This document specifies SA46T Prefix Resolution (SA46T-PR) specification. SA46T-PR is almost same as SA46T, however method of generation of outer IPv6 address is different. SA46T is backbone network based approach, however SA46T-PR is stub network based approach.

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].

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Table of Contents

1. Introduction ................................................. 3
2. Basic Network Configuration ................................. 3
3. Basic Function of SA46T-PR .................................. 4
   3.1. IPv4 over IPv6 Encapsulation / Decapsulation .......... 4
   3.2. SA46T-PR Address Format ............................... 5
   3.3. Resolving SA46T-PR address ............................ 6
4. Mode of SA46T-PR .............................................. 7
   4.1. Router mode ........................................... 7
   4.2. Host mode ............................................. 7
5. Sample configuration ......................................... 7
6. Comparison with SA46T ........................................ 9
   6.1. Difference with SA46T .................................. 9
   6.2. Compatibility with SA46T ............................... 9
7. IANA Considerations .......................................... 9
8. Security Considerations ..................................... 9
9. Acknowledgements ............................................ 9
10. References .................................................. 9
    10.1. Normative References ................................. 9
    10.2. Informative References .............................. 10
11. Author’s Address ........................................... 10
1. Introduction

This document provide SA46T Prefix Resolution (SA46T-PR) specification.

The basic strategy for IPv6 deployment is dual stack. However, because of exhaustion of IPv4 address, there will be no IPv4 addresses for configuring dual stack in near future. That means there will be IPv6 only networks automatically.

However, there are many IPv4 only networks still exist and those seems continuous use in near future. That means methods continuous use of IPv4 network over IPv6 only network will be required.

SA46T [I-D.draft-matsuhira-sa46t-spec] provide such methods. In addition, SA46T-PR also provide such methods. SA46T is backbone network based approach, on the other hand, SA46T-PR is stub network based approach.

2. Basic Network Configuration

Figure 1 shows network configuration with SA46T-PR. The network consists of three parts, backbone network, stub network, and SA46T-PR.

Backbone network can be operated with IPv6 only. Stub network has three cases, IPv4 only, Dual Stack (both IPv4 and IPv6), and IPv6 only.

SA46T connects backbone network and stub network in case IPv4 still works in that stub network. If stub network is IPv6 only, SA46T-PR is not needed.
3. Basic Function of SA46T-PR

SA46T-PR has mainly two function. One is IPv4 over IPv6 Encapsulation / Decapsulation, and another is generate a table where IPv4 stub network belong to IPv6 network.

3.1. IPv4 over IPv6 Encapsulation / Decapsulation

SA46T-PR excapsulates IPv4 packet to IPv6 from stub network to backbone network, and decapsulates IPv6 packet to IPv4 from backbone network to stub network. Figure 2 shows packet format on both backbone network and stub network.
3.2. SA46T-PR Address Format

SA46T-PR address is a IPv6 address used in outer IPv6 header which encapsulate IPv4 packet by SA46T-PR. Figure 3 shows SA46T-PR address format.

```
+--------------------------+------------------------+--------------+
| SA46T-PR address prefix  | IPv4 network plane ID  | IPv4 address |
+--------------------------+------------------------+--------------+
```

Figure 3

SA46T address consists of three parts as follows.

SA46T-PR address prefix

SA46T-PR address prefix is the IPv6 network prefix of stub network which contain IPv4 network of the IPv4 network plane.

IPv4 network plane ID

IPv4 network plane ID is an identifier of IPv4 network stack over IPv6 backbone network.

IPv4 address

IPv4 address in inner IPv4 packet.
### 3.3. Resolving SA46T-PR address

SA46T-PR resolve SA46T-PR address using SA46T Prefix Resolution Table (SA46T-PR Table). SA46T-PR generate SA46T-PR address resolving SA46T-PR prefix from IPv4 network plane ID and IPv4 address. Figure 4 show this processing.

```
| 96 - m bits | m bits | 32 bits |
+-------------+--------+---------+
| SA46T-PR address prefix | IPv4 network plane ID | IPv4 address |
+--------------------------+------------------------+--------------+
```

Figure 4

Figure 5 show SA46T-PR Table. This table consists four parts, IPv4 network plane ID, IPv4 address, netmask, and SA46T-PR address prefix.

```
+---------------------+------------+-------++-----------------------+
|IPv4 network plane ID|IPv4 address|netmask||SA46T-PR address prefix|
+---------------------+------------+-------++-----------------------+
|IPv4 network plane ID|IPv4 address|netmask||SA46T-PR address prefix|
+---------------------+------------+-------++-----------------------+
|IPv4 network plane ID|IPv4 address|netmask||SA46T-PR address prefix|
+---------------------+------------+-------++-----------------------+
|IPv4 network plane ID|IPv4 address|netmask||SA46T-PR address prefix|
+---------------------+------------+-------++-----------------------+
|IPv4 network plane ID|IPv4 address|netmask||SA46T-PR address prefix|
+---------------------+------------+-------++-----------------------+
|IPv4 network plane ID|IPv4 address|netmask||SA46T-PR address prefix|
```

Figure 5

SA46T-PR configured IPv4 network plane ID, so SA46T-PR know IPv4 network plane ID value the interface belongs.

Resolving destination address, SA46T-PR use pre-configured IPv4
network plane ID value, and destination address of IPv4 packets, and search the SA46T-PR table. SA46T-PR table return the SA46T-PR address prefix value corresponding IPv4 network plane ID and IPv4 destination address. Then SA46T-PR generate whole SA46T-PR address.

Resolving source address, SA46T-PR already know IPv4 network plane ID value and IPv6 address prefix as SA46T-PR prefix. So, searching the SA46T-PR table does not require for resolving source address.

4. Mode of SA46T-PR

SA46T-PR has two working modes, one is router mode, another is host mode.

4.1. Router mode

In router mode, SA46T-PR act as a IPv6 router. SA46T-PR occupy IPv6 subnet, and SA46T-PR advertise route for SA46T-PR.

4.2. Host mode

In host mode, SA46T-PR act as a IPv6 host. SA46T-PR share IPv4 subnet, that mean, SA46T-PR and IPv6 hosts exists on same IPv6 subnet. SA46T-PR do proxy NDP function for IPv4 host.

5. Sample configuration

Figure 6 shows sample configuration of SA46T-PR. In this example, there are three IPv4 stub network with the same IPv4 network plane.
Figure 7 shows SA46T-PR table for sample network.

<table>
<thead>
<tr>
<th>IPv4 network plane ID</th>
<th>IPv4 address</th>
<th>netmask</th>
<th>SA46T-PR address prefix</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.1.1.0</td>
<td>/120</td>
<td>2001:0db8:0:1</td>
</tr>
<tr>
<td>1</td>
<td>10.1.2.0</td>
<td>/120</td>
<td>2001:0db8:0:2</td>
</tr>
<tr>
<td>1</td>
<td>10.1.3.0</td>
<td>/120</td>
<td>2001:0db8:0:3</td>
</tr>
</tbody>
</table>
6. Comparison with SA46T

SA46T is backbone network based approach, and SA46T-PR is stub network based approach.

6.1. difference with SA46T

SA46T require route advertisement of SA46T prefix, so additional route are require, however configuration is few. On the other hand, SA46T-PR does not require additional route, however SA46T-PR table is require.

There are such trade-off between SA46T and SA46T-PR.

6.2. Compatibility with SA46T

If configure SA46t-PR table with default prefix as SA46T prefix, SA46T-PR acts as SA46T. In this case, netmask value of SA46T-PR table is /0, that mean any IPv4 network plane ID and IPv4 address pair match this entry.

7. IANA Considerations

This document makes no request of IANA.

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

8. Security Considerations

Security Considerations does not discussed in this memo.

9. Acknowledgements

10. References

10.1. Normative References

10.2. Informative References

[I-D. draft-matsuhira-sa46t-spec]

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