IPv6 Working Group
INTERNET DRAFT
Expires: April 2005

J-S. Park
ETRI
M-K. Shin
ETRI/NIST
H-J. Kim
ETRI

October 2004

Link Scoped IPv6 Multicast Addresses
<draft-ietf-ipv6-link-scoped-mcast-06.txt>

Status of this Memo

Abstract

This document specifies an extension to the multicast addressing architecture of the IPv6 protocol. The extension allows for the use

of Interface Identifiers (IIDs) to allocate multicast addresses. When a link-local unicast address is configured at each interface of a node, an IID is uniquely determined. After then, each node can generate their unique multicast addresses automatically without conflicts. Basically, it is preferred to use this method for the link-local scope rather than unicast-prefix-based IPv6 multicast addresses [RFC 3306].

Table of Contents:

1. Introduction

This specification defines an extension to the multicast portion of the IPv6 addressing architecture [RFC 3513]. The current architecture does not contain any built-in support for dynamic address allocation. The extension allows for use of IIDs to allocate multicast addresses. When a link-local unicast address is configured at each interface of a node, an IID is uniquely determined. After then, each node can generate their unique multicast addresses automatically without conflicts. That is, these addresses could safely be configured at any time after DAD (Duplicate Address Detection) is completed.

Basically, it is preferred to use this method for the link-local scope rather than unicast-prefix-based IPv6 multicast addresses [RFC 3306]. This document restricts the usage of defined fields such as scop, plen and network prefix fields of [RFC 3306]. Therefore, this document specifies encoded information for link-local scope in multicast addresses.

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 [RFC 2119].

2. Applicability

The allocation technique in this document is designed to be used in any environment in which link-local scope IPv6 multicast addresses are assigned or selected. Especially, this method goes well with nodes supplying multicast services in a zeroconf/serverless environment. For example, multicast addresses less than or equal to link-local scope are themselves generated by nodes supplying multicast services without conflicts. Also, nodes which are supplied multicast services, easily consist of multicast addresses of multicast servers using NDP (address resolution) and well-known group IDs.

Consequently, this technique MUST only be used for link scoped multicast addresses. If you want to use multicast addresses greater than link-local scope, you need to use other methods as described in [RFC 3306].

3. Link Scoped Multicast Address Format

[RFC 3306] defines the following format of unicast-prefix-based IPv6 multicast addresses:

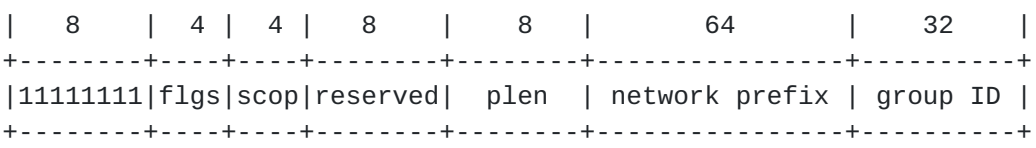

Figure 1: Unicast-Prefix-based IPv6 multicast address format

This document specifies a new format that incorporates IID information in the multicast addresses. The idea of delegating multicast addresses can be applicable to link-local scope.

Figure 2 illustrates the new format for link scoped multicast addresses.

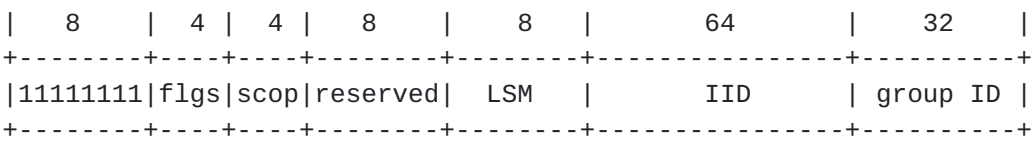

Figure 2: Link scoped multicast IPv6 address format

flgs MUST be "0011". (The first two bits have been yet undefined, sent as zero and ignored on receipt) flgs MUST use the same flag defined in section 4 of [RFC 3306].

scop MUST be <= 2. It is preferred to use this method for the link-local scope rather than unicast-prefix-based IPv6 multicast addresses [RFC 3306].

The reserved field MUST be zero.

LSM (Link Scoped Multicast) field MUST be "1111 1111" which maps to the plen field in [RFC 3306], whereas the plen field in [RFC 3306] MUST NOT be greater than 64.

That is, flgs, scop, and LSM fields are used to identify whether an address is a multicast address as specified in this document.

The IID field is used to distinguish each node from others. And this value is obtained from the IEEE EUI-64 based interface identifier of the link-local unicast IPv6 address. Given the use

of this method for link-local scope, the IID embedded in the multicast address MUST only come from the IID of the link-local unicast address on the interface after DAD has completed. That is, the creation of the multicast address MUST only occur after DAD has completed as part of the auto-configuration process.

Group ID is generated to indicate multicast application and is used to guarantee its uniqueness only in the host. It may also be set on the basis of the guidelines outlined in [RFC 3307].

The lifetime of link scoped multicast addresses has no dependency on the Valid Lifetime field in the Prefix Information option, corresponding to the unicast address being used, contained in the Router Advertisement message [RFC 2461].

4. Example

This is an example of link scoped IPv6 multicast addresses. For example in an ethernet environment, if the link-local unicast address is FE80::A12:34FF:FE56:7890, the link scoped multicast prefix of the node is FF32:00FF:A12:34FF:FE56:7890::/96.

5. Considerations

Since multicast addresses are created from the unique IID, their useful lifetime is linked to the period during which the IID is known to be unique. Thus, it is possible to conflict between IIDs, due to a new node joining the network that uses the same IID. The document does not consider this case at this phase. It is another challenging issue and out of scope of this document.

The link scoped multicast address format supports source-specific multicast addresses by the same method, as defined by [RFC 3306].

6. Security Considerations

[RFC 3041] describes the privacy extension to IPv6 stateless

address autoconfiguration for an IID. The secure IID, generated by [RFC 3041], can be used for consisting of a link scoped multicast address since the uniqueness is verified by the DAD procedure as part of the secure auto-configuration process.

7. Acknowledgements

We would like to thank Dave Thaler and Brian Haberman for his comments related to the consistency between the unicast prefix-based multicast draft and this one. Special thanks are due to Erik Nordmark and Pekka Savola for valuable comments.

8. References

Normative

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

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

[RFC 3041] T. Narten and R. Draves, "Privacy Extensions for Stateless Address Autoconfiguration in IPv6," RFC 3041, April 2001.

[RFC 3306] B. Haberman and D. Thaler, "Unicast-Prefix-based IPv6 Multicast Addresses," RFC 3306, August 2002.

[RFC 3307] B. Haberman, "Allocation Guidelines for IPv6 Multicast Addresses," RFC 3307, August 2002.

[RFC 3513] R. Hinden and S. Deering, "IP Version 6 Addressing Architecture", RFC 3513, April 2003.

Informative

[SSM ARCH] H. Holbrook and B. Cain, "Source-Specific Multicast for IP", Work In Progress, September 2004.

Authors' Addresses

Jung-Soo Park
ETRI PEC
161 Gajeong-Dong, Yuseong-Gu, Daejeon 305-350, Korea
Phone: +82 42 860 6514
Email: jspark@pec.etri.re.kr

Myung-Ki Shin
ETRI/NIST
820 West Diamond Avenue
Gaithersburg, MD 20899, USA
Tel : +1 301 975-3613
Fax : +1 301 590-0932
E-mail : mshin@nist.gov

Hyoung-Jun Kim
ETRI PEC
161 Gajeong-Dong, Yuseong-Gu, Daejeon 305-350, Korea
Phone: +82 42 860 6576
Email: khj@etri.re.kr

Intellectual Property Statement

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at http://www.ietf.org/ipr.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

Disclaimer of Validity

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Copyright Statement

78, and except as set forth therein, the authors retain all their rights.

Acknowledgment

Funding for the RFC Editor function is currently provided by the Internet Society.