Considerations for Mobility Support in NAT-PT
<draft-lee-v6ops-natpt-mobility-00.txt>

1. Introduction

NAT-PT (RFC-2766) enables end-nodes in IPv6 realm to communicate with end-nodes in IPv4 realm and vice versa. RFC-2766 [1] needs some fixes and/or applicability statements. Among them, there exists considerations in NAT-PT [1] when IPv6 end-nodes move. 3GPP drafts [2, 3] mention that there is a need for translators, such as NAT-PT, but in this case, current RFC-2766 [1] does not support IPv6 mobile nodes. The document specifies considerations for mobility support in NAT-PT (RFC-2766)[1].
2. Issues with mobility support in NAT-PT

2.1 Movement of end-nodes in IPv6 realm (IPv6-MNs)

When IPv6 end-nodes move, there are issues should be considered in RFC-2766. Basically, since mobile IPv6 (MIPv6) [4] provides route optimization, NAT-PT box must update its associated address mapping entries. As well, NAT-PT box needs appropriate handling of controls such as RR (Return Routability), BU (Binding Update), etc.

```
+---------+
|         |
V IPv4 domain

+---------+
|         |
/--
| NAT-PT |
|--
+---------+

+-----+/   |
| R1   |
+-------+

+-------+
| HA    |
+-------+

+-------+
| R2    |
+-------+

+-------+
| IPv6 MN|
+-------+

\-------------------------------/
IPv6 realm
```

2.2 Movement of end-nodes in IPv4 realm (IPv4-MNs)

Obviously, there is no issue when IPv4 end-nodes move, since mobile IPv4 (MIPv4) [5] uses tunneling.

3. Mobility support in NAT-PT box

This section describes the case that an IPv6-MN moves from home network to other network in the same IPv6 island.

Main consideration is that NAT-PT box does all of MIPv6
functionalities on behalf of IPv4-CNs. Following subsections show how NAT-PT box works in this situation.

In the example below, the following notations will be used.

==> means IPv6 packet.
---> means IPv4 packet.
++> means IPv6 over IPv6 tunnel.

3.1 Control Sessions

3.1.1 Initial state

In initial state <IPv6 MN> is in home network and it communicates with <IPv4 CN> like general NAT-PT outbound session.

<table>
<thead>
<tr>
<th>IPv6 MN</th>
<th>HA</th>
<th>NAT-PT</th>
<th>IPv4 CN</th>
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<tbody>
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</tbody>
</table>

* IPv6 MN
  P1::xxxx/64 (Home Address)

* HA
  advertises P1::/64

* NAT-PT
  advertises PREFIX::/64
  Mapping Table:
    mapping_entry[0] = {P1::xxxx/64, w.x.y.z}
  Binding Cache Table:
    binding_cache_entry[0] = {}
  Kcn/nonce Table:
    kcn_entry[0] = {}

* IPv4 CN
  a.b.c.d
3.1.2 RR procedure

After <IPv6 MN>’s moving from home network to other subnet, <IPv6 MN> tries RR procedure to check reachability of <IPv4 CN> before sending BU.

```
IPv6 MN <HA> <R1> <NAT-PT> <IPv4 CN>
```

| ===========> | ======> | - IPv6 MN sends CoTI message to IPv4 CN. |
| ++++> ============> | - IPv6 MN sends HoTI message to IPv4 CN through HA. |

```
<=========< ======>
```

- <NAT-PT> intercepts CoTI message and return CoT message to IPv6 MN. Before sending CoT message, <NAT-PT> must save kcn and care-of nonce index for IPv4 CN.

```
<+++++< ============>
```

- <NAT-PT> intercepts HoTI message and return HoT message to IPv6 MN. Before sending HoT message, <NAT-PT> must save kcn and home nonce index for IPv4 CN.

* IPv6 MN
  P1::xxxx/64 (Home Address)
  P2::xxxx/64 (Care of Address)

* HA
  advertises P1::/64

* R1
  advertises P2::/64

* NAT-PT
  advertises PREFIX::/64

Mapping Table:
  mapping_entry[0] = { P1::xxxx/64, w.x.y.z }

Binding Cache Table:
  binding_cache_entry[0] = {}

Kcn/nonce Table:
  kcn_entry[0] = { HA: P1::xxxx/64, COA: P2::xxxx/64, CN: a.b.c.d, Kcn: nnn, Home Nonce index: nnn, Care-of Nonce Index: nnn }

* IPv4 CN
  a.b.c.d

3.1.3 Binding Update/Acknowledge
After finishing RR procedure <IPv6 MN> makes authenticator and sends BU message to <IPv4 CN> for route optimization.

- <IPv6 MN> sends BU message to <IPv4 CN>
- <NAT-PT> intercepts BU message and returns BA to <IPv6 MN>. Before sending BA <NAT-PT> must add new binding cache entry.

* IPv6 MN
  P1::xxxx/64 (Home Address)
  P2::xxxx/64 (Care of Address)
* HA
  advertises P1::/64
* R1
  advertises P2::/64
* NAT-PT
  advertises PREFIX::/64
Mapping Table:
  mapping_entry[0] = { P1::xxxx/64, w.x.y.z }
Binding Cache Table:
  binding_cache_entry[0] = { HA: P1::xxxx/64,
                            COA: P2::xxxx/64,
                            Lifetime: nnn, Flag: 0,
                            Seq no: nnn, Usage info: nnn}
Kcn/nonce Table:
  kcn_entry[0] = { HA: P1::xxxx/64, COA: P2::xxxx/64,
                   CN: a.b.c.d, Kcn: nnn,
                   Home Nonce index: nnn,
                   Care-of Nonce Index: nnn }
* IPv4 CN
  a.b.c.d

3.2 General Data Transmission

- <IPv6 MN> sends IPv6 packet with HAO to <IPv4 CN>.
- <NAT-PT> intercepts IPv6 packet with HAO. To translate packet with HAO <NAT-PT> searches connection (src(HA), dst(PREFIX::a.b.c.d)) which has mapping information.
4. IPv6-MNs move from one island to another island

This issue should be also considered. This version of the draft is not mentioned yet.

5. Security Considerations
Security consideration is not studied yet.

8. Acknowledgments

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References


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