


Computer Communications - CSCI 551

## How Is Wireless & Mobile Different From Traditional Networking?

Wireless

- cellular vs. ad hoc
- transmission media is air
- interference from other radios and obstacles
- much less reliable
- higher error rates
- mitigated by physical level work (coding)
- not everyone can hear each other
- slower speed than traditional (limited spectrum)
- security
- network may not trust users
- users may not trust network

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


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## Dimensions of Wireless/Mobile

- mobility
  - one-hop to base-station
  - vs. ad hoc/multi-hop
- wireless
  - fixed vs. mobile
- protocols
  - IP vs. cell phone (3G)
  - vs. protocols for sensor networks
- constraints
  - energy
  - radio range
  - antenna directionality
- trust
  - do you trust others to forward your data
  - to overhear your packets
  - app-level issues
  - even if you have connectivity, what can you do? Ex: it may be easier to share files with floppies
  - often e-mail must go through a central server

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# CS551


## Mobile IP

[Johnson96b]

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
# Wireless and Mobile

## Networking

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## How Is Wireless & Mobile Different From Traditional Networking? (Cont...)

Mobile

- location change ⇒ routing needs to change
- what base station are you talking to
- limited energy (battery)
- scaling may not be as important
- scaling in ad hoc network is open research
- security, again
- network may not trust users
- users may not trust network

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## Approach For This Class

- Lots of work in mobile/wireless
- Look at small sample
- link-layer: MACAW
- routing: Mobile IP and DSR
- transport-layer: SNOOP
- sensor network: Direct Diffusion
- applications (CSci555)

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## Key Ideas

- Mobile IP:
  - how do people find you if you move around?
  - specifically: how do you keep your IP address anywhere you go

### How do we deliver IP packets when endpoints move?

- Issues
- Impact on IP addressing
- Impact on routing
- Key design considerations
- Scale
- Incremental deployment
- Result: Mobile IP [\[RFC 2290\]](#)
- Internet standard for support for mobility in IP

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## Mobile IP

### How do we deliver IP packets when endpoints move?

- Issues
- Impact on IP addressing
- Impact on routing
- Key design considerations
- Scale
- Incremental deployment
- Result: Mobile IP [\[RFC 2290\]](#)
- Internet standard for support for mobility in IP

### The IETF Mobile IP Approach

- A location registry
- keeps track of where you are
- tunnels packets to you
- Pros:
  - good scalability (many users)
  - incremental deployment easy
- Cons:
  - triangle routing through home
  - must be careful about security
  - is it really necessary? (consider end-to-end argument)

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## Mobile IP Terminology

Foreign Agent (FA) Home Agent (HA) Home Network (HN) Mobile Host (MH) Corresponding Host (CH)

Routers periodically beacon ICMP router advertisements

Discovering Agents

Q: How do laptops usually figure things out? Why not use that? A: DHCP... because it didn't exist when Mobile IP started.

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## Possible Approaches

- Why not just announce a route to your host?
  - doesn't scale to millions of hosts
  - breaks hierarchical addressing!
- Why not re-address your host?
  - then people can't find out
  - but this is what 95% of people do today, because they only run clients, not servers
- Why not separate naming and addressing?
  - too many protocols use IP addresses instead of hostnames, especially for open connections

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## Discovering Agents

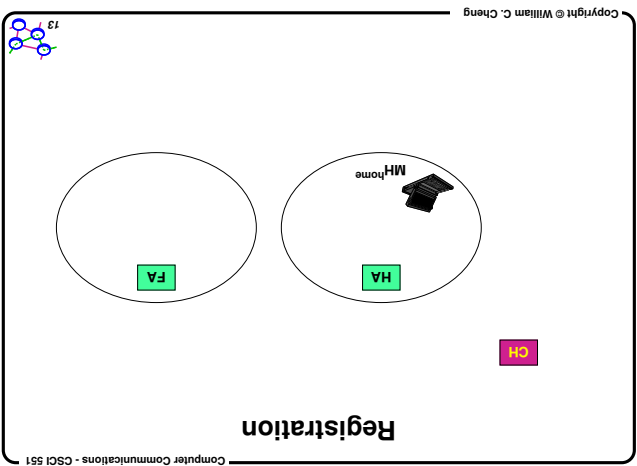
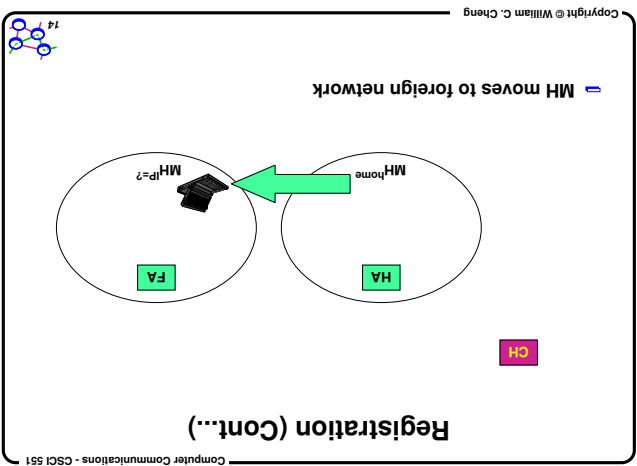
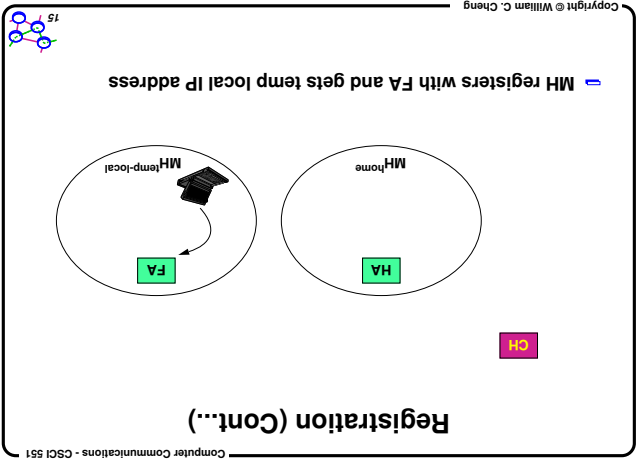
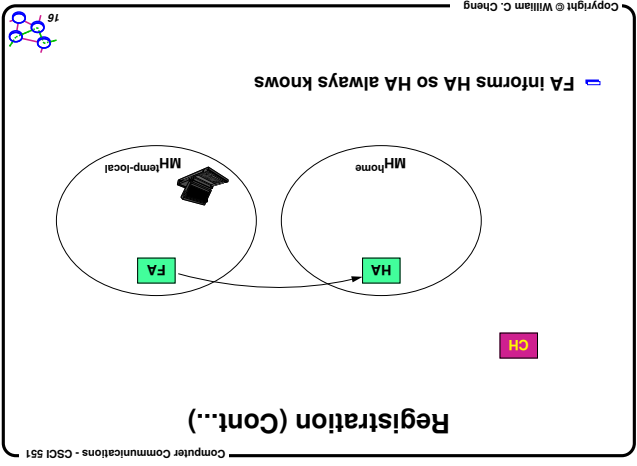
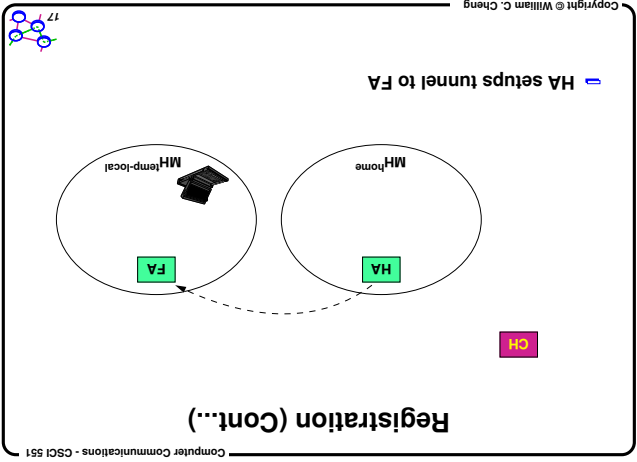
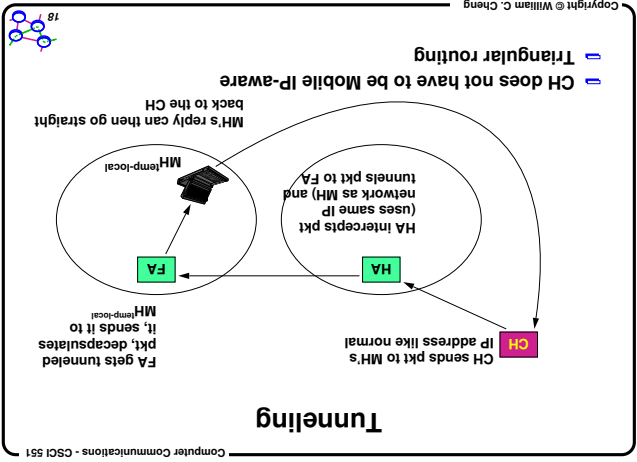
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Routers periodically beacon ICMP router advertisements

Discovering Agents

Q: How do laptops usually figure things out? Why not use that? A: DHCP... because it didn't exist when Mobile IP started.

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## Other Mobile IP Issues

- ↳ Route optimality
  - = resulting paths are not optimal, they all go through the HA
  - = can be improved with *route optimization*  
local-temp
  - smart senders keep cache of FA & MH
  - one more thing to keep updated
- ↳ Smooth handoffs
  - = don't want to drop pkts when changing FAs
- ↳ Security issues
  - = authentication
  - FA may make false claim that MH is in its network
  - don't want others to claim to be MH
  - = confidentiality
  - FA may be listening and recording
  - = FA may modify messages

