A New Multicasting-based Architecture for Internet Host Mobility

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Presented by Barath Raghavan for CSE291K, Winter 2003

Multicast-based Mobility

- Prior mobility solutions have deployment issues
- Prior multicast solutions have deployment issues
- Observation that multicast architecture is similar to proposed mobility architecture
- Idea: Use multicast to solve the mobility problem

Review: Multicast

- Problem: How does a host efficiently send data to many hosts simultaneously?
- Idea: Special addresses are for multicast – arbitrary number of receivers
- Problem: How does the network know the receivers?
- Idea: Store group information for each multicast address
- Problem: How do the receivers join the groups? How do routers build the tree? How do they share state? How do they ...?

Review: Multicast Approaches

- Distance-Vector Multicast Routing Protocol (DVMRP)
- Link-state Multicast (MOSPF)
- Core Based Trees (CBT)
- Protocol Independent Multicast (PIM-SM/DM)
- Many others...

Multicast Requirements

- Distinct end-host and location-based identifiers
- All hosts within a group should receive multicast packets
- Hosts must be located automatically
- Hosts should be able to join and leave at will

Mobility vs. Multicast

	Mobile IP	Multicast
Registration	MH registers with the local agent	Receiver registers with multicast router
Connectivity	Provided by the foreign agent	Provided by the multicast router
Address translation	Home agents translate packets for MHs	No translation
Routing	Home agent tunnels messages to MH	Receiver forwarded messages by routers

- Approach: Solve mobility with multicast architecture
- Proposal: Mobility Support using Multicast (MSM-IP)

MSM-IP

Addressing

- Assign a multicast address for each MH
- Adv: All hosts can communicate with the MH at a fixed address
- Disadv: Limited number of multicast addresses

Packet Forwarding

- IP multicast forwards packets directly to a MH

Handoffs

- Allow MH to pre-register with its next network before handoff

MSM-IP Communication

- Static hosts communicate with MHs using multicast address
- Mobile hosts communicate with static hosts using unicast address
- Mobile hosts set the source of the IP packets to their multicast address
- Only one host (the MH) is in a group at a time
- What are some possible problems with this strategy?
- What constraints are placed on the multicast infrastructure?

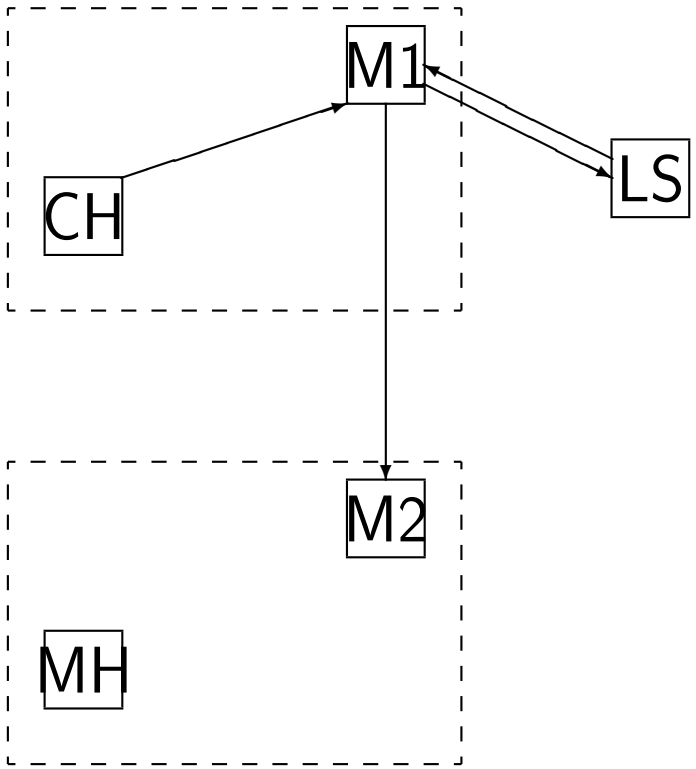
MSM-IP Handoff

- A Mobile Host registers itself when it enters a domain by sending a JOIN to the local multicast router
- When it moves, it sends a JOIN to the new local router
- The old router sends a PRUNE to its parent router after a time-out period
- Is this efficient?

MSM-IP Location Management

Locating the MH

1. Correspondent Host (CH) talks to its Multicast router (M1)
2. M1 finds the MH's router, M2, from the Location server (LS)
3. M1 communicates with M2



Protocol Support...?

- Unfortunately, TCP won't work as is – multicast end-points are disallowed
- Solution: Modify TCP
- ARP replies to the MH need to have a local address
- Solution: Use a local IP for ARP, ICMP, ...
- Several Multicast related problems

Performance

- Handoffs between cells, subnets, and interfaces
- Hot (pre-registered) switches or cold (post-registered) switches
- TCP (post-modification) worked, with a slight pause
- Insignificant packet loss...?
- Likely unrealistic simulation

Mobile IP vs. MSM-IP

- MSM-IP uses a location server – analagous to the home agent
- Security is questionable
- Requires a few hacks (including modification of TCP)
- Requires IP Multicast capability (preferably sparse)
- Limited Multicast address space

A Case for MSM-IP

Given scalable IP Multicast using IPv4, MSM-IP has potential:

- No triangle routing inefficiency
- Lower handoff latency (due to advance-registration)
- No additional infrastructure