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IANA Considerations for the IPv4 and IPv6 Router Alert Options

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Abstract

This document updates the IANA allocation rules and registry 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 the Resource Reservation Protocol (RSVP) [RFC2205] and IGMP [RFC3376].

Both the IPv4 and IPv6 options 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.

There can be up to 65536 values for the RAO. Yet, currently there is only a registry for IPv6 values. No registry or allocation policies are defined for IPv4.

This document updates the IANA registry for managing IPv4 and IPv6 Router Alert Option Values, and removes one existing IPv6 Router Alert Option Value.

2. Use of the Router Alert Option Value Field

One difference between the specifications for the IPv4 and IPv6 Router Alert Options is the way 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. Neither a management mechanism (e.g., an IANA registry) nor an allocation policy are provided for the IPv4 RAO values.

The IPv6 Router Alert Option has an IANA-managed registry [IANA-IPv6RAO] containing allocations for the Value field.

In [RFC3175], the IPv4 Router Alert Option Value is described as a parameter that 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, IANA has assigned a set of 32 values to indicate reservation levels. However, since other registrations have already been made in that registry, these values are from 3-35 (which is actually a set of 33 values).

Although it might have been desirable to have the same values 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 the 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 assignment
65535	Reserved	Reserved [IANA-IPv6RAO]

Note (*): The entry in the above table for the IPv6 RAO Value of 35 (Aggregated Reservation Nesting Level 32) has been marked due to an inconsistency in the text of [RFC3175], and 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). Similarly, value 3 is a duplicate, because aggregation level 0 means end-to-end signaling, and this already has an IPv6 RAO value "1" assigned.

Also note that 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]).

Section 3.2 of this document redefines these so that for IPv6, value 3 is no longer used and values 4-35 represent levels 1-32. This removes the above inconsistencies.

3. IANA Considerations

This section contains the new procedures for managing IPv4 Router Alert Option Values. IANA has created a registry for IPv4 Router Alert Option Values (described in Section 3.1) and has updated the IPv6 Router Alert Option Values (described in Section 3.2).

IP Router Alert Option Values are currently managed separately for IPv4 and IPv6. This document does not change this, as there is little value in forcing the two registries to be aligned.

3.1. 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	[RFC2113]
1-32	Aggregated Reservation Nesting Level	[RFC3175]
33-65502	Available for assignment by the IANA	
65503-65534	Available for experimental use	
65535	Reserved	

New values are to be assigned via IETF Review as defined in [RFC5226].

3.2. IANA Considerations for IPv6 Router Alert Option Values

The registry for IPv6 Router Alert Option Values continues to be maintained as specified in [RFC2711]. In addition, the following value has been removed from the IANA registry and reserved for possible future use (not to be allocated currently). The reason is that it is a duplicate value; aggregation level 0 means end-to-end signaling, and this already has an IPv6 RAO value "1" assigned.

Value	Description	Reference
3	RSVP Aggregation level 0	[RFC3175]

The following IPv6 RAO values are available for experimental use:

Value	Description	Reference
65503-65534	Experimental use	

4. Security Considerations

Since this document is only concerned with the IANA management of the IPv4 and IPv6 Router Alert Option Values registry, it raises no new security issues beyond those identified in [RFC2113] and [RFC2711].

Yet, as discussed in RFC 4727 [RFC4727], production networks do not necessarily support the use of experimental code points in IP option headers. The network scope of support for experimental values should be evaluated carefully before deploying any experimental RAO value across extended network domains, such as the public Internet. The potential to disrupt the stable operation of the network hosting the experiment through the use of unsupported experimental code points is a serious consideration when planning an experiment using such code points.

When experimental RAO values are deployed within an administratively self-contained network domain, the network administrators should ensure that each value is used consistently to avoid interference between experiments. When experimental values are used in traffic that crosses multiple administrative domains, the experimenters should assume that there is a risk that the same values will be used simultaneously by other experiments, and thus that there is a

possibility that the experiments will interfere. Particular attention should be given to security threats that such interference might create.

5. Acknowledgements

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6. References

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