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.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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.

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 Link-State Database Overload Protection

It is presumed that you have OSPF running on your network.
Information About OSPF Link-State Database Overload Protection

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 that 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 OSPF Link-State Database Overload Protection

Limiting the Number of Self-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
### OSPF Link-State Database Overload Protection

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

8. `end`

9. `show ip ospf [process-id area-id] database[database-summary]`

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> router ospf process-id</td>
<td>Enables OSPF routing.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config)# router ospf 1</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> router-id ip-address</td>
<td>Specifies a fixed router ID for an OSPF process.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-router)# router-id 10.0.0.1</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> log adjacency-changes [detail]</td>
<td>Configures the router to send a syslog message when an OSPF neighbor goes up or down.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-router)# log-adjacency-changes</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong> max-lsa maximum-number [threshold-percentage] [warning-only] [ignore-time minutes] [ignore-count count-number] [reset-time minutes]</td>
<td>Limits the number of nonself-generated LSAs that an OSPF routing process can keep in the OSPF link-state database (LSDB).</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-router)# max-lsa 12000</td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong> network ip-address wildcard-mask area area-id</td>
<td>Defines the interfaces on which OSPF runs and defines the area ID for those interfaces.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-router)# network 209.165.201.1 255.255.255.255 area 0</td>
<td></td>
</tr>
<tr>
<td><strong>Step 8</strong> end</td>
<td>Ends the current configuration mode and returns to Privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-router)# end</td>
<td></td>
</tr>
</tbody>
</table>
### Purpose

Displays lists of information related to the OSPF database for a specific router.

- Use this command to verify the number of nonself-generated LSAs on a router.

### Command or Action

<table>
<thead>
<tr>
<th>Step 9</th>
<th><code>show ip ospf [process-id area-id] database[database-summary]</code></th>
<th>Purpose</th>
</tr>
</thead>
</table>

**Example:**

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

### Example

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 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-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 OSPF Link-State Database Overload Protection

### 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 1
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 1
    Ignoring all neighbors due to max-lsa limit, time remaining: 00:09:51
It is an area border and autonomous system boundary router
```

OSPF Link-State Database Overload Protection
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

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
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<tbody>
<tr>
<td>Configuring OSPF</td>
<td>&quot;Configuring OSPF&quot;</td>
</tr>
<tr>
<td>OSPF commands</td>
<td>Cisco IOS IP Routing: OSPF Command Reference</td>
</tr>
<tr>
<td>Cisco IOS master command list, all releases</td>
<td>Cisco IOS Master Command List, All Releases</td>
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Standards

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<tr>
<th>Standard</th>
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MIBs

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<thead>
<tr>
<th>MIB</th>
<th>MIBs Link</th>
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<tbody>
<tr>
<td>No new or modified MIBs are supported by this</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS XE releases,</td>
</tr>
<tr>
<td>feature, and support for existing MIBs has not</td>
<td>and feature sets, use Cisco MIB Locator found at the following URL:</td>
</tr>
<tr>
<td>been modified by this feature.</td>
<td><a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
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RFCs

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<td>None</td>
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Technical Assistance

<table>
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<tr>
<th>Description</th>
<th>Link</th>
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<tbody>
<tr>
<td>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.</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
</tbody>
</table>

Feature Information for OSPF Link-State Database Overload Protection

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 Link-State Database Overload Protection

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
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<tbody>
<tr>
<td>OSPF Link-State Database Overload Protection</td>
<td>Cisco IOS XE Release 2.1</td>
<td>The OSPF Link-State Database Overload Protection feature allows you to limit the number of nonself-generated link-state advertisements (LSAs) for a given OSPF process. Excessive LSAs generated by other routers in the OSPF domain can substantially drain the CPU and memory resources of the router. The following commands are introduced or modified in the feature documented in this module:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• max-lsa</td>
</tr>
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</table>