Design of an Operational Mobility Support Model in Next-Generation Mobile Internet

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1 Motivation

Enormous HAs are located discretely over the world, which makes them unmanageable, lacks of business model and is hard for billing statistics.

Due to the selfish nature of ARs, MH which moves to a new sub-network is hard to have its packets forwarded.

Data packets received by the HA need to be encapsulated and tunneled to the MH.

Extension header is used during the communication between the MH and CH.
2 Methodologies

ID/Locator split architecture has demonstrated its significant predominance in next-generation mobile networks.

Cloud Computing is a promising technique for enabling ubiquitous, convenient, on-demand network access, particularly suitable for the case of increasingly large volume users and high computing capabilities.

Objective of this research

Design a new OPERATIONAL mobility support model for next-generation mobile Internet based on the idea of Cloud Computing and ID/Locator split architecture.
3 Design of OMIPv6

- The architecture of OMIPv6

![Diagram of OMIPv6 architecture]

- Cloud Mobility Management Center
- Naming System
- Autonomous System
- Mobile Host
- Corresponding Host
3.1 The principles of OMIPv6

- Give each MH a name
- Register MH’s information at the CMMC
- Update MH’s information at the CMMC
- Acquire the information, e.g., address, of the MH from the CMMC and start data communication

The principles of the CMMMC
3.2 The implementation of OMIPv6

- Functionality of CMMC

- Communication processes of OMIPv6 protocol
3.2.1 Cloud mobility management center (CMMC)

- The naming mechanism gives the host full name (HFN) to the MH, e.g., host@domain.

- The name resolution mechanism consists of

  - **Domain name resolver (DNR)**
    - maintaining the domain names

  - **Autonomous system manager (ASM)**
    - managing the sub-networks

  - **Host name resolver (HNR)**
    - maintaining the host names
3.2.2 Operation process of OMIPv6

- **Initial Registration**
- **AR discovery**
- **Update at HNR and ASM**

**Lookup at DNR, HNR and ASM**

<table>
<thead>
<tr>
<th>Index</th>
<th>Domain</th>
<th>Host</th>
<th>AS</th>
<th>HFN</th>
<th>NPF</th>
<th>HID</th>
<th>Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**MH**
- Reg (HFN, NPF, HID, Bill)
- Reg Ack
- Upd (HFN, NPF, HID, Bill)
- Upd Ack

**AR**
- RA
- Reg (host, AS)
- Reg Ack
- Upd (host, AS)
- Upd Ack

**HNR**
- Lookup (domain)
- Return: Locator of domain
- HNRs negotiation
- Return: Locator of domain
- Upd (HFN, NPF, HID, Bill)

**ASM**
- Lookup (domain)
- Return: Locator of domain
- Lookup (host)
- Return: Locator of AS
- Lookup (HFN)

**DNR**
- Lookup (domain)
- Return: Locator of domain

**CH**
- Return: NPF and HID of CH
- Return: NPF and HID of MH
3.2.2 Operation process of OMIPv6

Domain Name Resolver (DNR)  Autonomous System Manager (ASM)  Host Name Resolver (HNR)

Content:
- Cloud Mobility Management Center (CMMC)
- Core Network

Graphical representation of the process:
- MH: Mobile Host
- AR: Access Router
- AS: Autonomous System

Table:

<table>
<thead>
<tr>
<th>DNR: domain-name</th>
<th>ASM: domain.k</th>
<th>HNR: AS.m</th>
</tr>
</thead>
<tbody>
<tr>
<td>index</td>
<td>domain</td>
<td>host</td>
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</tbody>
</table>

Diagram:
- Initial Registration
- AR Discovers
- Update of DNR and ASM
4. A Cost Model for OMIPv6

- **Total_Cost =** \( \text{Query_Cost (CMMC)} + \text{Lookup_Cost (CMMC)} + \text{Registration_Cost (CMMC)} + \text{Packet_Delivery_Cost} \)

- **Overheads =** 1 - \( \frac{\text{Packet_Delivery_Cost}}{\text{Total_Cost}} \)
5. Performance Analysis

Figure 1: Total cost of OMIPv6 predicated by the cost analytical model with varying mean session length in packets

Figure 2: Percentage overhead of OMIPv6 predicated by the cost analytical model with varying subnet residence time
6. Conclusions

- This paper has developed a new operational mobility model over IPv6 (OMIPv6).
- The cloud mobility management center (CMMC) is adopted to be responsible for maintaining the ID and Locator mappings of mobile hosts, as well as providing the name resolution services to the mobile hosts.
- The CMMC has been designed in a hierarchical manner to relief the burden of domain-name resolvers, host-name resolvers, and autonomous system managers.
- An analytical model has been proposed to calculate all possible costs required for the operation of OMIPv6.
- The model has been adopted as a cost-effective tool to evaluate and analyse the performance of OMIPv6 protocol.
Thanks for your attention!

Questions?