duplicate LSA is received as 2s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# timers lsa arrival 2000
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.83 timers pacing lsa-group

Function

Run the **timers pacing lsa-group** command to configure a group pacing interval of LSA.

Run the **no** form of this command to restore the default configuration.

The group pacing interval of LSA is 30s by default.

Syntax

timers pacing lsa-group *pacing-interval*

no timers pacing lsa-group

Parameter Description

update-time: Group pacing interval of LSA, in seconds. The range is from 10 to 1800.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

Every LSA has its time to live (LSA age). When the LSA age reaches 3,600s, a refreshment is needed to prevent normal LSAs from being cleared because their ages reaching the maximum. If LSA update and aging computation are performed for every LSA, the device will consume a lot of CPU resources. To use CPU resources effectively, you can refresh LSAs by group on the device. The interval of group refreshment is called

group pacing interval. The group refreshment operation is to organize the LSAs generated within a group pacing interval into a group and refresh the group as a whole.

If the total number of LSAs does not change, a larger group pacing interval indicates that more LSAs need to be processed after timeout. For CPU stability, the number of LSAs processed upon each timeout cannot be too large. If the number of LSAs is large, you are advised to reduce the group pacing interval. For example, if there are 10,000 LSAs in the database, you can reduce the pacing interval. If there are 40 to 100 LSAs only, you can set the pacing interval to 10-20 minutes.

Examples

The following example configures the group pacing interval of LSA as 120s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 20
Hostname(config-router)# timers pacing lsa-group 120
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.84 timers pacing lsa-transmit

Function

Run the **timers pacing lsa-transmit** command to configure an interval for sending LSA group and a number of LS-UPD packets in each group.

Run the **no** form of this command to restore the default configuration.

By default, the interval for sending LSA group is 40 ms, and the number of LS-UPD packets in each group is 1.

Syntax

timers pacing lsa-transmit *transmit-interval transmit-count*

no timers pacing lsa-transmit

Parameter Description

transmit-interval: Interval of sending LSA group packets, in milliseconds. The value range is from 10 to 1000.

transmit-count: Number of LS-UPD packets in each group. The value range is from 1 to 200.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

When the number of LSAs is large and the device load is heavy in an environment, configuring an appropriate interval of sending LSA group and an appropriate number of LS-UPD packets in each group can limit the number of LS-UPD packets flooded on a network.

If the CPU usage is not high and the network bandwidth load is not heavy, reducing the interval of sending LSA group and increasing the number of LS-UPD packets in each group can accelerate the environment convergence.

Examples

The following example configures the interval for sending LSA group as 50 ms, and the number of LS-UPD packets in each group as 20.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# timers pacing lsa-transmit 50 20
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.85 timers spf

Function

Run the **timers spf** command to configure the delay time for SPF computation after an OSPF process receives the topology change information and the time interval between two SPF computations.

Run the **no** form of this command to restore the default configuration.

By default, the **timers spf** command does not take effect, and the delay for SPF computation is subject to the default configuration of the **timers throttle spf** command. Refer to the description of the **timers throttle spf** command.

Syntax

timers spf *spf-delay spf-holdtime*

no timers spf

Parameter Description

spf-delay: Delay for SPF computation, in seconds. After receiving the topology change information, the OSPF routing process must wait for the specified time before performing SPF computation. The range is from 0 to 2147483647.

spf-holdtime: Interval between two SPF computations, in seconds. If the waiting time expires, but the interval between two computations does not time out, the SPF computation cannot start. The range is from 0 to 2147483647.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

Changes to LSDB trigger SPF computation. Frequent network jitter consumes a lot of CPU resources. Setting a reasonable delay for SPF computation can avoid occupying excessive device memory and bandwidth resources.

A smaller value set for *spf-delay* and *spf-holdtime* indicates that the OSPF can adapt to topology changes more quickly. In other words, a shorter network convergence time means that more CPU time of the router will be occupied.

The configurations of **timers spf** and **timers throttle spf** are mutually overwritten.

Examples

The following example configures the delay time for SPF computation after an OSPF process receives the topology change information as 3s and the time interval between two SPF computations as 9s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 20
Hostname(config-router)# timers spf 3 9
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**

1.86 timers throttle lsa all

Function

Run the **timers throttle lsa all** command to configure an exponential backoff algorithm of LSA packet generation.

Run the **no** form of this command to restore the default configuration.

By default, the minimum delay of LSA generation is 0 ms, the minimum interval between the first update and the second update of LSA is 5,000 ms, and the maximum interval between consecutive LSA updates is 5,000 ms.

Syntax

timers throttle lsa all *delay-time hold-time max-wait-time*

no timers throttle lsa all

Parameter Description

delay-time: Minimum delay for LSA generation, in milliseconds. The first LSA in the database is always generated instantly. The value range is from 0 to 600000.

hold-time: Minimum interval between the first LSA update and the second LSA update, in milliseconds. The value range is from 1 to 600000.

max-wait-time: Maximum interval between two LSA updates when the LSA is updated continuously, in milliseconds. This interval is also used to determine whether the LSA is updated continuously. The value range is from 1 to 600000.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

If a high convergence requirement is raised when a link changes, you can set *delay-time* to a smaller value. To reduce the CPU usage, you can set *delay-time, hold-time* and *max-wait-time* to larger values.

When this command is configured, the value of *hold-time* cannot be smaller than the value of *delay-time*, and the value of *max-wait-time* cannot be smaller than the value of *hold-time*.

Examples

The following example configures the first delay as 10 ms, the minimum interval between the first update and the second update of LSA as 1s, and the maximum interval between two LSA updates as 5s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# timers throttle lsa all 10 1000 5000
```

Notifications

When the configured value of *max-wait-time* is smaller than that of *hold-time*, the following notification will be displayed:

```
% Warning: max-wait-time should be no less than hold-time, set to (5).
```

When the configured value of *hold-time* is smaller than that of *delay-time*, the following notification will be displayed:

```
% Warning: hold-time should be no less than delay-time, set to (5).
```

Common Errors

The configured value of *hold-time* is smaller than that of *delay-time*, or the configured value of *max-wait-time* is smaller than that of *hold-time*.

Platform Description

N/A

Related Commands

- **show ip ospf**

1.87 timers throttle route

Function

Run the **timers throttle route** command to configure the delay time for route computation when an OSPF process receives changed inter-area and external LSAs.

Run the **no** form of this command to restore the default configuration.

By default, the waiting time for inter-area route computation is 0 ms, and that of external route computation is 0 ms.

Syntax

timers throttle route { **inter-area** *ia-delay* | **ase** *ase-delay* }

no timers throttle route { **inter-area** | **ase** }

Parameter Description

inter-area: Indicates inter-area route computation.

ia-delay: Delay for inter-area route computation, in milliseconds. When an inter-area LSA change is detected, the route computation triggered by the OSPF process is performed at least after the delay for inter-area route computation elapses. The value range is from 0 to 600000.

ase: Indicates the external route computation.

ase-delay: Delay for external route computation, in milliseconds. When an external LSA change is detected, the route computation triggered by the OSPF process is performed at least after the delay for external route computation elapses. The value range is from 0 to 600000.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

If a strict requirement is raised for the network convergence time, use the default value. If a lot of inter-area or external routes exist on the network and the network is not stable, adjust the corresponding delays and optimize route computation to reduce the load on the device.

Examples

The following example configures the delay time for route computation when an OSPF process receives changed inter-area and external LSAs as 1s.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# timers throttle route inter-area 1000
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

N/A

1.88 timers throttle spf

Function

Run the **timers throttle spf** command to configure the delay time for SPF computation, and the minimum interval and maximum interval for two SPF computations after an OSPF process receives the topology change information.

Run the **no** form of this command to restore the default configuration.

By default, the delay for SPF computation is 1000 ms, the minimum interval for two SPF computations is 5000 ms, and the maximum interval between two SPF computations is 10,000 ms.

Syntax

timers throttle spf *spf-delay spf-holdtime spf-max-waittime*

no timers throttle spf

Parameter Description

spf-delay: Delay for SPF computation, in milliseconds. When a topology change is detected, the SPF computation triggered by the OSPF process is performed at least after the delay for SPF computation elapses. The value range is from 1 to 600000.

spf-holdtime: Minimum interval between two SPF computations, in milliseconds. The value range is from 1 to 600000.

spf-max-waittime: Maximum interval between two SPF computations, in milliseconds. The value range is from 1 to 600000.

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

Here, *spf-delay* indicates the minimum time between the occurrence of a topology change and the start of SPF computation. The minimum interval between the first SPF computation and the second SPF computation is *spf-holdtime*. After that, the interval between two SPF computations must be at least twice of the previous interval. When the interval reaches *spf-max-waittime*, the interval cannot increase again. If the interval between two SPF computations already exceeds the required minimum value, the interval for SPF computation is calculated starting from *spf-holdtime*.

You can set *spf-delay* and *spf-holdtime* to smaller values to accelerate topology convergence. Set *spf-max-waittime* to a larger value to reduce SPF computation. Flexible settings can be used based on stability of the network topology.

Compared with the **timers spf** command, this command supports more flexible settings to accelerate the convergence speed of SPF computation and further reduce the system resources consumed by SPF computation when the topology continuously changes. Therefore, you are advised to run the **timers throttle spf** command for configuration.

- The value of *spf-holdtime* cannot be smaller than that of *spf-delay*; otherwise, *spf-holdtime* will be automatically set to the value of *spf-delay*.
- The value of *spf-max-waittime* cannot be smaller than that of *spf-holdtime*; otherwise, *spf-max-waittime* will be automatically set to the value of *spf-holdtime*.
- The configurations of **timers throttle spf** and **timers spf** are mutually overwritten.
- When neither **timers spf** nor **timers throttle spf** is configured, the default value of **timers throttle spf** prevails.

Examples

The following example configures the SPF computation delay, minimum interval and maximum interval of an OSPF process as 5 ms, 1,000 ms, and 90,000 ms in turn. If the topology changes continuously, the SPF computation time is as follows: 5 ms, 1s, 3s, 7s, 15s, 31s, 63s, 89s, 179s, 179+90.

```
Hostname> enable
Hostname# configure terminal
```

```
Hostname(config)# router ospf 20
Hostname(config-router)# timers throttle spf 5 1000 90000
```

Notifications

When the configured value of **max-wait-time** is smaller than that of **hold-time**, the following notification will be displayed:

```
% Warning: max-wait-time should be no less than hold-time, set to (5).
```

When the configured value of **hold-time** is smaller than that of **delay-time**, the following notification will be displayed:

```
% Warning: hold-time should be no less than delay-time, set to (5).
```

Common Errors

The configured value of *hold-time* is smaller than that of *delay-time* or the configured value of *max-wait-time* is smaller than that of *hold-time*.

Platform Description

N/A

Related Commands

- **show ip ospf**

1.89 two-way-maintain

Function

Run the **two-way-maintain** command to enable the two-way maintenance function of an OSPF process.

Run the **no** form of this command to disable the two-way maintenance function of an OSPF process.

By default, the two-way maintenance function is enabled for an OSPF process.

Syntax

two-way-maintain

no two-way-maintain

Parameter Description

N/A

Command Modes

Routing process configuration mode

Default Level

14

Usage Guidelines

On a large network, a lot of packets may be sent or received, occupying a great proportion of CPU and memory. As a result, some packets are delayed or discarded. If the time required for processing hello packets exceeds the neighbor dead interval, the corresponding adjacency times out and is removed. If the two-way

maintenance function is enabled, in addition to the hello packets, the DD, LSU, LSR, and LSAck packets from a neighbor can also be used to maintain the bidirectional communication between neighbors when a large number of packets exist on the network. This prevents termination of the adjacency caused by delayed or discarded hello packets.

Examples

The following example enables the two-way maintenance function of an OSPF process.

```
Hostname> enable
Hostname# configure terminal
Hostname(config)# router ospf 1
Hostname(config-router)# no two-way-maintain
```

Notifications

N/A

Common Errors

N/A

Platform Description

N/A

Related Commands

- **show ip ospf**