



OSPF RFC 3623 Graceful Restart Helper Mode

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This document focuses on non-stop forwarding (NSF) helper mode for OSPFv2 in Cisco IOS software, using IETF standardized graceful restart helper mode functionality as described in RFC 3623 OSPF Graceful Restart. Graceful restart helper mode functionality, which is enabled by default, is useful for multiplatform network environments where helper mode routers on some platforms can assist restarting routers on mixed platforms that support OSPF graceful restart mode as well as helper mode.

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Prerequisites for OSPF RFC 3623 Graceful Restart Helper Mode

- OSPF must be configured on the router.

Restrictions for OSPF RFC 3623 Graceful Restart Helper Mode

- IETF Graceful Restart is not supported over sham-links.

Information About OSPF RFC 3623 Graceful Restart Helper Mode

Before configuring the OSPF RFC 3623 Graceful Restart Helper Mode feature, you should understand the following concepts:

- [Cisco NSF Routing and Forwarding Operation, page 2](#)
- [Cisco Express Forwarding for NSF, page 3](#)
- [OSPF Graceful Restart Helper Mode Functionality per RFC 3623, page 3](#)

Cisco NSF Routing and Forwarding Operation

Prior to RFC 3623 Cisco implemented the Cisco proprietary NSF referred to as Cisco NSF. Users can configure either Cisco or RFC 3623 IETF NSF, depending on which versions are supported by the Cisco IOS software version running on the network. If the software version supports both types of NSF, you need to configure all routers with the same type of NSF.

Cisco NSF is supported by the BGP, EIGRP, OSPF, and IS-IS protocols for routing and by Cisco Express Forwarding (CEF) for forwarding. The BGP, EIGRP, OSPF, and IS-IS routing protocols have been enhanced with NSF capability and awareness, which means that routers that run these protocols can detect a switchover and take the necessary actions to continue forwarding network traffic and to recover route information from the neighbor routers.

In this document, a networking device is said to be NSF-aware if it is running NSF-compatible software. A device is said to be NSF-capable if it has been configured to support NSF; therefore, it would rebuild routing information from NSF-aware or NSF-capable neighbors. The NSF router mode of operation common to the Cisco and IETF NSF implementations is as follows:

- **Restarting Mode**—Also known as IETF NSF-restarting mode or graceful-restarting mode. In this mode, the OSPF router process is performing non-stop forwarding recovery because of an RP switchover; this may result from an RP crash or a software upgrade on the active RP.
- **Helper Mode**—Also known as IETF NSF-awareness. In this mode, the neighboring router is restarting, and this router is helping in the non-stop forwarding recovery.

For more information on Cisco NSF see the following information:

<http://www.cisco.com/univercd/cc/td/doc/product/software/ios122s/122snwft/release/122s20/fsnsf20s.htm>

For more information on OSPF RFC 3623 Graceful Restart, see the following information:

<http://www.ietf.org/rfc/rfc3623.txt>

Cisco Express Forwarding for NSF

A key element of NSF is packet forwarding. The OSPF protocol depends on CEF to continue forwarding packets during switchover while the routing protocols rebuild the Routing Information Base (RIB) tables. Once OSPF has converged, CEF updates the Forwarding Information Base (FIB) table and removes stale route entries. CEF then updates the line cards with the new FIB information. CEF maintains the FIB and uses the FIB information that was current at the time of a switchover to continue forwarding packets during the switchover. This feature reduces traffic interruption during the switchover.

During normal NSF operation, CEF on the active RP synchronizes its current FIB and adjacency databases with the FIB and adjacency databases on the standby RP. Upon switchover of the active RP, the standby RP initially has FIB and adjacency databases that are mirror images of those that were current on the active RP. For platforms with intelligent line cards, the line cards maintain the current forwarding information over a switchover; for platforms with forwarding engines, CEF keeps the forwarding engine on the standby RP current with changes that are sent to it by CEF on the active RP. In this way, the line cards or forwarding engines can continue forwarding after a switchover as soon as the interfaces and a data path are available.

As the OSPF routing protocol starts to repopulate the RIB on a prefix-by-prefix basis, the updates in turn cause prefix-by-prefix updates that CEF uses to update the FIB and adjacency databases. Existing and new entries receive the new version number, indicating that they have been refreshed. The forwarding information is updated on the line cards or forwarding engines during convergence. The RP signals when the RIB has converged. The software removes all FIB and adjacency entries that have an epoch older than the current switchover epoch. The FIB now represents the newest routing protocol forwarding information.

The OSPF routing protocol runs on only the active RP, and OSPF receives routing updates from OSPF neighbor routers. The OSPF routing protocol does not run on the standby RP. Following a switchover, OSPF requests that the NSF-aware neighbor devices send state information to help rebuild the routing tables.

**Note**

For NSF operation, OSPF depends on CEF to continue forwarding packets while OSPF rebuilds the routing information.

OSPF Graceful Restart Helper Mode Functionality per RFC 3623

Helper Mode Initiation

When a neighbor router that is on the same network segment as the restarting router receives a grace-LSA from the restarting router, the neighbor enters helper mode as long as the following criteria are met:

- The neighbor must have a full adjacency with the restarting router over the associated network segment.
- There have been no changes to the link-state database since the restarting router began restarting.
- The grace period has not yet expired.
- Local policy allows the neighbor router to act as a helper router.
- The neighbor router must not be in its own graceful restart process.
- Helper mode for this router has not been disabled by the network administrator.

Helper Mode Exit

The helper router stops performing helper mode for its neighbor when one of the following events occur:

- The grace-LSA that was originated by the restarting router is flushed, to signify that the restarting router has exited the graceful restart process successfully.
- The grace period of the grace-LSA expires.
- A change in link-state database contents indicates a network topology change, forcing the termination of the graceful restart process.

For complete information regarding graceful restart functionality refer to RFC 3623:

<http://www.ietf.org/rfc/rfc3623.txt>

How to Use OSPF RFC 3623 Graceful Restart Helper Mode to Manage the Graceful Restart Process of a Neighbor Router

This section contains the following task:

- [Disabling Graceful Restart Helper Mode and Configuring Strict LSA Checking on the Helper Router, page 4](#) (optional)

Disabling Graceful Restart Helper Mode and Configuring Strict LSA Checking on the Helper Router

The graceful restart helper mode feature is enabled by default. It is not recommended to disable helper mode because the disabled neighbor will detect the lost adjacency and the graceful restart process will be terminated on the restarting neighbor router.

The strict LSA checking feature allows a helper router to terminate the graceful restart process if it detects a changed LSA that would cause flooding during the graceful restart process. Strict LSA checking is disabled by default. You can enable strict LSA checking on an OSPF helper to have the router terminate graceful restart when there is a change to an LSA that would be flooded to the restarting router. You can configure strict LSA checking on both NSF-aware and NSF-capable routers; however, this feature will become effective only when the router is in helper mode.

Complete the steps in the following task to disable helper mode or enable strict LSA checking on the NSF-aware (helper) router.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router ospf** *process-id* [**vrf** *vpn-name*]
4. **nsf ietf helper disable**
5. **nsf ietf helper strict-lsa-checking**
6. **end**
7. **show ip ospf** [*process-id*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>router ospf process-id [vrf vpn-name]</code> Example: Router(config)# router ospf 454	Configures an Open Shortest Path First (OSPF) routing process and enters router configuration mode.
Step 4	<code>nsf ietf helper disable</code> Example: Router(config-router)# nsf ietf helper disable	Disables helper mode for IETF NSF.
Step 5	<code>nsf ietf helper strict-lsa-checking</code> Example: Router(config-router)# nsf ietf strict-lsa-checking	Enables strict LSA checking on an NSF-aware (helper) router.
Step 6	<code>end</code> Example: Router(config-router)# end	Returns to privileged EXEC mode.
Step 7	<code>show ip ospf [process-id]</code> Example: Router# show ip ospf 454	Displays general information about OSPF routing processes and whether helper mode or strict LSA checking is enabled for the NSF-aware (helper) router.

Configuration Example for OSPF RFC 3623 Graceful Restart Helper Mode

This section contains the following example:

- [Disabling Helper Support for IETF NSF: Example, page 6](#)

Disabling Helper Support for IETF NSF: Example

The following configuration example disables helper support for OSPF NSF.

```
Router(config)# router ospf 200
Router(config-router)# nsf ietf helper disable
```

Additional References

The following sections provide references related to the OSPF RFC 3623 Graceful Restart Helper Mode feature.

Related Documents

Related Topic	Document Title
OSPF commands	<i>Cisco IOS IP Routing Protocols Command Reference</i>
OSPF configuration	<i>Cisco IOS IP Routing Configuration Guide</i>
Cisco Nonstop Forwarding (NSF) feature in Cisco IOS software.	<i>Cisco Nonstop Forwarding, Cisco IOS Release 12.0(22)S</i>

Standards

Standard	Title
None	—

MIBs

MIB	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

RFC	Title
RFC 2328	<i>OSPF Version 2</i>
RFC 3623	<i>Graceful OSPF Restart</i>

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

The following commands are new:

- **`nsf cisco helper disable`**
- **`nsf ietf helper disable`**
- **`nsf ietf helper strict-lsa-checking`**

nsf cisco helper disable

To disable Cisco non-stop forwarding (NSF) helper mode on a Cisco router running OSPF, use the **nsf cisco helper disable** command in router configuration mode. To reenable Cisco NSF helper mode, use the **no** form of this command.

nsf cisco helper disable

no nsf cisco helper disable

Syntax Description This command has no arguments or keywords.

Command Default Cisco NSF helper mode is enabled.

Command Modes Router configuration

Command History	Release	Modification
	12.0(32)S	This command was introduced.
	12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.

Usage Guidelines When a router in an OSPF process has NSF enabled it is said that the router is NSF-capable and will operate in graceful restart mode—the OSPF router process performs non-stop forwarding recovery due to an RP switchover. By default, the neighboring routers of the NSF-capable router will be NSF-aware and will operate in NSF helper mode. When the NSF-capable router is performing graceful restart, the helper routers assist in the non-stop forwarding recovery process. If you do not want the router to help the restarting neighbor with non-stop forwarding recovery, enter the **nsf cisco helper disable** command.

Examples The following example disables NSF helper mode for the Cisco router on OSPF process 3:

```
router ospf 3
 nsf cisco helper disable
```

Related Commands	Command	Description
	nsf cisco	Enables Cisco NSF on a Cisco router.
	nsf ietf helper disable	Disables IETF NSF helper mode on a router.
	nsf ietf helper strict-lsa-checking	Enables strict LSA checking on routers.

nsf ietf helper disable

To disable non-stop forwarding (NSF) IETF helper mode on a router running OSPF, use the **nsf ietf helper disable** command in router configuration mode. To reenable NSF helper mode, use the **no** form of this command.

nsf ietf helper disable

no nsf ietf helper disable

Syntax Description This command has no arguments or keywords.

Command Default IETF NSF helper mode is disabled.

Command Modes Router configuration

Command History	Release	Modification
	12.0(32)S	This command was introduced.
	12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.

Usage Guidelines When a router in an OSPF process has NSF enabled it is said that the router is NSF-capable and will operate in graceful restart mode—the OSPF router process performs non-stop forwarding recovery due to an RP switchover. By default, the neighboring routers of the NSF-capable router will be NSF-aware and will operate in NSF helper mode. When the NSF-capable router is performing graceful restart, the helper routers assist in the non-stop forwarding recovery process. If you do not want the router to help the restarting neighbor with non-stop forwarding recovery, enter the **nsf ietf helper disable** command.

Examples The following example disables IETF NSF helper mode on a router on OSPF process 4:

```
router ospf 4
 nsf ietf helper disable
```

Related Commands	Command	Description
	nsf cisco	Enables Cisco NSF on a Cisco router.
	nsf ietf helper disable	Disables IETF NSF helper mode on a router.
	nsf ietf helper strict-lsa-checking	Enables strict LSA checking on routers.

nsf ietf helper strict-lsa-checking

To enable strict link-state advertisement (LSA) checking on routers in an OSPF process, use the **nsf ietf helper strict-lsa-checking** command in router configuration mode. To disable strict LSA checking, use the **no** form of this command.

nsf ietf helper strict-lsa-checking

no nsf ietf helper strict-lsa-checking

Syntax Description This command has no arguments or keywords.

Command Default Strict LSA checking is disabled.

Command Modes Router configuration

Command History	Release	Modification
	12.0(32)S	This command was introduced.
	12.4(6)T	This command was integrated into Cisco IOS Release 12.4(6)T.

Usage Guidelines To configure strict LSA checking on both NSF-aware and NSF-capable routers, enter the **nsf ietf helper strict-lsa-checking** command on the router. However, strict LSA checking will not become effective until the router becomes a helper router during an IETF graceful restart process. With strict LSA checking enabled, the helper router will terminate the helping process of the restarting router if it detects that there is a change to an LSA that would be flooded to the restarting router, or if there is a changed LSA on the retransmission list of the restarting router when the graceful restart process is initiated.

Examples The following example enables strict LSA checking on a router on OSPF process 12:

```
router ospf 12
 nsf ietf helper strict-lsa-checking
```

Related Commands	Command	Description
	nsf cisco	Enables Cisco NSF on a Cisco router.
	nsf cisco helper disable	Disables IETF NSF helper mode on a Cisco router.
	nsf ietf helper disable	Disables IETF NSF helper mode on a router.

Glossary

cutover—An event in which system control and routing protocol execution are transferred from an active processor to a standby processor. This may include transfer of the packet forwarding function as well.

NSF—Non-stop forwarding. The continuation of forwarding packets across line cards during RP cutover.

OSPF—Open Shortest Path First interior gateway routing protocol.

RF—Redundancy Facility.

RP—Route Processor.

switchover—*See* cutover.



Note

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

Feature Information for OSPF RFC 3623 Graceful Restart Helper Mode

[Table 1](#) lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

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Note

[Table 1](#) lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 1 Feature Information for OSPF RFC 3623 Graceful Restart Helper Mode

Feature Name	Releases	Feature Information
OSPF RFC 3623 Graceful Restart Helper Mode	12.4(6)T	This document focuses on non-stop forwarding (NSF) for OSPFv2 in Cisco IOS software, using IETF standardized graceful restart functionality as described in RFC 3623.

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