Scalable QoS provisioning for mobile networks using Wireless sensor

Outline

- Introduction
- QoS provisioning using Wireless Sensor
- Conclusion
- References

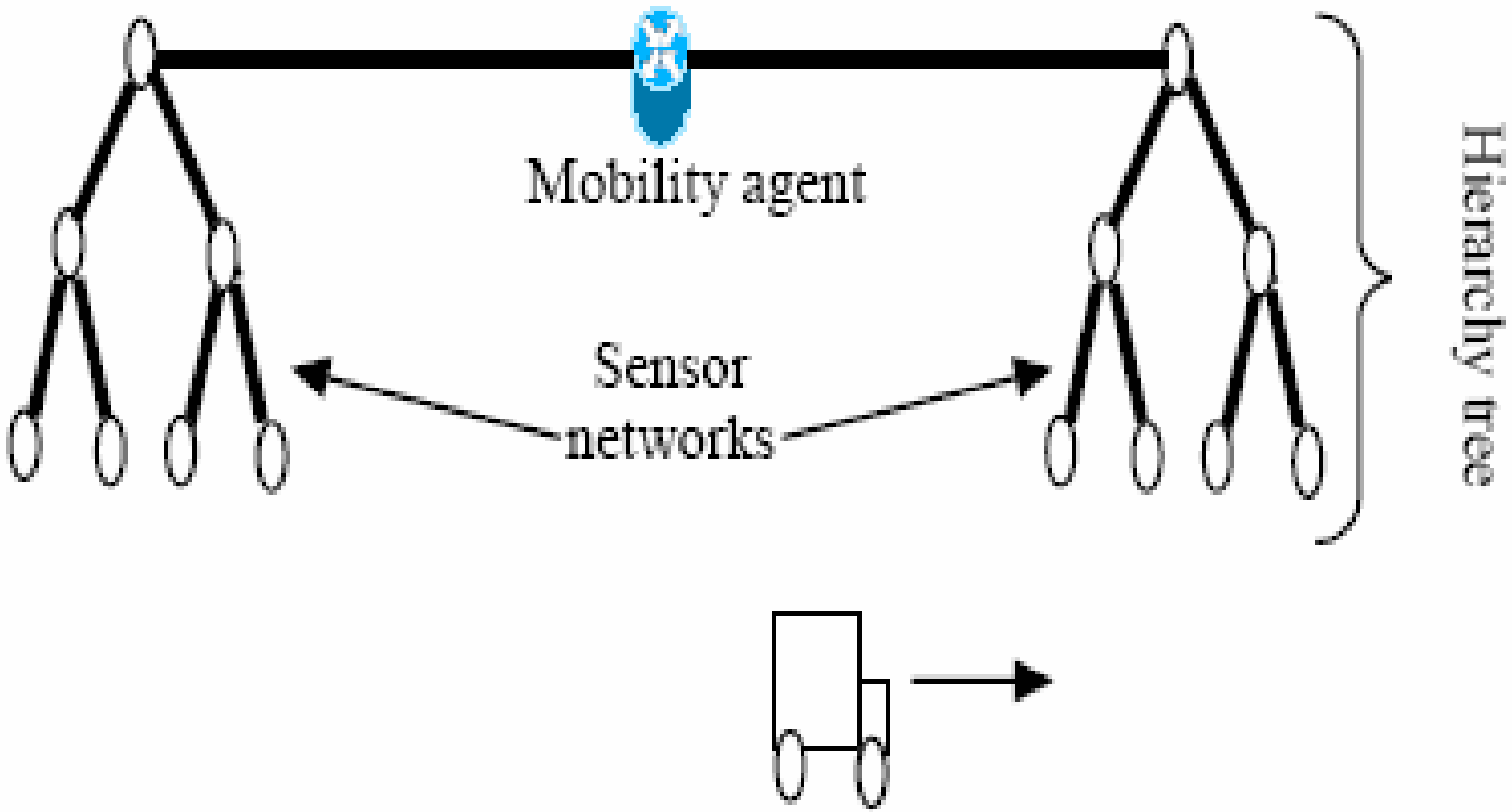
Introduction

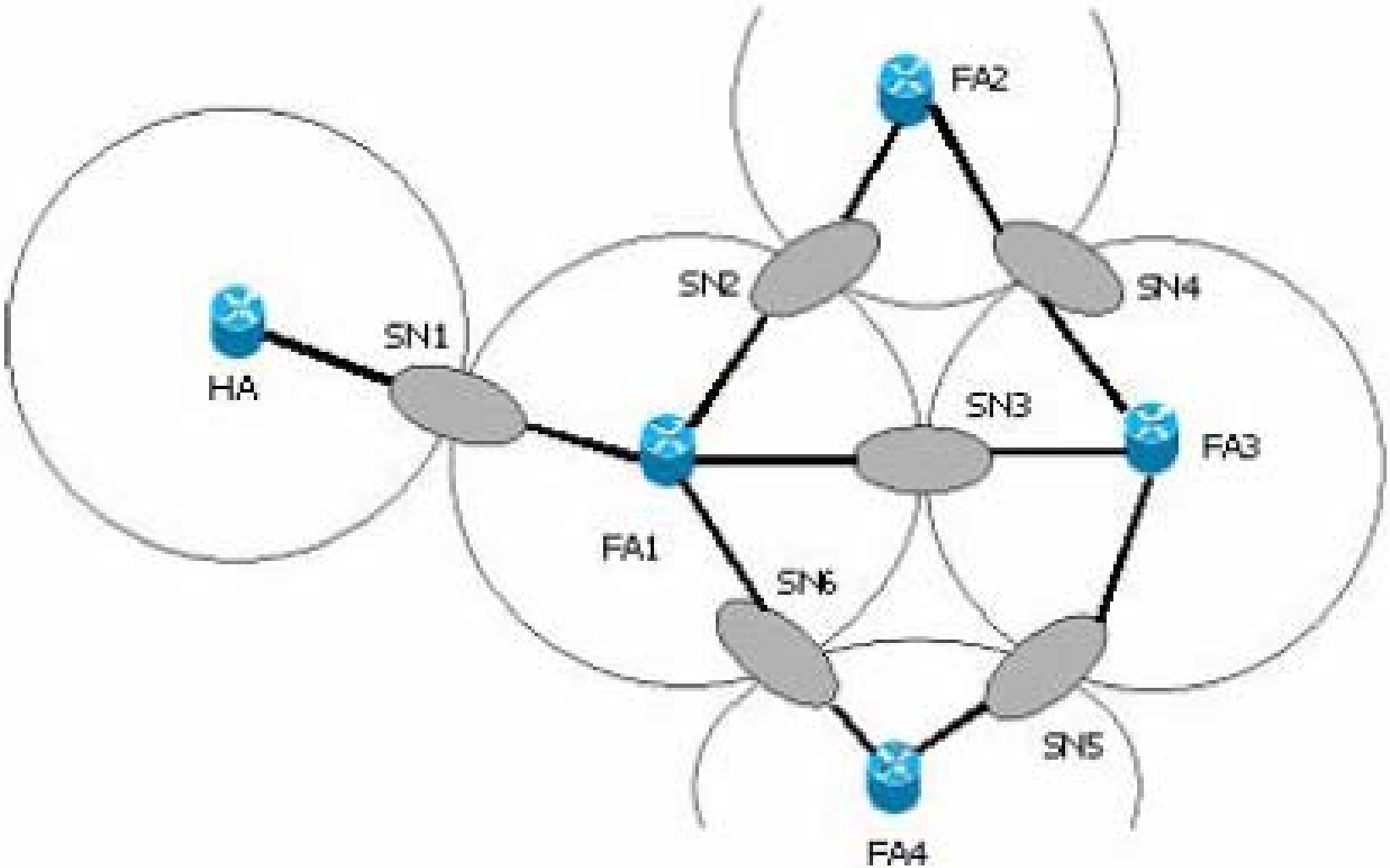
- Mobile IP enables nodes to move from one network to the other while maintaining the same IP address. When MN goes into a FA ,it must do registration.
- Problem:
  - Since packets will not be delivered to the MN until the registration is over,there will be service degradation especially affecting real-time appliction,like VoIP.

QoS provisioning using Wireless Sensor

- Goal
  - To reduce handoff time and QoS provisioning delay
- System components
  - WSN with STUN architecture
  - Mobility agent determination table
  - IP-QoS Mapping Table(IPQMT)

WSN with STUN architecture




FA2
SN2
SN4
SN1
HA
SN3
FA3
FA1
SN6
SN5
FA4

Mobility agent determination table

- With WSN installed at network boundaries, each MA must maintain a table mapping neighboring MA with associated SN
- Ex. **NEW MOBILITY AGENT DETERMINATION TABLE FOR FA1**

SN1	HA
SN2	FA2
SN3	FA3
SN6	FA4

IP-QoS Mapping Table(IPQMT)

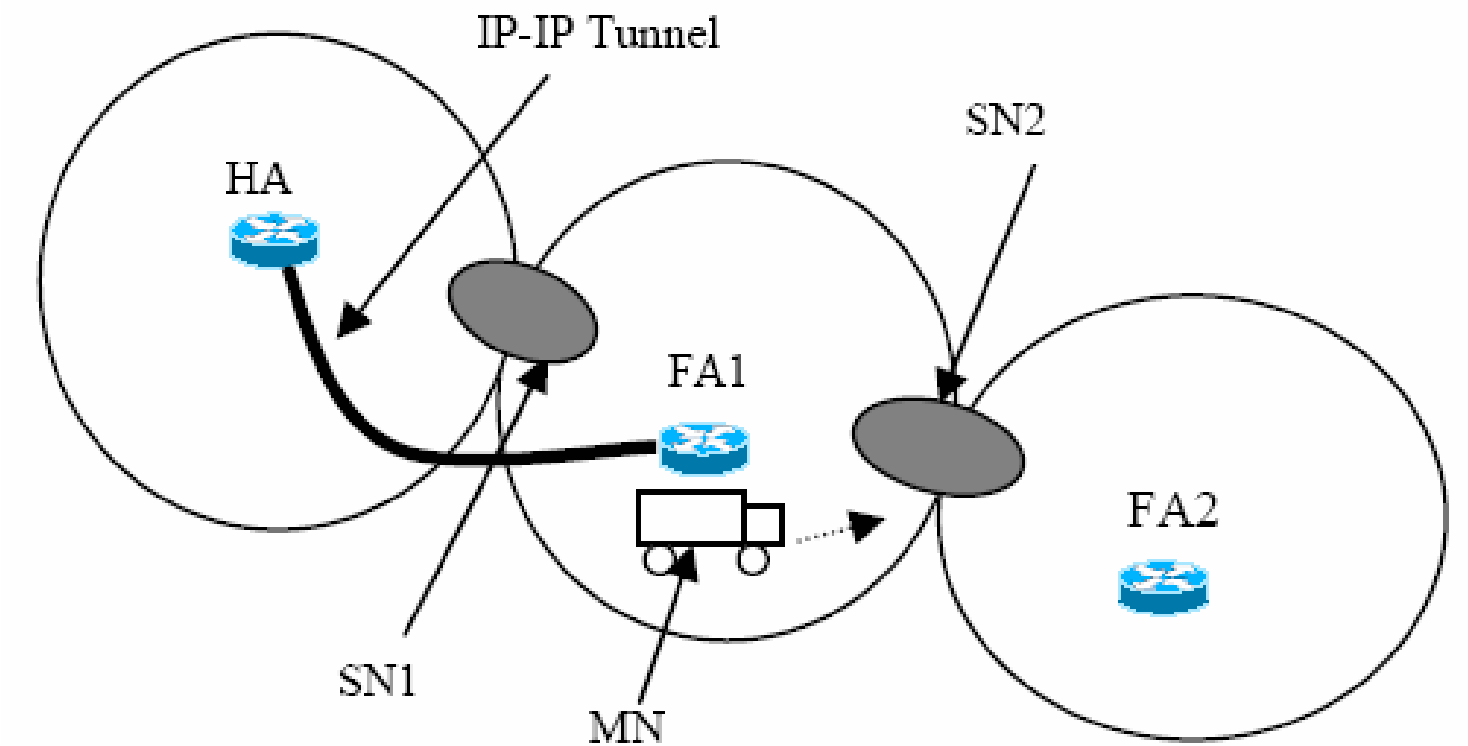
- Every MA stores the max rate envelope and the variance for each node's traffic characteristics
- Ex.

Field 1	Field 2	Field 3
Home address	Maximal rate envelope	Variance

- It is useful while handoff operation.

Proposed handoff and QoS mechanism

- While the MN in FA1 is moving towards FA2



Proposed handoff and QoS mechanism(cont.)

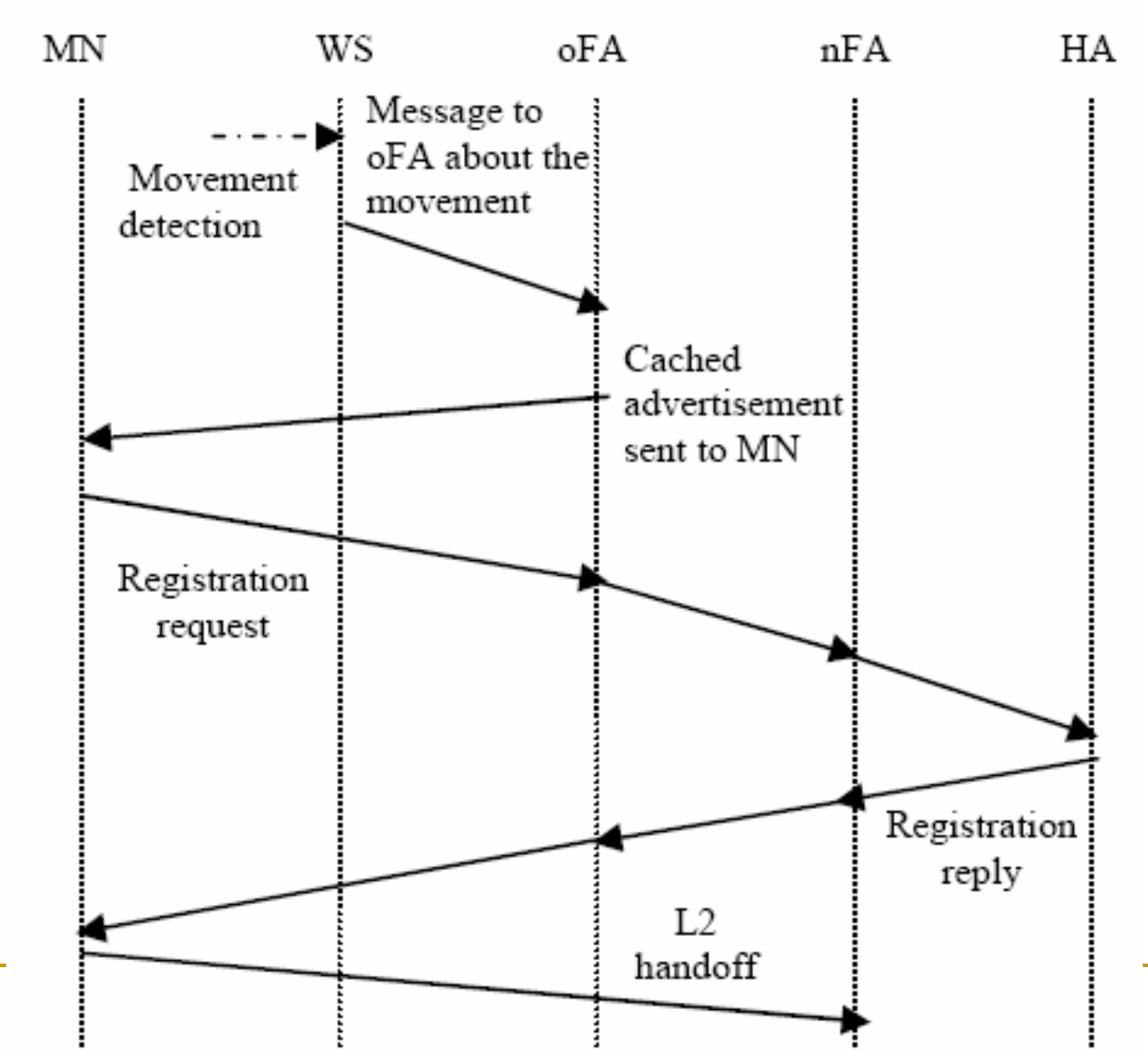
Steps:

1. Wireless sensor network SN2 detects the movement of MN and informs FA1 about this movement.
2. Having received the information from SN2, FA1 knows that MN is moving towards FA2 by looking up its new mobility agent determination table.
3. FA1 looks up its IPQMT and creates a message that contains the nodes home address and traffic characteristics. It then forwards this to FA2.
4. FA1 also sends FA2s cached registration advertisement to MN.

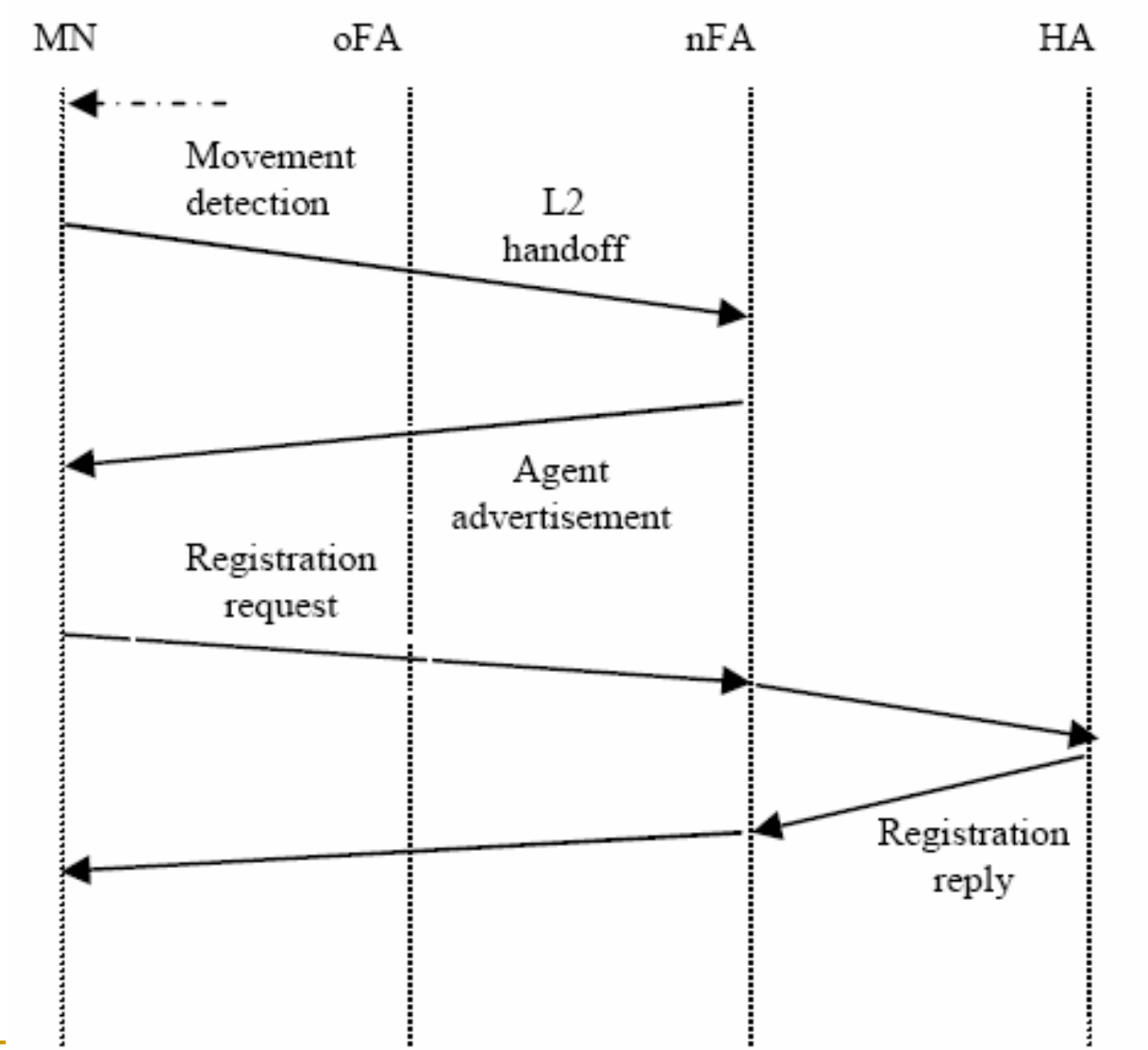
Proposed handoff and QoS mechanism(cont.)

5. MN sends a registration request to FA2 through FA1.
6. HA creates a simultaneous binding for the MN. Packets intercepted by the HA will be tunneled to both care-of addresses and the mobile network may receive duplicate datagrams for a short duration
7. HA sends a registration reply to FA2, which is forwarded to the MN through FA1. On receiving the reply, MN forces an L2 handoff.
8. FA2 may forward a message to FA1 informing it to delete the entry and reservations for MN.

Proposed handoff and QoS mechanism(cont.)



Traditional Mobile IP operation



Comparison

- Let handoff time may be defined as the time difference between receiving the last packet from the oFA and the first packet from the nFA
- Traditional method
  - Assume the life expiration is used to detect MN movement
  - The handoff time is

$$T_{Handoff} = T_{Lifetime} + L2delay + T_3 + T_{MN-FA} + T_{FA-HA} + T_{HA-FA} + T_{FA-MN}$$

Comparison

- New method
  - The total handoff latency is

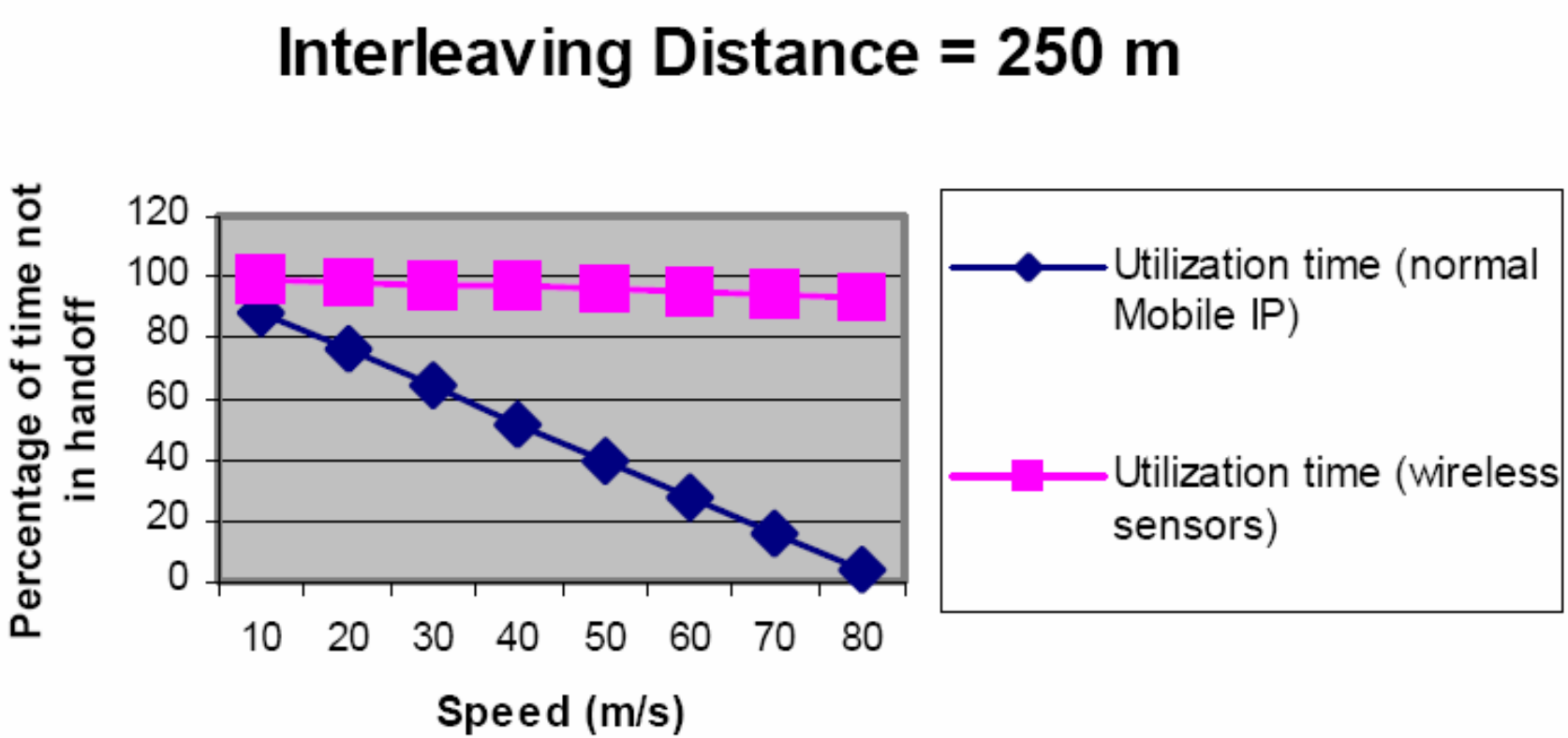
$$T_{(WS)Handoff} = L2_{delay}$$

- Since L2 handoff takes 0.2 s

  L3 handoff takes 3 s

  voice packets send to MN every 20ms
  - Old mobile IP will lose 3.2/20ms = 160packets
  - Mobile IP with WSN will lose 0.2/20ms = 10 packets
  - 93% Improved

Comparison


Interleaving Distance = 250 m
Percentage of time not in handoff
120
100
80
60
40
20
0
10
20
30
40
50
60
70
80
Speed (m/s)
Utilization time (normal Mobile IP)
Utilization time (wireless sensors)

Conclusion

- Tracking mobile networks and performing handoff in advance can improve performance of Mobile IP to a large extend.
- Packet loss is reduced by 93.75%
- The affect while high speed is almost eliminated.

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