NEMO WG, IETF 62

IPv4 traversal for IPv6 mobility protocols

Ryuji Wakikawa

Vijay Devarapalli

Carl Williams

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

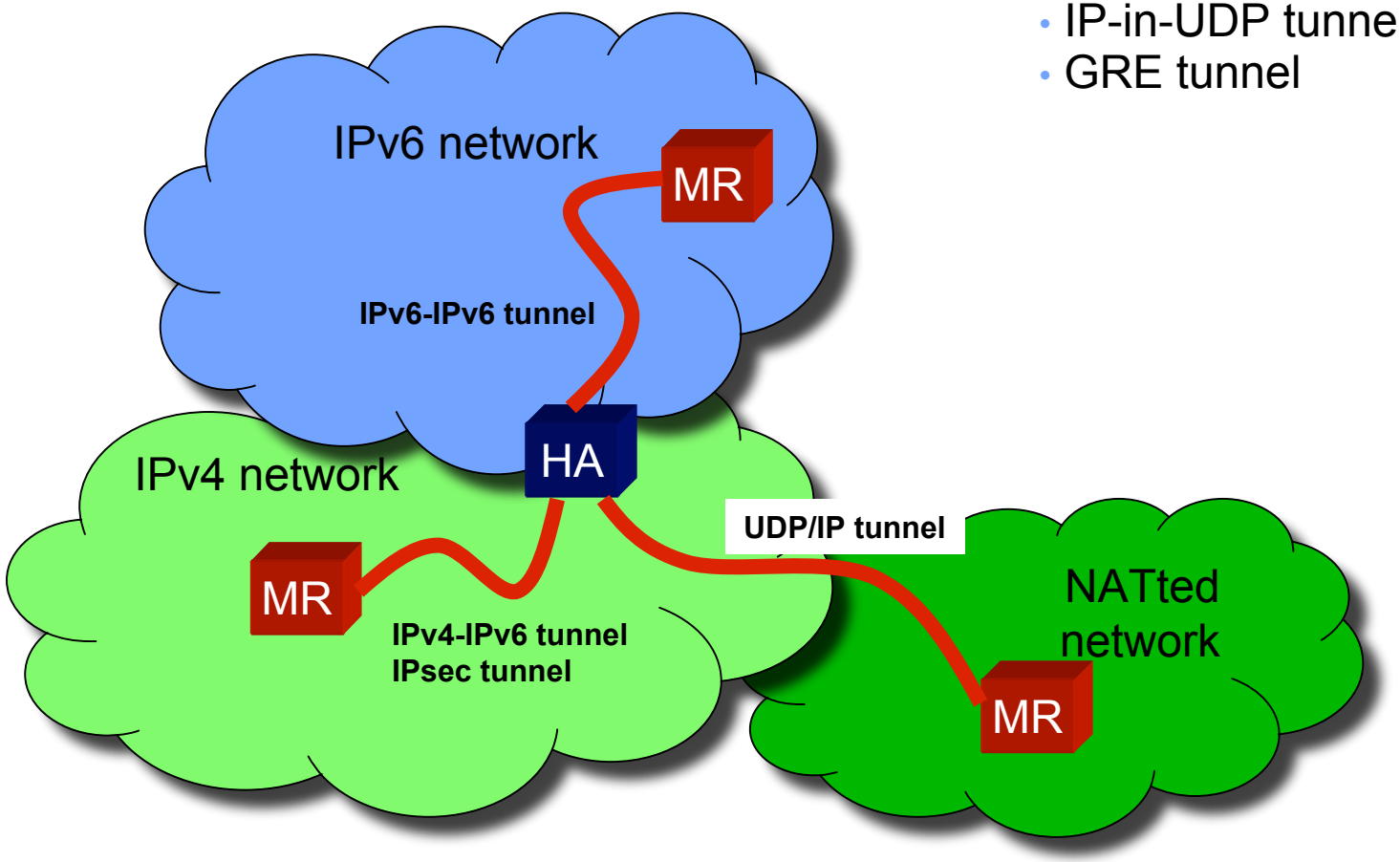
- MR is dual-stack, supports IPv4 and IPv6
- HA supports IPv4 and IPv6
- Collapse HA and transition router into the same box
- HA IPv4 address discovery
    - Configured on the MR
    - Discovered through DNS
    - Discovered through DHAAD, when MR is on IPv6 access network

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

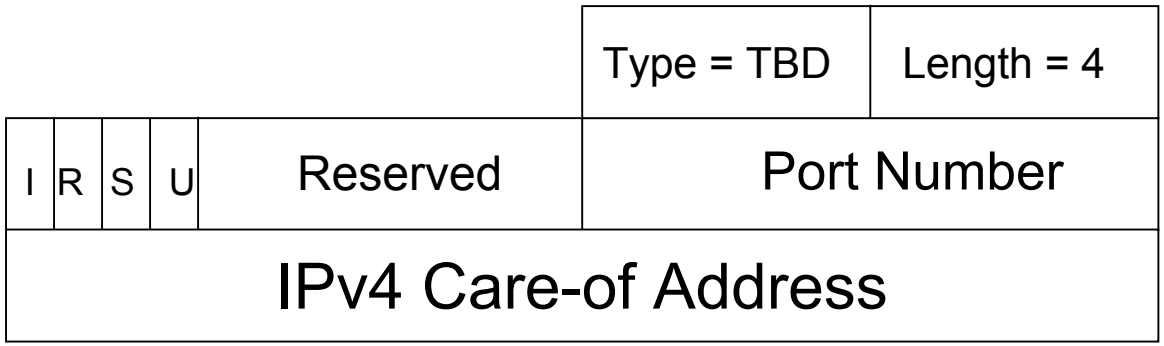


Binding Update

- 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
```



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