IPv6 Maintenance
Internet-Draft
Updates: 4861 (if approved)
Intended status: Standards Track
Expires: June 1, 2018

S. Krishnan
Kaloom
J. Korhonen
Broadcom
S. Chakrabarti
Ericsson
E. Nordmark
Arista Networks
A. Yourtchenko
cisco

November 28, 2017

Support for adjustable maximum router lifetimes per-link
draft-ietf-6man-maxra-04

Abstract

The IPv6 Neighbor Discovery protocol specifies the maximum time allowed between sending unsolicited multicast Router Advertisements from a router interface as well as the maximum router lifetime. It also allows the limits to be overridden by link-layer specific documents. This document allows for overriding these values on a per-link basis.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at https://datatracker.ietf.org/drafts/current/.

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."

This Internet-Draft will expire on June 1, 2018.

Table of Contents

1. Introduction

IPv6 Neighbor Discovery relies on IP multicast based on the expectation that multicast makes efficient use of available bandwidth and avoids generating interrupts in the network nodes. On some datalink layers multicast may not be natively supported. On such links, any possible reduction of multicast traffic will be highly beneficial. Unfortunately, due to the fixed protocol constants specified in [RFC4861], it is difficult to relax the multicast timers for neighbor discovery. There are already link technology specific clarifications describing how to tune the Neighbor Discovery Protocol (NDP) constants for certain systems with in order to reduce excess NDP traffic. e.g. [RFC6459][RFC7066] contain such clarifications for 3GPP cellular links.

This document specifies updates to the IPv6 Neighbor Discovery Protocol [RFC4861] for increasing the the maximum time allowed between sending unsolicited multicast Router Advertisements (RA) from a router interface as well as for the maximum router lifetime.

2. Terminology

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. Relationship between AdvDefaultLifetime and MaxRtrAdvInterval

MaxRtrAdvInterval is an upper bound on the time between which two successive Router Advertisement messages are sent. Therefore one might reason about the relationship between these two values in terms of a ratio K=AdvDefaultLifetime/MaxRtrAdvInterval, which expresses how many Router Advertisements will be guaranteed to be sent before the router lifetime expires.

Assuming unicast Solicited Router Advertisements or a perfectly stable network, on a theoretically perfect link with no losses, it would have been sufficient to have K just above 1 - so that the sent Router Advertisement refreshes the router entry just before it expires. On the real links which allow for some loss, one would need to use K>2 in order to minimize the chances of a single router advertisement loss causing a loss of the router entry.

The exact calculation will depend on the packet loss probability. An example: if we take a ballpark value of 1% probability of a packet loss, then K=2 will give 0.01% percent chance of an outage due to a packet loss, K=3 will give 0.0001% chance of an outage, and so forth. To reverse the numbers, with these parameters, K~=1 gives 99% reliability, K~=2 gives 99.99% reliability, and K~=3 gives 99.9999% reliability - the latter should be good enough for a lot of scenarios.

In a network with higher packet loss probabilities or if the higher reliability is desired, the K might be chosen to be even higher. On the other hand, some of the data link layers provide reliable delivery at layer 2 - so there one might even consider using the "theoretical" value of K just above 1. Since the choice of these two parameters does not impact interoperability per se, this document does not impose any specific constraints on their values other than providing the guidelines in this section, therefore each individual link can optimize accordingly to its use case.

Also AdvDefaultLifetime MUST be set to a value greater than or equal to the selected MaxRtrAdvInterval. Otherwise, a router lifetime is guaranteed to expire before the new Router Advertisement has a chance to be sent, thereby creating an outage.

4. Updates to RFC4861

This document updates Section 4.2 and Section 6.2.1. of [RFC4861] to update the following router configuration variables.

In Section 4.2, inside the paragraph that defines Router Lifetime, change 9000 to 65535 seconds.

In Section 6.2.1, inside the paragraph that defines MaxRtrAdvInterval, change 1800 to 65535 seconds.

In Section 6.2.1, inside the paragraph that defines AdvDefaultLifetime, change 9000 to 65535 seconds.

As explained in Section 3, the relationship between MaxRtrAdvInterval and AdvDefaultLifetime must be chosen to take into account the probability of packet loss.

5. Host Behavior

Legacy hosts on a link with updated routers may have issues with a Router Lifetime of more than 9000 seconds. In the few implementations we have tested with general purpose operating systems, there does not seem to be any issues with setting this field to more than 9000, but there might be implementations that incorrectly (since RFC4861 requires receivers to handle any value) reject such RAs.

6. Security Considerations

On a link where router advertisements are few and far between, the detrimental effects of a rogue router that sends an unsolicited RA are greatly increased. These rogue RAs can be prevented by using approaches like RA-Guard [RFC6105] and SeND [RFC3971]

7. IANA Considerations

This document does not require any IANA action.

8. Acknowledgements

The authors would like to thank the members of the 6man efficient ND design team for their comments that led to the creation of this draft. The authors would also like to thank Lorenzo Colitti, Erik Kline, Jeena Rachel John, Brian Carpenter, Tim Chown, Fernando Gont, Warren Kumari and Adam Roach for their comments and suggestions that improved this document.

9. References

9.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC4861] Narten, T., Nordmark, E., Simpson, W., and H. Soliman, "Neighbor Discovery for IP version 6 (IPv6)", RFC 4861, DOI 10.17487/RFC4861, September 2007, <https://www.rfc-editor.org/info/rfc4861>.

9.2. Informative References

[RFC3971] Arkko, J., Ed., Kempf, J., Zill, B., and P. Nikander, "SEcure Neighbor Discovery (SEND)", RFC 3971, DOI 10.17487/RFC3971, March 2005, <https://www.rfc-editor.org/info/rfc3971>.

[RFC6105] Levy-Abegnoli, E., Van de Velde, G., Popoviciu, C., and J. Mohacsi, "IPv6 Router Advertisement Guard", RFC 6105, DOI 10.17487/RFC6105, February 2011, <https://www.rfc-editor.org/info/rfc6105>.

[RFC6459] Korhonen, J., Ed., Soininen, J., Patil, B., Savolainen, T., Bajko, G., and K. Iisakkila, "IPv6 in 3rd Generation Partnership Project (3GPP) Evolved Packet System (EPS)", RFC 6459, DOI 10.17487/RFC6459, January 2012, <https://www.rfc-editor.org/info/rfc6459>.

[RFC7066] Korhonen, J., Ed., Arkko, J., Ed., Savolainen, T., and S. Krishnan, "IPv6 for Third Generation Partnership Project (3GPP) Cellular Hosts", RFC 7066, DOI 10.17487/RFC7066, November 2013, <https://www.rfc-editor.org/info/rfc7066>.

Authors' Addresses

Suresh Krishnan
Kaloom
335 Rue Peel
Montreal, QC
Canada

Email: suresh@kaloom.com

Jouni Korhonen
Broadcom
Porkkalankatu 24
FIN-00180 Helsinki
Finland

Email: jouni.nospam@gmail.com

Samita Chakrabarti
Ericsson
USA

Email: samita.chakrabarti@ericsson.com

Erik Nordmark
Arista Networks
Santa Clara, CA
USA

Email: nordmark@acm.org

Andrew Yourtchenko
cisco
6b de Kleetlaan
Diegem 1831
Belgium

Email: ayourtch@cisco.com