Identifier Locator Addressing
ILA

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Problem statement

New access technologies (5G), new devices (IoT), and new applications (AR/VR) drive requirements for IP mobility* and protocols

* “Mobility” here refers to mobility of real and virtual nodes

Current problems

- Mobility is not seamless, may use anchors
- Identity tied to location in addresses
- Privacy in addressing is not strong
- Encapsulation is a performance hit
- A lot of hops to jump through for tunneling
- Support in network for alternate protocols

ILA solution

- Split IPv6 address into identifier “who” & locator “where”
- Identifier is a logical endpoint and can be mobile
- Locator indicates location of logical endpoint
- Apps see addresses with common prefix and identifier
- Mapping database of identifiers to locators

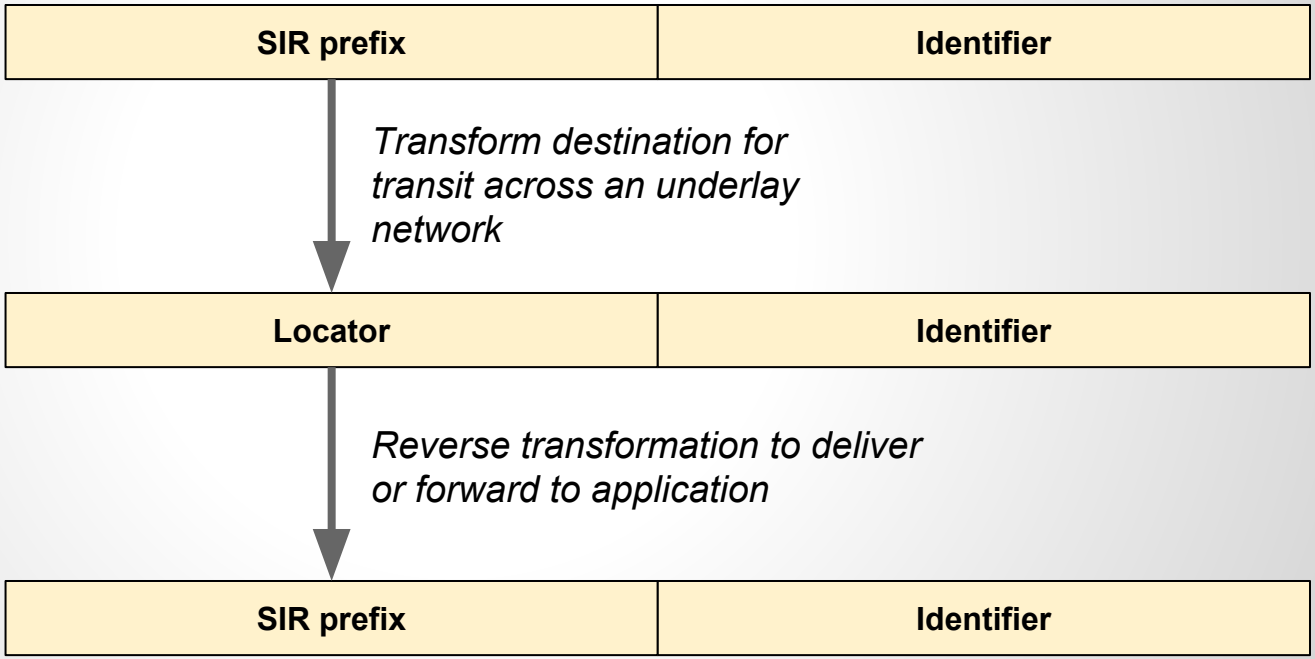
ILA transformations

- ILA nodes **transform** destination addresses to locator addresses for forwarding to logical endpoint
- At peer ILA nodes, original address restored before delivering packet to application
- Transformations are always paired like this!
- **ILA is not NAT**

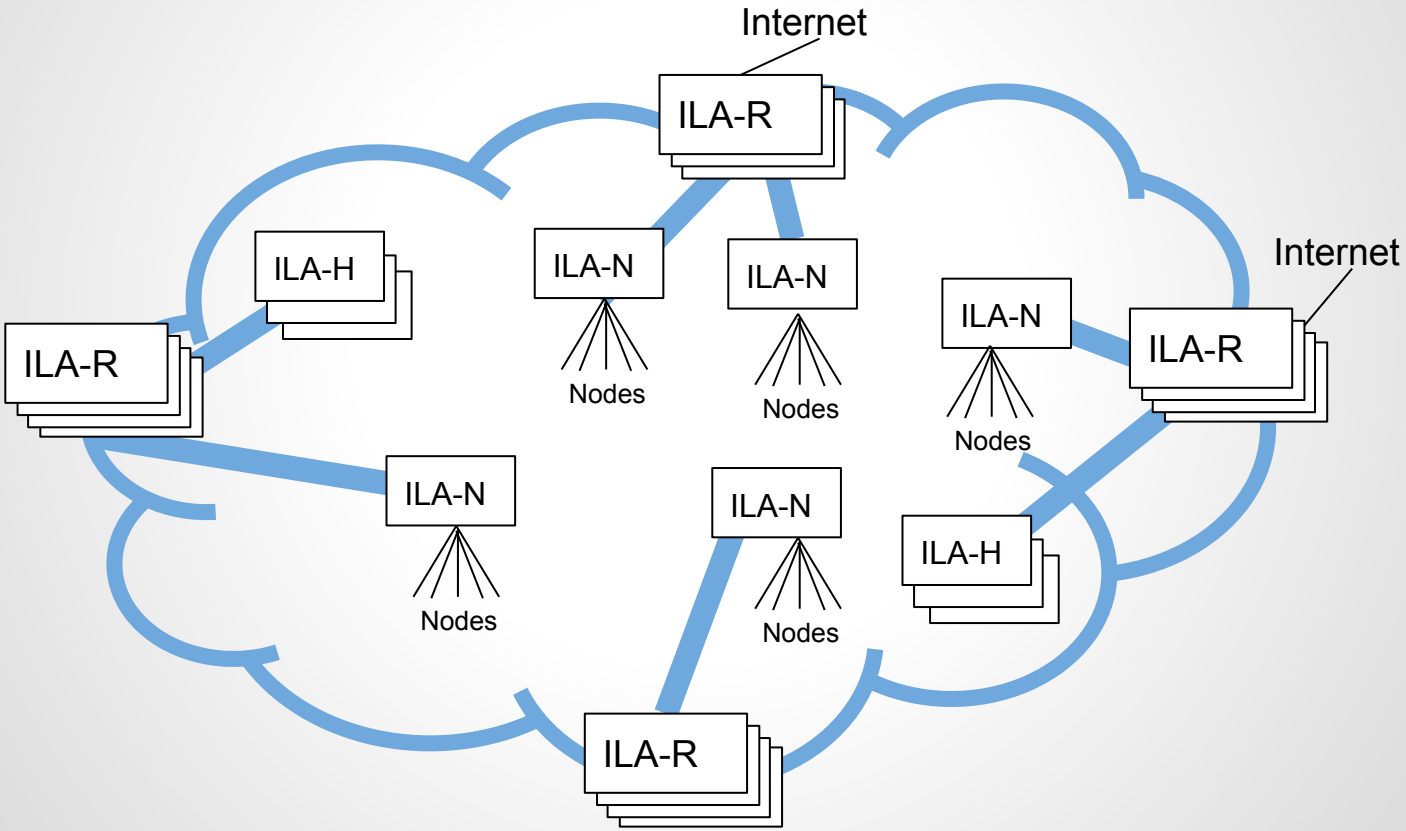
Addressing and transformations

Standard Identifier Representation (SIR). Address visible to apps

Locator address. Routes packets to physical location of logical node



Reference topology



Salient properties

- ILA is identifier locator split
  - Facilitates mobility and virtualization
  - Helps strong privacy in addressing
- ILA is a network overlay method
  - No encapsulation, EH overhead, or tunnel issues
  - Transparent to the network
- Contained in network layer
  - Unlike 8+8, ILNP

Scope

- Data plane
  - Process of transformation
  - Checksum neutral
  - Alternative address encodings
- Control plane
  - Mapping system (identifier to locator mappings)
  - Addressing (including for privacy)
  - Mapping caches, routers, forwarding nodes
  - Protocols: DBs, ILAMP, ILA-LISP-CP,...

Limitations

- ILA is IPv6 only
- ILA is **not** extensible
  - Everything needs to fit into 128 bit addresses
  - If that’s not enough then encapsulate!
- Data plane is simple, could mean control plane more complex
- Does not naturally support multicast
- Not really intended to run on user devices

Use cases

- Mobility
- Data center virtualization
- Cloud (multi-tenant virtualization)

- Converged network (all three of above)

Datacenter virtualization

- Every task gets is own IP address
- Tasks can move around
- Solve address/port space problem
- Eventually *everything* in DC gets address
- Performance is critical, apps don’t tolerate any hit for infrastructure improvement

Cloud networking

- Multi-tenancy
- Like nvo3 protocols, but lighter weight
- ILA provides alternative to NAT for VMs to speak to outside work (v4->v6)

Open issues

- Scalability
- Security
- Privacy
- DOSability

The four pillars of any mapping system - Uma Chunduri

Scalability

- Number of mappings in the system
- Rate of update, control message
- Target is billions of mappings
- High throughput dataplane
- Managing state in a mapping system
- Scaling mapping caches

Security

- Mapping system contains sensitive PII
  - Identity: IP address to device (user for personal dev)
  - Geo-location: of device and hence possibly user
- So needs to be secure
  - Secure control protocols
  - Limit visibility of data (no global mapping system)
  - Law enforcement considerations

DOSability

- Mapping cache is potential DOS target
  - Cache driven by a third party potential for DOS
  - Common case in mobile networks
  - Need quantitative explanation for an DOS mitigation
- Practical limits
  - Like number of addresses a device can get
  - Rate of change

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Thank you!