CSC2209
Computer Networks

Mobility

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Reminder

• No class next week!
  – Next class on October 31st (Tuesday)
Mobility

- Do we care?
Mobility

• Do we care?
  – In 10 years, a $500 PDA will have a 20x faster CPU and a 30x bigger hard disk than your desktop [Keshav’ 05]
  – 1.4 billion cell-phones vs. 600 million PCs (in 2003)

• Internet is changing
  – Old user: sitting in front of well-provisioned, always-on, bandwidth-rich desktop
  – New user: on the run, multiple, power-constrained, sparse connectivity devices
The Mobility Problem

• Internet initially designed to assume hosts are static
• What breaks on the Internet if hosts are mobile?
The Mobility Problem

- Internet initially designed to assume hosts are static
- What breaks on the Internet if hosts are mobile?
  - Routing
  - Many assumptions under hierarchical delegation of IPs
Mobile IP Approach

• Mobile host has two addresses:

• Home address:
  – Never changes, uniquely identifies the host
  – In “home network”
  – Corresponding host addresses all packets to home address

• Care-of address:
  – Changes, perhaps frequently
  – In “foreign network”
  – Related to current location (IP routing gets it to the right place)
Mobile IP Issues

- Lots of pieces under the cover
  - Discovering agents
  - Registering addresses with agents
  - Authentication
  - Tunneling
  - Performance

- Key problems
  - Requires ubiquitous changes to network layer implementations
  - Unclear which apps need network layer transparency
Revisiting Motivation

• Simple solution to mobility
  – Boot up to new network
  – Use DHCP server to get new IP address

• Pros:
  – Simple, not much to deploy

• Cons:
Revisiting Motivation

• Simple solution to mobility
  – Boot up to new network
  – Use DHCP server to get new IP address

• Pros:
  – Simple, not much to deploy

• Cons:
  – IP address keeps changing
  – How will others find out about new address
  – Solution: use DNS names as identifiers
E2E Host Mobility

• Three components:
  – Addressing
  – Locating mobile hosts
  – Connection migration
Addressing

• Mobile hosts obtain a local IP address
  – No home agent, foreign agent
  – No tunneling
  – Communication occurs directly

• Problem: how does correspondent learns about mobile’s address
  – Solution: if mobile host initiate connection SYN packet can tell the correspondent the correct IP address
  – How about incoming connections?
Locating Mobiles

• Observation: whenever connections are established, DNS lookup is performed

• Idea: use DNS
  – When mobile obtains new IP address, forces a DNS update
  – Force lookups setting TTL=0
  – Opportunity for a race condition
    • Application-level retries
Revisiting Motivation

• What are driving apps for mobility?
Revisiting Motivation

• What are driving apps for mobility?
  – Mobile host is a client for most apps (not a problem)
  – VoIP seems an important app where mobile host might be receiving first
    • However, VoIP has a call setup that does not need to be very fast
      – Could use slow, robust mechanism (home-agent?) for VoIP
• Seems like the only problem is: connection migration
Connection Migration

• When changing IP, mobile host initiates new connection to correspondent, forces correspondent to migrate
• Uses token to show that connections are related

• Issues:
Connection Migration

• When changing IP, mobile host initiates new connection to correspondent, forces correspondent to migrate

• Uses token to show that connections are related

• Issues:
  – What if both hosts move?
  – What if becomes disconnected for 30 seconds? 15 minutes?
  – Lots of details that need to get right
Taking a step-back

• Although not simple, solutions for supporting mobility exist
• Why hasn’t this take off?
Taking a step-back

• Although not simple, solutions for supporting mobility exist
• Why hasn’t this take off?
  – Two kinds of Wi-Fi “providers”
    • Home, independent users
      – Most networks closed!
    • Hotspot providers
      – Sparse connectivity
      – Billing issues are very important
• Can we build this on campus?