OSPF Link-State Advertisement (LSA) Throttling

The OSPF Link-State Advertisement (LSA) Throttling feature provides a dynamic mechanism to slow down link-state advertisement (LSA) updates in OSPF during times of network instability. It also allows faster Open Shortest Path First (OSPF) convergence by providing LSA rate limiting in milliseconds.

History for the OSPF LSA Throttling Feature

Release	Modification
12.0(25)S	This feature was introduced.
12.3(2)T	This feature was integrated into Cisco IOS Release 12.3(2)T.
12.2(18)S	This feature was integrated into Cisco IOS Release 12.2(18)S.
12.2(27)SBC	This feature was integrated into Cisco IOS Release 12.2(27)SBC.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Contents

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Prerequisites for OSPF LSA Throttling

It is presumed that you have OSPF configured in your network.

Information About OSPF LSA Throttling

Before you enable OSPF LSA Throttling, you should understand the following concepts:

- Benefits of OSPF LSA Throttling, page 2
- How OSPF LSA Throttling Works, page 2

Benefits of OSPF LSA Throttling

Prior to the OSPF LSA Throttling feature, LSA generation was rate-limited for 5 seconds. That meant that changes in an LSA could not be propagated in milliseconds, so the OSPF network could not achieve millisecond convergence.

The OSPF LSA Throttling feature is enabled by default and allows faster OSPF convergence (in milliseconds). This feature can be customized. One command controls the generation (sending) of LSAs and another command controls the receiving interval. This feature also provides a dynamic mechanism to slow down the frequency of LSA updates in OSPF during times of network instability.

How OSPF LSA Throttling Works

The **timers throttle lsa all** command controls the generation (sending) of LSAs. The first LSA is always generated immediately upon an OSPF topology change, and the next LSA generated is controlled by the minimum start interval. The subsequent LSAs generated for the same LSA are rate-limited until the maximum interval is reached. The “same LSA” is defined as an LSA instance that contains the same LSA ID number, LSA type, and advertising router ID.

The **timers lsa arrival** command controls the minimum interval for accepting the same LSA. If an instance of the same LSA arrives sooner than the interval that is set, the LSA is dropped. It is recommended that the arrival interval be less than or equal to the hold-time interval of the **timers throttle lsa all** command.

How to Customize OSPF LSA Throttling

This section contains the following optional procedure:

- Customizing OSPF LSA Throttling, page 2 (optional)

Customizing OSPF LSA Throttling

This task describes how to customize OSPF LSA throttling if you prefer to set values other than the defaults.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router ospf** *process-id*
4. **timers throttle lsa all** *start-interval hold-interval max-interval*
5. **timers lsa arrival** *milliseconds*
6. **end**
7. **show ip ospf timers rate-limit**
8. **show ip ospf**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**router ospf** *process-id* **Example:** `Router(config)# router ospf 1`	Configures an OSPF routing process.
Step 4	**timers throttle lsa all** *start-interval hold-interval max-interval* **Example:** `Router(config-router)# timers throttle lsa all 100 10000 45000`	(Optional) Sets the rate-limiting values (in milliseconds) for LSA generation. • The default values are as follows: – *start-interval* is 0 milliseconds – *hold-interval* is 5000 milliseconds – *max-interval* is 5000 milliseconds
Step 5	**timers lsa arrival** *milliseconds* **Example:** `Router(config-router)# timers lsa arrival 2000`	(Optional) Sets the minimum interval (in milliseconds) between instances of receiving the same LSA. • The default value is 1000 milliseconds. • We suggest you keep the *milliseconds* value of the LSA arrival timer less than or equal to the neighbors' *hold-interval* value of the **timers throttle lsa all** command.

	Command or Action	Purpose
Step 6	**end** **Example:** `Router(config-router)# end`	Exits router configuration mode.

Step 7	**show ip ospf timers rate-limit**
	
	Example:
	`Router# show ip ospf timers rate-limit`
	
	`LSAID: 10.1.1.1 Type: 1 Adv Rtr: 172.16.2.2 Due in: 00:00:00.028`
	
	`LSAID: 192.168.4.1 Type: 3 Adv Rtr: 172.17.2.2 Due in: 00:00:00.028`
		(Optional) Displays a list of the LSAs in the rate limit queue (about to be generated).
		
		• The example shows two LSAs in the queue. Each LSA is identified by LSA ID number, Type (of LSA), Advertising router ID, and the time in hours:minutes:seconds (to the milliseconds) when the LSA is due to be generated.

	Command or Action	Purpose

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

Configuration Examples for OSPF LSA Throttling

This section contains an example of customizing OSPF LSA throttling:

• OSPF LSA Throttling: Example, page 5

OSPF LSA Throttling: Example

This example customizes OSPF LSA throttling so that the start interval is 200 milliseconds, the hold interval is 10,000 milliseconds, and the maximum interval is 45,000 milliseconds. The minimum interval between instances of receiving the same LSA is 2000 milliseconds.

```
router ospf 1
```

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

Additional References

The following sections provide references related to OSPF LSA throttling.

Related Documents

Related Topic	Document Title
OSPF commands	"OSPF Commands" chapter in the *Network Protocols Command Reference, Part 1,* Release 12.0
OSPF configuration tasks	"Configuring OSPF" chapter in the *Network Protocols Configuration Guide, Part 1,* Release 12.0

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Command Reference

This section documents modified commands only.

- **debug ip ospf database-timer rate-limit**
- **show ip ospf**
- **show ip ospf timers rate-limit**
- **timers lsa arrival**
- **timers throttle lsa all**

debug ip ospf database-timer rate-limit

To display when link-state advertisement (LSA) rate-limiting timers will expire, use the **debug ip ospf database-timer rate-limit** command in privileged EXEC mode.

debug ip ospf database-timer rate-limit [*access-list-number*]

Syntax Description

access-list-number	(Optional) Number of the standard or expanded IP access list to apply to the debug output. Standard IP access lists are in the range 1 to 99. Expanded IP access lists are in the range 1300 to 1999.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(25)S	This command was introduced.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.

Usage Guidelines

Use this command if you need to see when the timers will expire per LSA. Use an access list if you want to limit the output.

Examples

The following is sample output from the **debug ip ospf database-timer rate-limit** command for an example configuration that includes the **timers throttle lsa all 100 10000 45000** command. Comments are inserted to explain the preceding output.

```
Router# debug ip ospf database-timer rate-limit

OSPF rate limit timer events debugging is on
*Mar 12 20:18:20.383:OSPF:Starting rate limit timer for 10.10.24.4
10.10.24.4 1 with 100ms delay
```

The interface is shut down, which causes OSPF to generate a new router LSA. The system starts a timer for 100 milliseconds.

```
*Mar 12 20:18:20.495:OSPF:Rate limit timer is expired for 10.10.24.4
10.10.24.4 1
```

The rate limit timer is expired after 100 milliseconds (a small delta is added to the timer).

```
*Mar 12 20:18:20.495:OSPF:For next LSA generation - wait :10000ms next:
20000ms
*Mar 12 20:18:20.495:OSPF:Build router LSA for area 24, router ID
10.10.24.4, seq 0x80000003
```

The system will generate update a router LSA after the timer expires.

show ip ospf

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

show ip ospf [*process-id*]

Syntax Description

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

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(4)T	This command was modified to show packet pacing timers in the displayed output.
12.2(15)T	This command was modified to show additional information if the OSPF Forwarding Address Suppression in Type-5 link-state advertisements (LSAs) feature is configured.
12.0(25)S	The output of this command was expanded to display LSA throttling timers.
12.3(2)T	The output of this command was expanded to display LSA throttling timers and the limit on redistributed routes.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.

Examples

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

```
Router# show ip ospf

  Routing Process "ospf 201" with ID 10.0.0.1 and Domain ID 10.20.0.1
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
  Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
  LSA group pacing timer 100 secs
  Interface flood pacing timer 55 msecs
  Retransmission pacing timer 100 msecs
  Number of external LSA 0. Checksum Sum 0x0
  Number of opaque AS LSA 0. Checksum Sum 0x0
  Number of DCbitless external and opaque AS LSA 0
  Number of DoNotAge external and opaque AS LSA 0
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  External flood list length 0
     Area BACKBONE(0)
         Number of interfaces in this area is 2
         Area has message digest authentication
         SPF algorithm executed 4 times
         Area ranges are
         Number of LSA 4. Checksum Sum 0x29BEB
```

```
        Number of opaque link LSA 0. Checksum Sum 0x0
        Number of DCbitless LSA 3
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
    Area 172.16.26.0
        Number of interfaces in this area is 0
        Area has no authentication
        SPF algorithm executed 1 times
        Area ranges are
           192.168.0.0/16 Passive Advertise
        Number of LSA 1. Checksum Sum 0x44FD
        Number of opaque link LSA 0. Checksum Sum 0x0
        Number of DCbitless LSA 1
        Number of indication LSA 1
        Number of DoNotAge LSA 0
        Flood list length 0
```

Table 1 describes the significant fields shown in the display.

Table 1 show ip ospf Field Descriptions

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

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

```
Router# show ip ospf

.
.
.
Area 2
   Number of interfaces in this area is 4
```

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

Table 2 describes the significant fields shown in the display.

Table 2 show ip ospf Field Descriptions

Field	Description
Area	OSPF area and tag.
Number of interfaces...	Number of interfaces configured in the area.
It is...	Possible types are internal, area border, or autonomous system boundary.
Routing Process “ospf 1” with ID 192.168.0.1	Process ID and OSPF router ID.
Supports...	Number of types of service supported (Type 0 only).
Initial SPF schedule delay	Delay time of SPF calculations at startup.
Minimum hold time	Minimum hold time between consecutive SPF calculations.
Maximum wait time	Maximum wait time between consecutive SPF calculations.
Incremental-SPF	Status of incremental SPF calculations.
Minimum LSA...	Minimum time interval (in seconds) between link-state advertisements, and maximum arrival time (in milliseconds) of link-state advertisements,
LSA group pacing timer	Configured LSA group pacing timer (in seconds).
Interface flood pacing timer	Configured LSA flood pacing timer (in milliseconds).
Retransmission pacing timer	Configured LSA retransmission pacing timer (in milliseconds).
Number of...	Number and type of link-state advertisements that have been received.
Number of external LSA	Number of external link-state advertisements.

Table 2 show ip ospf Field Descriptions (continued)

Field	Description
Number of opaque AS LSA	Number of opaque link-state advertisements.
Number of DCbitless external and opaque AS LSA	Number of demand circuit external and opaque link-state advertisements.
Number of DoNotAge external and opaque AS LSA	Number of do not age external and opaque link-state advertisements.
Number of areas in this router is	Number of areas configured for the router listed by type.
External flood list length	External flood list length.

The following is sample output from the **show ip ospf** command. In this example, the user had configured the **redistribution maximum-prefix** command to set a limit of 2000 redistributed routes. Shortest Path First (SPF) throttling was configured with the **timers throttle spf** command.

```
Router# show ip ospf 1

 Routing Process "ospf 1" with ID 10.0.0.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 It is an autonomous system boundary router
 Redistributing External Routes from,
    static, includes subnets in redistribution
    Maximum limit of redistributed prefixes 2000
    Threshold for warning message 75%
Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
```

Table 3 describes the significant fields shown in the display.

Table 3 show ip ospf Field Descriptions

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

Table 3 show ip ospf Field Descriptions (continued)

Field	Description
Minimum hold time between two consecutive SPFs	Minimum hold time (in milliseconds) between two consecutive SPF calculations for SPF throttling. Configured with the **timers throttle spf** command.
Maximum wait time between two consecutive SPFs	Maximum wait time (in milliseconds) between two consecutive SPF calculations for SPF throttling. Configured with the **timers throttle spf** command.
Number of areas	Number of areas in router, area addresses, and so on.

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

```
Router# show ip ospf 1

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

The following is sample output from the **show ip ospf** command. In this example, the user had configured the **redistribution maximum-prefix** command to set a limit of 2000 redistributed routes. Shortest Path First (SPF) throttling was configured with the **timers throttle spf** command.

```
Router# show ip ospf 1

 Routing Process "ospf 1" with ID 10.0.0.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
```

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

Table 4 describes significant fields shown in the display.

Table 4 show ip ospf Field Descriptions

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

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

```
Router# show ip ospf 1

Routing Process "ospf 4" with ID 10.10.24.4
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
```

```
 Initial LSA throttle delay 100 msecs
 Minimum hold time for LSA throttle 10000 msecs
 Maximum wait time for LSA throttle 45000 msecs
Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 Number of external LSA 0. Checksum Sum 0x0
 Number of opaque AS LSA 0. Checksum Sum 0x0
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 External flood list length 0
    Area 24
        Number of interfaces in this area is 2
        Area has no authentication
        SPF algorithm last executed 04:28:18.396 ago
        SPF algorithm executed 8 times
        Area ranges are
        Number of LSA 4. Checksum Sum 0x23EB9
        Number of opaque link LSA 0. Checksum Sum 0x0
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

show ip ospf timers rate-limit

To display all of the link-state advertisements (LSAs) in the rate limit queue, use the **show ip ospf timers rate-limit** command in privileged EXEC mode.

show ip ospf timers rate-limit

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(25)S	This command was introduced.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.

Usage Guidelines

Use this command if you need to see when LSAs in the queue will be sent.

Examples

The following is sample output from the **show ip ospf timers rate-limit** command:

```
Router# show ip ospf timers rate-limit

LSAID: 10.1.1.1    Type: 1   Adv Rtr: 172.16.2.2 Due in: 00:00:00.028
LSAID: 172.16.4.1   Type: 3   Adv Rtr: 172.16.2.2 Due in: 00:00:00.028
```

Table 1 describes the significant fields shown in the display.

Table 5 show ip ospf timers rate-limit Field Descriptions

Field	Description
LSAID	ID of the LSA.
Type	Type of LSA.
Adv Rtr	ID of advertising router.
Due in	When the LSA is scheduled to be sent (in hours:minutes:seconds).

timers lsa arrival

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

timers lsa arrival *milliseconds*

no timers lsa arrival

Syntax Description

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

Defaults

1000 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.0(25)S	This command was introduced.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.

Usage Guidelines

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

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

Examples

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

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

Related Commands

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

timers throttle lsa all

To set rate-limiting values for Open Shortest Path First (OSPF) link-state advertisement (LSA) generation, use the **timers throttle lsa all** command in router configuration mode. To restore the default values, use the **no** form of this command.

timers throttle lsa all *start-interval hold-interval max-interval*

no timers throttle lsa all

Syntax Description

start-interval	Minimum delay in milliseconds for the generation of LSAs. The first instance of LSA is always generated immediately upon a local OSPF topology change. The generation of the next LSA is not before the start interval. The range is 0 to 600,000 milliseconds. The default is 0 milliseconds, which means no delay; the LSA is sent immediately.
hold-interval	Incremental time in milliseconds. This value is used to calculate the subsequent rate limiting times for LSA generation. The range is 1 to 600,000 milliseconds. The default value is 5000 milliseconds.
max-interval	Maximum wait time in milliseconds between generation of the same LSA. The range is 1 to 600,000 milliseconds. The default value is 5000 milliseconds.

Defaults

start-interval: 0 milliseconds
hold-interval: 5000 milliseconds
max-interval: 5000 milliseconds

Command Modes

Router configuration

Command History

Release	Modification
12.0(25)S	This command was introduced.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.

Usage Guidelines

The “same LSA” is defined as an LSA instance that contains the same LSA ID number, LSA type, and advertising router ID. We suggest you keep the *milliseconds* value of the **timers lsa arrival** command less than or equal to the *hold-interval* value of the **timers throttle lsa all** command.

Examples

This example customizes OSPF LSA throttling so that the start interval is 200 milliseconds, the hold interval is 10,000 milliseconds, and the maximum interval is 45,000 milliseconds. The minimum interval between instances of receiving the same LSA is 2000 milliseconds.

```
router ospf 1
 log-adjacency-changes
 timers throttle lsa all 200 10000 45000
```

```
timers lsa arrival 2000
network 10.10.4.0 0.0.0.255 area 24
network 10.10.24.0 0.0.0.255 area 24
```

Related Commands

Command	Description
show ip ospf	Displays information about OSPF routing processes.
timers lsa arrival	Sets the minimum interval at which the software accepts the same LSA from OSPF neighbors.

timers throttle lsa all

Cisco IOS Release: Multiple releases (see the Feature History table)