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Graceful OSPF Restart Implementation Report  
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## Abstract

Graceful OSPF Restart as specified in [RFC 3623](#) provides a mechanism whereby an OSPF router can stay on the forwarding path even as its OSPF software is restarted. This document provides an implementation report for this extension to the base OSPF protocol.

## Table of Contents

<a href="#">1</a>	Overview .....	<a href="#">2</a>
<a href="#">2</a>	Implementation Experience .....	<a href="#">3</a>
<a href="#">2.1</a>	Implementation Differences .....	<a href="#">3</a>
<a href="#">3</a>	MIB Reference .....	<a href="#">4</a>
<a href="#">4</a>	Authentication Mechanisms .....	<a href="#">4</a>
<a href="#">5</a>	List of Implementations .....	<a href="#">4</a>
<a href="#">6</a>	Test Scenarios .....	<a href="#">4</a>
<a href="#">7</a>	Operational Experience .....	<a href="#">4</a>
<a href="#">8</a>	Security Considerations .....	<a href="#">5</a>
<a href="#">9</a>	Intellectual Property .....	<a href="#">5</a>
<a href="#">10</a>	Normative References .....	<a href="#">5</a>

<a href="#">11</a>	Informative References .....	<a href="#">6</a>
<a href="#">12</a>	Acknowledgments .....	<a href="#">6</a>
<a href="#">13</a>	Author's Address .....	<a href="#">6</a>

## [1.](#) Overview

Today many Internet routers implement a separation of control and forwarding functions. Certain processors are dedicated to control and management tasks such as OSPF routing, while other processors perform the data forwarding tasks. This separation creates the possibility of maintaining a router's data forwarding capability while the router's control software is restarted/reloaded. For the OSPF protocol [1], this protocol mechanisms necessary to accomplish this are described in Graceful OSPF Restart [[GRACE](#)].

This document satisfies the [RFC 1264](#) [[CRITERIA](#)] requirement for a report on implementation experience for Graceful OSPF Restart. [Section 2](#) of this document contains the results of an implementation survey. It also documents implementation differences between the vendors responding to the survey. [Section 3](#) contains a MIB reference. [Sections 4](#) provide an authentication reference. [Section 5](#) simply refers to the implementations listed in [section 2](#). [Section 6](#) includes a minimal set of test scenarios. Finally, [section 7](#) includes a disclaimer with respect to operational experience.

## [2.](#) Implementation Experience

Eleven vendors have implemented graceful OSPF and have completed the implementation survey. These include Redback, Juniper, Motorola Computer Group (formerly Netplane Systems), Mahi Networks, Nexthop technologies, Force10 Networks, Procket, Alcatel, Laurel Networks, DCL (Data Connection Limited), and Ericsson. All have implemented restart from the perspective of both a restarting and helper router. All but one vendor implemented both planned and unplanned restart. All implementations are original. Seven

successfully tested interoperability with Juniper. Juniper successfully tested interoperability with Force10 Networks. One vendor tested with John Moy's GNU Public License implementation [OSPFD]. Two vendors hadn't tested interoperability at the time of the survey.

## [2.1](#) Implementation Differences

The first difference was whether or not strict LSA checking was implemented and, if so, whether it was configurable. In the context of graceful OSPF restart, strict LSA checking indicates whether or not a changed LSA will result in termination of graceful restart by a helping router. Four vendors made it configurable (three defaulted it to enabled and one disabled), another made it a compile option (shipping with strict LSA checking disabled), another didn't implement it at all, and five implemented strict LSA checking with no configuration option to disable it.

The second was whether a received grace LSA would be taken to apply only to the adjacency on which it was received or all adjacencies with the restarting router. This is a rather subtle difference since it only applies to helping and restarting routers with more than one full adjacency at the time of restart. Eight vendors implemented the option of received grace LSA only applying to the adjacency on which it was received. Three vendors applied the grace LSA to all adjacencies with the grace LSA originator (i.e., the restarting router).

The final difference was in whether or not additional extensions were implemented to accommodate other features such as protocol redistribution or interaction with MPLS VPNs [[VPN](#)]. Five vendors implemented extensions and six did not. It should be noted that such extensions are beyond the scope of Graceful OSPF Restart [[GRACE](#)].

## [3](#). MIB Reference

MIB objects for the Graceful OSPF Restart have been added to the OSPF Version 2 Management Information Base [[OSPFMIB](#)]. Additions include:

- Objects ospfRestartSupport, ospfRestartInterval, ospfRestartAge, ospfRestartExitReason, and ospfRestartStrictLsaChecking to ospfGeneralGroup.
- Objects ospfNbrRestartHelperStatus, ospfNbrRestartHelperAge, and ospfNbrRestartHelperExitReason to ospfNbrEntry.
- Objects ospfVirtNbrRestartHelperStatus, ospfVirtNbrRestartHelperAge, and ospfVirtNbrRestartHelperExitReason to ospfVirtNbrEntry.

#### [4.](#) Authentication Mechanisms

The authentication mechanisms are the same as those implemented by the base OSPF protocol [[OSPF](#)].

#### [5.](#) List of Implementations

Refer to [section 2](#).

#### [6.](#) Test Scenarios

A router implementing graceful restart should test, at a minimum, the following scenarios as both a restarting and helping router. For all scenarios, monitoring data plane traffic may be used to assure the restart is non-disruptive:

1. Operation over a broadcast network.
2. Operation over a P2P network.
3. Operation over a virtual link.
4. Operation using OSPF MD5 authentication.
5. Early graceful restart termination when an LSA consistency is detected.
6. Early graceful restart termination when a flooded LSA changes (if implemented).

#### [7.](#) Operational Experience

Since the feature is configurable it is difficult to evaluate operational experience at this juncture. However, service providers have tested and evaluated the feature.

#### [8.](#) Security Considerations

This document does not address any security issues other a reference to the [RFC 2328](#) [OSPF]. Security considerations for the OSPF protocol are included in [RFC2328](#) [OSPF]. Security considerations for Graceful OSPF Restart are included in [[GRACE](#)].

## [9](#). Intellectual Property

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## [10](#). Normative References

- [OSPF] Moy, J., "OSPF Version 2", [RFC 2328](#), April 1998.
- [GRACE] Moy, J., Pillay-Esnault, P., Lindem, A., "Graceful OSPF Restart", [RFC 3623](#), July 2003.
- [OSPFMIB] Joyal, D., et al, "OSPF Version 2 Management Information Base", [draft-ietf-ospf-mib-update-08.txt](#), December 2003, work in progress.
- [CRITERIA] Hinden, R., "Routing Protocol Criteria", [RFC 1264](#), October 1991.

## 11. Informative References

- [VPN] Rosen, E., Rekhter, Y. "BGP/MPLS IP VPNs",  
[draft-ietf-l3vpn-rfc2547bis-01.txt](#),  
September 2003, work in progress.
- [OSPF] Moy, J., "OSPF Complete Implementation",  
Addison-Wesley, 1991, ISBN 0-201-30966-1

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