# Short Hierarchical IP Address at Edge Networks

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

Haoyu Song

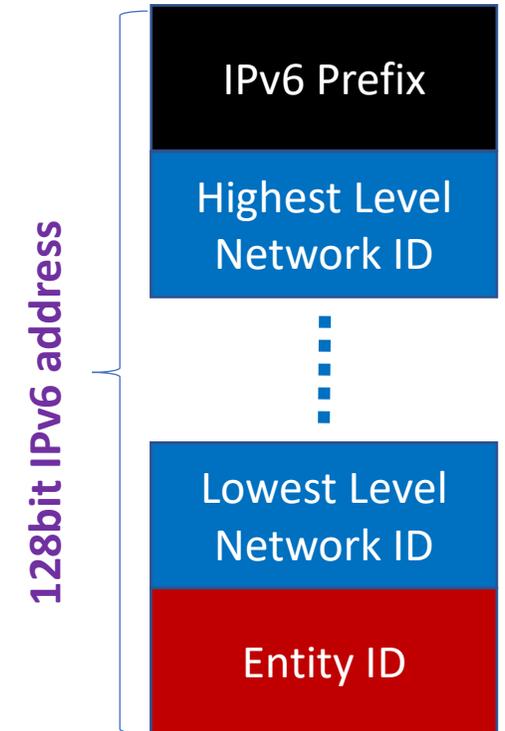# IoT Network Characteristics and Opportunity

- 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 <span style="color:red">a same IPv6 prefix</span>
  - Most communication could happen between adjacent and related entitles
- Question
  - Why does an entity need to know its prefix?

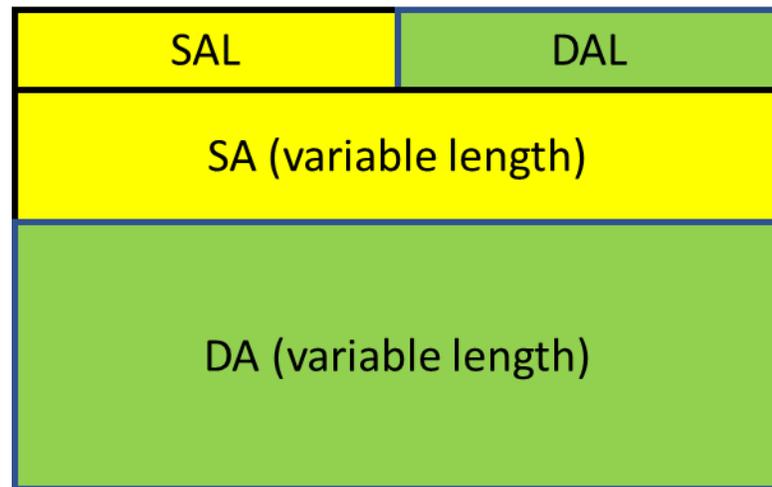# Short Address in Hierarchical Networks at Edge

***Complete Entity IPv6 Address** = **IPv6 subnet prefix +***
***L0 Network ID + L1 Network ID + … + Entity ID***
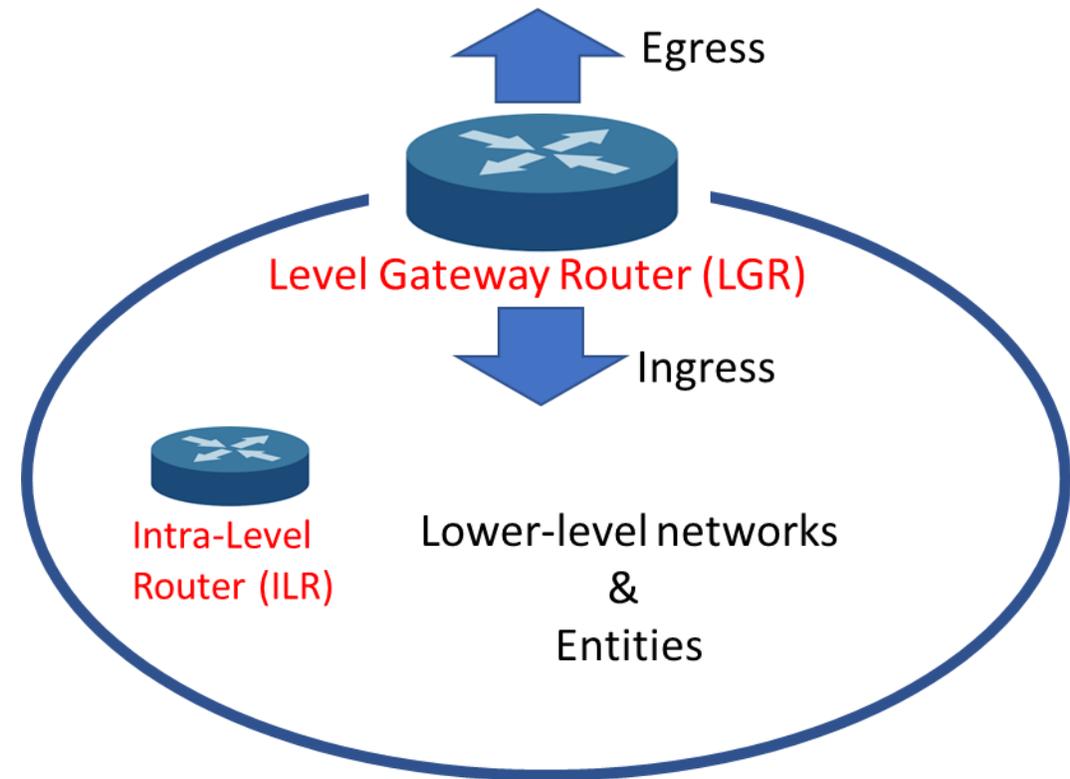
edge network

- ***Delegate*** Network ID/prefix maintenance and operation to network gateway routers
- Entity only knows and uses its own Entity ID

**128bit IPv6 address**

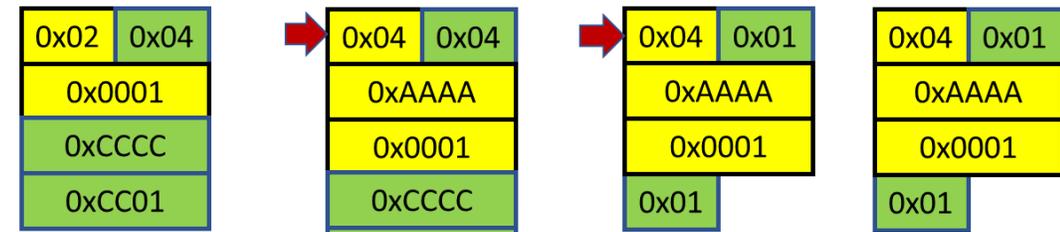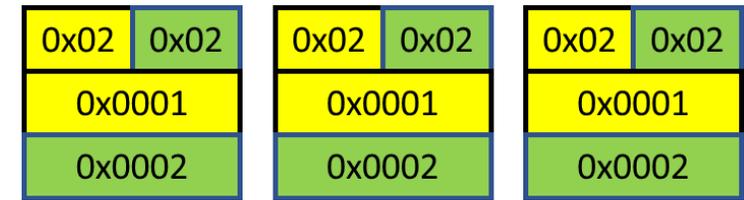| IPv6 Prefix |
| Highest Level Network ID |
| ⋮ |
| Lowest Level Network ID |
| Entity ID |

# Use short address in hierarchical edge network



Address format in packet header

SAL | DAL
SA (variable length)
DA (variable length)

Egress

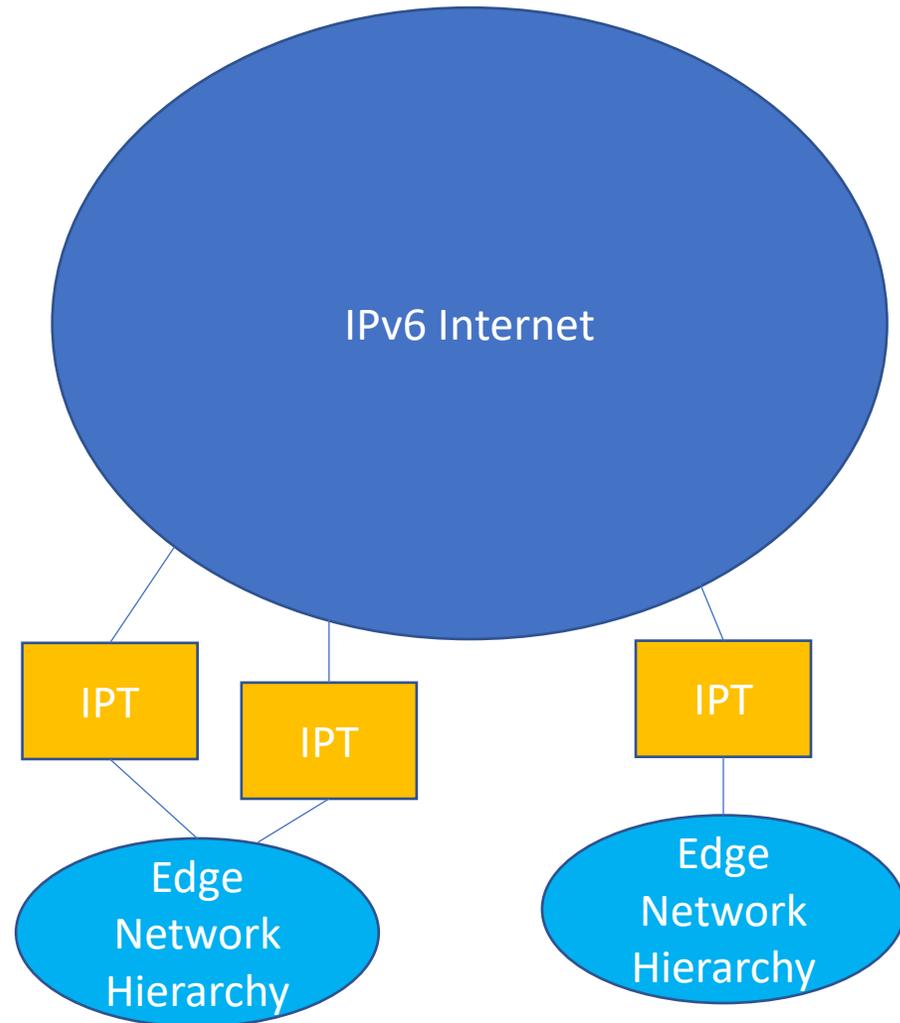Level Gateway Router (LGR)

Ingress

Intra-Level Router (ILR)

Lower-level networks & Entities

# Address Transformation at Gateway Routers
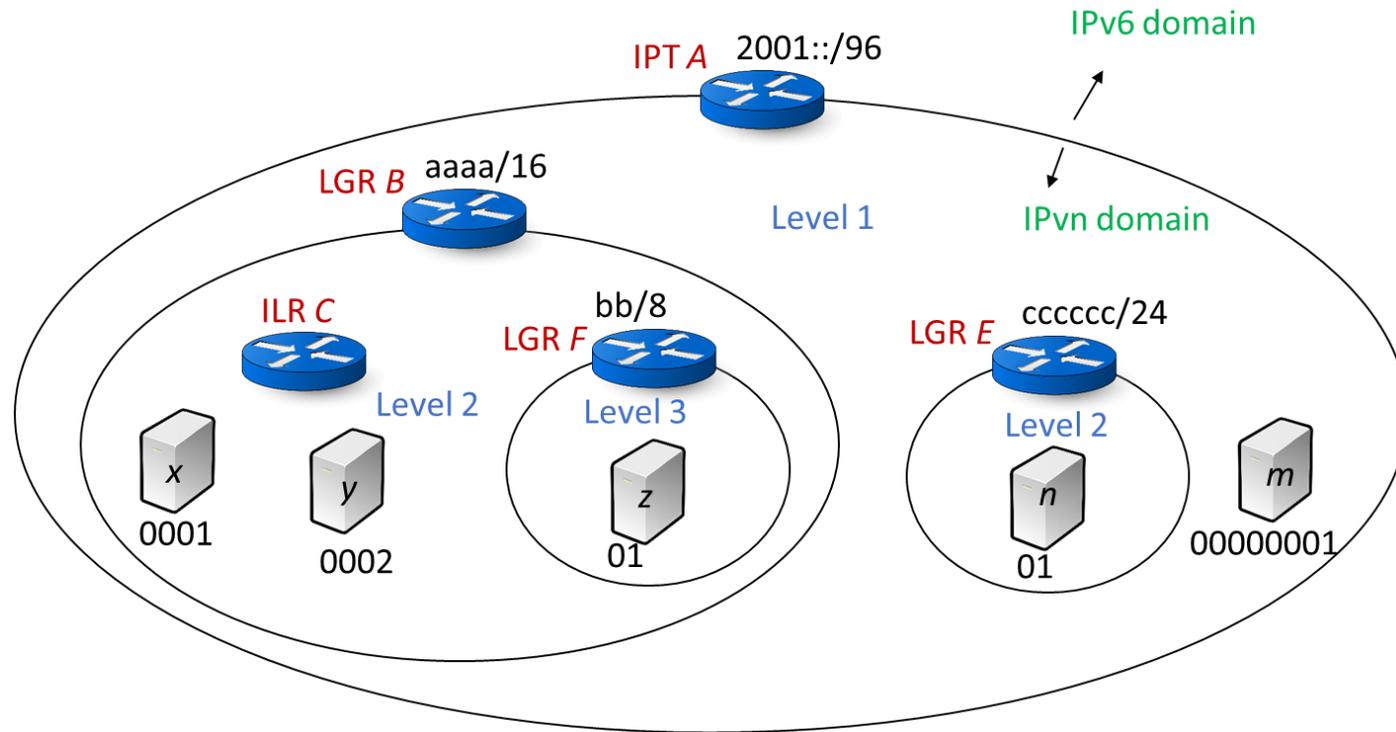
# Interface with the Internet



- 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