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Multiple Ethernet - IPv6 address mapping encapsulation - fixed prefix

Abstract

This document specifies Multiple Ethernet - IPv6 address mapping encapsulation - fixed prefix (ME6E-FP) base specification. ME6E-FP makes expantion ethernet network over IPv6 backbone network with encapsuation technoogy. And also, E6ME-FP can stack multiple Ethernet networks. ME6E-FP work on 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

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This Internet-Draft will expire on 6 October 2022.

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1. Introduction

This document provides Multiple Ethernet - IPv6 address mapping encapsulation - fixed prefix (ME6E-FP) base specification.

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

ME6E-FP can use on own routing domain, i.e. can advertise routes to the network.

2. Basic Network Configuration

Figure 1 shows network configuration with ME6E-FP. The network consists of three parts. IPv6 network, Nodes (Host or Router) , and ME6E-FP.

Backbone network is operated with Dual Stack or IPv6 only. Node may physical node or virtual node, and have Ethernet Interface.

ME6E-FP connects IPv6 network and nodes. ME6E-FP connect to node with Ethernet (Layer2), and ME6E-FP connect to IPv6 network with IPv6 (Layer3).

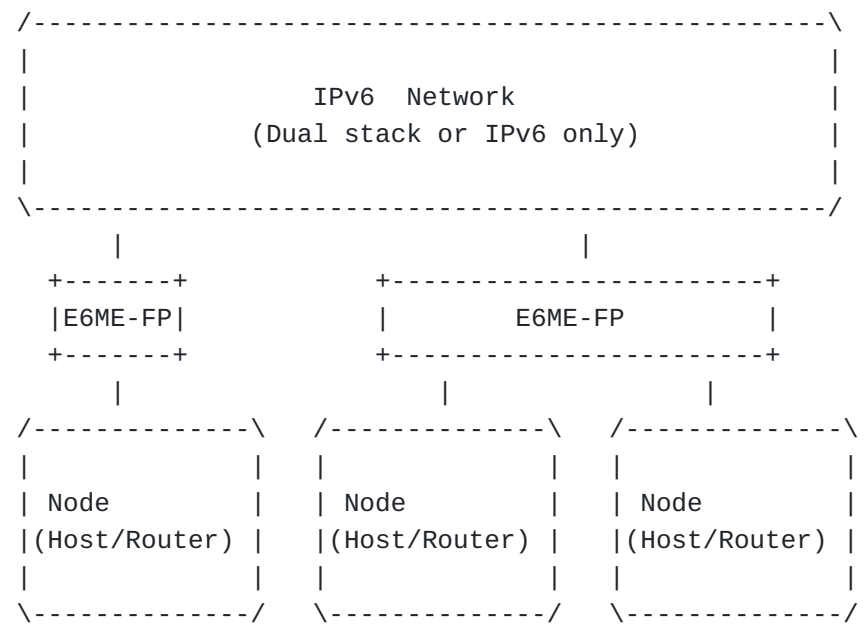

Figure 1

3. Basic Function of ME6E-FP

ME6E-FP has mainly two function. One is encapsulate from Ethernet frame to IPv6 packet, and decapsulate from IPv6 packet to Ethernet frame. Another is advertise route corresponding to Ethernet MAC address.

3.1. Ethernet over IPv6 Encapsulation

ME6E-FP 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 encapsulation and decapsulation of Ethernet frame and IPv6 packet

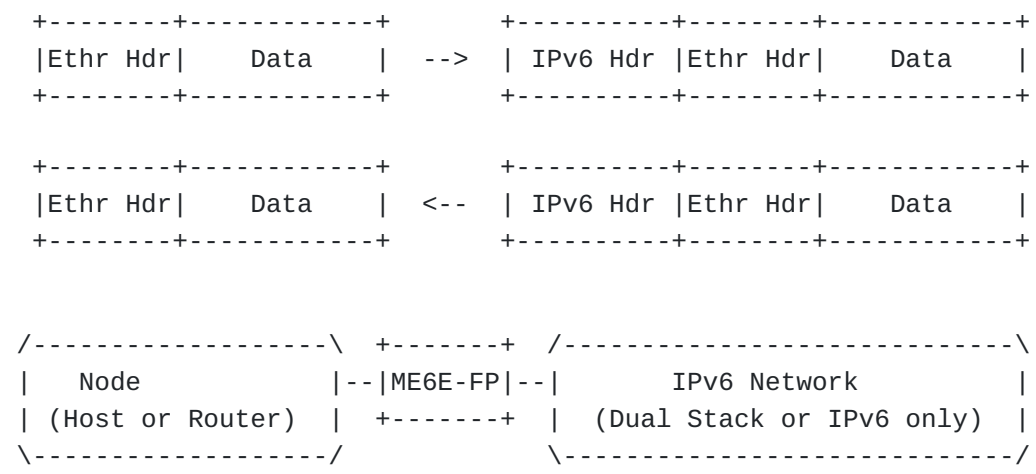

Figure 2

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

When encapsulated IPv6 Packet size exceed path MTU , ME6E-FP 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-FP.

Figure 3 shows ME6A architecture

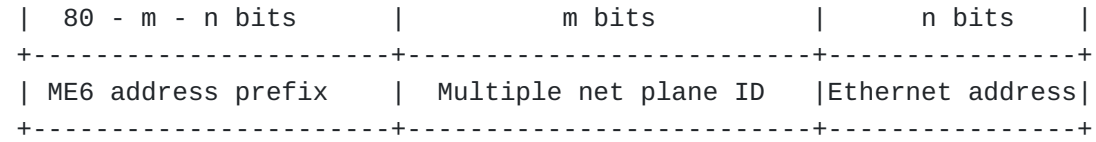

Figure 3

ME6 address consists of three parts as follows.

ME6 address prefix
ME6 address prefix . This value is preconfigured to all ME6E-FP in the IPv6 networks.

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-FP 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.

ME6 address is resolved by copying ethernet MAC address in inner ethernet frame, and preconfigured values, ME6 prefix and multiple network plane ID.

3.3. Route Advertisement

ME6E-FP advertises ME6 address host route to the IPv6 network. The number of the route of ME6 addresses is the same as the number of MAC address table.

In the IPv6 network, usual dynamic routing protocol for IPv6 can be used such as RIPng [RFC2080], OSPFv3 [RFC2740] and IS-IS [RFC5308] .

4. ME6E-FP address format

ME6E-FP can be used closely in the IPv6 network, so ME6 address does not be advertised outside of the IPv6 network, and IPv6 packet which contains ME6 address does not be forwarded outside of the backbone network.

So, ME6 address format and ME6 address prefix can be decided each IPv6 network. Some example are shown as follows. These address is based on EUI-48 MAC address. EUI-64 address is the future study.

4.1. IPv6 Global Unicast Address

This example is based on IPv6 Global Unicast Address Format [RFC3587].

Figure 4 shows IPv6 Global Unicast Address Format.

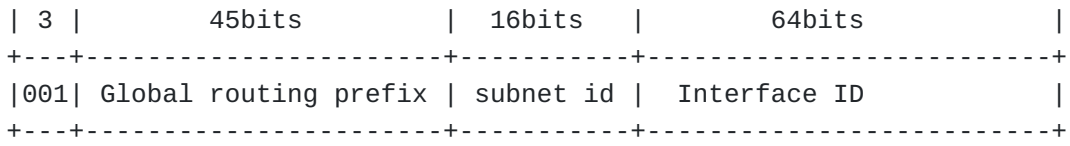

Figure 4

4.2. 16bits plane ID ME6 address

Figure 5 shows ME6 address format with 16bits multiple network plane ID using part of IPv6 Global Unicast Address.

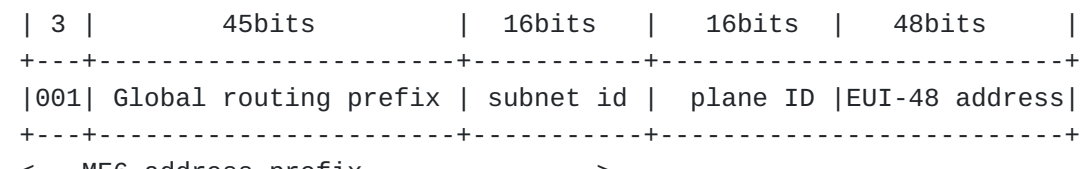

Figure 5

Where:

Global routing prefix
global routing prefix

subnet id
indication for ME6 prefix.

multiple network plane id
ethernet network plane ID.

EUI-48 address
EUI-48 MAC address of inner ethernet frame.

16bits plane ID can represent 65535 ethernet network plane.

4.3. 32bits plane ID ME6 address

Figure 6shows ME6 address format with 32bits plane ID using part of IPv6 Global Unicast Address.

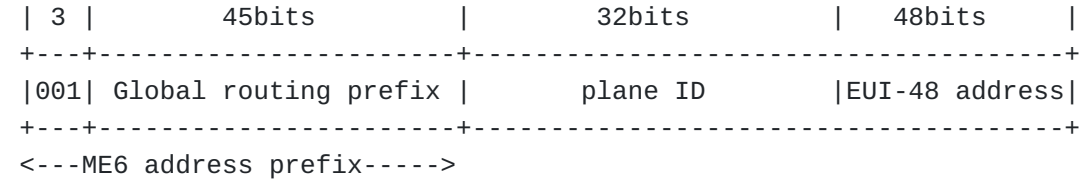

Figure 6

Where:

Global routing prefix
global routing prefix

multiple network plane id
ethernet network plane ID.

EUI-48 address
EUI-48 MAC address of inner ethernet frame

32bits plane ID can represent about 4.3 billion ethernet network plane.

4.4. mixture and renumbering of ME6 address

If ME6 address prefix does not overlap, ME6 address can co-existing. And also, ME6 address prefix may renumber, that mean, small start with 16bits plane ID ME6 address, then renumber to 32bits plane ID ME6 address.

ME6E-FP provide flexible operation for scalability of multiple network plane id.

5. Configuration of ME6E-FP

Configuration of ME6E-FP require just three information, ME6 address prefix, multiple Network plane ID, and prefix length of ME6E-FP route. These information could explain just only one line, "<ME6E-FP address prefix><multiple network plane ID>/ prefix length of ME6E-FP route".

6. Characteristic

ME6E-FP has following useful characteristics.

*can operate unicast routing domain

*TBD

7. 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.

8. Security Considerations

ME6E-FP use automatic tunneling technologies. Security consideration related tunneling technologies are discussed in RFC2893 [RFC2893], RFC2267 [RFC2267], etc.

9. References

9.1. Normative References

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