                 Unicast-Prefix-Based IPv4 Multicast Addresses

Abstract

   This specification defines an extension to the multicast addressing
   architecture of the IP Version 4 protocol. The extension presented
   in this document allows for unicast-prefix-based assignment of
   multicast addresses. By delegating multicast addresses at the same
   time as unicast prefixes, network operators will be able to identify
   their multicast addresses without needing to run an inter-domain
   allocation protocol.

Status of This Memo

   This is an Internet Standards Track document.

   This document is a product of the Internet Engineering Task Force
   (IETF). It represents the consensus of the IETF community. It has
   received public review and has been approved for publication by the
   Internet Engineering Steering Group (IESG). Further information on
   Internet Standards is available in Section 2 of RFC 5741.

   Information about the current status of this document, any errata,
   and how to provide feedback on it may be obtained at
   http://www.rfc-editor.org/info/rfc6034.

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1. Introduction

   RFC 3180 [RFC3180] defines an allocation mechanism (called "GLOP") in
   233/8 whereby an Autonomous System (AS) number is embedded in the
   middle 16 bits of an IPv4 multicast address, resulting in 256
   multicast addresses per AS. Advantages of this mechanism include the
   ability to get multicast address space without an inter-domain
   multicast address allocation protocol, and the ease of determining
   the AS that was assigned the address for debugging and auditing
   purposes.

   Some disadvantages of GLOP include:

   o RFC 4893 [RFC4893] expands the size of an AS number to 4 bytes,
      and GLOP cannot work with 4-byte AS numbers.

   o When an AS covers multiple sites or organizations, administration
      of the multicast address space within an AS must be handled by
      other mechanisms, such as manual administrative effort or the
      Multicast Address Dynamic Client Allocation Protocol (MADCAP)
      [RFC2730].

   o During debugging, identifying the AS does not immediately identify
      the correct organization when an AS covers multiple organizations.

   o Only 256 addresses are automatically available per AS, and
      obtaining any more requires administrative effort.

   More recently, a mechanism [RFC3306] has been developed for IPv6 that
   provides a multicast range to every IPv6 subnet, which is at a much
   finer granularity than an AS. As a result, the first three
   disadvantages above are avoided (and the last disadvantage does not
   apply to IPv6 due to the extended size of the address space).

Another advantage of providing multicast space to a subnet, rather
than just to an entire AS, is that multicast address assignments
within the range need only be coordinated within the subnet.

This document specifies a mechanism similar to [RFC3306], whereby a
range of global IPv4 multicast address space is provided to each
organization that has unicast address space. A resulting advantage
over GLOP is that the mechanisms in IPv4 and IPv6 become more
similar.

This document does not obsolete or update RFC 3180, as the mechanism
described in RFC 3180 is still required for organizations with prefix
allocations more specific than /24. Organizations using RFC 3180
allocations may continue to do so. In fact, it is conceivable that
an organization might use both RFC 3180 allocations and the
allocation method described in this document.

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. Address Space

A multicast address with the prefix 234/8 indicates that the address
is a Unicast-Based Multicast (UBM) address. The remaining 24 bits
are used as follows:

```
Bits:  |   0 thru 7  |        8 thru N        |   N+1 thru 31   |
       +-------+-------------------+----------------------------+
Value: |    234      |    Unicast Prefix      |    Group ID     |
       +-------+-------------------+----------------------------+
```

For organizations with a /24 or shorter prefix, the unicast prefix of
the organization is appended to the common /8. Any remaining bits
may be assigned by any mechanism the organization wishes.

For example, an organization that has a /16 prefix assigned might
choose to assign multicast addresses manually from the /24 multicast
prefix derived from the above method. Alternatively, the
organization might choose to delegate the use of multicast addresses
to individual subnets that have a /24 or shorter unicast prefix, or
it might choose some other method.

Organizations with a prefix length longer than 24 do not receive any
multicast address space from this mechanism; in such cases, another
mechanism must be used.

Compared to GLOP, an AS will receive more address space via this
mechanism if it has more than a /16 for unicast space. An AS will
receive less address space than it does from GLOP if it has less than
a /16.

The organization that is assigned a UBM address can be determined by
taking the multicast address, shifting it left by 8 bits, and
identifying who has been assigned the address space covering the
resulting unicast address.

The embedded unicast prefix MUST be a global unicast prefix (i.e., no
loopback, multicast, link-local, or private-use IP address space).
In addition, since global unicast addresses are not permanently
assigned, UBM addresses MUST NOT be hard-coded in applications.

4. Examples

   The following are a few examples of the structure of unicast-prefix-
   based multicast addresses.

   o Consider an organization that has been assigned the global unicast
      address space 192.0.2.0/24. This means that organization can use
      the global multicast address 234.192.0.2 without coordinating with
      any other entity. Someone who sees this multicast address and
      wants to find who is using it can mentally shift the address left
      by 8 bits to get 192.0.2.0, and can then look up who has been
      assigned unicast address space that includes that address.

   o Consider an organization that has been assigned a larger address
      space, x.y.0.0/16. This organization can use the global multicast
      address space 234.x.y.0/24 without coordinating with any other
      entity, and can assign addresses within this space by any
      mechanism the organization wishes. Someone who sees a multicast
      address (say) 234.x.y.10 and wants to find who is using it can
      mentally shift the address left by 8 bits to get x.y.10.0, and can
      then look up who has been assigned unicast address space that
      includes that address.

5. Security Considerations

   The same well-known intra-domain security techniques can be applied
   as with GLOP. Furthermore, when dynamic allocation is used within a
   prefix, the approach described here may have the effect of reduced
   exposure to denial-of-service attacks, since the topological area
   within which nodes compete for addresses within the same prefix is
   reduced from an entire AS to only within an individual organization
   or an even smaller area.

6. IANA Considerations

   IANA has assigned a /8 in the global IPv4 multicast address space for
   this purpose.

7. Acknowledgments

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8. References

8.1. Normative References

   [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
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8.2. Informative References

   [RFC2730] Hanna, S., Patel, B., and M. Shah, "Multicast Address
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   [RFC4893] Vohra, Q. and E. Chen, "BGP Support for Four-octet AS
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