Identifier Locator Addressing

Network virtualization without encapsulation

draft-herbert-nvo3-ila-00

Tom Herbert <tom@herbertland.com>
Motivations

- Task Virtualization
- Connectivity for VMs (external to VN)
Task virtualization

Capability that every task in the data center can be seamlessly live migrated per discretion of a job scheduler.
Data center topology
Job scheduler

Job scheduler schedules tasks for each job based on resource requirements.
Scheduling dilemma

Job scheduler: new, high priority job with resource constraints
Unpleasant solution today

Kill existing tasks to make room
Task migration solution

Migrate tasks to make room
After migration

Fabric

No tasks needed to be killed
Requirements/assumptions

- Be **transparent** to apps, users, & network
- **Zero** performance impact when not migrating
- Does **not** adversely impact security or control
- Tasks run in containers not VMs
- No overlay networks, no vswitch needed
- ECMP and NIC offloads continue to work
- Most tasks will probably never be migrated
ILA Solution

- Split IPv6 address into identifier (who) and locator (where) ala ILNP
- Each task gets its own unique identifier
- Mapping identifiers to locators
- If task migrates between hosts, its locator changes but its identifier does not
- When not migrating, data path is essentially same as before
## Address split

<table>
<thead>
<tr>
<th>Locator</th>
<th>Type</th>
<th>Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 bits identifier of physical hosts</td>
<td>Routable</td>
<td>64 bit logical endpoint address of virtual node</td>
</tr>
<tr>
<td>Routable</td>
<td>Not used as connection endpoint</td>
<td></td>
</tr>
<tr>
<td>Not used as connection endpoint</td>
<td></td>
<td>Used as connection endpoint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Typed to allow different mode</td>
</tr>
</tbody>
</table>
Network virtualization use cases

- Embed VNID in ILA address
  - Potentially eliminate encapsulation for NVO3
  - No place to put security to authenticate VNID, so intra VN use might be limited
- Allows VM to common DC service, or Internet w/o stateful NAT or encapsulation
- Allow two VMs to communicate under policy w/o NAT

<table>
<thead>
<tr>
<th>Locator</th>
<th>Type</th>
<th>VNID</th>
<th>Vaddr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locator 1</td>
<td>Type 1</td>
<td>VNID 1</td>
<td>Vaddr 1</td>
</tr>
<tr>
<td>Locator 2</td>
<td>Type 2</td>
<td>VNID 2</td>
<td>Vaddr 2</td>
</tr>
<tr>
<td>Locator 3</td>
<td>Type 3</td>
<td>VNID 3</td>
<td>Vaddr 3</td>
</tr>
</tbody>
</table>
Details

- Need to map identifiers to locators
  - Same problem of mapping Vaddr to Paddr in NV
  - Use NVO3 control plane to distribute mappings
- User visible representation of ILA address (used to connect, in DNS, etc.)
- Generate identifier for each task, duplicate address detection
Status

- I-D posted
- Plan to integrate into Linux stack
- Linux implementation is (barely) underway