OSPF Limiting Adjacency Formations

The OSPF: Limit Simultaneous Adjacency Formations feature allows you to limit to the number of adjacencies in an OSPF area.

Information About OSPF Limiting Adjacency Formations

Overview of Limiting Adjacencies

The OSPF: Limit Simultaneous Adjacency Formations feature allows you to limit to the number of adjacencies that are in "exchange" or "loading" state at the same time. A process limit (PL) determines the number of "forming" adjacencies and applies to all adjacencies for the entire process. The term "forming" refers to adjacencies that are in "exchange" or "loading" state. Adjacencies form in an OSPF area during the initial period after the area is created. The Initial Limit applies when no adjacencies have reached the "full" state in an OSPF area. If there are any "full" adjacencies in the area, the new adjacencies are governed by the Process Limit. At a given point of time, process limit and initial limit are effective in an OSPF area. When there are no adjacencies "forming" in an area, at least one adjacency is allowed to form regardless of the maximum limit specified for it. In other words, the maximum number of adjacencies can be exceeded before adjacencies form in one or more areas. The maximum limit can be exceeded by the number of areas minus one.

When a limit is reached, adjacencies in a state less than EXCHANGE are terminated. To terminate the adjacency, a hello packet is sent to the neighbor which does not have the neighbor's device ID. This causes the neighbor to put the adjacency in the INIT state. This prevents a deadlock with the neighbor, which could otherwise happen if the neighbor is blocking an adjacency from forming on a different interface. By causing the neighbor to bring the adjacency to INIT, it allows the neighbor to form an adjacency on a different interface. Packets from unknown neighbors are ignored when the limit has been reached or exceeded.

If graceful restart or Cisco nonstop forwarding is configured, the hello packets must be accepted from every neighboring device The restarting device must include the neighbors' device IDs in its hello packets to prevent the adjacency from being dropped by the neighbor. If graceful restart is in configured, the grace link-state advertisements (LSAs) must be sent in a normal mode and not in a throttling mode. When the device is performing graceful restart and if the limit is reached, new adjacencies are allowed to remain in 2-WAY or

EXSTART. However, they are prevented from proceeding to EXCHANGE until the number of forming adjacencies is less than the limit.

Configuring Adjacency Formations

Use the **adjacency stagger** command to configure the maximum limit and the initial limit for an area in the router or address-family configuration modes. The initial limit must not be greater than the process limit. The default value is 300 and the minimum is 1. If the **none** keyword is used, the maximum limit is only effective. The **none** keyword also disables the initial limit for areas. If an initial limit is reached in an area and no adjacencies are forming, no adjacencies will be allowed to form in the area until global number of adjacencies forming is less than the PL.

Use the **ip ospf adjacency stagger disable** or the **ospfv3 adjacency stagger disable** command to disable staggering on an interface. Adjacencies forming on a disabled interface are counted towards throttling limits. Disabling the throttling on an interface allows exceeding the maximum limit when the maximum limit is reached and a new adjacency forms on an interface where throttling is disabled.

Note   When using the **no adjacency stagger** command to disable the feature, the command is displayed in the running configuration. To return to the default values, use the **default adjacency stagger** command. After using this command, the **adjacency stagger** command does not appear in the running configuration.

How to Configure OSPF Limiting Adjacency Formations

Configuring Adjacency Formations Globally

Configuring Adjacency Limit in the Router Configuration Mode

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router ospf** *process-id*
4. **adjacency stagger** {*initial-limit* | **none**} *maximum-limit*
5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router ospf** *process-id* **Example:** `Device(config)# router ospf 109`	Enables OSPF routing and enters router configuration mode.
Step 4	**adjacency stagger** {*initial-limit*	**none**} *maximum-limit* **Example:** `Device(config-router)# adjacency stagger 10 50`	Controls the number of adjacencies forming in an area. • *initial-limit*—Minimum number of adjacencies allowed in an area. • *maximum-limit*—Maximum number of adjacencies allowed in an area. • **none**—No minimum number for adjacencies allowed in an area.
Step 5	**end** **Example:** `Device(config-router)# end`	Exits router configuration mode and returns to privileged EXEC mode.

Configuring Adjacency Limit in the Address Family Configuration Mode

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router ospfv3** [*process-id*]
4. Do one of the following:

   • **address-family ipv4 unicast**
   • **address-family ipv6 unicast**

5. **adjacency stagger** {*initial-limit* | **none**} {*maximum-limit* | **disable**}
6. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	**Purpose**
Step 2	**configure terminal** **Example:** Device# configure terminal	Enters global configuration mode.
Step 3	**router ospfv3** [*process-id*] **Example:** Device(config)# router ospfv3 1	Enables OSPFv3 router configuration mode for the IPv4 or IPv6 address family.

Step 4	Do one of the following:
	
	    • **address-family ipv4 unicast**
	    • **address-family ipv6 unicast**
	
	Example:
	
	Device(config-router)# address-family ipv4 unicast
	
	Example:
	
	Device(config-router)# address-family ipv6 unicast
		Enters IPv4 or IPv6 address family configuration mode for OSPFv3.

Step 5	**adjacency stagger** {*initial-limit* | **none**} {*maximum-limit*| **disable**} **Example:** Device(config-router-af)# adjacency stagger 10 50	Controls the number of adjacencies forming in an area. • *initial-limit*—Minimum number of adjacencies allowed in an area. • **none**—No minimum number for adjacencies allowed in an area. • *maximum-limit*—Maximum number of adjacencies allowed in an area. • **disable**—Disable adjacency formations.
Step 6	**end** **Example:** Device(config-router-af)# end	Exits address family configuration mode and returns to privileged EXEC mode.

Disabling Adjacency Staggering in the Interface Configuration Mode

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. Do one of the following:

      • **ip ospf adjacency stagger disable**
      • **ospfv3 adjacency stagger disable**

5. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface serial 2/0`	Specifies the interface and enters interface configuration mode.

Step 4	Do one of the following:
	
	    • **ip ospf adjacency stagger disable**
	    • **ospfv3 adjacency stagger disable**
	
	Example:
	`Device(config-if)# ip ospf adjacency stagger disable`
	
	Example:
	`Device(config-if)# ospfv3 adjacency stagger disable`
		Disables adjacency staggering on the interface.

Step 5	**end** **Example:** `Device(config-if)# end`	Returns to privileged EXEC mode.

Verifying Adjacency Staggering

SUMMARY STEPS

1. **enable**
2. **show ip ospf**
3. **show ospfv3**

DETAILED STEPS

Procedure

Step 1 **enable**

Example:

```
Device> enable
```

Enables privileged EXEC mode.

• Enter your password if prompted.

Step 2 **show ip ospf**

Example:

```
Device# show ip ospf

 Routing Process "ospf 10" with ID 10.8.3.3
 Start time: 2w0d, Time elapsed: 00:16:43.033
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Supports NSSA (compatible with RFC 3101)
 Supports Database Exchange Summary List Optimization (RFC 5243)
 Event-log enabled, Maximum number of events: 1000, Mode: cyclic
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 EXCHANGE/LOADING adjacency limit: initial 300, process maximum 300
 Number of external LSA 0. Checksum Sum 0x000000
 Number of opaque AS LSA 0. Checksum Sum 0x000000
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 0. 0 normal 0 stub 0 nssa
 Number of areas transit capable is 0
 External flood list length 0
 IETF NSF helper support enabled
 Cisco NSF helper support enabled
 Reference bandwidth unit is 100 mbps
```

Displays information about OSPF routing processes.

Step 3 **show ospfv3**

Example:

```
Device# show ospfv3

 OSPFv3 12 address-family ipv6
 Router ID 10.8.3.3
 Supports NSSA (compatible with RFC 3101)
 Supports Database Exchange Summary List Optimization (RFC 5243)
```

```
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msecs
Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msecs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Retransmission limit dc 24 non-dc 24
EXCHANGE/LOADING adjacency limit: initial 10, process maximum 50
Number of external LSA 0. Checksum Sum 0x000000
Number of areas in this router is 0. 0 normal 0 stub 0 nssa
Graceful restart helper support enabled
Reference bandwidth unit is 100 mbps
RFC1583 compatibility enabled
```

Displays information about OSPFv3 routing processes.

Configuration Examples for OSPF Limiting Adjacency Formations

Example: Configuring Adjacency Limit in the Router Configuration Mode

```
Device> enable
Device# configure terminal
Device(config)# router ospf 109
Device(config-router)# adjacency stagger 10 50
Device(config-router)# end
```

Example: Configuring Adjacency Limit in the Address Family Configuration Mode

```
Device> enable
Device# configure terminal
Device(config)# router ospfv3 1
Device(config-router)# address-family ipv6 unicast
Device(config-router-af)# adjacency stagger 10 50
Device(config-router-af)# end
```

Example: Disabling Adjacency in the Interface Configuration Mode

```
Device> enable
Device# configure terminal
Device(config)# interface serial 2/0
Device(config-if)# ospfv3 adjacency stagger disable
Device(config-if)# end
```

Additional References for OSPF Limiting Adjacency Formations

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
OSPF commands	Cisco IOS IP Routing: OSPF Command Reference
Configuring OSPF	Configuring OSPF
Multiarea Adjacency	• OSPFv2 Multiarea Adjacency • OSPFv3 Multiarea Adjacency

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for OSPF Limiting Adjacencies Formations

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for OSPF Limiting Adjacencies Formations

Feature Name	Releases	Feature Information
OSPF: Limit Simultaneous Adjacency Formations	Cisco IOS XE Release 3.15S	The following commands were introduced or modified: **adjacency stagger**, **ip ospf adjacency stagger disable**, **ip ospfv3 adjacency stagger disable**, **show ip ospf**, **show ip ospfv3**.

Table 2: Feature Information for OSPF Limiting Adjacencies Formations

Feature Name	Releases	Feature Information
OSPF: Limit Simultaneous Adjacency Formations	Cisco IOS XE Release 17.4	This feature was introduced.

Feature Information for OSPF Limiting Adjacencies Formations