S-MIP: A Seamless Handoff Architecture for Mobile IP

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Objective

To reduce the MIP handoff latency by
- reducing home network registration time through a hierarchical management structure
- minimizing the lengthy address resolution delay by address preconfiguration through fast-handoff mechanism

Introduction

- Generally, when MN moves, it obtains a new IP address, all existing IP connections are terminated and it reconnects to the new network.
- To avoid this, MIP introduces indirection at the IP layer, achieved by network agents.
  * Each MN is identified by static home network address from its home network
  * MN updates home agent about its current IP
  * Home agent intercept any packet for MN and tunnels them to MN
- Causes of Handoff Latency
  - Time taken for a MN to register its location with home agent
  - Configure a new network care of address
- Solution proposed
  * hierarchical network management structure
  * preconfiguration

Background & Related Works

A Hierarchical Mobile IPv6
MAP - placed at the edge of the network above the access router
- maintain a binding between itself and mobile nodes currently visiting it's network domain
Whenever MN attaches to a new network
  * MN registers with MAP
  * MAP intercept every packet to MN, tunnel then through LCoA
  * if LCoA changes, new LCoA is required
  * if MN moves to another MAP, new RCoA and LCoA is required

Fast-Handoff mechanism
- Router Solicitation for Proxy (RSsPr)
- Proxy Router Advertisement (PrRAdv)
- Handover Initiation (HI)
- Handover Acknowledgment (HACK)
- Fast Binding Acknowledgment (F-BACK)
- Fast Binding Update (F-BU)
- Fast Neighbor Advertisement (F-NA)

Even with this, packet loss at IP still exist

Background & Related Works

B Fast-Handoff mechanism

S-MIP: A Seamless Handoff Architecture

Builds on fast handoff and hierarchical scheme
Introduce the use of an intelligent handoff mechanism

A Design
- Extreme Low Handoff Latency
- Minimal Handoff signaling
- Indoor Large open space Environment
- Scalability, High Availability, Fault Tolerance
S-MIP : A Seamless Handoff Architecture

Section 1: Causes of Packet Losses
- Segment [MAP & access routers]
- Edge [last access router & mobile device]

Section 2: Solution to Packet Loss
- Keep anchor point for forwarding mechanism close to MN
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
  - SPS – multicast packet to both current and future location of MN (s-packet & f-packet)
  - Hybrid - MN initiated – best knowledge about current position to initiate handoff

Synchronize feedback - movement tracking
1. Linear
2. Stochastically
3. Stationary

Section 3: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
  - SPS – multicast packet to both current and future location of MN (s-packet & f-packet)
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Section 4: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 5: Solution to Packet Loss
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Section 6: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 7: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 8: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 9: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 10: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 11: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 12: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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  - Hybrid - MN initiated – best knowledge about current position to initiate handoff

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Section 13: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 14: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 15: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 16: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 17: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 18: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 19: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 20: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 21: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 22: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 23: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 24: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 25: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
  - SPS – multicast packet to both current and future location of MN (s-packet & f-packet)
  - Hybrid - MN initiated – best knowledge about current position to initiate handoff

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Section 26: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
  - SPS – multicast packet to both current and future location of MN (s-packet & f-packet)
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Section 27: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 28: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 29: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Section 30: Solution to Packet Loss
- Use newly developed synchronized packet – Simulcast (SPS) scheme and a hybrid handoff mechanism
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Performance Evaluation Result

**Conclusion**

- Combined scheme can provide lossless handovers at the IP layer, with minimal increase in signaling overheads.
- SMIP is capable of providing an effective seamless handover in IP.

**Advantages/ Disadvantages**

- S-MIP eliminates the L3 disruption perceived by communication end-host.
- No packet loss at IP layer.
- The need of re-ordering packet.
- The need of waiting for the Handoff Decision (HD) message.

**Critique**

- The paper is a good paper.
- Eliminates packet loss at L3.
- The author did not give details of how location tracking was performed.
- The symbols use in fig 7 handoff is confusing.
- The need for doubling buffering at the Access Routers so as not to activate the TCP congestion control mechanism.

**Questions**

- Explain why the old access router send duplicate fast binding Acknowledged and not just one.
- What is the usefulness of adding Decision Engine to the S-MIP Network Architecture.
- What is the reason behind sending a s-packet and f- packet.
- Explain what type of messages are contained in Handover Acknowledgement and what happens.
- What could be the cause of edge packet loss.