Traffic-engineering-compatible multi-homing with HIP & Six/One

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Limits in HIP multi-homing
Multi-homing with Six/One
Combined Six/One & HIP
Traffic Engineering in Multi-Homed Edge Networks

- HIP multi-homing extensions do not allow traffic engineering
  - IP address encodes provider
  - Host selects IP source address
  - \( \Rightarrow \) Provider (= border link) fixed

- Provider selection by edge network desired
  - E.g., based on network load
  - Requires IP source address enforcement by edge network
  - Six/One multi-homing protocol supports this

- Integrate Six/One into HIP
Traffic Engineering in Multi-Homed Edge Networks

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IP addresses


Routing prefix = provider
Each provider allocates addresses
Hosts configure “address bunch”
Routers may rewrite source address
Hosts recognize rewrites and adapt
- Address mapping at hosts’ IP layer
- Address ownership verification via crypto interface ID in address bunch
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Case 1: no rewriting
- Host selects source address
- It thereby suggests provider
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Six/One: Mapping and Rewriting in Detail

**Case 1: no rewriting**
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**Case 2: rewriting in edge network**
- Router **rewrites** source address
- Hosts learn new address and **adapt**
- No address change in application
Context establishment when hosts initiate first communication session.
Six/One: Context Establishment

- Context establishment when hosts initiate first communication session
- Context IDs for subsequent look-up
- Routers do not rewrite IP address prefixes before context established
Learning from Six/One to make HIP better

- Six/One is traffic-engineering-compatible
  - Address rewrites in routers and host adaptation enable edge network to select border link

- This functionality misses in HIP multi-homing

- Idea: Integrate Six/One into HIP multi-homing
### What’s there, what’s new?

<table>
<thead>
<tr>
<th>Six/One</th>
<th>HIP multi-homing</th>
</tr>
</thead>
<tbody>
<tr>
<td>address mapping</td>
<td>✓ HIT/address mapping</td>
</tr>
<tr>
<td>context establishment</td>
<td>✓ base exchange</td>
</tr>
<tr>
<td>address ownership proof</td>
<td>✓ IPsec authentication</td>
</tr>
<tr>
<td>address bunch configuration</td>
<td>✗ not provided</td>
</tr>
<tr>
<td>address rewriting in router</td>
<td>✗ not provided</td>
</tr>
<tr>
<td>address adaptation</td>
<td>✗ not provided</td>
</tr>
</tbody>
</table>

- Much Six/One functionality pre-exists in HIP multi-homing
- Minor extensions required
- Now integrating missing pieces into our HIP implementation
- Work in progress…