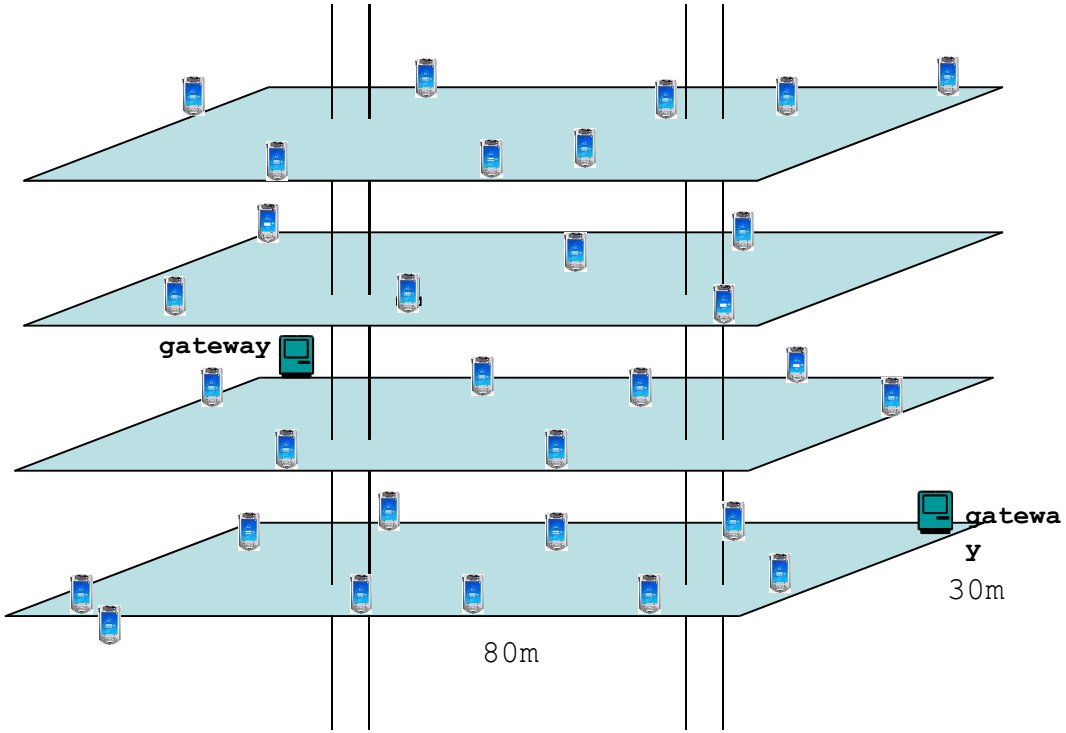
Optimized Multicast

Cho, song yean
Samsung Electronics

What we trying to do ?

- Communication Service inside the building



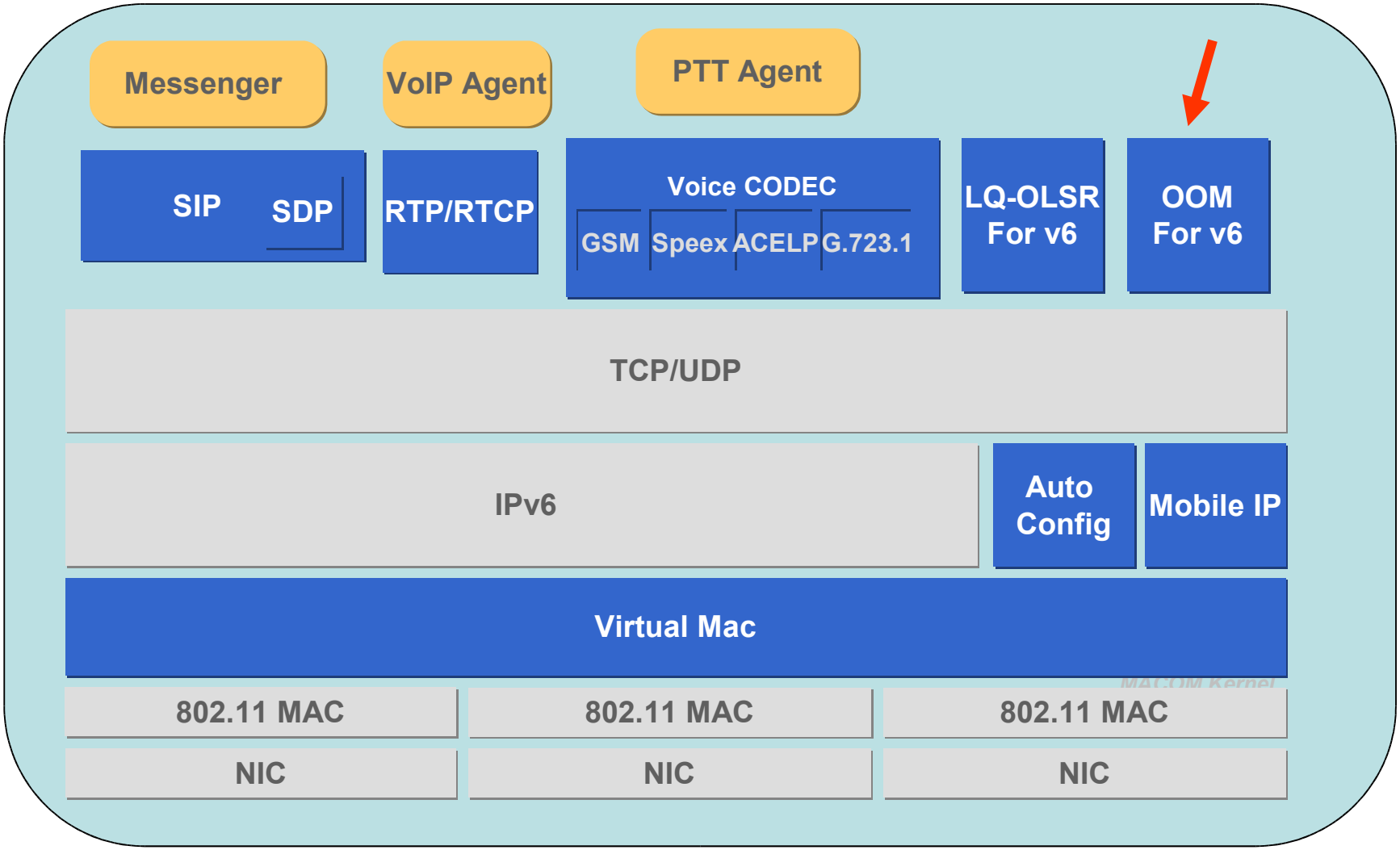
Testbed

- 30 nodes
- 4 gateway
- 802.11b
- Barriers
  - Barrier per 20 m
  - Barrier per 15 m

Services

- Push to Talk (PTT)
- VoIP
- Alarm & Notification
- Messenger

What functions We need?



Requirements for OOM

- Minimizing Overhead
  - Utilizing Information I have already

    → Use Information (MPR, Routing Table) of OLSR
  - Making Multicast Delivery Path only for Real multicast data

    → building multicast delivery paths when Multicast Client try to send data

- Maximizing group member reachability
  - Delivering Data to All Group Members

    → building redundant paths

Assume what we have already?

- Info from OLSR
  - Which Node is Group?
  - Shortest Hop Count to all Group members
- Mechanism to Build Multicast Paths
  - Source Tree
  - Multicast Mesh
  - Stateless

Tree vs. Mesh

- Source Based or Shared Tree
- Multicast Mesh
- Stateless

Source Based	Mesh Based
• Build Multicast Tree – Root: source – Leaves : group members • Combining shortest path from source to all group members • Optimal → Efficient • Fragile to Mobility Ex) AMRIS, MAODV,MOLSR	• Build Mesh – Mesh : multiple paths between source and group members • Outperforms tree-based multicasting when node moves frequently and fast • Alternative Path → Higher Reachability • Less Optimal • Ex) ODMPR, CAMP,FGMP

Basic Idea

- On-Demand : (Group Members, Shortest Hop Count) in Packet
- Multiple Paths to Group Members
  - Node N is forwarder?

Condition	Effect	
D(S) + D(GM) <= Shortest Hop Coun	Use All Shortest Paths to Group Membe	Mesh
D(S) + D(GM) <= Shortest Hop && MPRSelector(N) ∈ Sende	Use some Shortest Paths connecting MPF to Group Members	Mesh +MPR
(D(S) + D(GM) <= Shortest Hop && MPRSelector(N) ∈ Sender) (D(S) + D(GM) <= Shortest Hop Count && MPRSelector(N) ∈ Sender	Use some Shortest Paths connecting MPF to Group Members including paths without MPRs	Mesh +MPR +extra

Simulation Model

- **Testbed Model**
  - Random Unit graph G
    - Graph obtained by systematically linking pairs nodes whose distance is smaller or equal to the unit length-r
    - N : nodes distributed uniformly on square of size L x L unit lengths (L>0)
  - Mobility
    - 100 * (r / R)
      - r :distance to move at a time
      - R:distance to transfer the data

Comparison Mechanism

- MPR flooding with radius
  - delivering data through MPRs to all directions until it reaches the furtherest group members
- Mesh
  - delivering data through all shortest paths from source to group members
- Mesh+MPR
  - delivering data through some shortest paths connecting MPRs from source to group members
- Mesh+MPR+extra
  - delivering data through some shortest paths connecting MPRs from source to group members and extending the paths to extra hops

OOM for static topology

OOM for dynamic topology

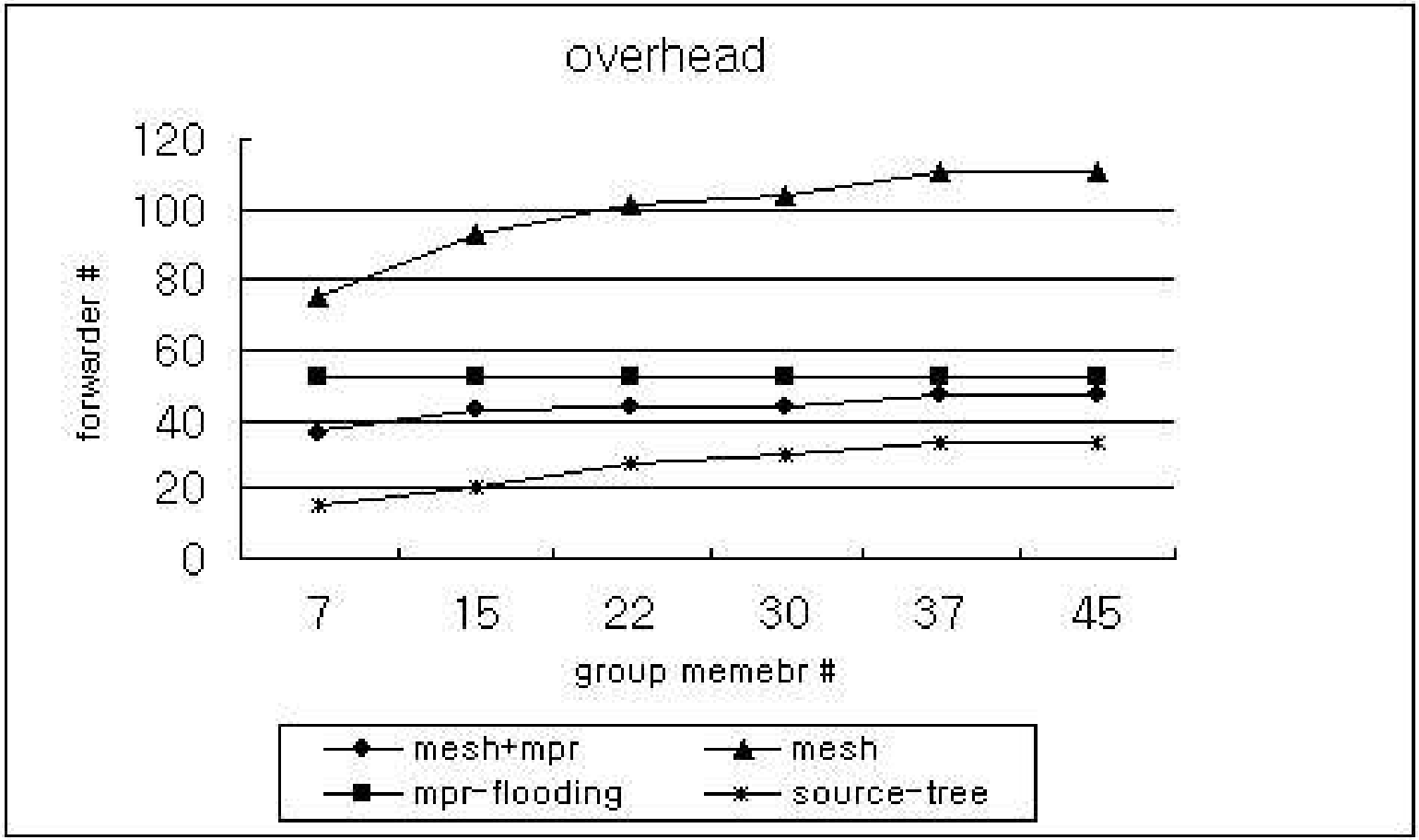
Comparison Result

- **Overhead**
  - Minimizing the Cost to transmit Multicast Data?
  - the number of forwarders

- **Group Reachability**
  - Maximizing the Reachability of Group Members
  - (group members to receive the packet #/total node#) * 100

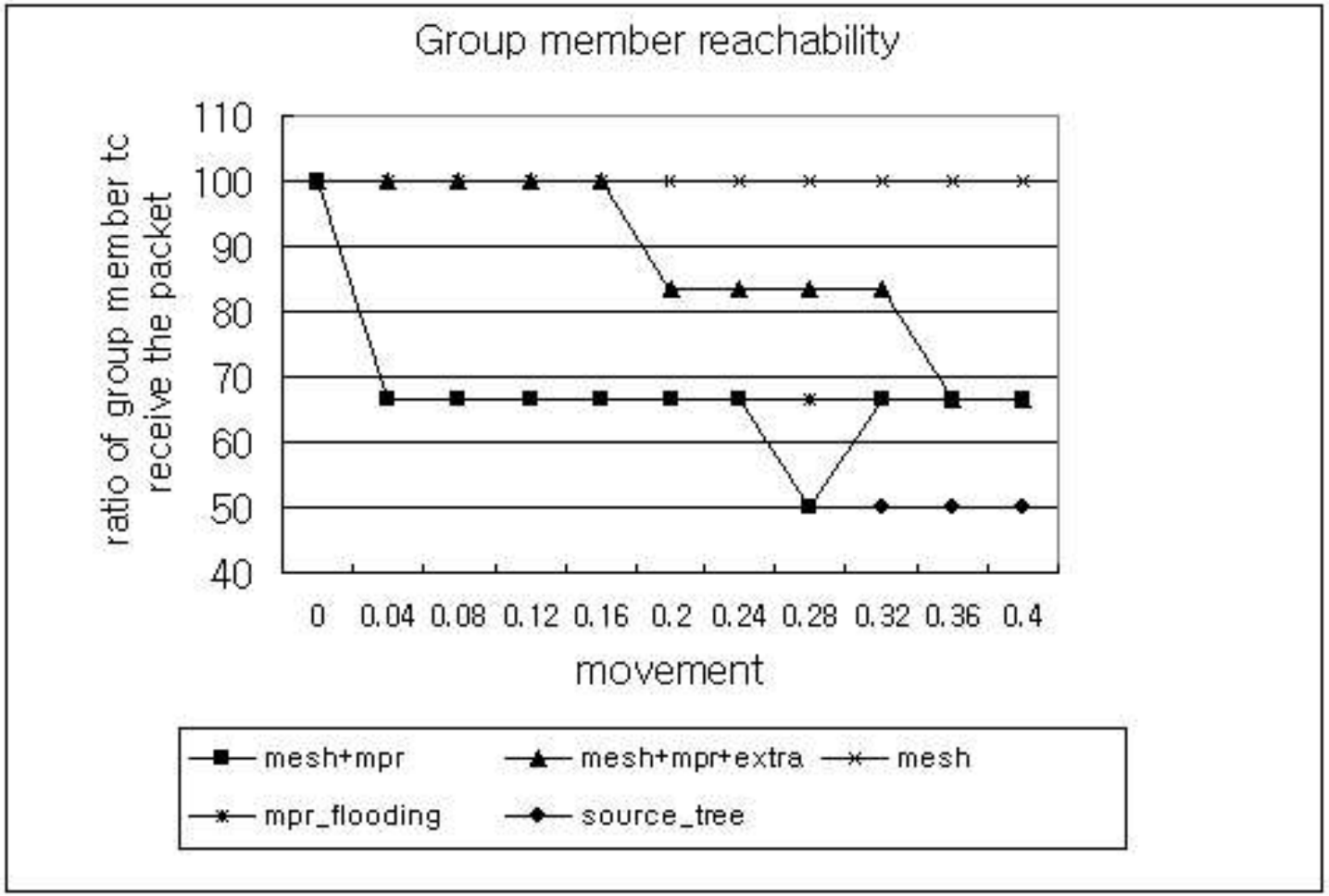
Overhead without mobility

Node # = 200



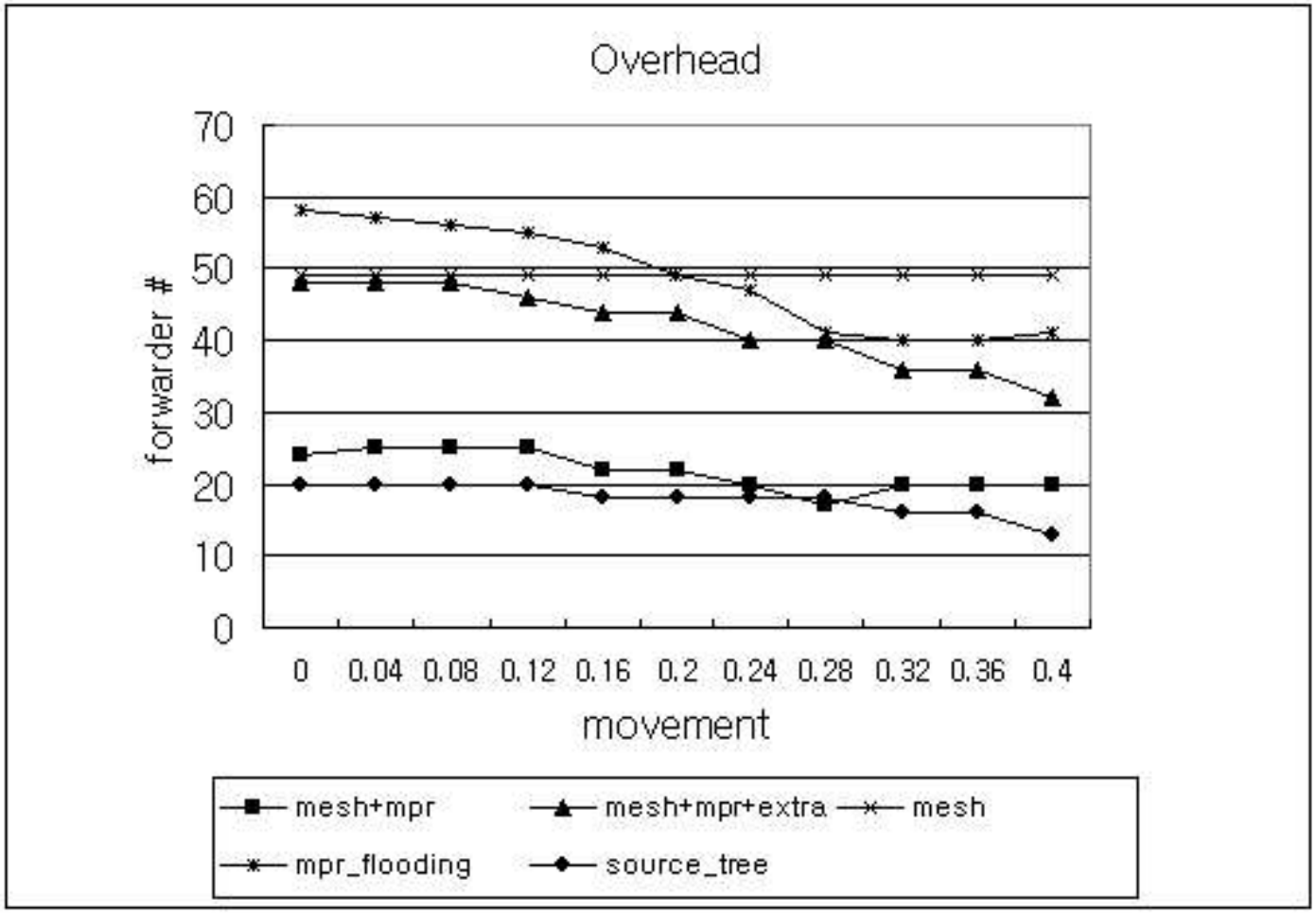
Group Reachability with mobility

Node #= 200 , Group member #= 10



Overhead with mobility

Node #= 200 , Group member #= 10



Implementation Design on Linux