ILNP – Identifier Locator Network Protocol
FreeBSD 14.0 dynamic host multihoming

https://ilnp.cs.st-andrews.ac.uk/
School of Computer Science, University of St Andrews
ILNP – The story so far ...

• RFCs 6740 – 6748 (Experimental)
• Ongoing research and development:
  • University of St Andrews
• IETF104/Prague – Linux 4.9 kernel
• IETF118/Prague & IETF119/Brisbane – FreeBSD 14.0 kernel
IETF120/Vancouver

• Team:
  • Saleem Bhatti (Hackathon, project lead)
  • Gregor Haywood (BSD dev, remote)
  • Rod Grimes (BSD dev, Hackathon)
  • Alistair Woodman (Hackathon)
  • Many thanks to NOC Team 😊

• Aim: test ILNP host multihoming connectivity between Vancouver and Scotland.
ILNP addressing

IPv6 (RFC8200(S)) – general IPv6 global address format:

```
  +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
  | 3 | 45 bits | 16 bits | 64 bits |
  +---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

- | 001 | global routing prefix | subnet ID | Interface Identifier (IID) |

IPv6 routing (address) prefix

same syntax, different semantics

ILNP (RFC6741(E)) – Identifier Locator Vector (I-LV):

```
  +---+---+---+---+---+---+---+---+---+
  | 64 bits | 64 bits |
  +---+---+---+---+---+---+---+---+
```

- | Locator (L64) | Node Identifier (NID) |

same syntax and semantics as IPv6 routing (address) prefix
so IPv6 core routers work as today

these bits only examined and acted upon by end systems
**ILNP Locator Update (LU)**

ICMPv6 Locator Update Message (RFC 6743(E)):

```
<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
<th>Checksum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Num of Locs</td>
<td>Operation</td>
<td>RESERVED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locator [1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locator [2]</td>
<td></td>
<td></td>
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<tr>
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</tbody>
</table>
```

Type = 156, Code = 0
Experiment

1. ILNP addressing architecture (RFC6741(E)).
2. ILNP Locator Update (RFC6743(E)).
3. **Dynamic multihoming by host**:
   - add Locators, dynamically, and try “multipath” TCP.
   - (Purely end-to-end control plane.)
   - Locator / interface sequence: 1, 2, 3, 4, 3, 2, 1.
   - *iperf3* (using 1., 2. and 3. above).
   - **IPv6 binaries (not modified for ILNP).**
   - server at University of St Andrews, Scotland.
   - client at IETF120/Vancouver.
Results (Hackathon, 21 July 2024)