Provisioning Domains

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WHAT ARE WE TRYING TO SOLVE?
Back to Basics
The Internet Protocol

IPv4: 192.168.1.1

IPv6: FE80::0202:B3FF:FE1E:8329
2001:db8:abba:babe::1234
fd00::1:3060:2a08:1505:f6ca
IPv6 Nodes have Multiple Addresses

- Each IPv6 nodes can have multiple addresses
  - 1 Link-Local Address
  - Several Global Addresses
    - Through DHCPv6 which can give multiple addresses
    - Through Stateless Address Auto Configuration (SLAAC)
      1. Based on several distinct Router Advertisements from each adjacent IPv6 routers
      2. Each Router Advertisements can include multiple /64 prefixes
      3. Nodes then generate 1, 2, ... Addresses per prefixes
Issue with Multi-Homing (Resiliency)

Using src addr from Blue
First hop is Blue
OK

Using src addr from Blue
First hop is Red
Anti-spoofing => blocked
Solving the First Hop Issue

• Need to associate a prefix with first hop
• Mainly a host issue (IETF work in progress)
• More complex (provisioning domain)
  • DNS servers from different ISP can have a different view (wwwin.cisco.com does not exist in global DNS)
  • Provisioning domain (PvD)
  • Need support in multi-interface router, IETF work in progress (Cisco, Apple, Google)
• Could have multiple layers of routers
  • Destination / source routing (IETF work in progress, aka source address dependent routing SADR) easier that Policy Based Routing
Use case 3: Service Selection

Two prefixes from router
1. For service Red
2. For service Blue
At least two global addresses
3. From prefix Blue
4. From prefix Red

Traffic engineering
Different QoS
Different routing (€€€ or security)
Yes, that’s right. Choose your source address, I’ll make sure packets go down the right path.

“So, the source address I select affects the path and associated policy throughout the network?”

Yikes! What do I do! I’ve never asked the user for this kind of information before!

Credit: Mark Townsley
I Have.
PROVISIONING DOMAINS (PVD)
Provisioning Domain (PvD)

- Configuration items for a node to access a network
  - PvD ID (similar to FQDN) to tag all PvD information
    - can be used to remove PvD information when PvD is expired/removed/..
  - Human readable (localized) name
  - Prefix, next-Hop router
  - Internet access is possible
  - Captive portal is present
  - Recursive DNS server, DNS search list
  - Maximum Throughput, latency
  - Financial cost structure
  - Time validity/refresh period of the PvD
  - Security
  - Quality of Service for the first hop
Bootstrap PvD

- Bootstrap PvD information added to IPv6 Router Advertisement
  - PvD applies to all Prefix Information Options (PIO)
    - Use multiple RA if the PvD is not to be shared among PIO
  - Main information is PvD ID: a FQDN
  - Optional information as a string
    - “nl10n=Connexion à Internet;mp6=2001:db8::/32;cp=1”
  - Bootstrap PvD ID may be used to retrieve additional PvD information (next slide)
2nd Stage PvD

- A JSON file can be fetched via https://<PvDID>/v1.json
- All HTTP headers MUST be enforced
  - Accept-Language
  - Expiration
- The “masterIpv6Prefix” key is used to check whether the RA PIO is correct
What kind of information?

- DNS information including search domains
- Reachable prefixes
- Internet access or walled garden
- Captive portal is present
- IPv4 NAT presence, time-outs
- Segment Routing Header value
- Cost structure
Link to IPv4 Information

- PvD obtained by IPv6 could be linked to IPv4
  - IPv4 prefix included in bootstrap/2nd-stage PvD?
  - Link via the source MAC address of the RA w/ DHCPv4 message
  - Interface ID (such as 3GPP link) when not ambiguous
  - DNS search list of DHCPv4 and IPv6 PvD
RUNNING CODE
IPv6 Multiprefix @ IETF 94 Hackathon - Test

1. One Homenet SSID
2. Two IPv6 Prefixes “Cellular” and “Cable”
3. Disabled “Cable” prefix on iPhone
4. iPhone app reports it only as “Cellular”
IPv6 Multiprefix Application Integration

Credit: Gert Doering, SpaceNet AG, Munich, Germany
A New, Evolutive API and Transport-Layer Architecture for the Internet: [https://www.neat-project.org/](https://www.neat-project.org/)

European H-2020 project
10 partners (Cisco, Mozilla, EMC, Celerway…)

**Provisioning Domain** (information about a prefix) via DNS [draft-stenberg-mif-mpvd-dns-00](https://www.rfc-editor.org/rfc/rfc7962) (old)

Integration to NEAT code: [https://github.com/NEAT-project/neat/pull/80](https://github.com/NEAT-project/neat/pull/80)

### Asking the user to choose with relevant criteria and simple UI

<table>
<thead>
<tr>
<th>Plan</th>
<th>Duration</th>
<th>Data</th>
<th>Price</th>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE (Orange)</td>
<td>2 min</td>
<td>0.5 GB</td>
<td>$0</td>
<td>3%</td>
</tr>
<tr>
<td>VPN over LTE (Orange)</td>
<td>6 min</td>
<td>0.5 GB</td>
<td>$0</td>
<td>4%</td>
</tr>
<tr>
<td>Wi-Fi (Oslo Hostel Wi-Fi)</td>
<td>11 min</td>
<td></td>
<td></td>
<td>1%</td>
</tr>
</tbody>
</table>

**Wednesday, June 29 2016: plenary session in Oslo**
IPv6 Multiprefix NEAT Integration