Stateless IPv4 Network Address Translation
draft-tsou-stateless-nat44-02

Tina Tsou <tina.tsou.zouting@huawei.com>
Will Liu <liushucheng@huawei.com>
Simon Perreault <simon.perreault@viagenie.ca>
Reinaldo Penno <repenno@cisco.com>
Maoke Chen <fibrib@gmail.com>

Sunset4
IETF 85, Atlanta
2012-11-05
Problem

- Stateful NAT44 in CGN
  - Fragile
  - Complex
  - Hard to scale up
  - Hard to log mappings
  - Doesn't like asymmetric routing
  - Etc.
Solution overview

- Each subscriber gets part of an external address (port set)
- The external address and port set are encoded in the internal address that is assigned to the CPE.
- The CPE restricts itself to its allowed port set.
- The stateless NAT44 only translates addresses, extracting the needed information from the address itself.
Topology and bridge mode

- Stateless NAT44 topology

```
Home ----+ CPE |----<ISP network>----+ SLNAT44 ----+ Internet
  ^           ^
  |           |
--- Internal Address ------- External Address

Figure 1: Stateless NAT44 topology
```

- Bridge mode - CPE is configured working as a transparent bridge

```
Home ----+ CPE |----<ISP network>----+ SLNAT44 ----+ Internet
  ^           ^
  |           |
--- Internal Addresses ------- External Address

Figure 2: Stateless NAT44 topology: CPE as bridge
```
Address formats

Figure 2: Internal Address format

Figure 3: External Address format
Fragment handling

- Address translation depends on L4 port number, therefore fragments need to be reassembled
- Same considerations as NAT64, text adapted from RFC 6146
Non-contiguous port sets

- Optionally, non-contiguous port sets can be used.
- Requires provisioning a port set **mask** to the CPE.

<table>
<thead>
<tr>
<th>0</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1 1 0 1</td>
<td>Port Set ID (length n = 5 bits)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&amp; &amp; &amp; &amp; &amp;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1 1 1 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V V V V V</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1 1 0 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>0</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>0 0 1 0 1 1 1 1</td>
<td>Port Set ID (length n = 8 bits)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&amp; &amp; &amp; &amp; &amp; &amp; &amp; &amp;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 1 1 1 1 1 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V V V V V V V V V</th>
</tr>
</thead>
<tbody>
<tr>
<td>x x 1 0 1 1 1 1 x x x x x x x x x</td>
</tr>
</tbody>
</table>

| 0 | 16 |
Advantages

- Stateless CGN
  - No logging
  - Robust, scalable, etc.
  - Allows asymmetric routing (careful with fragments)
- Minimal modifications to CPE
  - A vanilla Linux home router can do this today.
- Fits into existing infrastructure and operational practices
- Very flexible port set definition
How is this different from...

- **SD-NAT44 [draft-penno-softwire-sdnat-01]**
  - SD-NAT has per-customer state. SLNAT44 has no state at all.
  - SLNAT44 supports non-contiguous port sets.
  - SLNAT44 has no signaling between CGN and CPE.
  - SD-NAT44 has been dropped from draft -02.
- **MAP, 4rd**
  - SLNAT44 is IPv4-only, no impact on IPv6.
Next steps

- Is Sunset4 interested in this draft?
- What would be the next steps to progress this draft?