OSPF Link-State Advertisement Throttling

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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.

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Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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.

Prerequisites for OSPF LSA Throttling

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

Information About OSPF LSA Throttling

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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

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Customizing OSPF LSA Throttling

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

	Command or Action	Purpose
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.
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`
	
	Example:
	
	`LSAID: 10.1.1.1  Type: 1  Adv Rtr: 172.16.2.2 Due in: 00:00:00.028`
	
	Example:
	
	`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**
	
	Example:
	`Routing Process "ospf 4" with ID 10.10.24.4`
	
	Example:
	`Supports only single TOS(TOS0) routes`
	
	Example:
	`Supports opaque LSA`
	
	Example:
	`Supports Link-local Signaling (LLS)`
	
	Example:
	`Initial SPF schedule delay 5000 msecs`
	
	Example:
	`Minimum hold time between two consecutive SPFs 10000 msecs`
	
	Example:
	`Maximum wait time between two consecutive SPFs 10000 msecs`
	
	Example:
	`Incremental-SPF disabled`
		(Optional) Displays information about OSPF.
		
		• The output lines shown in bold in the example indicate the LSA throttling values.

Command or Action	Purpose

Example:
Initial LSA throttle delay 100 msecs
Example:
Minimum hold time for LSA throttle 10000 msecs
Example:
Maximum wait time for LSA throttle 45000 msecs
Example:
`Minimum LSA arrival 1000 msecs`
Example:
`LSA group pacing timer 240 secs`
Example:
`Interface flood pacing timer 33 msecs`
Example:
`Retransmission pacing timer 66 msecs`
Example:
`Number of external LSA 0. Checksum Sum 0x0`
Example:
`Number of opaque AS LSA 0. Checksum Sum 0x0`	

Command or Action	Purpose

Example:
`Number of DCbitless external and opaque AS LSA 0`
Example:
`Number of DoNotAge external and opaque AS LSA 0`
Example:
`Number of areas in this router is 1. 1 normal 0 stub 0 nssa`
Example:
`External flood list length 0`
Example:
`Area 24`
Example:
`Number of interfaces in this area is 2`
Example:
`Area has no authentication`
Example:
`SPF algorithm last executed 04:28:18.396 ago`
Example:
`SPF algorithm executed 8 times`
Example:
`Area ranges are`	

Command or Action	Purpose

Example:
`Number of LSA 4. Checksum Sum 0x23EB9`
Example:
`Number of opaque link LSA 0. Checksum Sum 0x0`
Example:
`Number of DCbitless LSA 0`
Example:
`Number of indication LSA 0`
Example:
`Number of DoNotAge LSA 0`
Example:
`Flood list length 0`	

Configuration Examples for OSPF LSA Throttling

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Example OSPF LSA Throttling

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	*Cisco IOS IP Routing: OSPF Command Reference*

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 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