



OSPF Link-State Database Overload Protection

The OSPF Link-State Database Overload Protection feature allows you to limit the number of nonself-generated link-state advertisements (LSAs) for a given Open Shortest Path First (OSPF) process. Excessive LSAs generated by other routers in the OSPF domain can substantially drain the CPU and memory resources of the router.

History for the OSPF Link-State Database Overload Protection Feature

Release	Modification
12.0(27)S	This feature was introduced.
12.3(7)T	This feature was integrated into Cisco IOS Release 12.3(7)T.
12.2(25)S	This feature was integrated into Cisco IOS Release 12.2(25)S.
12.2(18)SXE	This feature was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(27)SBC	This feature was integrated into Cisco IOS Release 12.2(27)SBC.

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Prerequisites for OSPF Link-State Database Overload Protection

It is presumed you have OSPF running on your network.

Information About OSPF Link-State Database Overload Protection

Before you configure the OSPF Link-State Database Overload Protection feature, you should understand the concepts described in the following sections:

- [Benefits of Using OSPF Link-State Database Overload Protection, page 2](#)
- [How OSPF Link-State Database Overload Protection Works, page 2](#)

Benefits of Using OSPF Link-State Database Overload Protection

The OSPF Link-State Database Overload Protection feature provides a mechanism at the OSPF level to limit the number of nonself-generated LSAs for a given OSPF process. When other routers in the network have been misconfigured, they may generate a high volume of LSAs, for instance, to redistribute large numbers of prefixes. This protection mechanism prevents routers from receiving a large number of LSAs and therefore experiencing CPU and memory shortages.

How OSPF Link-State Database Overload Protection Works

When the OSPF Link-State Database Overload Protection feature is enabled, the router keeps a count of the number of received (nonself-generated) LSAs it has received. When the configured threshold number of LSAs is reached, an error message is logged. When the configured maximum number of LSAs is exceeded, the router will send a notification. If the count of received LSAs is still higher than the configured maximum after one minute, the OSPF process takes down all adjacencies and clears the OSPF database. In this ignore state, all OSPF packets received on any interface that belongs to this OSPF process are ignored and no OSPF packets are generated on any of these interfaces. The OSPF process remains in the ignore state for the time configured by the **ignore-time** keyword of the **max-lsa** command. Each time the OSPF process gets into an ignore state a counter is incremented. If this counter exceeds the number of minutes configured by the **ignore-count** keyword, the OSPF process stays permanently in the same ignore state and manual intervention is required to get the OSPF process out of the ignore state. The ignore state counter is reset to 0 when the OSPF process remains in the normal state of operation for the amount of time that was specified by the **reset-time** keyword.

If the **warning-only** keyword of the **max-lsa** command has been configured, the OSPF process will send only a warning that the LSA maximum has been exceeded.

How to Configure the OSPF Link-State Database Overload Protection Feature

This section contains the following procedure:

- [Limiting the Number of Self-Generating LSAs for an OSPF Process, page 3](#) (required)

Limiting the Number of Self-Generating LSAs for an OSPF Process

This task describes how to configure and verify a limit on the number of nonself-generating LSAs for an OSPF process.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router ospf** *process-id*
4. **router-id** *ip-address*
5. **log-adjacency-changes** [**detail**]
6. **max-lsa** *maximum-number* [*threshold-percentage*] [**warning-only**] [**ignore-time** *minutes*] [**ignore-count** *count-number*] [**reset-time** *minutes*]
7. **network** *ip-address wildcard-mask area* *area-id*

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 <i>process-id</i> Example: Router(config)# router ospf 1	Enables OSPF routing. • The <i>process-id</i> argument identifies the OSPF process.
Step 4	router-id <i>ip-address</i> Example: Router(config-router)# router-id 10.0.0.1	Specifies a fixed router ID for an OSPF process.
Step 5	log-adjacency-changes [detail] Example: Router(config-router)# log-adjacency-changes	Configures the router to send a syslog message when an OSPF neighbor goes up or down.

	Command or Action	Purpose
Step 6	max-lsa <i>maximum-number</i> [<i>threshold-percentage</i>] [warning-only] [ignore-time <i>minutes</i>] [ignore-count <i>count-number</i>] [reset-time <i>minutes</i>] Example: Router(config-router)# max-lsa 12000	Limits the number of nonself-generated LSAs an OSPF routing process can keep in the OSPF link-state database (LSDB).
Step 7	network <i>ip-address wildcard-mask area</i> <i>area-id</i> Example: Router(config-router)# network 209.165.201.1 255.255.255.255 area 0	Defines the interfaces on which OSPF runs and defines the area ID for those interfaces.

Verifying the Number of Nonself-Generated LSAs on a Router

The **show ip ospf** command is entered with the **database-summary** keyword to verify the actual number of nonself-generated LSAs on a router. This command can be used at any given point in time to display lists of information related to the OSPF database for a specific router.

```
Router# show ip ospf 2000 database database-summary
```

```
OSPF Router with ID (192.168.1.3) (Process ID 2000)
```

```
Area 0 database summary
```

LSA Type	Count	Delete	Maxage
Router	5	0	0
Network	2	0	0
Summary Net	8	2	2
Summary ASBR	0	0	0
Type-7 Ext	0	0	0
Prefixes redistributed in Type-7	0		
Opaque Link	0	0	0
Opaque Area	0	0	0
Subtotal	15	2	2

```
Process 2000 database summary
```

LSA Type	Count	Delete	Maxage
Router	5	0	0
Network	2	0	0
Summary Net	8	2	2
Summary ASBR	0	0	0
Type-7 Ext	0	0	0
Opaque Link	0	0	0
Opaque Area	0	0	0
Type-5 Ext	4	0	0
Prefixes redistributed in Type-5	0		
Opaque AS	0	0	0
Non-self	16		
Total	19	2	2

Configuration Examples for the OSPF Link-State Database Overload Protection Feature

This section contains the following example:

- [Setting a Limit for LSA Generation: Example, page 5](#)

Setting a Limit for LSA Generation: Example

In the following example, the router is configured to not accept any more nonself-generated LSAs once a maximum of 14,000 has been exceeded:

```
Router(config)# router ospf 1
Router(config-router)# router-id 192.168.0.1
Router(config-router)# log-adjacency-changes
Router(config-router)# max-lsa 14000
Router(config-router)# area 33 nssa
Router(config-router)# network 192.168.0.1 0.0.0.0 area 1
Router(config-router)# network 192.168.5.1 0.0.0.0 area 1
Router(config-router)# network 192.168.2.1 0.0.0.0 area 0
```

In the following example, the **show ip ospf** command has been entered to confirm the configuration:

```
Router# show ip ospf 1

Routing Process "ospf 1" with ID 192.168.0.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
Supports Link-local Signaling (LLS)
Supports area transit capability
Maximum number of non self-generated LSA allowed 14000
  Threshold for warning message 75%
  Ignore-time 5 minutes, reset-time 10 minutes
  Ignore-count allowed 5, current ignore-count 0
It is an area border and autonomous system boundary router
```

In the following example, the following output appears when the **show ip ospf** command has been entered during the time when the router is in the ignore state:

```
Router# show ip ospf 1

Routing Process "ospf 1" with ID 192.168.0.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
Supports Link-local Signaling (LLS)
Supports area transit capability
Maximum number of non self-generated LSA allowed 14000
  Threshold for warning message 75%
  Ignore-time 5 minutes, reset-time 10 minutes
  Ignore-count allowed 5, current ignore-count 1
  Ignoring all neighbors due to max-lsa limit, time remaining: 00:04:52
It is an area border and autonomous system boundary router
```

The following output appears when the **show ip ospf** command has been entered after the router left the ignore state:

```
Router# show ip ospf 1

Routing Process "ospf 1" with ID 192.168.0.1
Supports only single TOS(TOS0) routes
```

```
Supports opaque LSA
Supports Link-local Signaling (LLS)
Supports area transit capability
Maximum number of non self-generated LSA allowed 14000
  Threshold for warning message 75%
  Ignore-time 5 minutes, reset-time 10 minutes
  Ignore-count allowed 5, current ignore-count 1 - time remaining: 00:09:51
It is an area border and autonomous system boundary router
```

The following output appears when the **show ip ospf** command has been entered for a router that is permanently in the ignore state:

```
Router# show ip ospf 1

Routing Process "ospf 1" with ID 192.168.0.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
Supports Link-local Signaling (LLS)
Supports area transit capability
Maximum number of non self-generated LSA allowed 14000
  Threshold for warning message 75%
  Ignore-time 5 minutes, reset-time 10 minutes
  Ignore-count allowed 5, current ignore-count 6
  Permanently ignoring all neighbors due to max-lsa limit
It is an area border and autonomous system boundary router
```

Additional References

The following sections provide references related to the OSPF Link-State Database Overload Protection feature.

Related Documents

Related Topic	Document Title
Configuring OSPF	Cisco IOS IP Routing Configuration Guide <i>Cisco IOS IP Command Reference, Volume 2 of 4: Routing Protocols</i>, Release 12.3T

Standards

Standards	Title
None	—

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
None	—

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 onemodified command only.

- [max-lsa](#)

max-lsa

To limit the number of nonself-generated link-state advertisements (LSAs) that an Open Shortest Path First (OSPF) routing process can keep in the OSPF link-state database (LSDB), use the **max-lsa** command in router configuration mode. To remove the limit of non self-generated LSAs that an OSPF routing process can keep in the OSPF LSDB, use the **no** form of this command.

```
max-lsa maximum-number [threshold-percentage] [warning-only] [ignore-time minutes]
[ignore-count count-number] [reset-time minutes]
```

```
no max-lsa maximum-number [threshold-percentage] [warning-only] [ignore-time minutes]
[ignore-count count-number] [reset-time minutes]
```

Syntax Description

<i>maximum-number</i>	Maximum number of nonself-generated LSAs the OSPF process can keep in the OSPF LSBD.
<i>threshold-percentage</i>	(Optional) The percentage of the maximum LSA number, as specified by the <i>maximum-number</i> argument, at which a warning message is logged. The default is 75 percent.
warning-only	(Optional) Specifies that only a warning message is sent when the maximum limit for LSAs is exceeded. Disabled by default.
ignore-time <i>minutes</i>	(Optional) Specifies the time, in minutes, to ignore all neighbors after the maximum limit of LSAs has been exceeded. The default is 5 minutes.
ignore-count <i>count-number</i>	(Optional) Specifies the number of times the OSPF process can consecutively be placed into the ignore state. The default is 5 times.
reset-time <i>minutes</i>	(Optional) Specifies the time, in minutes, after which the ignore count is reset to zero. The default is 10 minutes.

Defaults

The number of nonself-generated LSAs that an OSPF routing process can keep in the OSPF LSDB is not limited.

threshold-percentage: 75 percent

warning-only warning message: disabled

ignore-time *minutes*: 5 minutes

ignore-count *count-number*: 5 times

reset-time *minutes*: 10 minutes

Command Modes

Router configuration

Command History

Release	Modification
12.0(27)S	This command was introduced.
12.3(7)T	This command was integrated into Cisco IOS Release 12.3(7)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.

Usage Guidelines

To prevent the OSPF process from endlessly changing from the normal state of operation to the ignore state as a result of the LSA count exceeding the maximum configured number immediately after it returns from the ignore state to the normal state of operation, the OSPF process keeps a counter on how many times the process went into the ignore state. This counter is called the ignore count. If the ignore count exceeds the maximum number of LSAs that is specified by the **ignore-count** keyword and *counter-number* argument, the OSPF process remains in the ignore state permanently. To return the OSPF process to the state of normal operation, enter the **clear ip ospf** command.

If the router is placed into a permanent ignore state, we recommend that you identify and correct the cause of the problem involving the router that is generating the LSAs, or, if possible, increase the limit that has been configured by the **max-lsa** command before you try to bring the router back into normal operation.

If the router that has generated large numbers of LSAs is not reachable, these LSAs cannot be removed from the OSPF area and domain. As a result, any other router leaving the ignore state and returning to normal operation may reach the ignore state again. We recommend that you take one of the following actions in order to bring the router back into the network:

- Temporarily increase the LSA limit to account for the stale LSAs.
- Wait until the stale LSAs are removed as a result of reaching their maximum age.
- Make sure that the router that has generated the large number of LSAs is connected to the network and is no longer generating large numbers of LSAs.

When the **warning-only** keyword is used, the OSPF process never enters the ignore state. When the LSA count exceeds the maximum limit that is specified by the *maximum-number* argument, only an error message is logged and the OSPF process continues in its normal operation.

When the **max-lsa** command is entered for the first time or when any of the parameters of the command are changed, the OSPF process undergoes a soft-reset procedure.

Examples

The following example sets a limit of 12,000 LSAs that can be received before the OSPF process enters the ignore state:

```
Router(config)# router ospf 100
Router(config-router)# router-id 209.165.201.0
Router(config-router)# log-adjacency-changes
Router(config-router)# max-lsa 12000
Router(config-router)# network 209.165.201.1 255.255.255.255
```

In the following example, an OSPF process has remained in the ignore state permanently. When the **clear ip ospf** command is entered the OSPF process returns to the state of normal operation and clears redistribution based on the OSPF routing process ID.

```
Router(config-router)# clear ip ospf 100 process
```

Related Commands

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

Glossary

LSDB—link-state database.



Note

Refer to [Internetworking Terms and Acronyms](#) for terms not included in this glossary.

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