IPv6 Working Group
INTERNET DRAFT
Expires: January 2005

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

July 2004

Link Scoped IPv6 Multicast Addresses
<draft-ietf-ipv6-link-scoped-mcast-04.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-IDs to allocate multicast addresses. When the link-local unicast address is configured at each interface of a host, an interface ID is uniquely determined. By delegating multicast addresses at the same time as the interface ID, each host can identify their multicast addresses automatically at Layer 1 without running an intra- or inter-domain allocation protocol in serverless environments. 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 interface-IDs to allocate multicast addresses. When the link-local unicast address is configured at each interface of a host, an interface ID is uniquely determined. By delegating multicast addresses at the

same time as the interface ID, each host can identify its multicast addresses automatically without running an intra- or inter-domain allocation protocol in serverless environments.

The current multicast address allocation architecture [RFC 2908] is based on a multi-layered, multi-protocol system. The goal of this proposal is to reduce the number of protocols and servers to get dynamic multicast address allocation.

The use of interface ID-based multicast address allocation will, at a minimum, remove the need to run the Multicast Address-Set Claim (MASC) Protocol [RFC 2909] and the Multicast Address Allocation servers [RFC 2908].

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 scope, plen and network prefix field in [RFC 3306]. Therefore, this document specifies encoded information for link-local scope in the 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 environment. For example, multicast addresses less than or equal to link-local scope are themselves generated by nodes supplying multicast services.

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

3. Link scoped multicast address format

Section 2.7 of [EFC 3513] defines the following operational format of IPv6 multicast addresses:

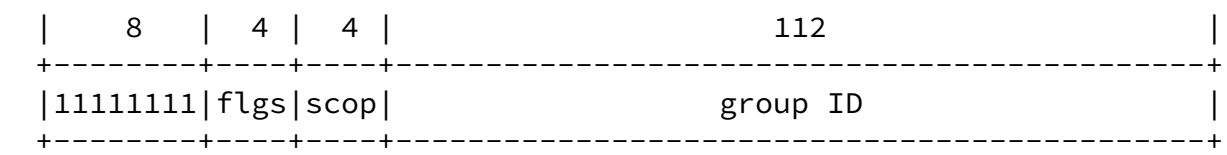

Figure 1: Generic IPv6 multicast address format

This document introduces new formats that incorporate interface ID information in the multicast address. The idea of delegating multicast addresses at the same time as the interface ID can be applicable to link-local.

Figure 2 illustrates the new format for link scoped multicast addresses. That is, if the scope of the multicast address is link-local scope, it is this format.

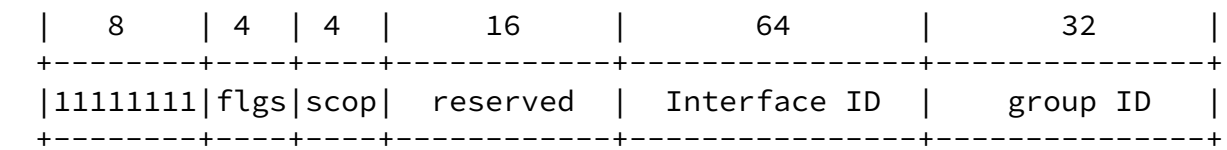

Figure 2: link scoped multicast IPv6 address format

+-+-+-+-+

o P = 0 indicates a multicast address that is not assigned
on the basis of the interface ID.
o P = 1 indicates a multicast address that is assigned
on the basis of the interface ID.
o If P = 1, T MUST be set to 1, otherwise the setting of

the T bit is defined in Section 2.7 of [RFC 2373].

flgs should use the same flag defined in section 4 of [RFC 3306]. That is, this document proposes the third bit of 'flgs' field to indicate an Interface ID-based multicast addresses.

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 which maps to a plen of zero in RFC 3306.

Interface ID field is used to distinguish each host 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 interface ID embedded in the multicast address SHOULD come from the interface ID of the link-local unicast address on the interface after DAD has completed. That is, the creation of the multicast address MUST occur after DAD has completed as part of the auto-config 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 an Interface ID-based multicast address 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. Examples

This is an example of an interface ID-based multicast address with link-local scope. For example in an Ethernet environment, if the link-local unicast address is FE80::a12:34ff:fe56:7890, the multicast prefix of the host is FF32:0:a12:34ff:fe56:7890::/96.

5. Considerations

It is preferred to use this method for scop <= 2 rather than Unicast-Prefix-based IPv6 Multicast Addresses [RFC 3306]. This document considers only link scoped multicast addresses. For this purpose, scop field is used shown in figure 2.

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

Note that if an SSM implementation checks for FF3x::/32, not FF3x::/96, the other nodes not implementing this specification will

interpret the link-local multicast addresses generated using this specification as SSM addresses, since the document uses the reserved field in such a fashion that plen=0 [RFC 3306]. In order to avoid this conflict, we recommend SSM implementations must check

for FF3x::/96, as described in Allocation Guidelines for IPv6 Multicast Addresses [RFC 3307] section 3.

6. Security Considerations

[RFC 3041] describes the privacy extension to IPv6 stateless address autoconfiguration for an interface ID. The interface ID, generated by [RFC 3041], is also used in this method since the uniqueness is verified by DAD procedure as part of the secure auto-config process.

Using source-specific multicast addresses can sometimes aid in the prevention of denial-of-service attacks by arbitrary sources, although no guarantee is provided. A more in-depth discussion of the security considerations for SSM can be found in [SSM ARCH].

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 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

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

[RFC 2908] D. Thaler, M. Handley and D. Estrin, "The Internet Multicast Address Allocation Architecture," RFC 2908, September 2000.

[RFC 2909] P. Radoslavov, D. Estrin, R. Govindan, M. Handley, S. Kumar, and D. Thaler, "The Multicast Address-Set Claim (MASC) Protocol", RFC 2909, September 2000.

[SSM ARCH] H. Holbrook and B. Cain, "Source-Specific Multicast for IP", Work In Progress, October 2003.

Authors' Addresses

Jung-Soo Park
ETRI PEC
161 Gajeong-Dong, Yuseong-Gu, Daejon 305-600, 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, Daejon 305-600, Korea
Phone: +82 42 860 6576
Email: khj@etri.re.kr

Intellectual Property Statement

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

Copyright Statement

Acknowledgment

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