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PIM/MLD flags for IPv4-IPv6 Multicast Translation Procedure
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Abstract

This document discusses the procedure that helps to identify IPv4 embedded IPv6 Multicast address without any embedded flags in the address. This document specifies the usage of additional data or attribute in MLD and PIM that helps identify this address. This document is not conclusive and is open for discussion.

Table of Contents

1. Introduction.....	2
2. Conventions used in this document.....	3
3. Terminology.....	4
4. Procedure.....	4
4.1. 64I Join Attribute.....	5
4.2. 64I Auxiliary Data.....	5
5. Use Cases.....	6
5.1. IPv4 Receiver and Source connected over IPv6-Only network.....	6
5.2. IPv6 Receiver Connected to IPv4 Source through IPv4 multicast access network and IPv6 Multicast network.....	7
5.3. IPv6 Receiver and IPv4 Source.....	9
6. Security Considerations.....	10
7. IANA Considerations.....	10
8. References.....	10
8.1. Normative References.....	10
8.2. Informative References.....	10
9. Acknowledgments.....	11

1. Introduction

As part of IPv4 to IPv6 migration, there are multiple standards developed for smooth transition for Unicast. Section 3 of [I-D.ietf-mboned-v4v6-mcast-ps] specifies

different possible scenarios for IPv4 to IPv6 multicast transition as below,

1. IPv4 Receiver and Source connected over IPv6-Only network
2. IPv6 Receiver Connected to IPv4 Source through IPv4 multicast access network and IPv6 Multicast network.
3. IPv6 Receiver and Source connected to IPv4-Only network.
4. IPv6 Receiver and IPv4 Source.
5. IPv4 Receiver and IPv6 Source.

Section 3.6 of [I-D.ietf-mboned-v4v6-mcast-ps] identifies the use cases involving IPv4 source as highest priority.

There are also various solutions proposed (ex., [I-D.ietf-software-mesh-multicast], [I-D.ietf-software-dslite-multicast]) addressing the above use cases requirement which requires to embed IPv4 multicast address into IPv6 address. This IPv4-embedded IPv6 multicast address will be used as group address within IPv6 cloud.

Currently [I-D.ietf-mboned-64-multicast-address-format] defines a new bit in IPv6 Multicast address that signals any router that IPv4 Multicast address is embedded as last 32 bits. This may create backward compatibility issue.

This document defines a set of procedures, a new PIM join attribute [RFC 5384] and a new MLD Auxiliary Data that helps achieve the above without a need for any bit embedded within IPv6 Multicast address.

2. Conventions used in this document

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 [RFC2119].

In this document, these words will appear with that interpretation only when in ALL CAPS. Lower case uses of these words are not to be interpreted as carrying RFC-2119 significance.

3. Terminology

(S4, G4)/(*, G4): (S, G) or (*, G) in IPv4 address format

(S6, G6)/(*, G6): (S, G) or (*, G) in IPv6 address format

4. Procedure

Any AFBR on receiving (S4, G4) or (*, G4) PIM join or IGMP Report message and if the S6 after translation is not IPv4 translatable address and if the upstream is IPv6 PIM neighbor MUST include transitive 64I JOIN ATTRIBUTE (Section 4.1) in IPv6 PIM Join and embed IPv4 group address in last 32 bits of IPv6 Multicast SSM range address.

Any AFBR on receiving (S4, G4) or (*, G4) PIM join or IGMP Report message and if the S6 after translation is IPv4 translatable address and if the upstream is IPv6 PIM neighbor SHOULD include transitive 64I JOIN ATTRIBUTE in IPv6 PIM Join and embed IPv4 group address in last 32 bits of IPv6 Multicast SSM range address.

Any AFBR on receiving (S4, G4) or (*, G4) PIM Join or IGMP Report message and if S6 after translation is not IPv4 translatable address and if upstream is IPv6 cloud without PIM neighbor MUST include 64I Auxiliary Data (Section 4.2) in MLDv2 Report Message.

Any AFBR on receiving (S4, G4) or (*, G4) PIM Join or IGMP Report message and if S6 after translation is IPv4 translatable address and if upstream is IPv6 cloud without PIM neighbor SHOULD include 64I Auxillary Data in MLDv2 Report Message.

Any AFBR on receiving IPv4 PIM Join with 64I JOIN ATTRIBUTE MUST carry forward the attribute in IPv6 PIM Join sent upstream.

Any router on receiving IPv6 PIM Join with 64I JOIN ATTRIBUTE and if upstream is IPv6 cloud without PIM neighbor MUST include 64I Auxillary Data in MLDv2 Report message.

Any AFBR on receiving (S6, G6) PIM Join for SSM range address without 64I JOIN ATTRIBUTE and if the IPv6 Source in Join is well known prefix (64:FF9B::/96) or IPv4 translatable IPv6

address [RFC 6052] and if the upstream is IPv4 PIM neighbor, MUST pull the last 32 bits to generate IPv4 group address.

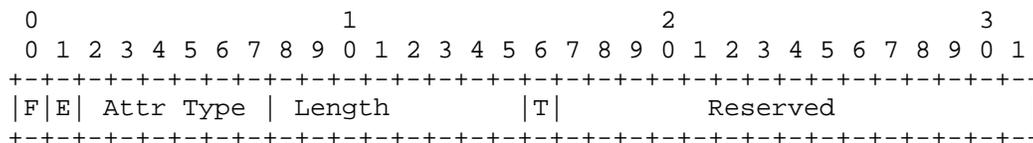
Any router on receiving (S6, G6) PIM Join from SSM range without 64I JOIN ATTRIBUTE and if Source address is well known prefix (64:FF9B::/96) or IPv4 translatable IPv6 address [RFC 6052] and if the upstream is IPv6 PIM neighbor, MUST include 64I JOIN ATTRIBUTE.

Any router on receiving MLD Report with 64I Auxiliary Data MUST include 64I JOIN ATTRIBUTE in IPv6 PIM join sent Upstream for the group.

While the above procedure is defined with SSM range address as an example, it is applicable for any (S6, G6) from ASM range.

4.1. 64I Join Attribute

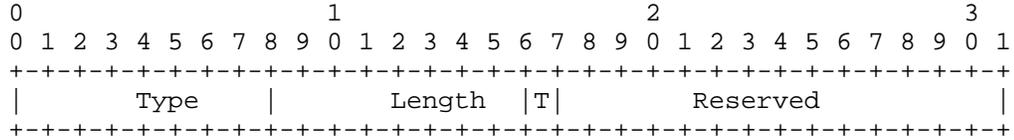
Below is the format of new PIM JOIN ATTRIBUTE specified in this document,



F bit: 1, Transitive Attribute
 E bit: As mentioned in [RFC 5384]
 Attr Type: TBD
 Length: 2
 T bit: 1
 Reserved: Reserved field for future use.

4.2. 64I Auxiliary Data

Below is the format of new Auxiliary Data specified in this document,



Type: TBD
 Length:
 T Flag: 1
 Reserved: Reserved bit for future use.

5. Use Cases

In this document, we also specify the behavior of high priority scenarios with above procedure.

5.1. IPv4 Receiver and Source connected over IPv6-Only network

This scenario simply known as 4-6-4 is shown below in Figure 1.

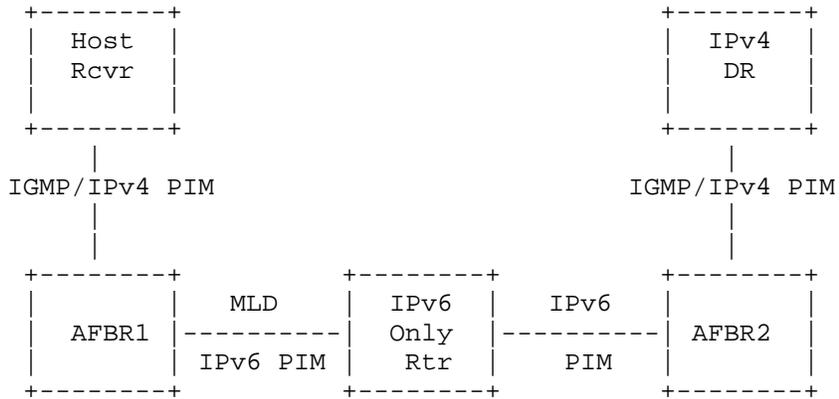


Figure 1: 4-6-4 Scenario

AFBR1 on receiving (S4, G4) or (*, G4) PIM Join or IGMP Report will perform the below,

1. If Upstream is IPv6 PIM neighbor, should embed the IPv4 multicast group into last 32 bits of IPv6 Multicast SSM range address and send (S6, G6) PIM join with 64I JOIN ATTRIBUTE.
2. If Upstream is IPv6 MLD router, should embed the IPv4 multicast group into last 32 bits of IPv6 Multicast SSM range address and send MLDv2 Report with 64I Auxillary Data.

AFBR2 on receiving (S6, G6) PIM Join without 64I JOIN ATTRIBUTE and if upstream is IPv4 cloud can derive the IPv4 multicast group address from last 32 bits.

Since F bit will be set in 64I JOIN ATTRIBUTE, it will be delivered to AFBR2 even if any router along the path doesn't understand the attribute.

IPv6-only Rtr on receiving (S6, G6) PIM Join with 64I JOIN ATTRIBUTE will send across to AFBR2 with attribute. Since 64I JOIN ATTRIBUTE is transitive in nature, this behavior doesn't change even if IPv6-Only Rtr doesn't understand the attribute.

IPv6-only Rtr on receiving (S6, G6) MLD Report with 64I Auxiliary Data will include 64I JOIN ATTRIBUTE in upstream PIM join for (S6, G6).

AFBR2 on receiving (S6, G6) PIM Join with 64I JOIN ATTRIBUTE must derive the IPv4 multicast group address from the last 32 bits.

5.2. IPv6 Receiver Connected to IPv4 Source through IPv4 multicast access network and IPv6 Multicast network

This scenario simply known as 6-4-6-4 is shown in Figure 2.

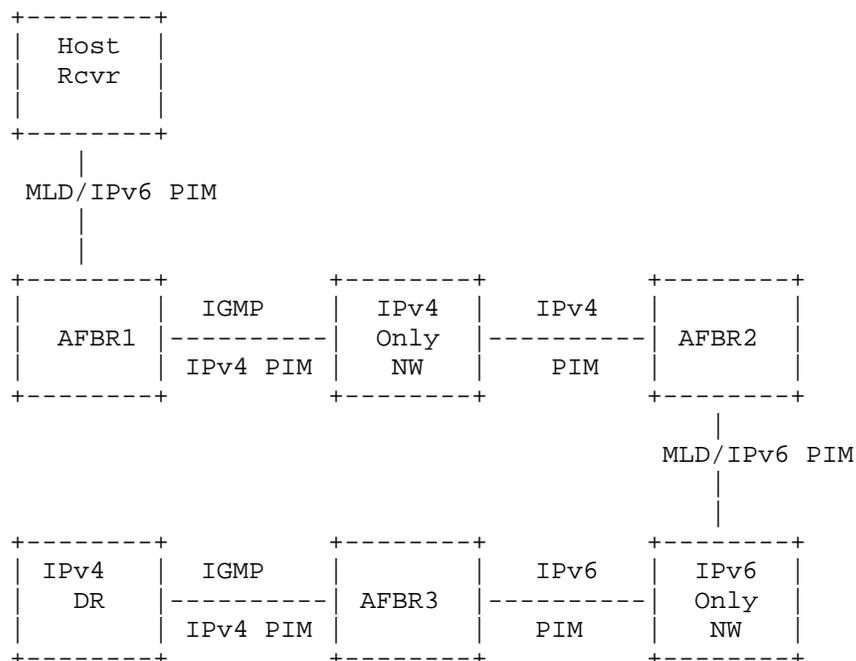


Figure 2: 6-4-6-4 Scenario

In Figure 2, AFBR3 will act as IP/ICMP translator and will advertise IPv4 prefixes into IPv6 cloud as either well known prefix (64:FF9B::/96) or IPv4 translatable IPv6 prefix.

In this scenario, AFBR1 or the DR router MUST include 64I JOIN ATTRIBUTE or 64I Auxiliary Data if the source is well known prefix (64:FF9B::/96). AFBR1 or the DR router SHOULD include 64I JOIN ATTRIBUTE or 64I Auxiliary Data if the source is with IPv4 translatable IPv6 prefix. How AFBR1/DR will understand if S6 belongs to IPv4 translatable IPv6 prefix is outside the scope of this document.

Various solutions are available by which AFBR1 will send the join towards AFBR2. This basically depends if multicast is enabled or disabled on IPv4 cloud. Depending on the solution,

AFBR1 will either send IPv6 PIM Join encapsulated within IPv4 PIM join or IPv6 PIM Join over some tunnel.

AFBR2 on receiving (S6, G6) PIM Join over tunnel or (S6, G6) PIM Join encapsulated within (S4, G4) will send 64I JOIN ATTRIBUTE or 64I Auxiliary Data upstreams towards AFBR3.

AFBR3 on receiving (S6, G6) Join with 64I JOIN ATTRIBUTE MUST derive the IPv4 group address from last 32 bits.

AFBR3 on receiving (S6, G6) PIM join without 64I JOIN ATTRIBUTE MUST check if S6 falls within well known prefix (64:FF9B::/96) or IPv4 translatable IPv6 Prefix. If S6 is within the above range, it MUST derive IPv4 group from the last 32 bits of G6.

5.3. IPv6 Receiver and IPv4 Source

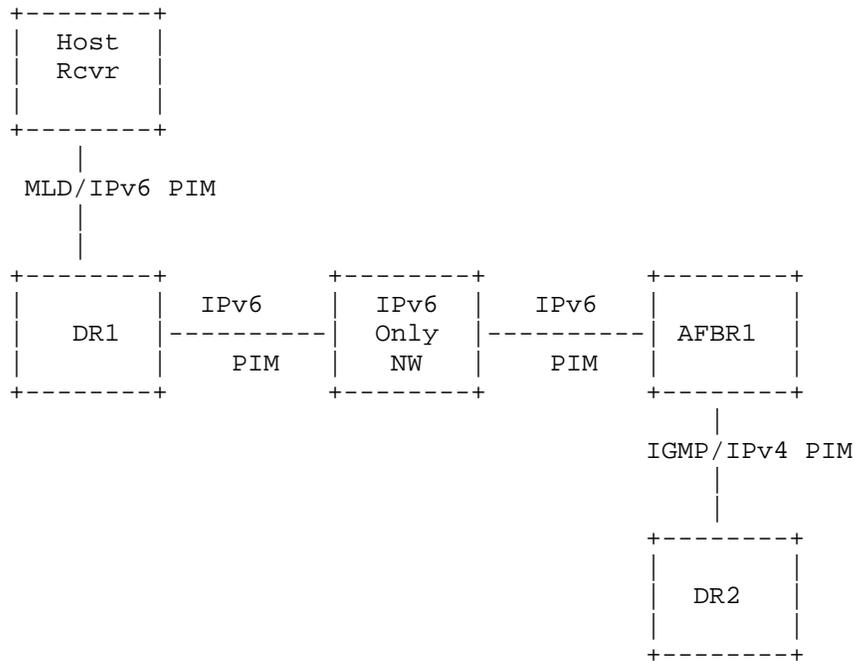


Figure 3: 6-4 Scenario

This scenario works similar to Section 5.2 except that IPv6 cloud is not partitioned by IPv4 cloud.

6. Security Considerations

Security consideration specified in [RFC 5384] and [RFC 6052] are applicable here as well.

7. IANA Considerations

TBD.

8. References

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