A Waypoint Service Approach to Connect Heterogeneous Internet Address Spaces

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Problem

Hosts with globally unique IP addresses

- Instance 1: Hosts with reusable-IP addresses
- Instance 2: Hosts with reusable-IP addresses
- Instance n: Hosts with reusable-IP addresses

Hosts with IPv6 addresses
Solution (AVES)

E: (IP\text{initiator}, IP\text{NET}, IP\text{responder})

Step | Action |
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1 | DNS query for $B$ |
2 | SETUP message ($IP_A, IP_R, IP'_B$) |
3 | ACCEPT message |
4 | DNS reply for $B$ ($IP_W$) |

Packet sent:

- Regular:
  - Step 1: $[IP_A \rightarrow IP_W]$ |
  - Step 2: $[IP_W \rightarrow IP_R \rightarrow IP_A \rightarrow IP'_B]$ |
  - Step 3: $[IP_A \rightarrow IP'_B]$ |
  - Step 4: $[IP'_B \rightarrow IP_A]$ |
  - Step 5: $[IP_W \rightarrow IP_A]$ |

- Multi-Homing:
  - Step 3: $[IP'_R, P_R \rightarrow IP'_B]$ |
  - Step 4: $[IP'_B \rightarrow IP'_R, P_R]$
Characteristics

- All non-IP hosts simultaneously reachable regardless of N.
- Each IP host can simultaneously reach up to N non-IP hosts.
- If multihoming is used
  - Each port on each non-IP host simultaneously reachable by up to 65,000 TCP, 65,000 UDP, and 1 each port-less protocol connection.
- Trade performance for deployability.
Implementation

- AVES-Aware DNS: Modified BIND
- AVES Waypoint: ipfw (Linux 2.2)
- AVES NAT: presumably also ipfw (Linux 2.2)
- 41-80 Mbps TCP and 96 Mbps UDP on 100Mbit Ethernet LAN.
Related Work

• Port forwarding on NAT gateway
• SSH port forwarding
• SRV DNS records
• IP server (UDP only)
• Host Identity Payload
• HTTP/1.1
• SOCKS
• TRIAD and IPNL
Conclusions