Internet Engineering Task Force (IETF)
Request for Comments: 7506
Updates: 4379
Category: Standards Track
ISSN: 2070-1721

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April 2015

IPv6 Router Alert Option for MPLS Operations, Administration, and Maintenance (OAM)

Abstract

RFC 4379 defines the MPLS Label Switched Path (LSP) Ping/Traceroute mechanism in which the Router Alert Option (RAO) MUST be set in the IP header of the MPLS Echo Request messages and may conditionally be set in the IP header of the MPLS Echo Reply messages depending on the Reply Mode used. While a generic "Router shall examine packet" Option Value is used for the IPv4 RAO, there is no generic RAO value defined for IPv6 that can be used. This document allocates a new, generic IPv6 RAO value that can be used by MPLS Operations, Administration, and Maintenance (OAM) tools, including the MPLS Echo Request and MPLS Echo Reply messages for MPLS in IPv6 environments. Consequently, it updates RFC 4379.

The initial motivation to request an IPv6 RAO value for MPLS OAM comes from the MPLS LSP Ping/Traceroute. However, this value is applicable to all MPLS OAM and not limited to MPLS LSP Ping/ Traceroute.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc7506.

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1. Introduction

A commonly deployed MPLS OAM tool is specified in [RFC4379], "Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures", which is used to diagnose MPLS network data planes. This specification, often referred to as "MPLS LSP Ping/Traceroute" [RFC4379], requires the use of the Router Alert Option (RAO) in the IP header. For example, Section 4.3 of [RFC4379] states that the IP RAO MUST be set in the IP header of an MPLS Echo Request message. Similarly, Section 4.5 of [RFC4379] states that the IP RAO MUST be set in the IP header of an MPLS Echo Reply message if the Reply Mode in the Echo Request is set to "Reply via an IPv4/IPv6 UDP packet with Router Alert".

[RFC2113] defines a generic Option Value 0x0 for IPv4 RAO that is used in LSP Ping and LSP Traceroute for MPLS in IPv4 environments. This IPv4 RAO value of 0x0 is assigned to "Router shall examine packet". However, currently there is no generic IPV6 RAO value defined that can be used in LSP Ping and LSP Traceroute for MPLS in

IPv6 environments. Specifically, [RFC2711] defined the Router Alert for a general IPv6 purpose but required the Value field in the RAO to indicate a specific reason for using the RAO. Because there is no defined value for MPLS LSP Ping/Traceroute use or for general use, it is not possible for MPLS OAM tools to use the IPv6 Router Alert mechanism.

As vendors are starting to implement MPLS on the IPv6 control plane (e.g., [LDP-IPV6]), there is a need to define and allocate such an Option Value for IPv6 in order to comply with [RFC4379]. This document defines a new IPv6 RAO value that can be used by MPLS OAM tools, including the MPLS Echo Request and MPLS Echo Reply messages for MPLS in IPv6 environments.

This document closes the gap discussed in the third paragraph of Section 3.4.2 in [RFC7439].

2. Specification of Requirements

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

3. IPv6 RAO Value for MPLS OAM

This document defines a new Option Value (69) for the IPv6 RAO to alert transit routers to examine the packet more closely for MPLS OAM purposes. This Option Value is used by any MPLS OAM application that requires their packets to be examined by a transit router.

In the scope of this document, this Option Value will be used by the MPLS Echo Request and MPLS Echo Reply for its IPv6 messages, as is required by [RFC4379].

4. Updates to RFC 4379

[RFC4379] specifies the use of the RAO in the IP header. Sections 4.3 and 4.5 of [RFC4379] are updated as follows:

For every time in which the "Router Alert IP Option" is used, the following text is appended:

> In case of an IPv4 header, the generic IPv4 RAO value 0x0 [RFC2113] SHOULD be used. In case of an IPv6 header, the IPv6 RAO value (69) allocated through this document for MPLS OAM MUST be used.

5. IANA Considerations

This document defines a new value (69) for the IPv6 RAO to alert transit routers to examine the packet more closely for MPLS OAM purposes. IANA has assigned a new code point under its "IPv6 Router Alert Option Values" registry defined by [RFC2711], updated by [RFC5350], and maintained in [IANA-IPv6-RAO]. The new code point is as follows:

Value	Description	Reference
69	MPLS OAM	RFC 7506

6. Security Considerations

This document introduces no new security concerns in addition to what have already been captured in [RFC4379] and [RFC6398], the latter of which expands the security considerations of [RFC2113] and [RFC2711].

IPv6 packets containing the MPLS OAM RAO are encapsulated with an MPLS header and are not expected to be inspected by every label switched hop within an MPLS LSP. Consequently, this value of the RAO will be processed by the appropriate router and is not subject to the problem of being ignored, as described in Section 2.2 of [RFC7045].

7. References

7.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, <http://www.rfc-editor.org/info/rfc2119>.

[RFC2711] Partridge, C. and A. Jackson, "IPv6 Router Alert Option", RFC 2711, October 1999, <http://www.rfc-editor.org/info/rfc2711>.

[RFC4379] Kompella, K. and G. Swallow, "Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures", RFC 4379, February 2006, <http://www.rfc-editor.org/info/rfc4379>.

[RFC5350] Manner, J. and A. McDonald, "IANA Considerations for the IPv4 and IPv6 Router Alert Options", RFC 5350, September 2008, <http://www.rfc-editor.org/info/rfc5350>.

[RFC6398] Le Faucheur, F., Ed., "IP Router Alert Considerations and Usage", BCP 168, RFC 6398, October 2011, <http://www.rfc-editor.org/info/rfc6398>.

7.2. Informative References

[IANA-IPv6-RAO]
IANA, "IPv6 Router Alert Option Values", <http://www.iana.org/assignments/ipv6-routeralert-values>.

[LDP-IPV6] Asati, R., Pignataro, C., Raza, K., Manral, V., and R. Papneja, "Updates to LDP for IPv6", Work in Progress, draft-ietf-mpls-ldp-ipv6-17, February 2015.

[RFC2113] Katz, D., "IP Router Alert Option", RFC 2113, February 1997, <http://www.rfc-editor.org/info/rfc2113>.

[RFC7045] Carpenter, B. and S. Jiang, "Transmission and Processing of IPv6 Extension Headers", RFC 7045, December 2013, <http://www.rfc-editor.org/info/rfc7045>.

[RFC7439] George, W., Ed. and C. Pignataro, Ed., "Gap Analysis for Operating IPv6-Only MPLS Networks", RFC 7439, January 2015, <http://www.rfc-editor.org/info/rfc7439>.

Acknowledgements

The authors would like to thank George Swallow, Ole Troan, Bob Hinden, Faisal Iqbal, Mathew Janelle, and Gregory Mirsky for their useful input.

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