IPv6 Fast Router Advertisement
draft-mkhalil-ipv6-fastra-03.txt

Status of this Memo

This document is an individual contribution for consideration by the mobile-IP Working Group of the Internet Engineering Task Force. Comments should be submitted to the mobile-ip@sunroof.eng.sun.com mailing list.

Distribution of this memo is unlimited.

This document is an Internet-Draft and is in full conformance with all provisions of Section 10 of RFC2026. Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at:

http://www.ietf.org/ietf/1id-abstracts.txt

The list of Internet-Draft Shadow Directories can be accessed at:


Abstract

This document specifies an amendment to the router solicitation handling procedures in RFC 2461 that allow for improved default router acquisition 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 acquisition 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 acquisition. However, if the router abides by RFC 2461, default router acquisition 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:

\[
\text{FastRACounter} \leq \text{MAX_FAST_RAS}
\]

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_BETWEEN_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 \((\text{MAX\_FAST\_RAS}+1)/\text{MIN\_DELAY\_BETWEEN\_RAS}\).

5.0 References


Acknowledgements

The authors would like to thank Erik Nordmark for his technical feedback.

Authors’ Contact Information

James Kempf
DoCoMo Communications Laboratories USA
180 Metro Drive
San Jose, CA
95110
Phone: +1 650 451 4711
Email: kempf@docomolabs-usa.com

Mohamed M Khalil
Nortel Networks Inc.
2201 Lakeside Blvd
Richardson, TX 75082-4399
mkhalil@nortelnetworks.com

Brett Pentland
Centre for Telecommunications and Information Engineering