Short Hierarchical IP Address at Edge Networks

https://datatracker.ietf.org/doc/draft-song-ship-edge/

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IoT Network Characteristics and Opportunity

- Entity communication are sensitive to overhead and energy
  - Short message exchange, battery powered devices, wireless channel, low storage and computing capability

- On the other hand
  - IPv6 header overhead is large – mainly attributed to addresses
  - An IoT network appears to be an edge network under a same IPv6 prefix
  - Most communication could happen between adjacent and related entities

- Question
  - Why does an entity need to know its prefix?
Short Address in Hierarchical Networks at Edge

**Complete Entity IPv6 Address** = IPv6 subnet prefix + L0 Network ID + L1 Network ID + ... + Entity ID

- **Delegate** Network ID/prefix maintenance and operation to network gateway routers
- Entity only knows and uses its own Entity ID
Use short address in hierarchical edge network

<table>
<thead>
<tr>
<th>SAL</th>
<th>DAL</th>
</tr>
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<tbody>
<tr>
<td>SA (variable length)</td>
<td></td>
</tr>
<tr>
<td>DA (variable length)</td>
<td></td>
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</tbody>
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Address format in packet header
Address Transformation at Gateway Routers
Interface with the Internet

- IPT – translates IP header between edge format and IPv6 format
  - To the Internet: attach the source prefix
  - From the Internet: prune the destination prefix

- IPT can also work as a NAT gateway
  - An edge network is assigned one or some public IP addresses
  - Internal address could have arbitrary length
Benefits

• Interoperable with the Internet
• Significant header overhead saving – 60%~70%
• Simply both control plane and data plane
  • P4 prototype done
• Incrementally deployable
Comparison: SHIP vs. 6LoPAN vs. SCHC (LPWAN)

• SHIP is hierarchical, extending from edge to core
• SHIP is applicable to all kinds of networks
  • 6LoPAN: IEEE 802.15
• SHIP is applicable on arbitrary network topology
  • HC is applicable on “point-to-point” channel only
  • Compressed packet is not routable unless decompressed first
• SHIP only concerns the IP addresses, orthogonal to the compression technique on the other header fields
• SHIP is solely determined by the subnetworks, needing no dynamic context negotiation or static context configuration
• SHIP allows communication between any Internet-addressable nodes
Next steps

• Collaboration and future-work suggestion welcome
• Find best place to adopt this work