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].
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. LinkScoped Multicast Address Format

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

```
|   8    |  4 |  4 |   8    |    8   |       64       |    32    |
+--------+----+----+--------+--------+----------------+----------+
|11111111|flgs|scop|reserved|  plen  | network prefix | group ID |
+--------+----+----+--------+--------+----------------+----------+
```

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.

```
|   8    |  4 |  4 |   8    |    8   |       64       |    32    |
+--------+----+----+--------+--------+----------------+----------+
|11111111|flgs|scop|reserved| LSM    |       IID      | group ID |
+--------+----+----+--------+--------+----------------+----------+
```

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


Informative


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