                 Allocation Guidelines for IPv6 Multicast Addresses

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Abstract

   This document specifies guidelines that must be implemented by any
   entity responsible for allocating IPv6 multicast addresses. This
   includes, but is not limited to, any documents or entities wishing to
   assign permanent IPv6 multicast addresses, allocate dynamic IPv6
   multicast addresses, and define permanent IPv6 multicast group
   identifiers. The purpose of these guidelines is to reduce the
   probability of IPv6 multicast address collision, not only at the IPv6
   layer, but also at the link-layer of media that encode portions of
   the IP layer address into the MAC layer address.

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1. 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 [RFC 2119].

   The term "group ID", throughout this document, conforms to the
   definition contained in [UNIMCAST], that is, the low-order 32 bits of
   the IPv6 multicast address.

2. Introduction

   This document specifies guidelines that MUST be implemented by any
   entity responsible for allocating IPv6 multicast addresses. This
   includes, but is not limited to, any documents or entities wishing to
   assign permanent IPv6 multicast addresses, allocate dynamic IPv6
   multicast addresses, and define permanent IPv6 multicast group
   identifiers. The purpose of these guidelines is to reduce the
   probability of IPv6 multicast address collision, not only at the IPv6
   layer, but also at the link-layer of media that encode portions of
   the IP layer address into the link-layer address.

   With the current IPv6 address architecture [ADDRARCH] and the
   extension to the multicast address architecture specified in
   [UNIMCAST], a set of guidelines is needed for entities assigning any
   flavor of IPv6 multicast addresses.

   The current approach of several physical media [RFC 2464][RFC 2467]
   is to map a portion of the IPv6 multicast address into a link-layer
   destination address. This is accomplished by taking the low order 32

bits (henceforth called the group ID) of the IPv6 multicast address
and including them in the link-layer destination address. Group IDs,
less than or equal to, 32 bits long will generate unique link-layer
addresses within a given multicast scope.

These guidelines specify how the group ID of the IPv6 multicast
address are chosen and assigned. The guidelines specify several
mechanisms that can be used to determine the group ID of the
multicast address, based on the type of allocation being done.

3. Applicability

   These guidelines are designed to be used in any environment in which
   IPv6 multicast addresses are delegated, assigned, or selected. These
   guidelines are not limited to use by MADCAP [RFC 2730] servers. The
   following is a non-exhaustive list of applications of these
   guidelines:

      - Source-specific multicast application servers can generate an
         SSM group address by generating a 96-bit multicast prefix, as
         defined in [UNIMCAST] (i.e. FF3x::/96) and concatenating that
         with a group ID, as defined in this document.

      - A MADCAP server allocates IPv6 multicast addresses conforming
         to section 2.7 of [ADDRARCH], creating the group ID using the
         rules defined in this document.

      - Nodes supplying multicast services in a zeroconf environment
         generate multicast addresses without the need of centralized
         control.

      - IANA can assign permanent multicast addresses to fulfill
         requests via the protocol standardization process.

4. Group ID Selection Guidelines

   The Group ID selection process allows for three types of multicast
   address assignments. These are permanent IPv6 multicast addresses,
   dynamic IPv6 multicast addresses, and permanent IPv6 multicast group
   IDs. The following guidelines assume that the prefix of the
   multicast address has been initialized according to [ADDRARCH] or
   [UNIMCAST].

4.1 Permanent IPv6 Multicast Addresses

   Permanent multicast addresses, like those defined in [RFC 2375], are
   allocated by IANA. These addresses will be assigned with group ID's,
   in the range of 0x00000001 to 0x3FFFFFFF, on an Expert Review basis.

   Multicast addresses assigned by IANA MUST have the T bit set to 0 and
   the P bit set to 0.

4.2 Permanent IPv6 Multicast Group Identifiers

   Permanent group IDs allow for a global identifier of a particular
   service (e.g. Network Time Protocol (NTP) being assigned the group ID
   0x40404040). The use of permanent group IDs differs from permanent
   multicast addresses in that a permanent group ID offers a global
   identifier for a service being offered by numerous servers.

   As an example, consider the NTP example group ID of 0x40404040. An
   NTP client would be able to access multiple servers and multiple
   scopes. That is, the NTP client will know that the group ID
   0x40404040 identifies an NTP multicast stream regardless of the upper
   96 bits of the multicast address.

   Permanent group IDs are allocated on an Expert Review basis, in the
   range 0x40000000 to 0x7FFFFFFF. These permanent group IDs are meant
   to be used in IPv6 multicast addresses, defined in [UNIMCAST].

4.3 Dynamic IPv6 Multicast Addresses

   Dynamic IPv6 multicast addresses can be allocated by an allocation
   server or by an end-host. Regardless of the allocation mechanism,
   all dynamically allocated IPv6 multicast addresses MUST have the T
   bit set to 1. This will distinguish the dynamically allocated
   addresses from the permanently assigned multicast addresses, defined
   in [RFC 2375], at the link-layer on any media that maps the lower
   portion of the IPv6 multicast address into a link-layer address. It
   should be noted that the high-order bit of the Group ID will be the
   same value as the T flag.

   As an example, the permanent IPv6 multicast address FF02::9 maps to
   an Ethernet group address of 33-33-00-00-00-09. A dynamically
   allocated IPv6 multicast address of FF32::8000:9 would map to the
   Ethernet group address 33-33-80-00-00-09.

4.3.1 Server Allocation

   The allocation of IPv6 multicast addresses, by a server, is defined
   in [RFC 2730]. Address management is the responsibility of the
   allocation protocol and outside the scope of this document.
   Allocation servers MUST use the group ID range 0x80000000 to
   0xFFFFFFFF.

4.3.2 Host Allocation

   Host-based allocation allows hosts to self-select IPv6 multicast
   addresses. One example of host-based allocation is the Zeroconf
   Multicast Address Allocation Protocol [ZMAAPDOC]. Issues with
   collision detection, claim notification, etc. are outside the scope
   of this document and the responsibility of the protocol being used,
   such as [ZMAAPDOC].

   The group ID portion of the address is created using either a
   pseudo-random 32-bit number or a 32-bit number created using the
   guidelines in [RFC 1750]. The generated group ID MUST fall in the
   range 0x80000000 to 0xFFFFFFFF. This can be accomplished by setting
   the high-order bit of the generated number to 1.

5. IANA Considerations

   This document requests the creation of a new registry maintained by
   IANA. This new registry will maintain permanent group ID values. The
   premise of this new registry is to allow for permanent group IDs to
   be used across multiple domains utilizing the multicast address
   architecture defined in [UNIMCAST]. The permanent group IDs will
   fall in the range 0x40000000 to 0x7FFFFFFF.

   In addition, this document also defines rules for the allocation of
   permanent IPv6 multicast addresses by IANA. These rules specify
   different ranges for multicast addresses that are IPv6-only and for
   IPv6 multicast addresses that have corresponding IPv4 multicast
   addresses.

   Following the policies outlined in [RFC 2434]:

      - Permanent IPv6 multicast addresses with corresponding IPv4
         multicast addresses, like those defined in [RFC 2375], are
         allocated with group ID's in the range of 1 to 0x3FFFFFFF on an
         Expert Review basis, see Section 4.1.

        - Permanent IPv6-only multicast addresses are allocated with
           group ID's in the range 0x100 to 0x3FFFFFFF on an Expert Review
           basis.
        - Permanent group ID's are allocated on an Expert Review basis in
           the range 0x40000000 to 0x7FFFFFFF, see Section 4.2.
        - The range 0x80000000 to 0xFFFFFFFF is reserved for use by
           dynamic multicast address allocation mechanisms, see Section
           4.3.

   All approved requests for a permanent IPv6 multicast address will
   result in the assignment of a unique group ID which shall be reserved
   in all valid IPv6 multicast scopes.

6. Security Considerations

   The allocation mechanisms described in this document do not alter the
   security properties of either the Any Source or Source Specific
   multicast service models of IPv4 and IPv6.

   The potential to allocate large blocks of addresses can lead to
   Denial-of-Service attacks. A more in-depth discussion of the
   security issues surrounding dynamic allocation of multicast addresses
   can be found in [RFC 2908].

7. Acknowledgements

   The author would like to thank Dave Thaler, Steve Deering, Allison
   Mankin, Thomas Narten, and Erik Nordmark for their thorough review of
   this document.

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Author's Address

   Brian Haberman
   Consultant
   Phone: 1-919-949-4828
   EMail: bkhabs@nc.rr.com

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