SA46T Prefix Translator (SA46T-PT)
draft-matsuhira-sa46t-pt-spec-05

Abstract

This document specifies SA46T Prefix Translator (SA46T-PT) specification. SA46T-PT expand IPv4 network plane by connecting SA46T domain and SA46T-PR domain. SA46T-PT translate prefix part of SA46T address and SA46T-PR address both are IPv6 address. SA46T-PT does not translate IPv4 packet which is encapsulated, so transparency of IPv4 packet is not broken.

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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1. Introduction

This document provides the SA46T Prefix Translator (SA46T-PT) specification.

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

However, there are many IPv4-only networks still exist and those seem 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] provides such methods. In addition, SA46T-PR [I-D.draft-matsuhira-sa46t-pr-spec] also provide such methods. SA46T is a backbone network-based approach, on the other hand, SA46T-PR is a stub network-based approach.

SA46T-PT expands IPv4 network plane by connecting SA46T domain and SA46T-PR domain. SA46T-PT translates the prefix part of SA46T address and SA46T-PR address both are IPv6 address. SA46T-PT does not translate IPv4 packet which is encapsulated, so transparency of IPv4 packet is not broken.

2. Basic Network Configuration

Figure 1 shows network configuration with SA46T-PT. At large view, the network consists three parts, SA46T domain, SA46T-PR domain, and SA46T-PT. SA46T-PT connects SA46T domain and SA46T-PR domain.
SA46T domain consists three parts, backbone network, stub network and SA46T. 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 is not needed. SA46T is a backbone network based approach, that mean SA46T advertise special route for SA46T.

And also, SA46T-PR domain consists three parts, backbone network, stub network and SA46T. 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. SA46T-PR is a stub network based approach.

3. Basic function of SA46T-PT

This section describe basic function of SA46T-PT.
3.1. Translation processing

SA46T-PT translate between SA46T packet and SA46T-PT packet. SA46T packet and SA46T-PT packet are almost the same, however IPv6 address are different.

Fig shows packet format of SA46T domain and SA46T-PT domain.

```
+--------+--------+------------+       +--------+--------+------------+
|IPv6Hdr|IPv4Hdr|    Data    |  -->  |IPv6Hdr|IPv4Hdr|    Data    |
+--------+--------+------------+       +--------+--------+------------+
+--------+--------+------------+       +--------+--------+------------+
|IPv6Hdr|IPv4Hdr|    Data    |  <--  |IPv6Hdr|IPv4Hdr|    Data    |
+--------+--------+------------+       +--------+--------+------------+
```

```
Figure 2
```

3.2. Address format of SA46T and SA46T-PR

figure Figure 3 shows SA46T address format and Figure 4 shows SA46T-PR address format. These format almost the same except SA46T address prefix in SA46T address and SA46T-PR address prefix in SA46T-PR address.

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

```
Figure 3
```

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

```
Figure 4
```
3.3. Resolving translate prefix

SA46T-PT translate from SA46T prefix to SA46T-PR prefix, or from SA46T-PR prefix to SA46T prefix using SA46T Prefix Translation (SA46T-PT) table. Figure 5 shows address resolution manner and Figure 6 shows SA46T-PT table.

<table>
<thead>
<tr>
<th>96 - m bits</th>
<th>m bits</th>
<th>32 bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA46T / SA46T-PR prefix</td>
<td>IPv4 network plane ID</td>
<td>IPv4 address</td>
</tr>
</tbody>
</table>

\----------------------------------------/
|   |   |
\----------------------------------------/

^                                     |
|                                     |
| SA46T Prefix Translation Table (SA46T-PT Table) |
|                                     |
\----------------------------------------/

Figure 5

SA46T-AT table is similar with SA46T-PR table, however SA46T-AT table may contain SA46T prefix.

<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>IPv4 network plane ID</td>
<td>IPv4 address</td>
<td>netmask</td>
<td>SA46T-PR address prefix</td>
</tr>
<tr>
<td>IPv4 network plane ID</td>
<td>IPv4 address</td>
<td>netmask</td>
<td>SA46T-PR address prefix</td>
</tr>
<tr>
<td>IPv4 network plane ID</td>
<td>IPv4 address</td>
<td>netmask</td>
<td>SA46T-PR address prefix</td>
</tr>
<tr>
<td>IPv4 network plane ID</td>
<td>IPv4 address</td>
<td>netmask</td>
<td>SA46T-PR address prefix</td>
</tr>
</tbody>
</table>

Figure 6

3.4. Destination address resolution

For address resolution for destination address, SA46T-PT use SA46T-PT table.
3.5. Source address resolution

For address resolution for source address, SA46T-PT use interface information, not SA46T-PT table. From SA46T domain to SA46T-PR domain, SA46T-PT use IPv6 address prefix of the interface which belong SA46T-PR domain. From

4. Sample Configuration

Figure 7 shows sample configuration of SA46T-PT. In this example, there are four IPv4 stub network with the same IPv4 network plane, and two of four are in SA46T domain and other two of four are in SA46T-PR domain.

In this example, SA46T prefix is 2001:0db8:0:46::/64.
Figure 7
Figure 8 shows SA46T-PT table for this example. This example is default free case.

<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>2001:0db8:0:46</td>
</tr>
<tr>
<td>1</td>
<td>10.1.2.0</td>
<td>/120</td>
<td>2001:0db8:0:46</td>
</tr>
<tr>
<td>1</td>
<td>10.1.3.0</td>
<td>/120</td>
<td>2001:0db8:2:1</td>
</tr>
<tr>
<td>1</td>
<td>10.1.4.0</td>
<td>/120</td>
<td>2001:0db8:2:2</td>
</tr>
</tbody>
</table>

Figure 8

Figure 9 shows another SA46T-PT table for this example. This example use default for SA46T. If there are many stub network in SA46T domain, by using default as SA46T prefix, reduction of SA46T-PT table size can be possible.

<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>10.1.3.0</td>
<td>/120</td>
<td>2001:0db8:2:1</td>
</tr>
<tr>
<td>1</td>
<td>10.1.4.0</td>
<td>/120</td>
<td>2001:0db8:2:2</td>
</tr>
<tr>
<td>1</td>
<td>0.0.0.0</td>
<td>/0</td>
<td>2001:0db8:0:46</td>
</tr>
</tbody>
</table>

Figure 9

5. IANA Considerations

This document makes no request of IANA.

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. Acknowledgements

8. References
8.1. Normative References


8.2. Informative References


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