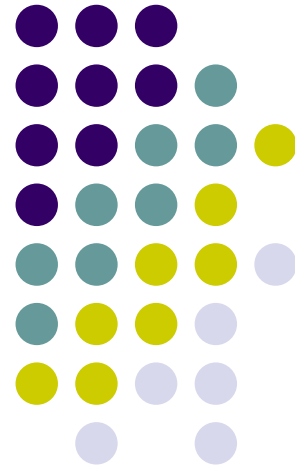


Design and Performance Evaluation of an Improved Mobile IP Protocol

INFOCOM 2004

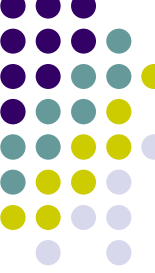
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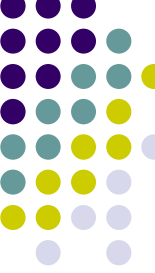
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Outline

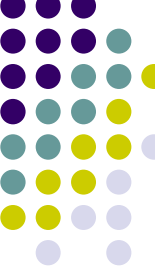
- Introduction
- Mailbox-based Scheme
 - Migrating
 - Packet forwarding
- Performance Evaluation
 - System model
 - Evaluation results
- Conclusion





Introduction

- Mobile IP
 - Provides mobility support in the Internet
 - Binding between *home address* and *care-of address*
 - Triangle routing problem
 - Route optimization
 - Smooth handoff
 - Binding between new Foreign Agent (FA) and previous FA to avoid packet loss



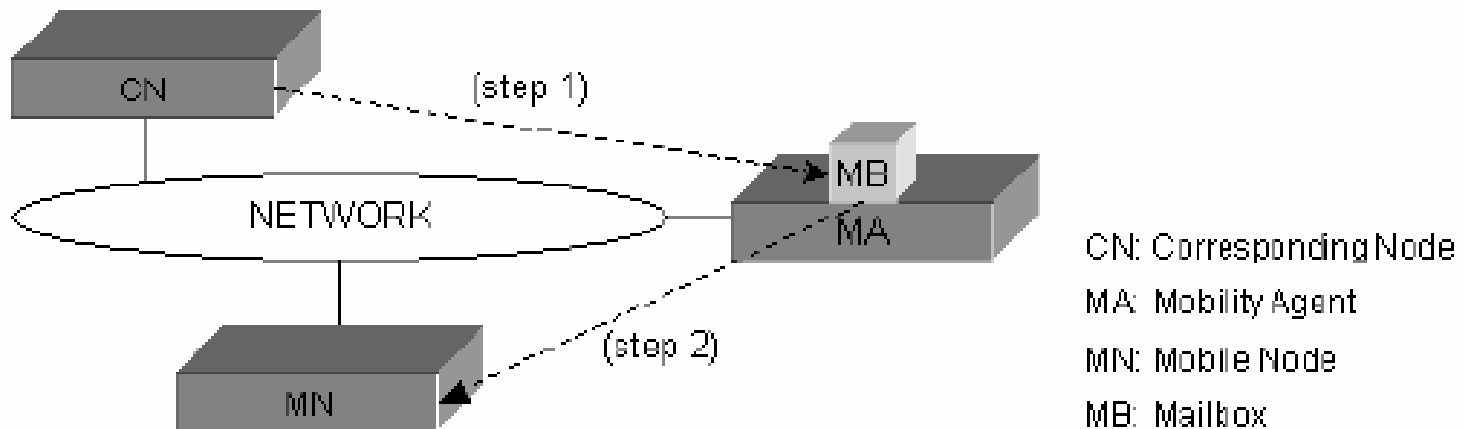
Introduction

- Problems of Mobile IP
 - The Home Agent (HA) needs to be notified of MN's every location change. The route optimization further requires the Correspondent Node (CN) to be notified
 - Mobile IP suffers slow handoff since the HA has to handle all handoffs
 - Massive signaling traffic between the MN and the HA may congest the network

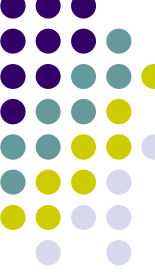


Mailbox-based Scheme

- Mobility Agent (MA): HA and FA
- Every MN is associated with a mailbox, which is a data structure residing at a MA



Mailbox-based scheme illustration



Mailbox-based Scheme

- When the MN moves to a new FA:
 - Old FA decides whether to move the mailbox to the new FA, considering following factors:
 - The distance to the new FA (d)
 - The communication traffic of the MN (n)
 - Threshold ($d;n$) is used to determine the mailbox's migration
 - When distance exceeds d or communication traffic exceeds n , the mailbox will migrate to the new FA

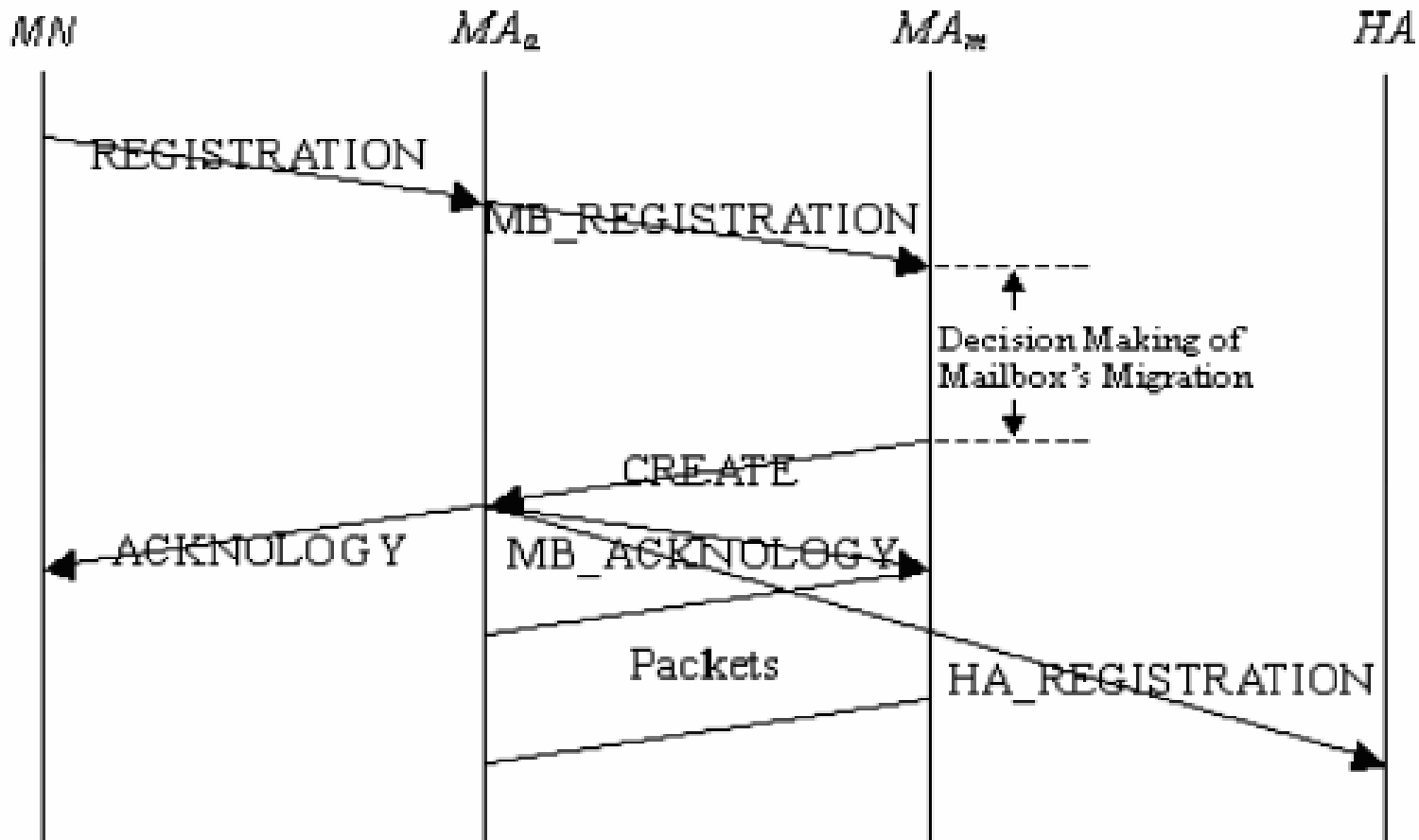


Mailbox-based Scheme

- Local handoff: handoff without mailbox
- Home handoff: handoff with mailbox
 - Threshold $(d;n)$ will be recalculated after home handoff
- Address table

Home Addr	Mailbox's Addr	Valid Tag	Threshold Pair	Pointer to Mailbox	Care-of Addr
Addr A	Remote Address	<i>true</i>	Null	Null	Null
Addr B	Local Address	<i>true</i>	$(d; n)$	A Pointer	Addr C

Mailbox-based Scheme Migrating



Message exchange in registration

Mailbox-based Scheme

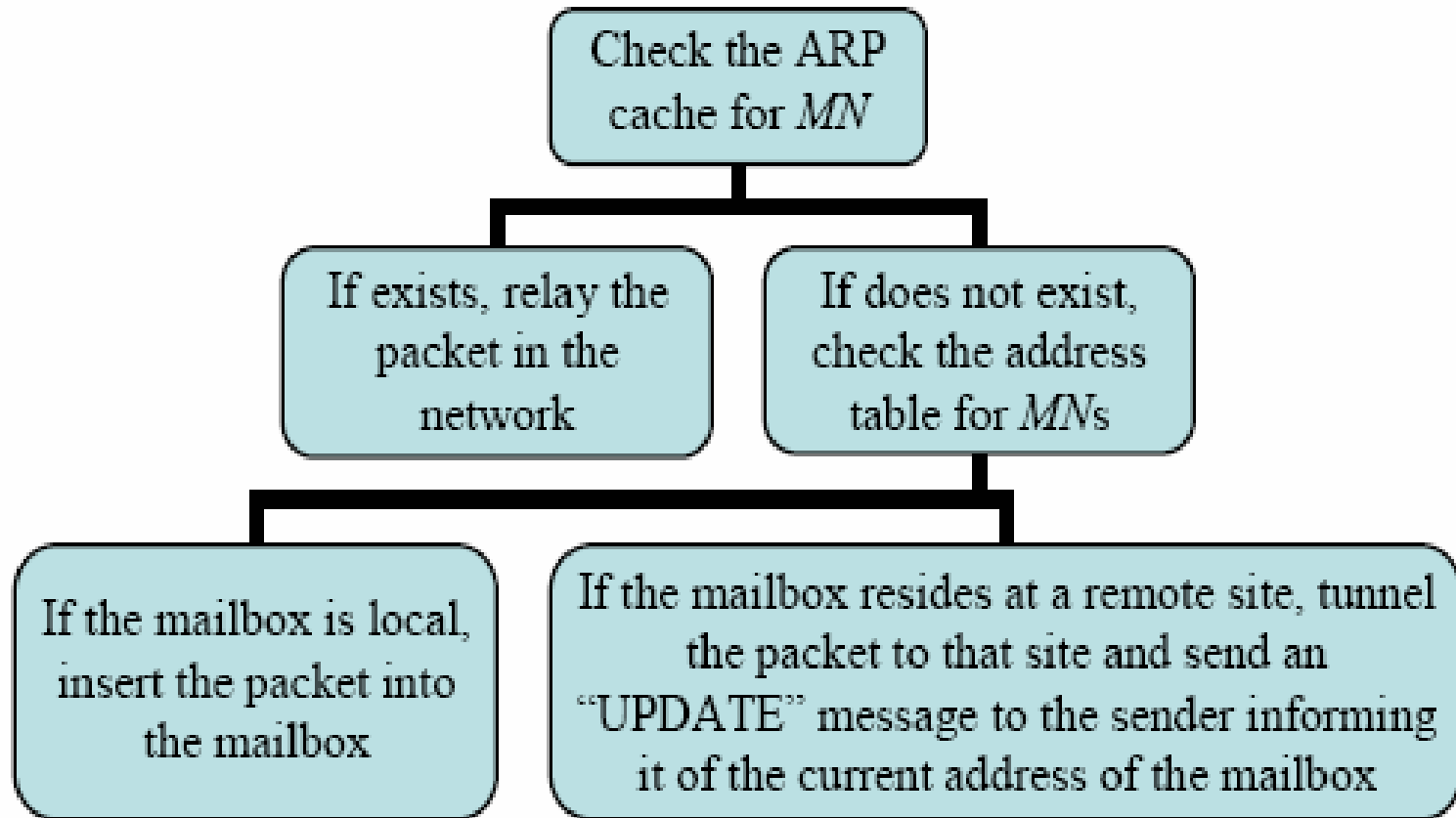
Packet forwarding



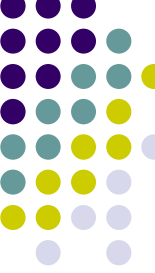
- When a CN wants to send a packet to a MN:
 - Check binding cache
 - If address cached then tunnel the packet to the cached address
 - Otherwise send the packet to MN's home address
 - MN's HA will intercept the packet

Mailbox-based Scheme

Packet forwarding

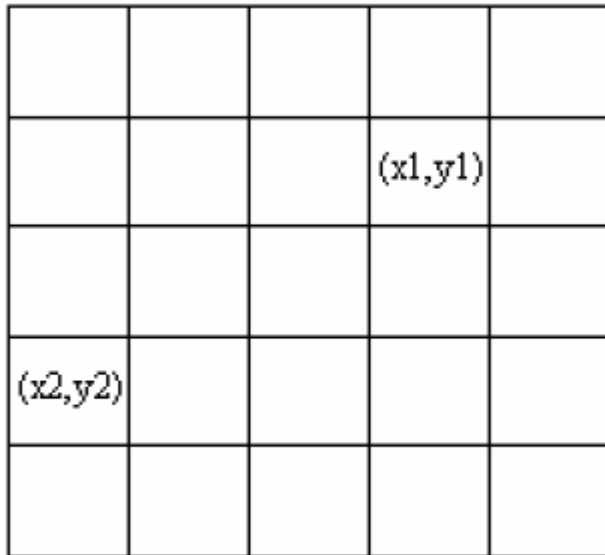


Decision tree when receiving a packet

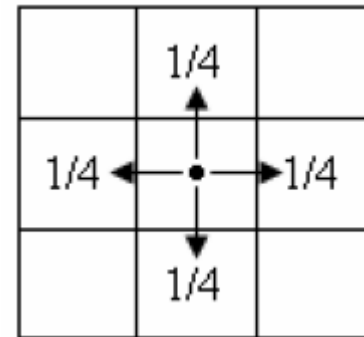


Performance Evaluation

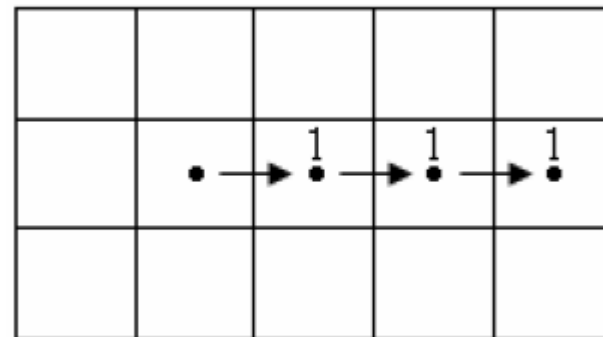
- System model



Mobile Network

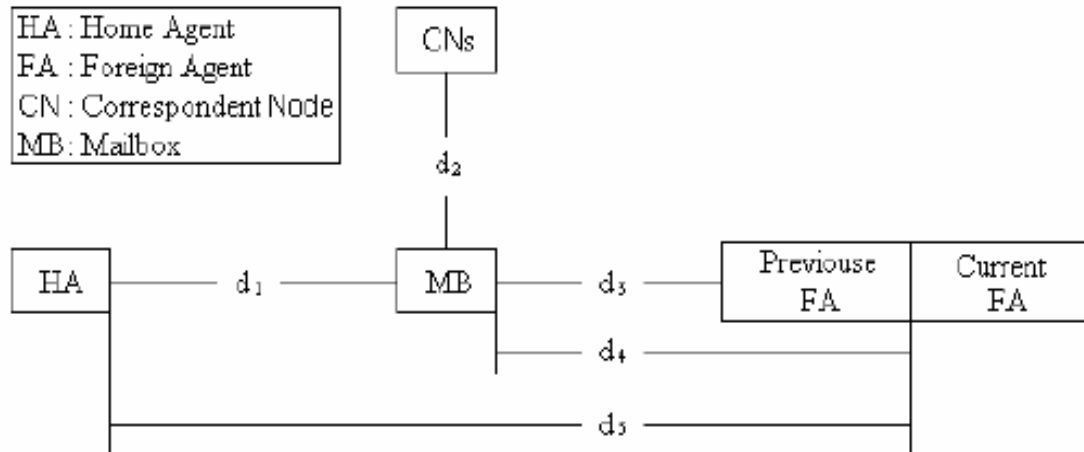


Random walk model

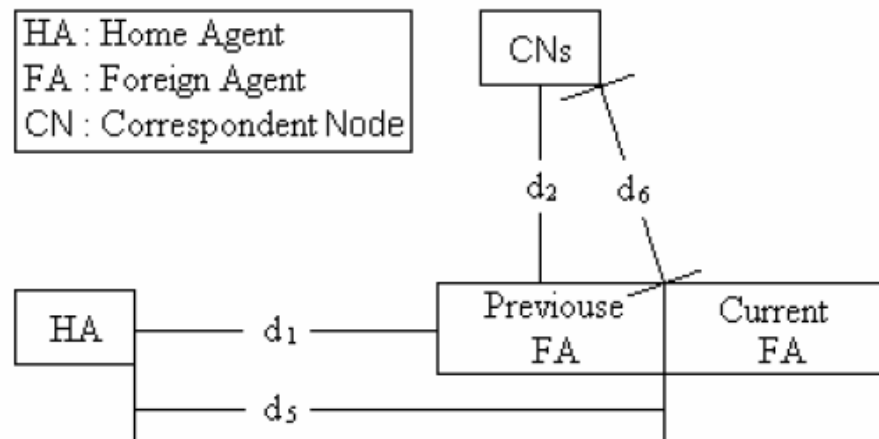


Directional walk model

Performance Evaluation

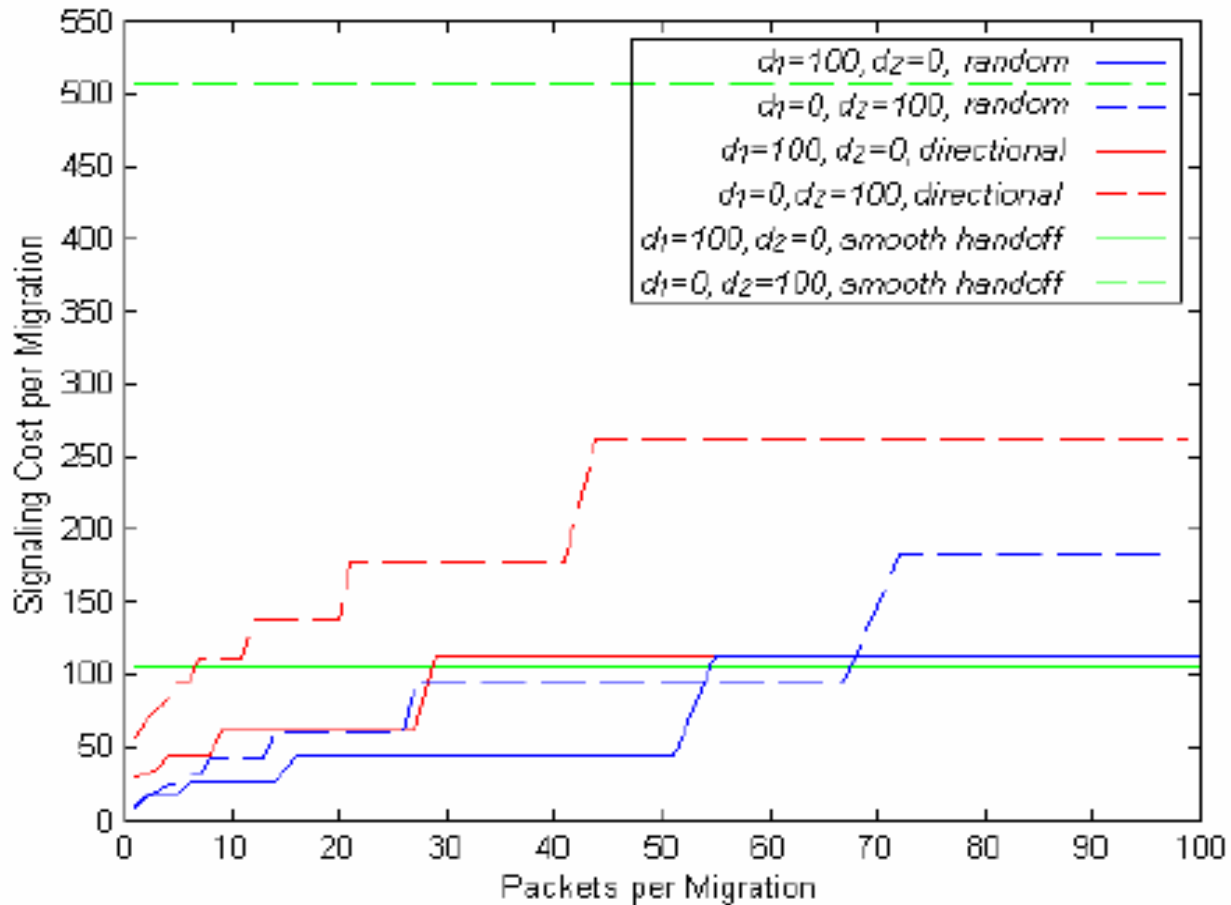


Mailbox-based Mobile IP



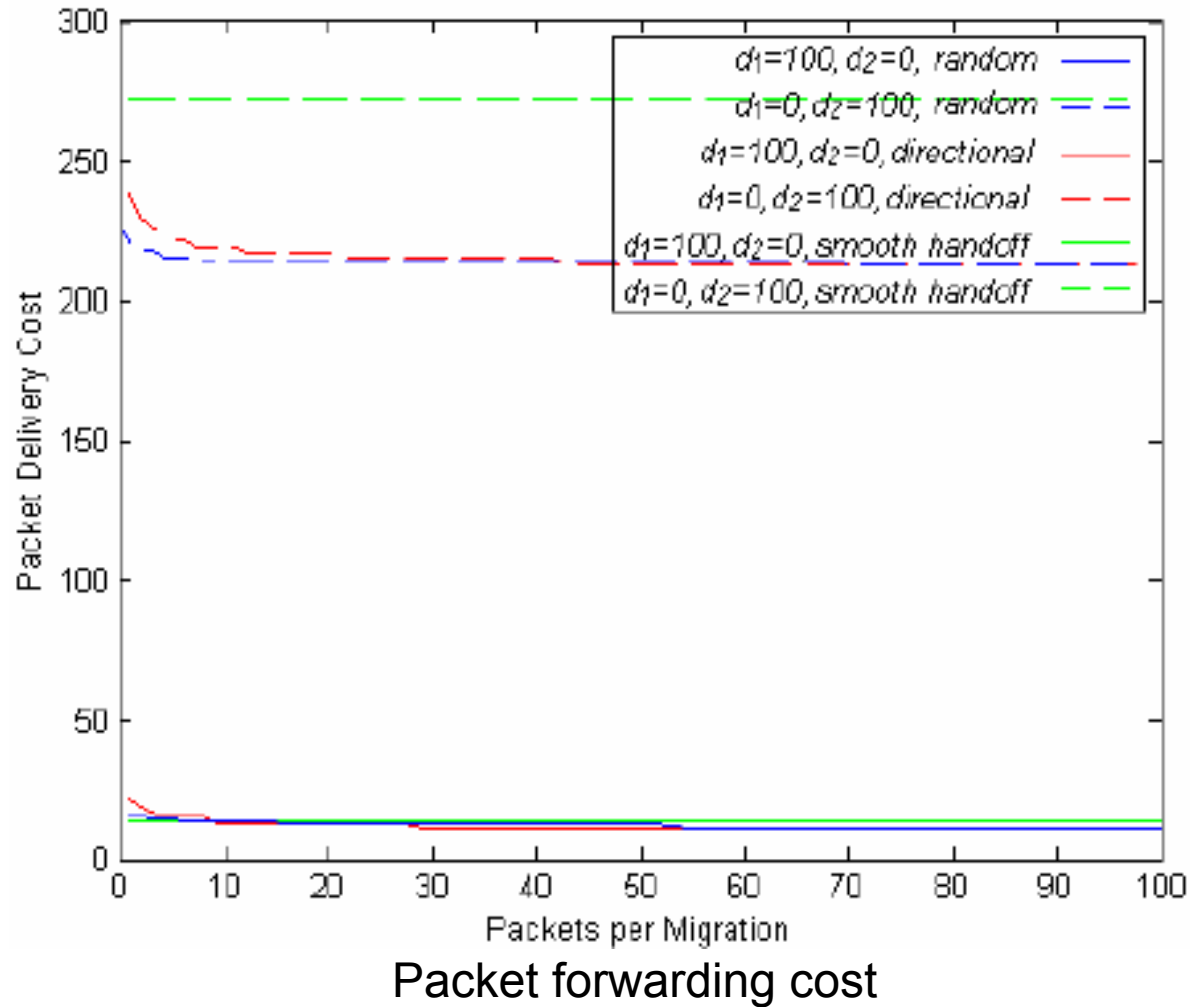
Mobile IP with route optimization and smooth handoff

Performance Evaluation

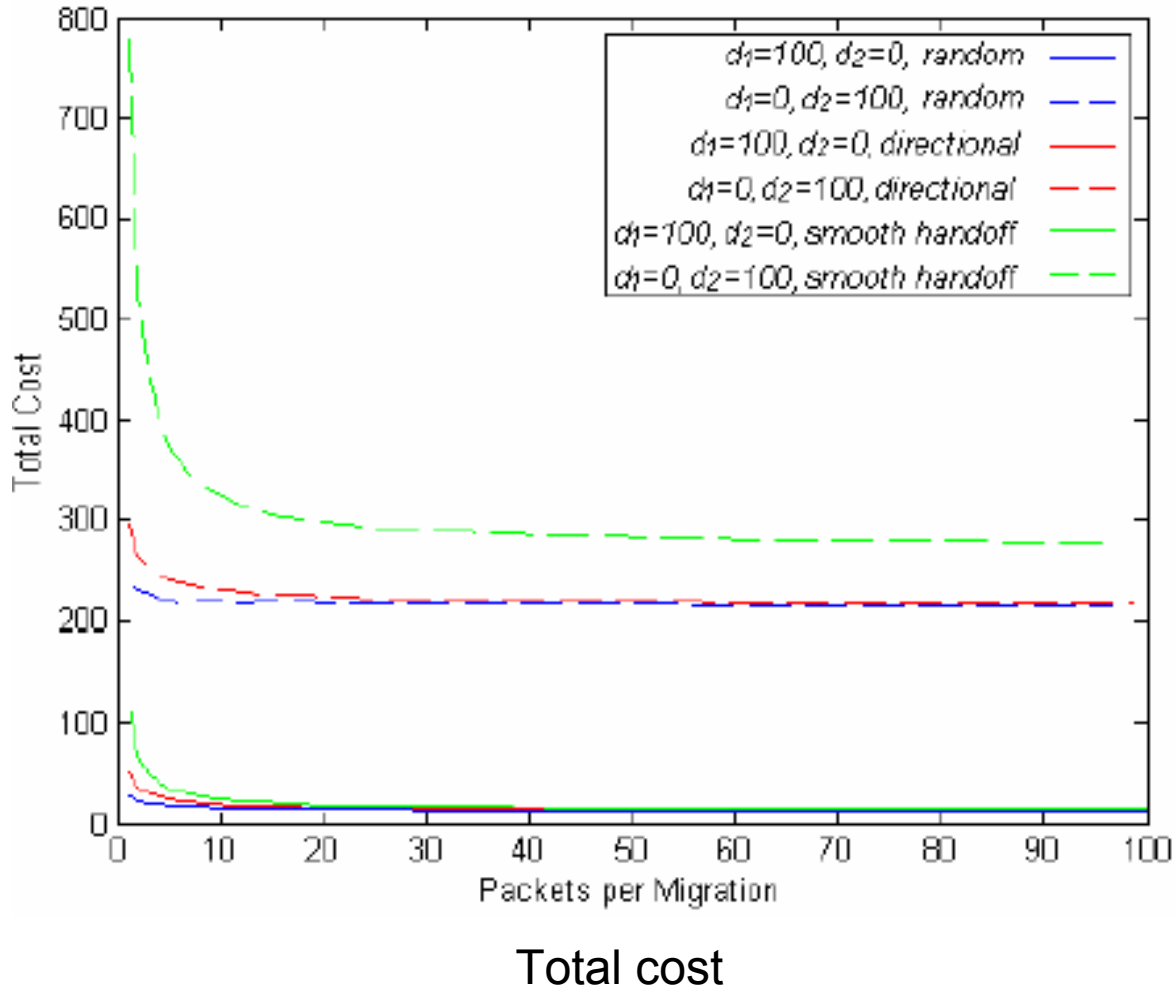


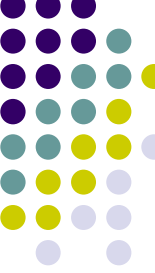
Signal cost per migration

Performance Evaluation



Performance Evaluation





Conclusion

- A mailbox-based scheme to improve Mobile IP's performance
 - Reduce workload on the HA
 - Reduced packet loss
 - Fast handoff
 - Per-user-based adaptive location management
 - Dynamic tradeoff between the packet delivery cost and the registration cost