IPv4 traversal for IPv6 mobility protocols

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draft-wakikawa-nemo-v4tunnel-01.txt
v4/v6 transition and mobility

• Goal
  • A Mobile Router might end up on an IPv4 only access network
  • Needs to access IPv6 services through its Home Agent

• V6ops transition mechanisms can be used, but there are issues…..

• If NEMO is not being used, the MR should use regular IPv6 transition mechanisms to access IPv6 services from an IPv4 access network

• Non-goal
  • To invent yet another tunneling mechanism
Issues with using transition tunnels and mobility tunnels

• Double Tunneling
  • IPv6 over IPv4 tunnel between MR and transition router
  • A NEMO tunnel between the MR and the HA inside the transition tunnel
  • Three IP header at the minimum
  • NEMO relies on the bi-directional tunnel for all traffic

• Movement Transparency on IPv4 access network
  • the MR moves and MR’s IPv4 access address changes, transition tunnel breaks
  • No mobility for transition tunnel
  • Tunnel needs to be setup again before binding update can be sent

• You need
  • Mobility for transition tunnel
  • Mobility for NEMO tunnel

• Security between the MR and the transition router
  • No pre-existing security relationship in all cases
  • MR and HA have pre-existing security relationship
Observations

- MR is dual-stack, supports IPv4 and IPv6
- HA supports IPv4 and IPv6
- Collapse HA and transition router into the same box
- HA IPv4 address discovery
  - Configured on the MR
  - Discovered through DNS
  - Discovered through DHAAD, when MR is on IPv6 access network
Requirements

- Establish single tunnel between MR and HA
- Support NAT Traversal
- Support mobility for transition tunnels
- Use same mechanism for v4 traversal between MIPv6 and NEMO
- Do not introduce new security vulnerabilities
Solutions

- Register IPv4 address as a care-of address
  - Outer tunnel is v4, inner is v6

- Ability to setup various tunnels between MR and HA
  - V6-over-v4 tunnel
  - ESP tunnel
  - UDP-encap-ESP tunnel
  - IP-in-UDP tunnel
  - GRE tunnel
Binding Update

- Two registrations by a single Binding Update
  - IPv6 CoA de-registration (except for stopping proxy ND)
  - IPv4 CoA Registration

- Packet format
  IPv4 header (src=MR’s CoA, dst=HA’s v4)
  ESP header in tunnel mode
  IPv6 header (src=MR’s HoA, dst=HA’s v6)
  Mobility Header
    Binding Update with IPv4 CoA sub-option

<table>
<thead>
<tr>
<th>Type = TBD</th>
<th>Length = 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserved</td>
<td>Port Number</td>
</tr>
</tbody>
</table>

IPv4 Care-of Address sub-option
IPsec/IKEv2

• IPsec for Mobility Headers is mandated
  • BU, BA, MPS, MPA, (payload is optional)
  • SA must be established between v4 CoA and v4 HA in tunnel mode

• Manually created IPsec SAs also possible

• Payload traffic can also be protected
NAT Traversal

- IKEv2 supports NAT Traversal
  - MR will know whether there is NAT in a visiting network before sending BU

- If NAT detected, and,
  - If IPsec used for payload traffic, use UDP encapsulation for ESP packets
  - If IPsec is not used, use IPv6-in-UDP-over-IPv4 tunneling

- Might be useful to develop a alternate MIP6 specific mechanism
  - Similar to MIPv4 NAT detection mechanism
  - HA detects NAT by observing difference between IPv4 source address on outer tunnel and the IPv4 CoA