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IPv6 Router Alert Option

Status of this Memo

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Abstract

This memo describes a new IPv6 Hop-by-Hop Option type that alerts transit routers to more closely examine the contents of an IP datagram. This option is useful for situations where a datagram addressed to a particular destination contains information that may require special processing by routers along the path.

1.0 Introduction

New protocols, such as RSVP, use control datagrams which, while addressed to a particular destination, contain information that needs to be examined, and in some case updated, by routers along the path between the source and destination. It is desirable to forward regular datagrams as rapidly as possible, while ensuring that the router processes these special control datagrams appropriately. Currently, however, the only way for a router to determine if it needs to examine a datagram is to at least partially parse upper layer data in all datagrams. This parsing is expensive and slow. This situation is undesirable.

This document defines a new option within the IPv6 Hop-by-Hop Header. The presence of this option in an IPv6 datagram informs the router that the contents of this datagram is of interest to the router and to handle any control data accordingly. The absence of this option in an IPv6 datagram informs the router that the datagram does not contain information needed by the router and hence can be safely

routed without further datagram parsing. Hosts originating IPv6 datagrams are required to include this option in certain circumstances.

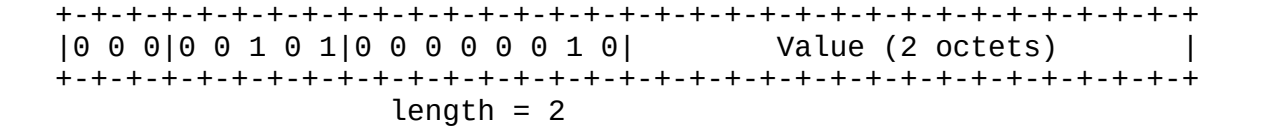
The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC-2119].

2.0 Approach

The goal is to provide an efficient mechanism whereby routers can know when to intercept datagrams not addressed to them without having to extensively examine every datagram. The described solution is to define a new IPv6 Hop-by-Hop Header option having the semantic "routers should examine this datagram more closely" and require protocols such as RSVP to use this option. This approach incurs little or no performance penalty on the forwarding of normal datagrams. Not including this option tells the router that there is no need to closely examine the contents of the datagram.

2.1 Syntax

The router alert option has the following format:



The first three bits of the first byte are zero and the value 5 in the remaining five bits is the Hop-by-Hop Option Type number. [RFC-2460] specifies the meaning of the first three bits. By zeroing all three, this specification requires that nodes not recognizing this option type should skip over this option and continue processing the header and that the option must not change en route.

There MUST only be one option of this type, regardless of value, per Hop-by-Hop header.

Value: A 2 octet code in network byte order with the following values:

0	Datagram contains a Multicast Listener Discovery message [RFC-2710].
1	Datagram contains RSVP message.
2	Datagram contains an Active Networks message.
3-65535	Reserved to IANA for future use.

Alignment requirement: 2n+0

Values are registered and maintained by the IANA. See section 5.0 for more details.

2.2 Semantics

The option indicates that the contents of the datagram may be interesting to the router. The router's interest and the actions taken by employing Router Alert MUST be specified in the RFC of the protocol that mandates or allows the use of Router Alert.

The final destination of the IPv6 datagram MUST ignore this option upon receipt to prevent multiple evaluations of the datagram. Unrecognized value fields MUST be silently ignored and the processing of the header continued.

Routers that recognize the option will examine datagrams carrying it more closely to determine whether or not further processing is necessary. The router only needs to parse the packet in sufficient detail to decide whether the packet contains something of interest. The value field can be used by an implementation to speed processing of the datagram within the transit router.

Observe that further processing can involve protocol layers above IPv6. E.g., for RSVP messages, the datagram will have to undergo UDP and RSVP protocol processing. Once the datagram leaves the IPv6 layer, there is considerable ambiguity about whether the router is acting as an IPv6 host or an IPv6 router. Precisely how the router handles the contents is value-field specific. However, if the processing required for the datagram involves examining the payload of the IPv6 datagram, then the interim router is performing a host function and SHOULD interpret the data as a host.

3.0 Impact on Other Protocols

For this option to be effective, its use MUST be mandated in protocols that expect routers to perform significant processing on datagrams not directly addressed to them. Routers are not required to examine the datagrams not addressed to them unless the datagrams include the router alert option.

All IPv6 datagrams containing an RSVP message MUST contain this option within the IPv6 Hop-by-Hop Options Header of such datagrams.

4.0 Security Considerations

Gratuitous use of this option can cause performance problems in routers. A more severe attack is possible in which the router is flooded by bogus datagrams containing router alert options.

The use of the option, if supported in a router, MAY therefore be limited by rate or other means by the transit router.

5.0 IANA Considerations

The value field described in Section 2.1 is registered and maintained by IANA. New values are to be assigned via IETF Consensus as defined in RFC 2434 [RFC-2434].

6.0 Notice on Intellectual Property

7.0 References

[RFC-2119] Bradner, S., "Key words for use in RFC's to Indicate Requirement Levels", BCP 14, RFC 2119, March 1977.

[RFC-2205] Braden, B. (ed.), Zhang, L., Berson, S., Herzog, S. and S. Jamin, "Resource ReSerVation Protocol (RSVP)", RFC 2205, September 1997.

[RFC-2434] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 2434, October 1998.

[RFC-2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", RFC 2460, December 1998.

[RFC-2710] Deering, S., Fenner, W. and B. Haberman, "Multicast Listener Discovery (MLD) for IPv6", RFC 2710, October 1999.

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7.0 Full Copyright Statement

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