Link Layer Addresses Assignment Mechanism for DHCPv6

IETF-101 (London)
DHC WG
Monday, 19 March 2018
17:40 – 18:40 (GMT)
Viscount
Background (1/2)

- RFC 7241 defines cooperation between IEEE 802 and IETF and there are periodic discussions
- IEEE 802c split “local” MAC address space into 4 quadrants to provide for different allocation schemes
- IEEE 802cq is working on defining allocation mechanisms
- Ralph Droms, Russ Housley, Suresh Krishnan thought that DHCPv6 might be usable as an MAC address allocation (802cq) mechanism
Background (2/2)

- Ralph Droms reached out to Bernie
- Tomek and Bernie discussed and decided to work on it
- Hence, the new I-D: draft-bvtm-dhc-mac-assgin-00
- More background about 802c/cq in Pat Thaler’s “Emerging IEEE 802 Work on MAC Addressing” slides from IETF-96 (https://datatracker.ietf.org/meeting/96/materials/slides-96-edu-ieee802work-0/)
### Why?

<table>
<thead>
<tr>
<th>Number of tries</th>
<th>Possible combinations</th>
<th>Collision chance</th>
<th>No collision chance</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 people</td>
<td>365 days</td>
<td>49.95%</td>
<td>50.05%</td>
</tr>
<tr>
<td>1024 VMs</td>
<td>$2^{24}$ (One OUI)</td>
<td>3.07%</td>
<td>96.93%</td>
</tr>
<tr>
<td>4824 VMs</td>
<td>$2^{24}$ (One OUI)</td>
<td>50.01%</td>
<td>49.99%</td>
</tr>
<tr>
<td>1M VMs</td>
<td>$2^{45}$ (Local address quadrant)</td>
<td>1.41%</td>
<td>98.59%</td>
</tr>
<tr>
<td>1M VMs</td>
<td>$2^{46}$ (“I know better than IEEE”)</td>
<td>0.71%</td>
<td>99.29%</td>
</tr>
</tbody>
</table>

- Roughly the same probability for IPv6 uniqueness, and we do DAD
- Calculator: [https://instacalc.com/28845](https://instacalc.com/28845)
Use Cases

• Hypervisor – to allocate the Virtual Machines
  – Lots of VMs
  – May have short or long life
  – May be possible to reuse addresses for different network segments based on data center

• IoT devices
  – Often short lived/disposable
  – Little need for global MAC address

• Individual clients

• …
Why DHCPv6?

- Existing infrastructure: protocol, network, tools
- Servers already know how to manage and assign resources
- Protocol easily extensible
- We are in DHC and …
**IA_LL Option**

- New Identity Association – IA_LL for link-layer addresses
- Just like IA_NA and IA_PD.
**LLADDR Option**

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---------------------------------------------------------------+
<p>|       OPTION_LLADDR                  | option-len          |
|---------------------------------------------------------------|
|       link-layer-type                 | link-layer-len      |
|---------------------------------------------------------------|</p>
<table>
<thead>
<tr>
<th>link-layer-address</th>
</tr>
</thead>
<tbody>
<tr>
<td>extra-addresses</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>valid-lifetime</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>LLaddr-options</td>
</tr>
</tbody>
</table>
```

- New container for link-layer address (similar to IAADDR, IAPREFIX)
- Address block = a number of consecutive LL addresses
- Minimal block is 1 address (extra-addresses = 0)
- Link-layer-len is usually 6
- No preferred-lifetime
Client / Server Operation (1)

• Essentials the same as address / prefix delegation, but simpler overall
• Confirm, Decline, Reconfigure, and Information-Request not used
  – Perhaps Decline could be useful if conflict found?
Client / Server Operation (2)

• For hypervisor model
  – Hypervisor is client, but does not use resulting link-layer addresses
  – Instead, address is provided to VMs
  – Those client(s) could do standard DHCPv6
• If “true” client (e.g. IoT) wants a link-layer address
  – Could use Temporary MAC address for anonymity
    (https://mentor.ieee.org/802.11/dcn/02/11-02-0109-00-000i-temporary-mac-address-for-anonymity.ppt) to get link-layer address
  – Clarify not to do DUID-LL based on temporary MAC
  – Then, use assigned address (for normal DHCPv6, …)
Open Issues

- Use of rapid-commit? (forbidden, allowed, mandatory)
- Reconfigure?
- Hypervisor – what to do if address expires?

Please discuss on dhc list and report here:

https://github.com/dhcwg/dhcp-mac/issues
Next Steps

• Provide feedback to authors
  – On Draft
  – Address open Issues
  – Indicate interest / support of work (or lack thereof)
• Adopt as Working Group item?
  – Interest? Who will determine the consensus?
  – Defer call?
• If adopted, will need a shepherd (both chairs are authors)
Question or comments ...

&

THANKS