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A MIP-SIP Macro-Mobility Management Scheme for VoIP Across Wired and Wireless Domains

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Agenda

- Introduction
- Hybrid MIP-SIP Architecture
- Analysis Methodology
- Numerical Results
- Conclusion



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Terminal Mobility

- **Macro Mobility**

- Mobile host (MH) moves from one administrative domain to another. Inter-domain handoffs involved.

- **Micro Mobility**

- MH moves inside a given domain, between sub-nets. Intra-domain handoffs involved.



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Standard IETF Protocols Supporting Terminal Mobility

- **Mobile IP (MIP)** Network-Layer Protocol
MIPv4: Home Agent (HA) and Foreign Agent (FA);
MIPv6: no FA; route optimisation integrated
Mobility transparent
- **Session Initiation Protocol (SIP)** Application-Layer Protocol
SIP servers (Proxy, Redirect Server, Registrar)
SIP User Agent (Client & Server)
Multimedia session (e.g. VoIP) control
Application-level mobility

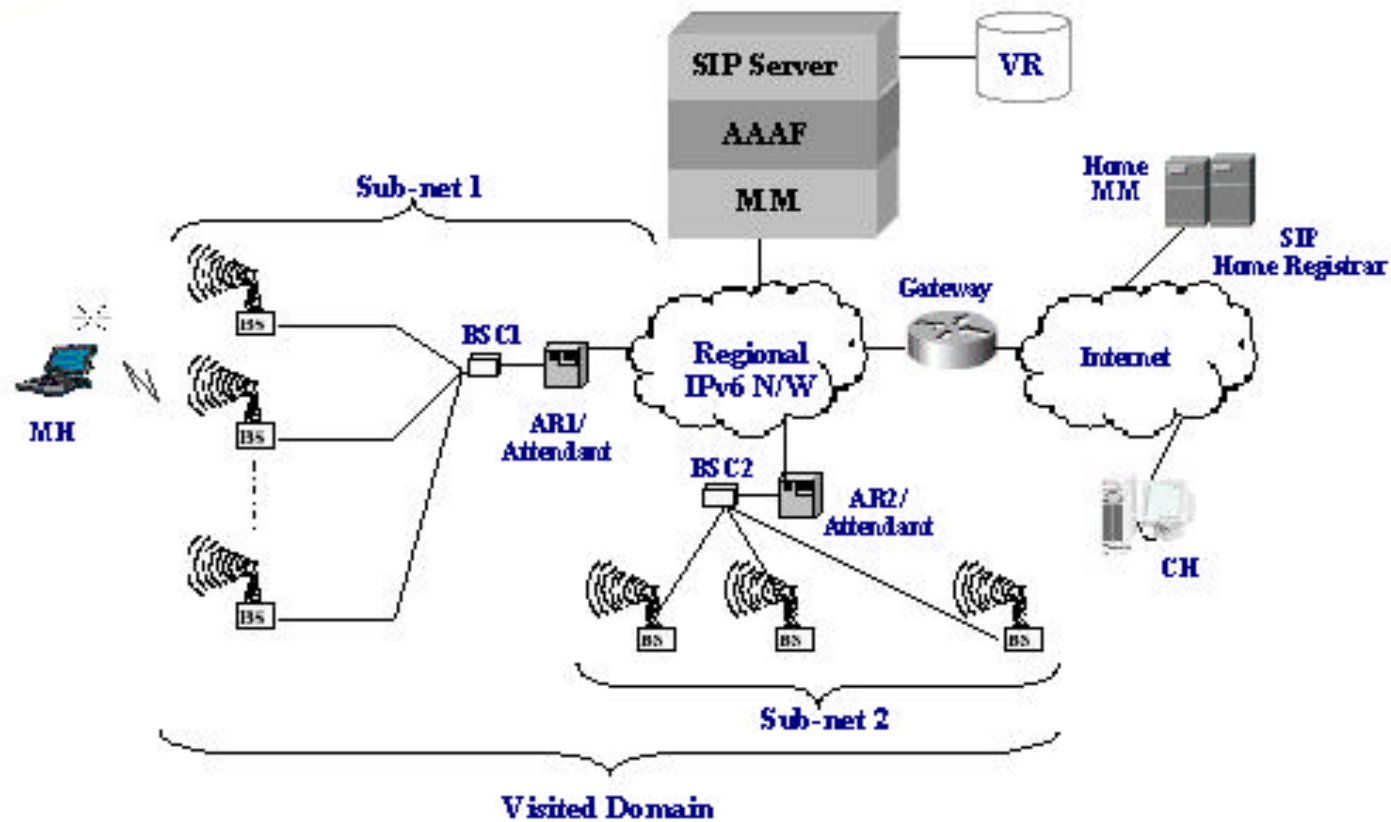
Mixed Scenarios & Hybrid Architecture



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- The abstract networking model: MIP domain communicates SIP domain
- The rationale behind such a model
 - 3GPP: SIP adopted, MIP NOT currently
 - 3GPP2: both SIP & MIP embraced
 - SIP-based mobility & MIP-based mobility
- Mixed SIP-MIP scenarios entail a hybrid architecture.
- We focus on the mobility signalling between SIP-alone (wired) domain & MIP-alone (wireless) domain here.

Hybrid MIP-SIP Architecture





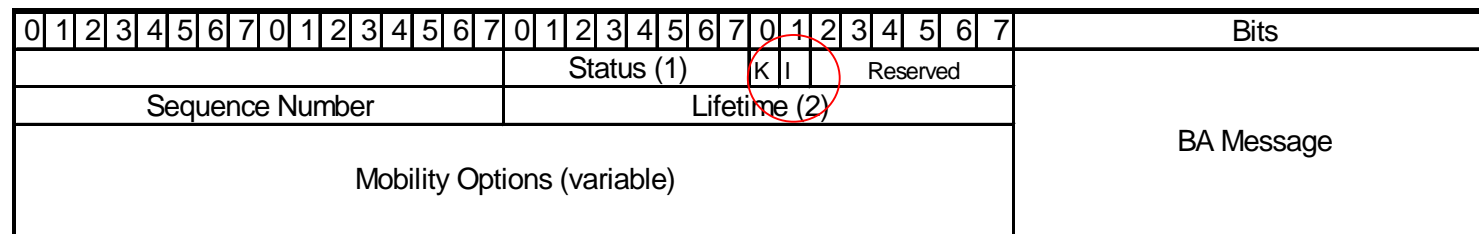
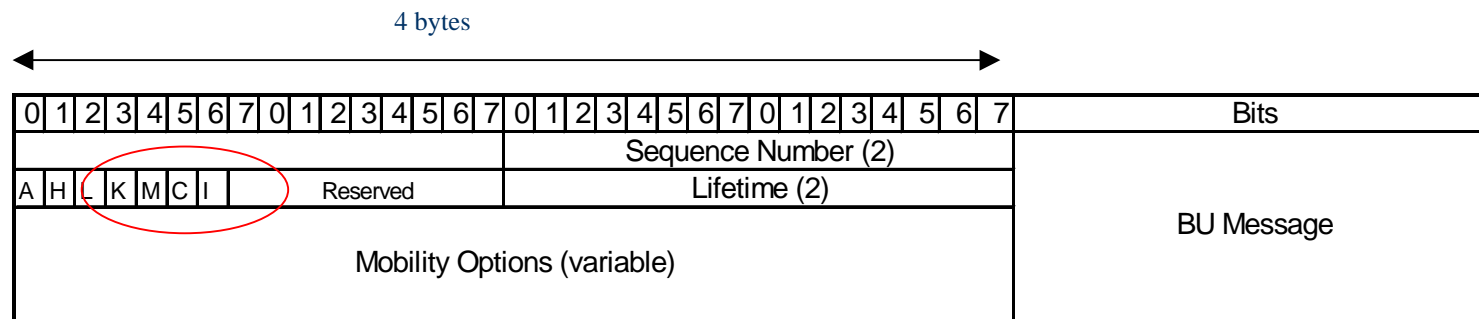
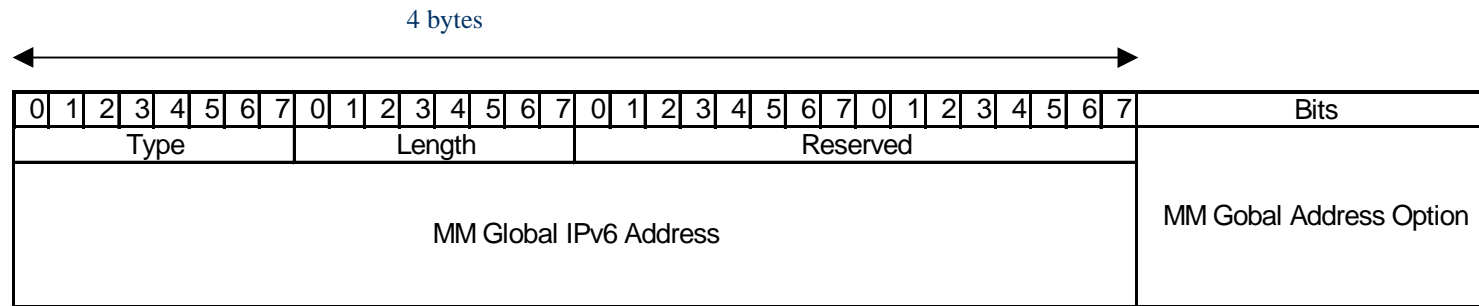
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Mobility Manager (MM)

- Translates MIP signalling to SIP signalling and vice-versa
- Acts as Home Agent (HA)
- Acts as SIP User Agent (UA)
- Acts as Mobility Anchor Point (MAP) for micro-mobility management



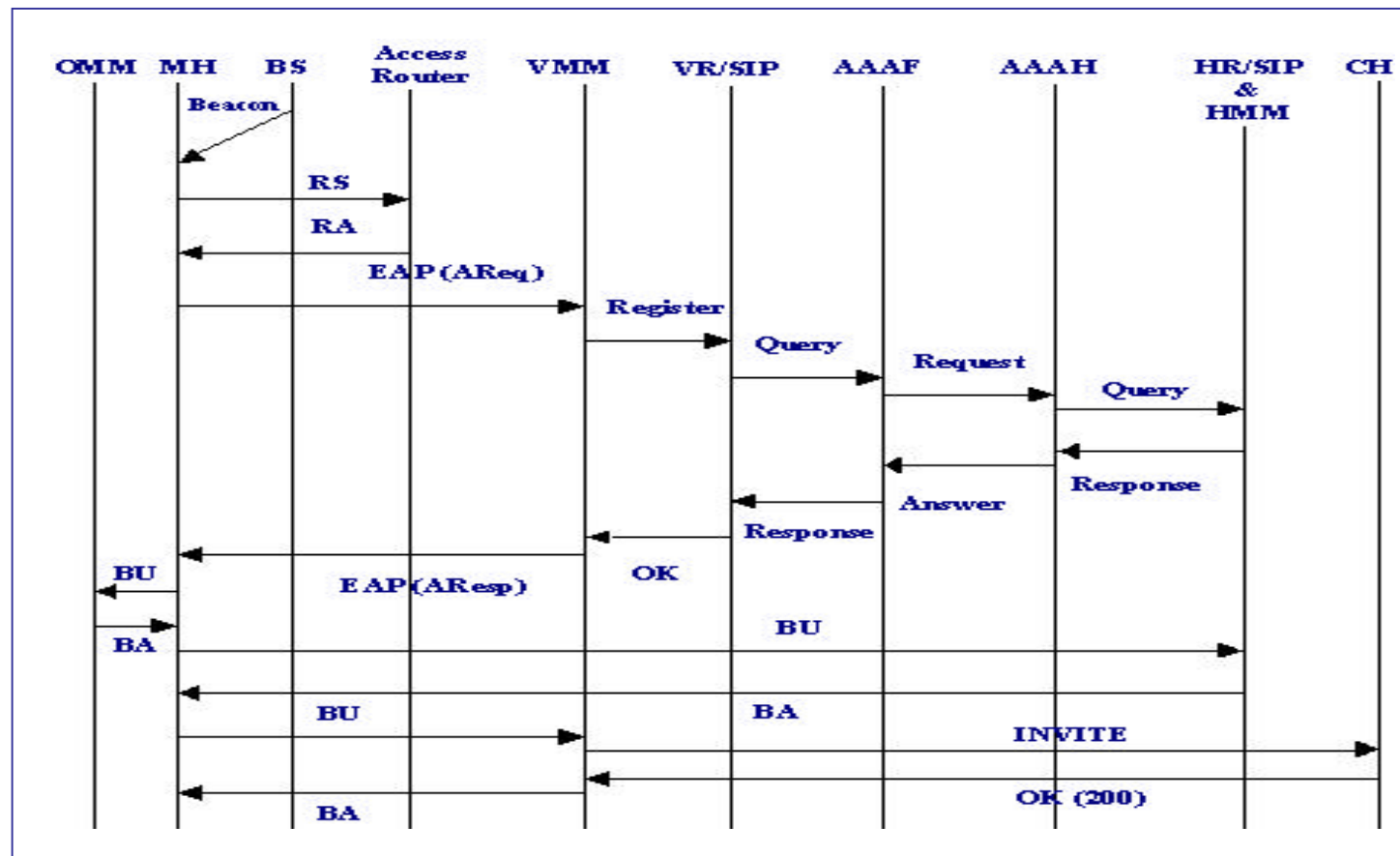
Extensions to MIPv6



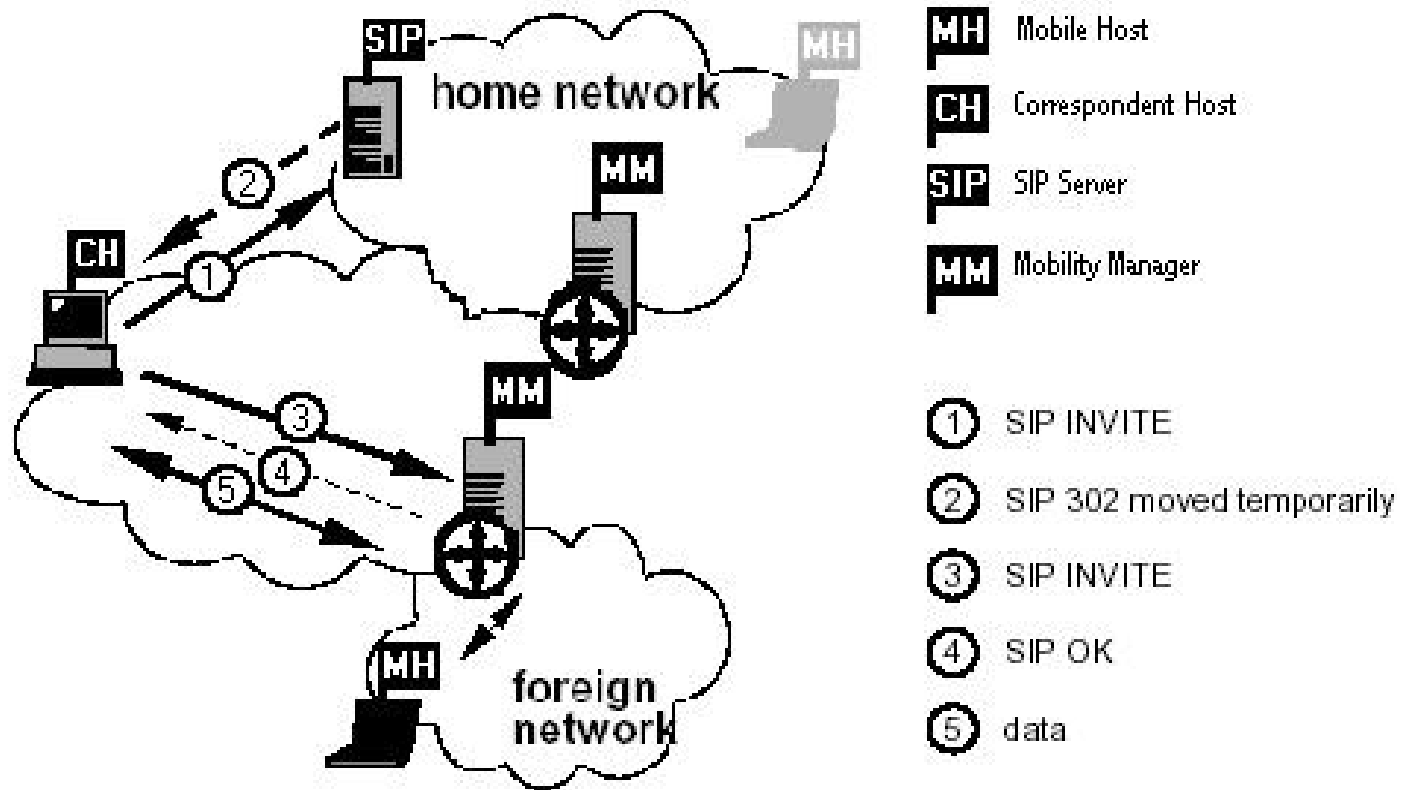


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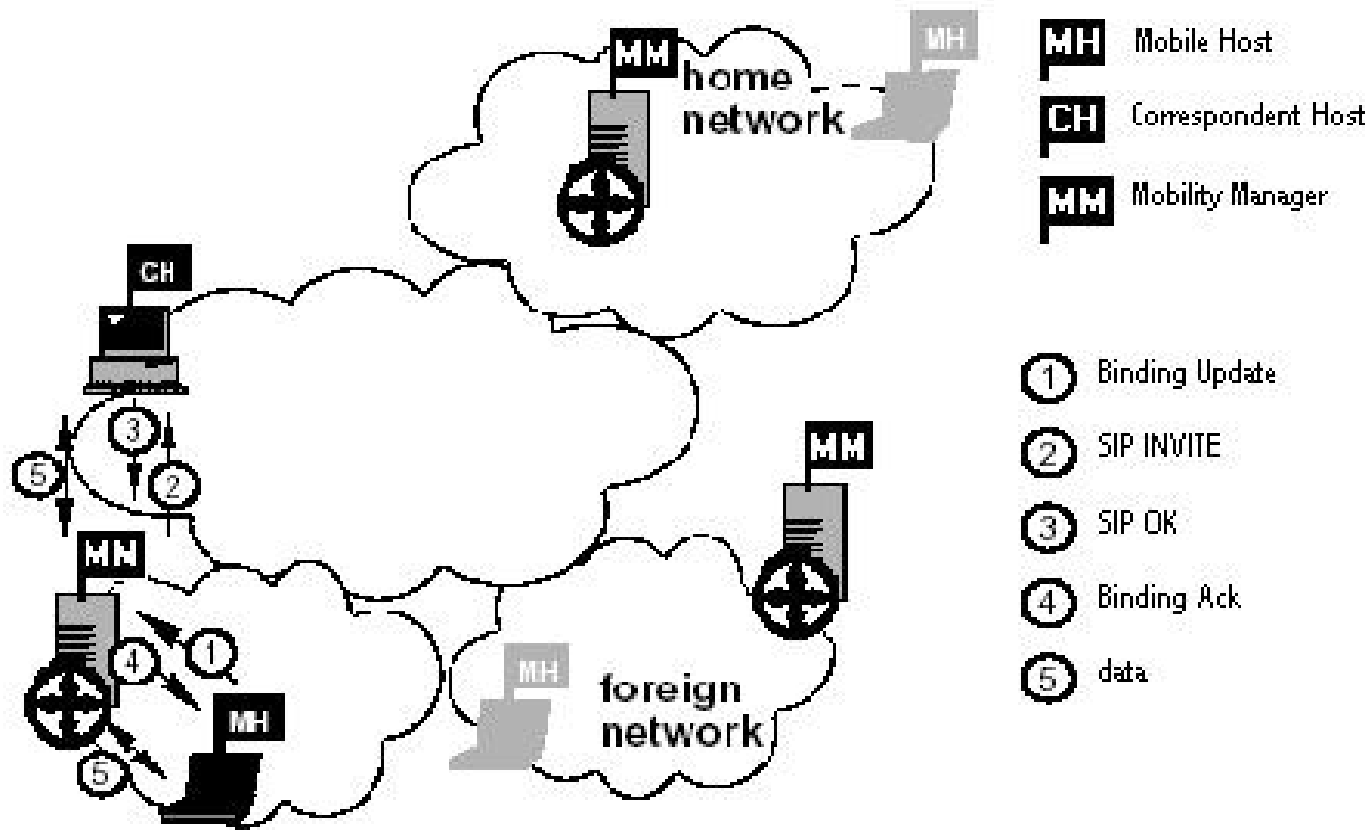
Hybrid MIP-SIP Signalling



Pre-Call Mobility



Mid-Call Mobility



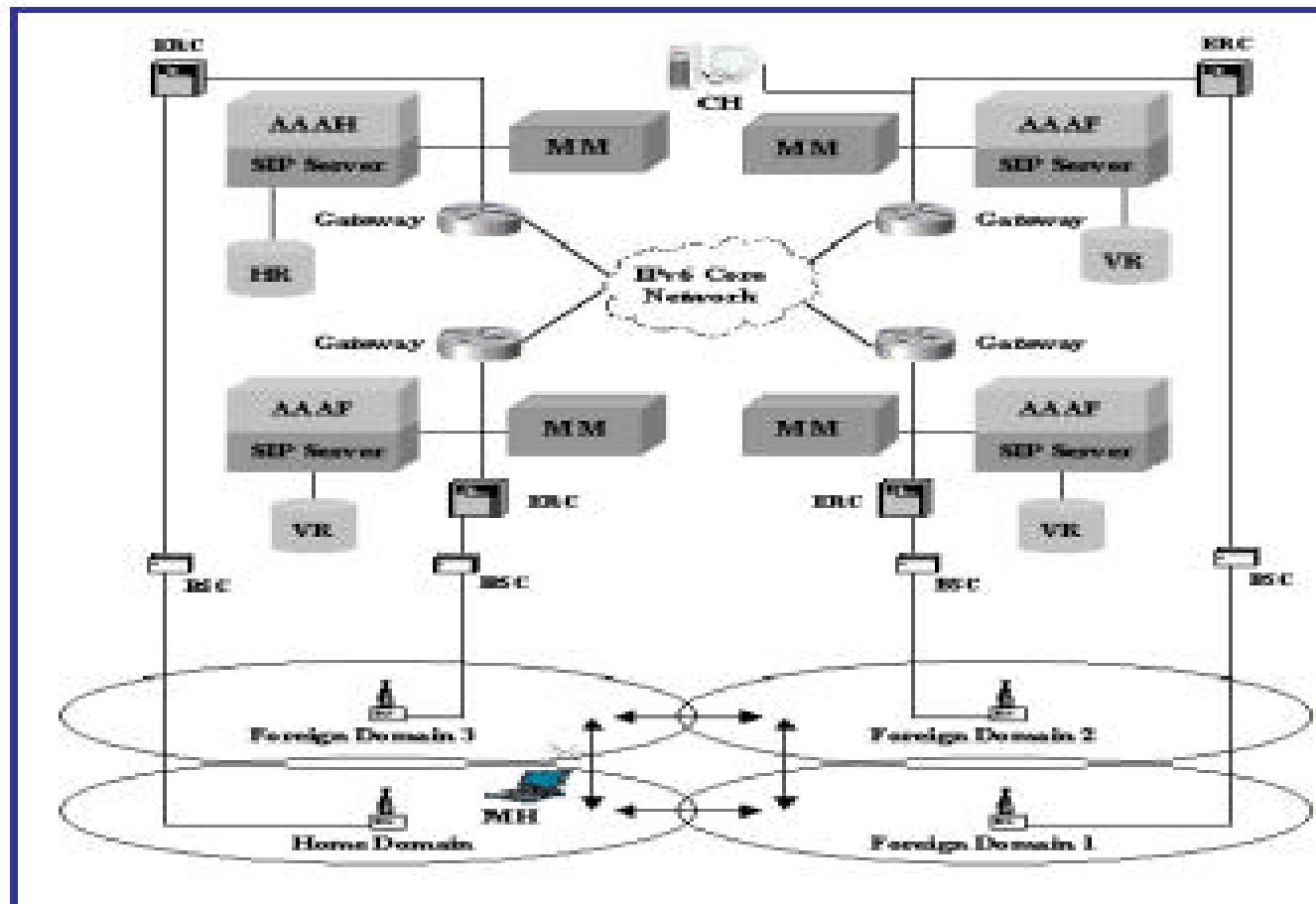
Simulation & Analysis Methodology



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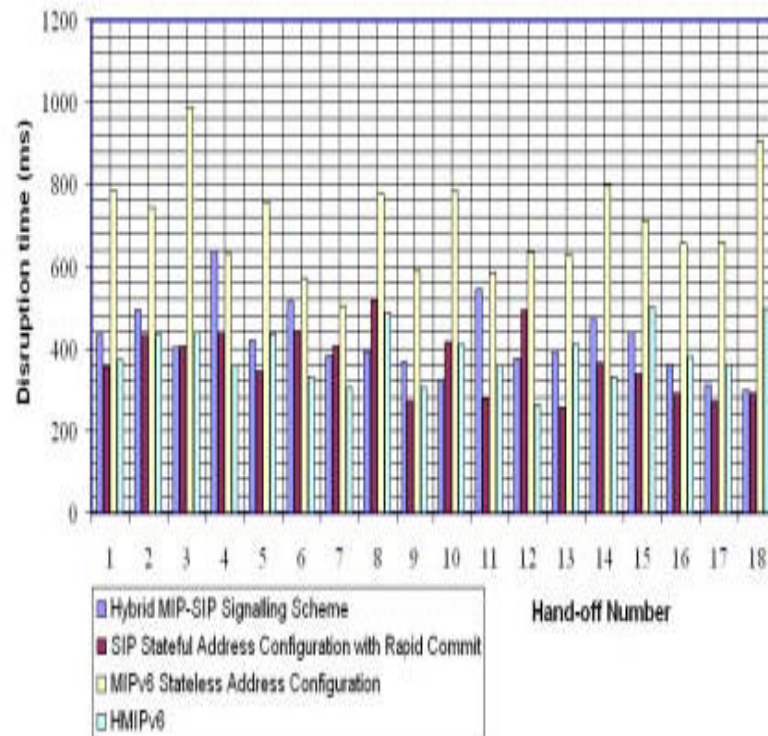
- Network model, for simplicity, consists of 4 access points.
- Each access point is considered as a different administrative domain.
- Voice sessions (calls) are generated by the wired CH using a G.729a codec.
- Voice quality is measured according to the ITU-T G.107 (E-model).
- Specific MIPv6 and SIP mobility implementations are assumed for the proof-of-concept high-level simulation.
- More assumptions are detailed in the paper.

Network Model for Simulation



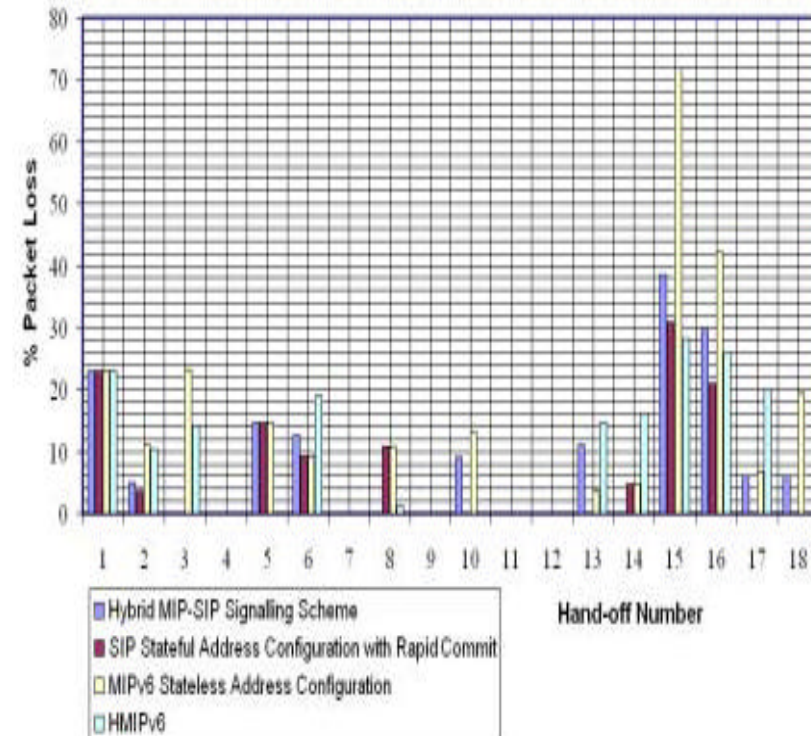
Results

Disruption time per Handoff Operation Comparison



a)

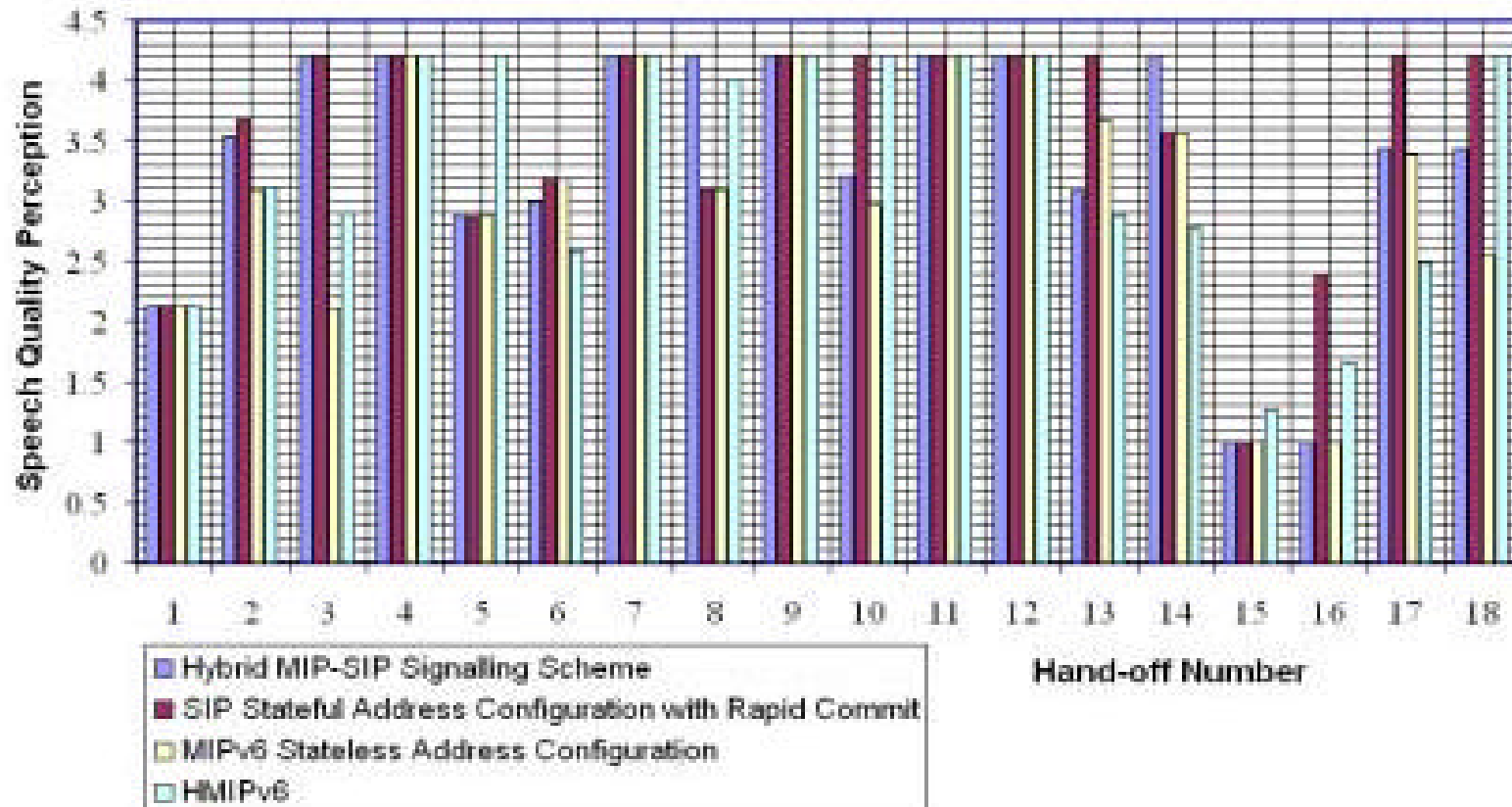
% Packet Loss per Handoff Operation Comparison



b)

Results (Cont.)

MOS Score per Handoff Operation Comparison





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Conclusion

- The Hybrid MIP-SIP architecture enables macro mobility support across SIP-alone and MIP-alone domains.
- Handoff disruption time is a direct function of delay signalling between the MH, the CH and the MH home network.
- Initial results, with certain assumptions, show an overall macro handoff performance improvements in the order of MIPv6, the Hybrid MIP-SIP architecture and SIP.
- However, this approach has the following disadvantages:
 - The MM can prove to be a bottleneck in the system.
 - SIP ability to initiate and release sessions is constrained.



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Discussions

Thank you very much for your attention!

For further information, please visit the Group Website:
<http://www.tech.plym.ac.uk/see/research/cdma/index.html>

For interest in collaboration, please contact Dr Mosa Ali Abu-Rgheff (mosa@plymouth.ac.uk).