                Multiple IPv4 - IPv6 address mapping translator (M46T)
                            draft-matsuhira-m46t-10

Abstract

   This document specifies Multiple IPv4 - IPv6 address mapping
   Translator (M46T) specification. M46T enable access to IPv4 only
   host from IPv6 host. IPv4 host is identified as M46 address in IPv6
   address space. The address assigned to IPv4 host may be global IPv4
   address or private IPv4 address. M46T does not support access to
   IPv6 host from IPv4 only host.

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

   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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   This Internet-Draft will expire on December 20, 2021.

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1. Introduction

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   address or private IPv4 address. M46T does not support access to
   IPv6 host from IPv4 only host.

2. M46T Architecture

2.1. M46 address

   Figure 1 show M46A [I-D.draft-matsuhira-m46a].

```
    |     96 - m bits       |           m bits          |    32 bits   |
    +-----------------------+---------------------------+--------------+
    |      M46A prefix      | IPv4 network plane ID     | IPv4 address |
    +-----------------------+---------------------------+--------------+
```
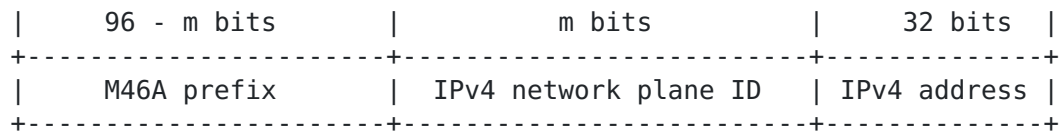
                             Figure 1

2.2. Mapping IPv4 address and IPv6 address

   M46A contain IPv4 address. Mapping IPv4 host address to IPv6 address
   space is already done with M46A. Address translation for IPv4 address
   is same as resolving M46A.

   IPv6 host address and corresponding IPv4 address should manage.

2.3. Address Translation Table

   Figure 2 shows translation table for M46T. Translation table contain
   three value, IPv6 adddress ot IPv6 host, mapped IPv4 address for the
   IPv6 host, and extry expire timer for remove the entry.

```
+---------------------+---------------------+-------------------+
| Address of IPv6 host | mapped IPv4 address | entry expire timer |
|                     | for IPv6 host       |                   |
+---------------------+---------------------+-------------------+
|         :           |         :           |         :         |
~         :           ~         :           ~         :         ~
|         :           |         :           |         :         |
+---------------------+---------------------+-------------------+
| Address of IPv6 host | mapped IPv4 address | entry expire timer |
|                     | for IPv6 host       |                   |
+---------------------+---------------------+-------------------+
```

Figure 2

2.4. DNS mapping of IPv4 only host

In the Domain Name System, hostnames are mapped to IPv6 addresses by
AAAA resource records. M46 address can be mapped to IPv4 only host
name.

3. Sample Configuration

3.1. M46 address and IPv4 network plane ID

In this example, M46A prefix length is 64bits, and IPv4 network plane
ID length is 32 bits. M46A prefix value is 2001:0DB8:0:46, and IPv4
network plane ID value is 0:46. Figure 3 shows these value.

```
|     64  bits        |        32 bits           |   32 bits  |
+---------------------+--------------------------+--------------+
| M46A prefix         | IPv4 network plane ID    | IPv4 address |
| (2001:0DB8:0:46)    | (0:46)                   |              |
+---------------------+--------------------------+--------------+
```

Figure 3

3.2. Network Configuration

Figure 4 shows sample network configuration. IPv6 network have 2001:
0DB8:1:0/64 network prefix and IPv4 network have 10.0.0.0/24 network
prefix.

```
    +----------------+
    |  IPv6 host     |
    |         2001:0DB8:1.0::10
    +----------------+
           |
           | 2001:0DB8:1:0/64
           |
    +----------------+
    |      2001:0DB8:1:0::1
    |                |
    |     M46T       |
    |             address pool for IPv6 host mapping
    |                192.168.0.0/24
    |                |
    |            10.0.0.1
    +----------------+
           |
           | 10.0.0.0/24
           |
    +----------------+
    | IPv4 only host |
    |                |
    |     ipv4onlyhost10.example.com
    |     10.0.0.10  |
    |     (2001:0DB8:0:46:0:64:10.0.0.10)
    |                |
    +----------------+
```
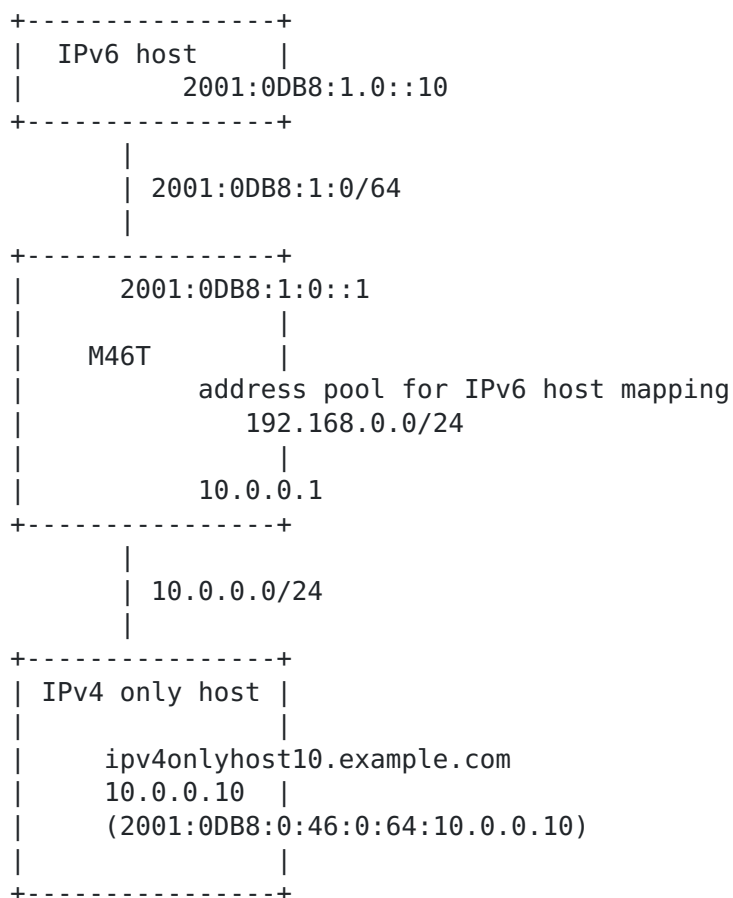
                         Figure 4

   IPv6 host address is 2001:0DB8:1:0::10. IPv4 only host address is
   10.0.0.10. M46 address for IPv4 only host is 2001:0DB8:0:46:0:64:
   10.0.0.10. FQDN of IPv4 only host is ipv6onlyhost10.example.com.
   Figure 5 shows DNS entry in IPv4 address space, and Figure 6 shows
   DNS entry in IPv6 space.

   ipv6onlyhost10.example.com IN A 10.0.0.10

                         Figure 5

   ipv6onlyhost10.example.com IN AAAA 2001:0DB8:0:46:0:64:10.0.0.10

Figure 6

The address of IPv4 interface of M46T is 10.0.0.1, and the address of
IPv6 interface of M46T is 2001:0DB8:1:0::1. M46T have also IPv4
address pool for IPv6 host mapping. This example, the IPv4 address
pool is 192.168.0.0/24.

The default router for IPv4 only host is M46T's IPv4 interface
address, 10.0.0.1.

3.3. Routing

If using M46T in own routing domain, M46T advertise M46 address
prefix for IPv4 only host, 2001:0DB8:0:46:0:64:10.0.0.0/120.

4. Processing of M46T

4.1. Configuration of M46T

1. M46A prefix for route advertisement (2001:0DB8:0:46:0:64:
    10.0.0.0/120)

2. IPv4 address pool for IPv6 hosts

3. entry expire default time (TBD)

M46A contain IPv4 network plane ID, so M46T know IPv4 network plane
ID from M46A prefix.

4.2. Processing from IPv6 to IPv4

1. M46T examine the exists of the entry for IPv6 host, that is
    source IPv6 address of IPv6 packet.

2. If there is no entry, get IPv4 address for mapping of IPv6 host
    from IPv4 address pool, and make entry to the translation table.

3. IF there is the entry, resove mapped IPv4 address for IPv6 host.

4. Make IPv4 header, source address is mapped IPv4 address, and
    destination address is from M46 address.

5. Translate IPv6 packet to IPv4 packet, and send it, and reset
    entry expire timer.

The example addess translation table is shown in Figure 7. In this
example, IPv6 host address is mapped to 192.168.0.200.

```
+----------------------+----------------------+--------------------+
| Address of IPv6 host | mapped IPv4 address  | entry expire timer |
|                      | for IPv6 host        |                    |
+----------------------+----------------------+--------------------+
| 2001:0DB8:1.0::10    | 192.168.0.200        | TBD                |
+----------------------+----------------------+--------------------+
```

Figure 7

4.3. Processing from IPv6 to IPv4

1. Search address translation table with key destination IPv4
   address, and resolve corrensponding IPv6 address.

2. Resolve source IPv6 address from sourve IPv4 address with M46
   address generation rule.

3. Translate IPv4 packet to IPv6 packet, and sent it, and reset
   extry expire timer.

4.4. Other processing

1. Remove the entry of address translation table if expire.

5. IANA Considerations

This document may requests IANA to assign IPv6 prefix for M46 Global
address.

6. Security Considerations

Security consideration does not discussed in this memo, at this time.

7. Normative References

[I-D.draft-matsuhira-m46a]
          Matsuhira, N., "Multiple IPv4 - IPv6 mapped IPv6 address",
          June 2019.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
          Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/
          RFC2119, March 1997,

<http://www.rfc-editor.org/info/rfc2119>.

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