Mobile IP versus IPsec
Tunneling with MOBIKE: A Comparison Under Wireless Vertical Handover

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ENSC 835 Project
April 2011
Agenda

- Motivation
- Tunneling Technologies
  - Mobile IP
  - IPsec
- NS-2 Simulations
- Conclusions
Motivation
Smart Phones And Tablets

- Mobile internet devices are popular
- Streaming internet applications do not tolerate data drops
- Data drops can occur during vertical handover
The Big Question

Is seamless vertical handover possible?
Tunneling Technologies
IP Mobility Fails Without Tunneling
Mobile IP

IP Address fixed, coordinates between agents.

Mobile Node

Foreign Agent

home office router

Home Agent

office VOIP phone

internet

cellular

802.11

smart phone
IPsec In A Nutshell

- Additions to the Internet Protocol suite
- Cryptographically protected headers and payload
- Provides compression and IP-in-IP tunneling
IPsec Tunneling

IP Address fixed, coordinated with gateway.

smart phone

802.11

cellular

internet

office VOIP phone

home office router

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Simulations
NS-2 Simulation Approach

- Use existing Mobile IP support
- Create a custom Internet Key Exchange (IKEv2) Agent
- Model cryptographic functions as extra processing delays
IKEv2 Initiator And Responder

- IKEv2 exchanges carried over UDP
- 500ms retransmission
- Six exchanges required to establish a security association
- Implemented as NS-2 Agents
Mobile IP

Vertical Handover Time Series Mobile IP

Constant Bit Rate Traffic

- Office VOIP Phone
- Internet WiFi Router
- Internet Cellular Router

Time (s)

3870 ms
IPsec IKEv2 (Break Before Make)
IPsec With MOBIKE (Make Before Break)
MOBIKE Handover Detail
## Vertical Handover Data Loss

<table>
<thead>
<tr>
<th>IP Mobility Strategy</th>
<th>Data Loss Period During Vertical Handover</th>
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<tbody>
<tr>
<td>Mobile IP</td>
<td>Approximately 3 seconds</td>
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<tr>
<td>IPsec tunneling with IKEv2</td>
<td>Approximately 8 seconds</td>
</tr>
<tr>
<td>IPsec tunneling with MOBIKE make-before-break</td>
<td>No data loss</td>
</tr>
</tbody>
</table>
Improvements And Future Work

- More detailed and complete implementation of IKEv2 and MOBIKE
- Add IP-in-IP representation of IPsec for tunnels
- Allow model parameters to adjust for selected security and cryptographic settings
- Integrate with multiple interface support in NS-2
- Integrate further with wireless support in NS-2
Conclusions
Seamless Vertical Handover Is Possible

- Tunneling can provide IP address mobility
- Mobile IP and earlier generation VPN tunnels have significant data drops during vertical handoff and expose security risks
- IKEv2 Mobility and Multihoming Protocol (MOBIKE) can provide seamless, make-before-break vertical handover
- IPsec extra benefits: security and compression
References


