**Multiple Ethernet - IPv6 address mapping encapsulation - prefix
resolution
draft-matsuhira-me6e-pr-01**

Abstract

   This document specifies Multiple Ethernet - IPv6 address mapping
   encapsulation - Prefix Resolution (ME6E-PR) specification. ME6E-PR
   makes expantion ethernet network over IPv6 backbone network with
   encapsuation technoogy. And also, E6ME-PR can stack multiple
   Ethernet networks. ME6E-PR work on non own routing domain.

Requirements Language

   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].

Status of this Memo

Copyright Notice

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[1](#). Introduction

   This document provide Multiple Ethernet - IPv6 address mapping
   encapsulation - Prefix Resolution (ME6E-PR) specification.

   ME6E-PR make many virtual ethernet network over IPv6 network with
   unicast base technology.

   ME6E-PR can use on both own routing domain and non own routing
   domain, i.e. can or cannot advertise routes to the network.

[2](#). Basic Network Configuration

   Figure 1 shows network configuration with ME6E-PR. The network
   consists of three parts, backbone network, nodes (host or router),
   and ME6E-PR.

   Backbone network can be operated with dual stack or IPv6 only. Node
   may physical node or virtual node, and have Ethernet Interface.

   ME6E-PR connects IPv6 network and nodes. ME6E-PR connect to node
   with Ethernet (Layer2), and ME6E-PR connect to IPv6 network with IPv6
   (Layer3).
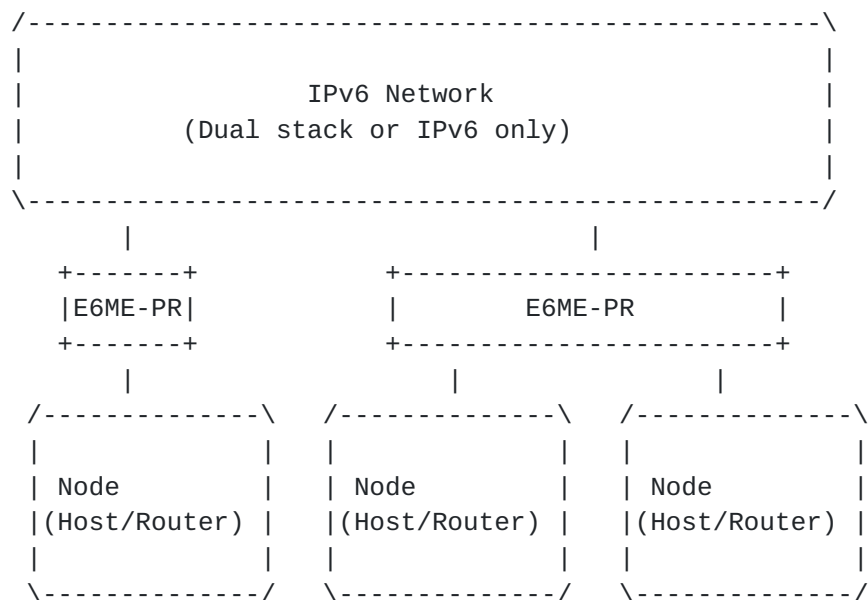
```
       /-----------------------------------------------------\
       |                                                     |
       |                  IPv6 Network                       |
       |            (Dual stack or IPv6 only)                |
       |                                                     |
       \-----------------------------------------------------/
            |                               |
        +-------+            +------------------------+
        |E6ME-PR|            |        E6ME-PR         |
        +-------+            +------------------------+
            |                     |                |
       /--------------\   /--------------\   /--------------\
       |              |   |              |   |              |
       | Node         |   | Node         |   | Node         |
       |(Host/Router) |   |(Host/Router) |   |(Host/Router) |
       |              |   |              |   |              |
       \--------------/   \--------------/   \--------------/



                          Figure 1
```

3. Basic Function of ME6E-PR

   ME6E-PR has mainly two function.

   One is encapsulate from Ethernet frame to IPv6 packet, and
   decapsulate from IPv6 packet to Ethernet frame. Another is generate
   a table where Ethernet MAC address belong to IPv6 network.

3.1. Ethernet over IPv6 Encapsulation

   ME6E-PR encapsulates Ethernet frame to IPv6 packet from node to IPv6
   network, and decapsulates IPv6 packet to Ethernet frame from IPv6
   network to node. Figure 2 shows frame and packet format on both IPv6
   network and IPv6 network.


```
    +--------+-----------+        +----------+--------+------------+
    |Ethr Hdr|    Data   |  -->   | IPv6 Hdr |Ethr Hdr|    Data    |
    +--------+-----------+        +----------+--------+------------+

    +--------+-----------+        +----------+--------+------------+
    |Ethr Hdr|    Data   |  <--   | IPv6 Hdr |Ethr Hdr|    Data    |
    +--------+-----------+        +----------+--------+------------+


   /------------------\  +----------+  /----------------------------\
   |    Node          |--| ME6E-PR  |--|        IPv6 Network         |
   |(Host or Router)  |  +----------+  |(Dual stack or IPv6 only)    |
   \------------------/                \----------------------------/
```
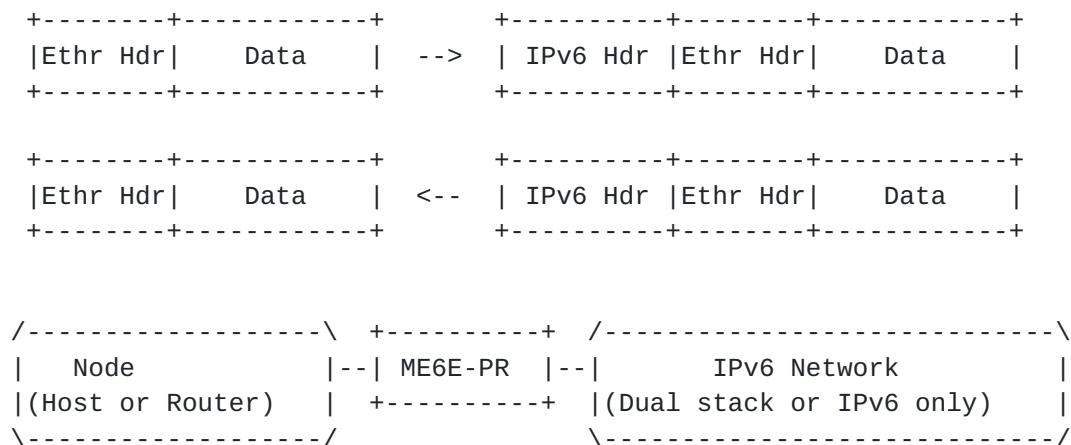

                              Figure 2

   The value of next header field of IPv6 header is TBD. The value of
   EtherIP(RFC3378) EtherIP [RFC3378]may used, however new value for
   this protocol may assigned.

   When encapsulated IPv6 Packet size exceed path MTU , ME6E-PR fragment
   Ethernet frame, and then send them.

3.2. Multiple Ethernet - IPv6 mapped address (ME6A) architecture

   ME6A[I-D.matsuhira-me6a] is a IPv6 address used in outer IPv6 header
   which encapsulate ethernet frame by ME6E-PR. Figure 3 shows ME6A
   architecture.

```
| 96 - m -n bits           |        m bits         |    n bits     |
+--------------------------+-----------------------+---------------+
|   ME6 address prefix     | Multiple net plane ID |Ethernet address|
+--------------------------+-----------------------+---------------+
```

Figure 3

ME6E address consists of three parts as follows.

ME6 address prefix

ME6 address prefix. This value is resolved by ME6E-PR.

Multiple network plane ID

Multiple network plane ID is an identifier of Ethernet network
over IPv6 backbone network. This value is preconfigured depend on
the ME6E-RP belong which ethernet network plane. This value is
just like VLAN-ID of IEEE802.1Q, tag VLAN.

EThernet address

Ethernet MAC address in inner Ethernet frame. EUI-48 address or
EUI-64 address.

3.3. Resolving ME6E address

ME6E-PR resolve ME6 address using ME6E Prefix Resolution Table
(ME6E-PR Table). ME6E-PR generate ME6E-PR address resolving ME6E-PR
prefix from Multiple network plane ID and Ethernet MAC address.
Figure 4 show this processing.

```
| 96 - m -n bits           |        m bits         |    n bits     |
+--------------------------+-----------------------+---------------+
|  ME6 address prefix      | Multiple net plane ID |Ethernet address|
+--------------------------+-----------------------+---------------+


 \-------------------------/\--------------------------------------/
          ^                                |
          |                                |
          |                                v
 +----------------------------------------------------------------+
 |                                                                |
 |       ME6E Prefix Resolution Table (ME6E-PR Table)             |
 |                                                                |
 +----------------------------------------------------------------+
```

Figure 4

Figure 5 show ME6E-PR Table. This table consists four parts,
Multiple network plane ID, Ehernet address, netmask, and ME6 address
prefix.

```
+--------------------+---------------+-------++------------------+
|Multiple net plane ID|Ethernet address|netmask|| ME6 address prefix|
+--------------------+---------------+-------++------------------+
|Multiple net plane ID|Ethernet address|netmask|| ME6 address prefix|
+--------------------+---------------+-------++------------------+
|Multiple net plane ID|Ethernet address|netmask|| ME6 address prefix|
+--------------------+---------------+-------++------------------+
|Multiple net plane ID|Ethernet address|netmask|| ME6 address prefix|
+--------------------+---------------+-------++------------------+
          :               :               :
+--------------------+---------------+-------++------------------+
|Multiple net plane ID|Ethernet address|netmask|| ME6 address prefix|
+--------------------+---------------+-------++------------------+
```

                             Figure 5

ME6E-PR configured multiple network plane ID, so ME6E-PR know
multiple network plane ID value the interface belongs.

Resolving destination address, ME6E-PR use pre-configured multiple
network plane ID valude, and destination MAC address of Ehernet
frame, and search the ME6E-PR table. ME6E-PR table return the ME6
address prefix value correspoiding multiple network plane ID and
ethernet destination MAC address. Then ME6E-PR generate whole ME6
address.

Resolving source address, ME6E-PR already know multiple network plane
ID value and IPv6 address prefix as ME6 prefix. So, searching the
ME6E-PR table does not require for resolving source address.

4. Sample configuration

Figure 6 shows sample confiuration of ME6E-PR. In this example,
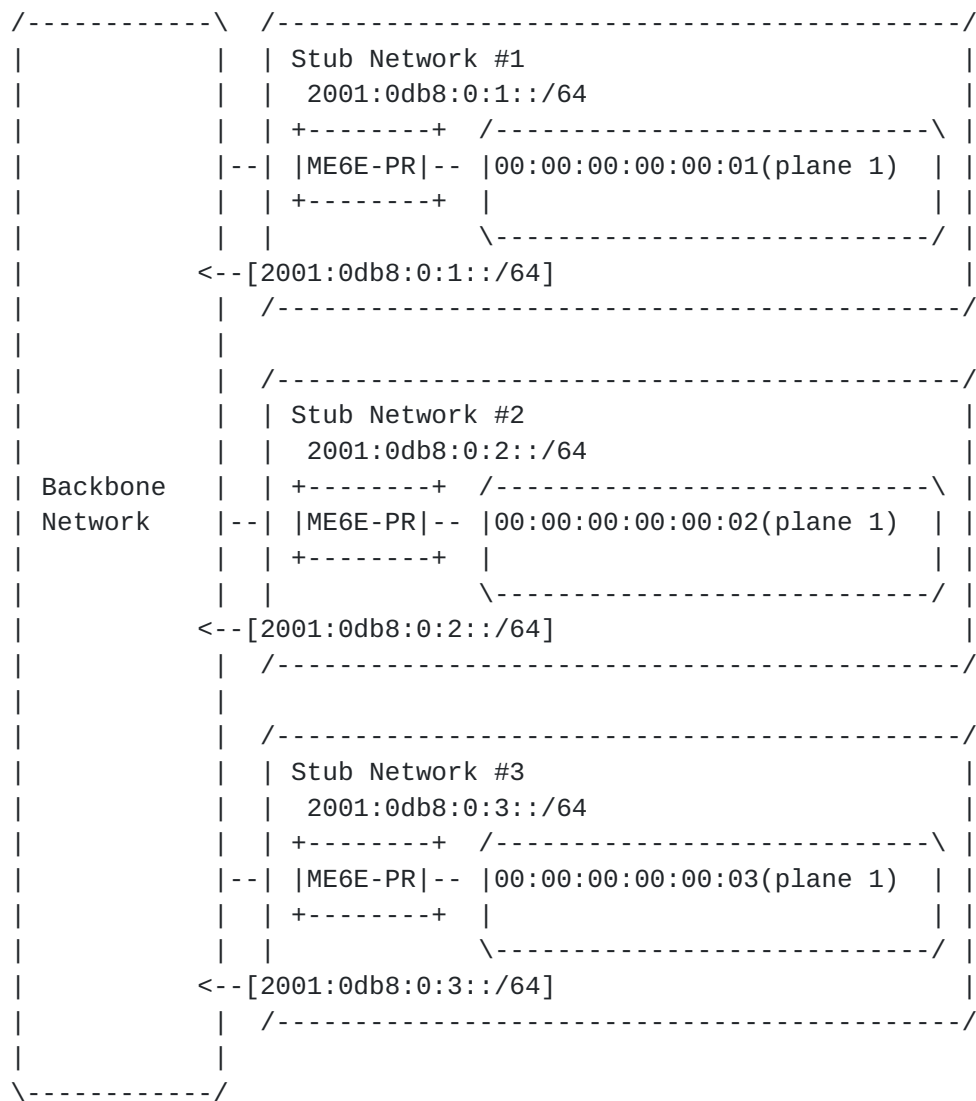there are three IPv4 stub network with the same IPv4 network plane.

```
   /-----------\  /------------------------------------------/
   |           |  | Stub Network #1                          |
   |           |  |   2001:0db8:0:1::/64                      |
   |           |  | +--------+  /---------------------------\ |
   |           |--| |ME6E-PR|-- |00:00:00:00:00:01(plane 1)  | |
   |           |  | +--------+  |                            | |
   |           |  |             \---------------------------/ |
   |          <--[2001:0db8:0:1::/64]                         |
   |           |  /------------------------------------------/
   |           |
   |           |
   |           |  /------------------------------------------/
   |           |  | Stub Network #2                          |
   |           |  |   2001:0db8:0:2::/64                      |
   | Backbone  |  | +--------+  /---------------------------\ |
   | Network   |--| |ME6E-PR|-- |00:00:00:00:00:02(plane 1)  | |
   |           |  | +--------+  |                            | |
   |           |  |             \---------------------------/ |
   |          <--[2001:0db8:0:2::/64]                         |
   |           |  /------------------------------------------/
   |           |
   |           |  /------------------------------------------/
   |           |  | Stub Network #3                          |
   |           |  |   2001:0db8:0:3::/64                      |
   |           |  | +--------+  /---------------------------\ |
   |           |--| |ME6E-PR|-- |00:00:00:00:00:03(plane 1)  | |
   |           |  | +--------+  |                            | |
   |           |  |             \---------------------------/ |
   |          <--[2001:0db8:0:3::/64]                         |
   |           |  /------------------------------------------/
   |           |
   \-----------/
```

                            Figure 6

   Figure 7 shows ME6E-PR table for sample network.

```
    +---------+------------------+-------++--------------------+
    | plane ID|   MAC address    |netmask||ME6E-PR address prefix|
    +---------+------------------+-------++--------------------+
    |    1    | 00:00:00:00:00:01 | /128  || 2001:0db8:0:1       |
    |    1    | 00:00:00:00:00:02 | /128  || 2001:0db8:0:2       |
    |    1    | 00:00:00:00:00:03 | /128  || 2001:0db8:0:3       |
    +---------+------------------+-------++--------------------+
```

                            Figure 7

[5](#). IANA Considerations

   This document makes no request of IANA if using EtherIP Header.

   Note to RFC Editor: this section may be removed on publication as an
   RFC.

[6](#). Security Considerations

   Security Considerations does not discussed in this memo.

[7](#). References

[7.1](#). Normative References

   [I-D.matsuhira-me6a]
              Matsuhira, N., "Multiple Ethernet - IPv6 mapped IPv6
              address (ME6A)", April 2016.

   [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
              Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[7.2](#). Informative References

   [RFC3378] Housley, R. and S. Hollenbeck, "EtherIP: Tunneling
              Ethernet Frames in IP Datagrams", [RFC 3378](#),
              September 2002.

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