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IPv6 Fast Router Advertisement
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Abstract

This document specifies an amendment to the router solicitation handling procedures in RFC 2461 that allow for improved default router aquisition performance when an active IP host moves from one subnet to another.

1.0 Introduction

RFC 2461 [RFC2461] states that a router MUST delay a response to a Router Solicitation (RS) by a random time between 0 and MAX_RA_DELAY_TIME seconds. The idea behind MAX_RA_DELAY_TIME is if there is more than one router on the link, simultaneously transmitted responses will collide if the routers try to answer the RS immediately, and, additionally, to avoid congestion when a link comes up and all hosts on the link solicit.

The impact of this constraint on the performance of default router aquisition for hosts that move between subnets can be severe. Consider a wireless link layer technology in which the mobile host gets a trigger from the link layer when the link comes up. The host can immediately send out a RS rather than waiting for the periodically multicast Router Advertisement (RA), in order to optimize default router aquisition. However, if the router abides by RFC 2461, default router aquisition is delayed by some random amount, increasing the amount of time before the host comes up on the link and can get its traffic.

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].

2.0 Fast Router Advertisement

To allow for faster response times in the processing of RSs, at most one router on any given link SHOULD be allowed to respond immediately to RSs sent by hosts on that link. Determination of how this router is designated is outside the scope of this document. An RA that is immediately unicast to the sender rather than delayed is known as a "fast RA".

3.0 Processing Router Solicitations

A router that is configured to provide fast RAs MUST maintain a counter, FastRACounter, of the fast RAs sent since the last unsolicited multicast RA was sent. when an RS is received, an RA MUST be sent immediately if:

FastRACounter <= MAX_FAST_RAS

where MAX_FAST_RAS is the maximum number of RAs returned before rolling over to multicast.

A router SHOULD choose to unicast the response directly to the soliciting host's address (if the solicitation's source address

is not the unspecified address), otherwise the router MUST schedule a multicast Router Advertisement in accordance with RFC 2461.

When a fast RA is sent, FastRACounter MUST be incremented by one. By default, MAX_FAST_RAS is 10, but it SHOULD be configured based on router capacity and expected mobile host solicitation load.

When FastRACounter exceeds MAX_FAST_RAS, a multicast Router Advertisement SHOULD be scheduled for transmission as soon as possible subject to the restriction that the interval between multicast Router Advertisements not be less than MIN_DELAY_BEWTEEN_RAS. Any further Router Solicitations received after FastRACounter exceeds MAX_FAST_RAS and before sending the next multicast Router Advertisement MUST be discarded. The FastRACounter MUST be reset to zero after the next multicast Router Advertisement is sent and processing for fast Router Advertisement recommences.

4.0 Security Considerations

RFC 2461 contains a possible vulnerability to a DoS attack from a host that bombards the router with RSs. Though the exact timing of the RA response is variable, the router is still required to respond with a unicast RA. As a consequence, a malicious host could tie a router up in responding to individually transmitted RSs. This document addresses this security vulnerability by limiting the upper bound of the Router Advertisement's response rate to (MAX_FAST_RAS+1)/MIN_DELAY_BETWEEN_RAS.

5.0 IANA Considerations

This document has no actions for IANA.

6.0 Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2461] Narten, T., Nordmark, E., and Simpson, W., "Neighbor Discovery for IP Version 6 (IPv6)", RFC 2461, December, 1998.

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