OSPF RFC 3623 Graceful Restart Helper Mode

This document focuses on Nonstop Forwarding (NSF) helper mode for OSPFv2 in Cisco IOS software, using IETF standardized graceful restart helper mode functionality as described in RFC 3623, *Graceful OSPF 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.

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 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

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 helping in the NSF recovery.

For more information about OSPF RFC 3623 Graceful Restart, see 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 about graceful restart functionality, see RFC 3623 at http://www.ietf.org/rfc/rfc3623.txt .

The OSPF RFC 3623 Graceful Restart Helper Mode feature is enabled by default. Disabling this feature is not recommended 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 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, it becomes effective only when the router is in helper mode.

How to Use OSPF RFC 3623 Graceful Restart Helper Mode

Configuring Strict LSA Checking on the 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	**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* [**vrf** *vpn-name*] **Example:** `Router(config)# router ospf 454`	Configures an Open Shortest Path First (OSPF) routing process and enters router configuration mode.

	Command or Action	Purpose
Step 4	**nsf ietf helper disable** **Example:** `Router(config-router)# nsf ietf helper disable`	Disables helper mode for IETF NSF.

Step 5	**nsf ietf helper strict-lsa-checking**
	
	Example:
	
	`Router(config-router)# nsf ietf`
	`strict-lsa-checking`
		Enables strict LSA checking on an NSF-aware (helper) router.

Step 6	**end** **Example:** `Router(config-router)# end`	Returns to privileged EXEC mode.
Step 7	**show ip ospf** [*process-id*] **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 Examples for OSPF RFC 3623 Graceful Restart Helper Mode

Example Disabling Helper Support for IETF NSF

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	*Cisco IOS IP Routing: OSPF Command Reference*
OSPF configuration	"Configuring OSPF"
Cisco NSF feature in Cisco IOS software.	"Cisco Nonstop Forwarding"
Master list of Cisco IOS commands	Cisco IOS Master Command List, All Releases
OSPFv3 Graceful Restart	' *OSPFv3 Graceful Restart* ' module

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	*OSPF Version 2*
RFC 3623	*Graceful OSPF Restart*

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

Feature Information for OSPF RFC 3623 Graceful Restart Helper Mode

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 . An account on Cisco.com is not required.

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 NSF for OSPFv2 in Cisco IOS software, using IETF standardized graceful restart functionality as described in RFC 3623. The following commands were introduced or modified: **nsf cisco helper disable**, **nsf ietf helper disable, nsf ietf helper strict-lsa-checking**.