Identifier Locator Addressing with IPv6

draft-herbert-intarea-ila
IETF 100

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Introduction

● ILA is an identifier/locator split protocol

● Use cases
  ○ Data center virtualization -- e.g. address per task
  ○ Mobile networks -- e.g. UE mobility

● Properties
  ○ Address translation, not encapsulation
  ○ No processing beyond IP header
  ○ Checksum neutral mapping to preserve L4 csums
  ○ Run at end host or in network router
Draft update

- draft-herbert-intarea-ila-00 (previously draft-herbert-nvo3-04)
- Clarified identifier format as being optional, identifiers are natively 64 bits in ILA
- Add non-local address identifier type
- Description of mobility networks use case
- Relax requirement for exactly 64/64 split
What “more” is needed?

Suresh (AD) asked at IETF 98

- Clarify use cases and reference architecture
- Addressing models and privacy
- Control plane
- “Running code”
- Deployment
## Use cases

<table>
<thead>
<tr>
<th>USE CASE</th>
<th>SUB CASE</th>
<th>DESCRIPTION</th>
<th>SCALING # NODES of addressed nodes</th>
<th>RATE OF MAP UPDATE (per s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Datacenter</strong></td>
<td>DC task virtualization</td>
<td>Assign every task an IP address</td>
<td>10’s of millions to potentially billions</td>
<td>1000’s</td>
</tr>
<tr>
<td></td>
<td>DC virtualization</td>
<td>Assign everything an IP address</td>
<td>Up to 10’s of billions</td>
<td>Millions</td>
</tr>
<tr>
<td></td>
<td>Multi tenant virtualization</td>
<td>VNID + Vaddr (VMs)</td>
<td>10’s of millions</td>
<td>1000’s</td>
</tr>
<tr>
<td><strong>Mobility &amp; IoT</strong></td>
<td>Mobile networks</td>
<td>Every UE has identifier or prefix</td>
<td>10’s of millions to 10s of billions</td>
<td>Millions</td>
</tr>
<tr>
<td></td>
<td>IoT</td>
<td>Low powered devices</td>
<td>Millions to hundreds of billions</td>
<td><strong>Millions</strong></td>
</tr>
</tbody>
</table>
Reference topology
Example datacenter topology
Example mobile network topology
Addressing modes

- Singleton addresses (e.g. from DHCPv6)
  - Identifier uniquely identifies object in domain
  - Allows single use addresses for cnxs (for privacy)
- /64 assignment (e.g. via SLAAC)
  - Encode relative index in locator (lower 64 bits is IID)
  - Locator + index => assigned prefix
- Non-local address
  - Map arbitrary addresses to identifier
  - Roaming as an example
Control plane

- Mapping system *is a key/value store*
- Need database features-- security, ACLs, replication, availability, pub/sub, etc.
- Use database in lieu of routing protocol
  - Distributed KV database (NoSQL for instance)
  - Precedence in SDN routing protocols
  - Open/R (also candidate for integration)
“Running code”

● Code
  ○ ILA in Linux (recent fixes, don’t require ident format)
  ○ ILA router in XDP, DPDK/VPP (Hackathon IETF 97)
  ○ Soon to opensource reference control daemons

● Deployment
  ○ Facebook: ILA virtual addresses (mobile) replace VIP injection

● Mobility
  ○ WIP in progress as replacement for GTP-U
Next steps

Request ILA to be take up as WG item in int-area
Thank you!
Singleton addressing in ILA

- Network prefix
- SIR
- Identifier

Identifier to locator mapping and translation

Network prefix
Locator
Identifier

Forwarding over underlay

ILA host
Addr Locator::/64

Task VM
Addr SIR:Identifier

Locator to SIR map

Datacenter

eNodeB
Addr Locator::/64

UE
Addr SIR:Identifier

Mobile network

Restore original prefix
/64 addressing in ILA

Network prefix | Device prefix | IID

Device prefix to locator+index and translation

Network prefix | Locator | Index | IID

Forwarding over underlay

ILA host
Addr Locator::/64

VM
Addr Prefix::/64

Locator table: Index->Device prefix

eNodeB
Addr Locator::/64

UE
Addr Prefix::/64

Virtualization

Mobile network

Restore original address
Non-local addressing in ILA

Address to locator and identifier mapping and translation

Forwarding over underlay

Restore original address

ILA host
Addr Locator::/64

Task VM
Addr Address

Identifier to non-local address map

eNodeB
Addr Locator::/64

UE
Addr Address

Datacenter

Mobile network
Privacy in addressing

● Goals
  ○ No correlating two addresses as being same host
  ○ No inferring accurate location just given address
  ○ LEA, legal intercept considerations

● Privacy addresses (RFC4941) is “weak”
  ○ Effect of periodic rand. prefix rotation not quantifiable
  ○ See recent thread 6man about unique prefixes

● ILA
  ○ Single use address as an option
  ○ Minimal topology present in externally visible addrs