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IANA Considerations for the IPv4 and IPv6 Router Alert Option
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Abstract

This document provides new instructions to IANA on the allocation of IPv4 and IPv6 Router Alert Option Values.

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1. Introduction

The IP Router Alert Option is defined for IPv4 in [RFC2113]. A similar IPv6 option is defined in [RFC2711]. When one of these options is present in an IP datagram, it indicates that the contents of the datagram may be interesting to routers. The Router Alert Option (RAO) is used by protocols such as RSVP [RFC2205] and IGMP [RFC3376].

Both the IPv4 and IPv6 option contain a two octet value field to carry extra information. This information can be used, for example, by routers to determine whether or not the packet should be more closely examined by them.

This document proposes the creation of a new IANA registry for managing IPv4 Router Alert Option Values. In conjunction with this, it also proposes an update to the way in which IPv6 Router Alert Option Values are assigned in the existing IANA registry.

2. Requirements notation

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. Use of the Router Alert Option Value Field

One difference betwen the specifications for the IPv4 and IPv6 Router Alert Options is the way in which values for the value field are managed.

In [RFC2113], the IPv4 Router Alert Option value field has the value 0 assigned to "Router shall examine packet". All other values (1-65535) are reserved. No mechanism is provided for the allocation of these values by IANA.

The IPv6 Router Alert Option has an IANA managed registry [IANA-IPv6RAO] containing allocations for the value field. All values in this registry are assigned by IETF consensus.

In [RFC3175] the IPv4 Router Alert Option Value is described as a parameter which provides "additional information" to the router in making its interception decision, rather than as a registry managed by IANA. As such, this aggregation mechanism makes use of the value field to carry the reservation aggregation level. For the IPv6 option, this document requests a set of 32 values to be assigned by

IANA for indicating reservation levels. However, since other registrations had already been made in that registry these values are from 3-35 (which is actually a set of 33 values).

Although it would be strongly desirable to have the same values being used in both the IPv4 and IPv6 registries, the initial allocations in [RFC2711] and the aggregation level allocations in [RFC3175] have made this impossible. The following table shows the allocations in the IPv6 registry and values used in the IPv4 registry, where the latter have been deduced from [RFC2113] and [RFC3175] with the assumption that the number of aggregation levels can be limited to 32 as in the IPv6 case. Entries for values 6 to 31 have been elided for brevity.

Value	IPv4 RAO Meaning	IPv6 RAO Meaning
0	Router shall examine packet [RFC2113] [RFC2205] [RFC3376] [RFC4286]	Datagram contains a Multicast Listener Discovery message [RFC2711] [RFC2710] [RFC4286]
1	Aggregated Reservation Nesting Level 1 [RFC3175]	Datagram contains RSVP message [RFC2711] [RFC2205]
2	Aggregated Reservation Nesting Level 2 [RFC3175]	Datagram contains an Active Networks message [RFC2711] [Schwartz2000]
3	Aggregated Reservation Nesting Level 3 [RFC3175]	Aggregated Reservation Nesting Level 0 [RFC3175]
4	Aggregated Reservation Nesting Level 4 [RFC3175]	Aggregated Reservation Nesting Level 1 [RFC3175]
5	Aggregated Reservation Nesting Level 5 [RFC3175]	Aggregated Reservation Nesting Level 2 [RFC3175]
...	...	...
32	Aggregated Reservation Nesting Level 32 [RFC3175]	Aggregated Reservation Nesting Level 29 [RFC3175]
33	Reserved	Aggregated Reservation Nesting Level 30 [RFC3175]
34	Reserved	Aggregated Reservation Nesting Level 31 [RFC3175]
35	Reserved	Aggregated Reservation Nesting Level 32(?) [RFC3175]

36-65534	Reserved	Reserved to IANA for future use
65535	Reserved	Reserved [IANA-IPv6RAO]

The entry in the above table for the IPv6 RAO Value of 32 has been marked with a question mark due to an inconsistency in the text of [RFC3175], which is consequently reflected in the IANA registry. In that document the values 3-35 (i.e. 33 values) are defined for nesting levels 0-31 (i.e. 32 levels).

It is unclear why nesting levels begin at 1 for IPv4 (described in section 1.4.9 of [RFC3175]) and 0 for IPv6 (allocated in section 6 of [RFC3175]).

Although it is not possible to remedy the past inconsistency between the two sets of allocations, it is still preferable that future allocations should be made identically in both registries.

4. IANA Considerations

This section contains the proposed new procedures for managing Router Alert Option Values. This requires the creation of a registry for IPv4 Router Alert Option Values (described in Section 4.1) and changes to the way in which IPv6 Router Alert Option Values are managed (described in Section 4.2).

4.1. IANA Considerations for IPv4 Router Alert Option Values

The value field, as specified in [RFC2113] is two octets in length. The value field is registered and maintained by IANA. The initial contents of this registry are:

Value	Description	Reference
0	Router shall examine packet	[RFC2119]
1-32	Aggregated Reservation Nesting Level	[RFC3175]
33-35	Reserved (not to be allocated) - Note: These values are allocated in the IPv6 Router Alert Option Values registry	
36-65534	Reserved to IANA for future use	
65535	Reserved	

New values are to be assigned via IETF Consensus as defined in [RFC2434]. When a new allocation is made in this registry an

identical registration MUST be made in the IPv6 Router Alert Option Values registry, or that value MUST be reserved. In the case that it is reserved rather than allocated, the registry entry should say "Reserved (not to be allocated) - Note: This value is allocated in the IPv6 Router Alert Options registry".

4.2. IANA Considerations for IPv6 Router Alert Option Values

The registry for IPv6 Router Alert Option Values should continue to be maintained as specified in [RFC2711]. However, when a new allocation is made in this registry an identical registration MUST be made in the IPv4 Router Alert Option Values registry, or that value MUST be reserved. In the case that it is reserved rather than allocated, the registry entry should say "Reserved (not to be allocated) - Note: This value is allocated in the IPv4 Router Alert Options registry".

5. Alternative Proposals

In Section 4 this document describes one way of modifying the Router Alert Option registry management, but this is not necessarily the only solution.

One question that arises is what the intended status of this document should be. Currently this document is aimed as a standards track document, that modifies [RFC2113] and [RFC2711]. It is not clear whether this is the right option. A draft aimed at becoming a BCP might be an alternative.

This document currently proposes the use of separate registries for IPv4 and IPv6 Router Alert Options, but with coordinated management of future allocations. This is mainly because of the differences in the existing allocation, e.g. for the 0 codepoint. An alternative proposal would be to use a single combined registry.

It might also be desirable to align the Aggregated Reservation Nesting Levels, as defined in [RFC3175], for IPv4 and IPv6. Aggregated Nesting Level 1 for IPv4 would then need to move to using the codepoint 4, as in the IPv6 case. However, such a change may not be possible.

6. Security Considerations

Since this document is only concerned with the IANA management of the IPv4 Router Alert Option values registry it raises no new security issues beyond those identified in [RFC2113] and [RFC2711].

7. Acknowledgements

Thanks to Robert Hancock, Martin Stiemerling and Alan Ford for their helpful comments on this document.

8. References

8.1. Normative References

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