A+P for Dual-Stack Mobile IPv6/ Proxy Mobile IPv6

draft-sarikaya-aplus-pmip-00.txt
draft-sarikaya-aplus-dsmip-00.txt

Behcet Sarikaya
Frank Xia
Mohamed Boucadair
November 2009
Context and Motivations

• Mobile devices, iPhone, Android Phone, Mobile Windows Phone, etc. are increasingly connected to the Internet

• Smart phones need always-on connectivity and should have access to advanced services

• Need for NAT binding refreshments when CGN is deployed
  • Power consumption to maintain NAT bindings may be a hurdle for mobile devices
Context and Motivations

• Performance degradation happens frequently in mobile networks due to (cascaded levels of) NAT boxes

• Problems stem from the use of private addresses in IPv4

  • Overlapping addresses may be used with some additional complexity
Context and Motivations

- In developing countries, mobile technologies are used to deliver broadband-like services
  - The same issues for IP addressing as fixed network would be valid

- Mobile architectures are essentially centralized
  - Scalability and performance degradation are important concerns
  - …let’s not forget also CAPEX and OPEX issues
Context and Motivations

• Migration to IPv6 of a local realm doesn’t solve the global problem because we will need NAT64 also

• A strategy for graceful migration to IPv6 is needed and **A+P contributes to this effort**
  ● Stateless IPv4 address sharing
  ● Stateless IPv4-IPv6 interconnection
Conclusions

- A+P solves both IPv4 address exhaustion and NAT issues related to the deployment of CGN as experienced by mobile operators.

- A+P is a step forward to prepare smooth migration to IPv6 within mobile networks.

- For convergence purposes, “similar” solutions should be encouraged for both fixed and mobile networks.
Appendix
DSMIP/PMIP A+P Architecture

- PMIPv6 (RFC 5213)
- DSMIPv6 (RFC 5555)
- Port Range Router at HA or LMA, binding table+ binding cache
- DHCP modifications for port range IPv4 addresses to MN
- Binding Update/Proxy Binding Update extensions
- DS-Lite network is an option
Message Flows - DSMIP

- MN gets Port Range Home Address

HA Binding cache includes port range

HA + PRR + Binding Table (binding identifier=IPv6 CoA)
Message Flows - DSMIP

● IPv4 Data Flow with Binding Table
● Incoming IPv4 datagrams are tunneled in IPv4-in-IPv6 tunnel to MN after binding table search
● Stateless mode: no binding table, PRR generates an IPv6 address and encapsulates IPv4 datagram without binding table search
● DS-Lite network mode: HA uses DHCPv6 to get port range IPv4 HoA
Message Flows - PMIP

- MN gets Port Range Home Address

<table>
<thead>
<tr>
<th>MN</th>
<th>MAG (DHCP-S)</th>
<th>LMA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1. DHCPDISCOVER (OPTION-IPv4-PRA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Proxy Binding Update</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Proxy Binding Acknowledgement (IPv4 HoA-PR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Tunnel/Route Setup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. DHCPOFFER (OPTION-IPv4-PRA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. DHCPREQUEST (OPTION-IPv4-PRA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. DHCPACK</td>
</tr>
</tbody>
</table>

LMA Binding cache includes port range

LMA + PRR + Binding Table (binding identifier=Proxy-CoA)
Message Flows - PMIP

- IPv4 Data Flow with Binding Table
- Outgoing IPv4 datagrams: MN sends it in IPv4 to MAG, MAG encapsulates in IPv6 and sends to LMA
- Incoming IPv4 datagrams are tunneled in IPv4-in-IPv6 tunnel to MAG at Proxy-CoA after binding table search
- Stateless mode: no binding table, no PRR IPv6 address generation, LMA finds Proxy-CoA in binding cache and encapsulates IPv4 datagram without binding table search
- DS-Lite network mode: MAG uses DHCPv6 to get port range IPv4 HoA or encapsulates DHCPv4 messages in IPv6
Thank you