

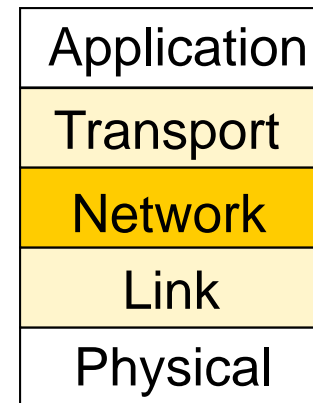
CSEP 561 – Mobility

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Mobility

- Focus:
 - Routing when some of the nodes are mobile
- Issues caused by mobility
- Mobile IP



Mobility scenarios

- Kind
 - Most routers/hosts stationary, a few are mobile (Internet)
 - Routers fixed, all hosts are mobile (cellular)
 - Routers and hosts are all mobile (ad hoc)
 - Entire network is mobile (plane)
- Approach
 - Transport; IP can change as node moves
 - Network; IP stays the same
 - Link; for mobility within a subnet
- Which of these can Internet routing handle?

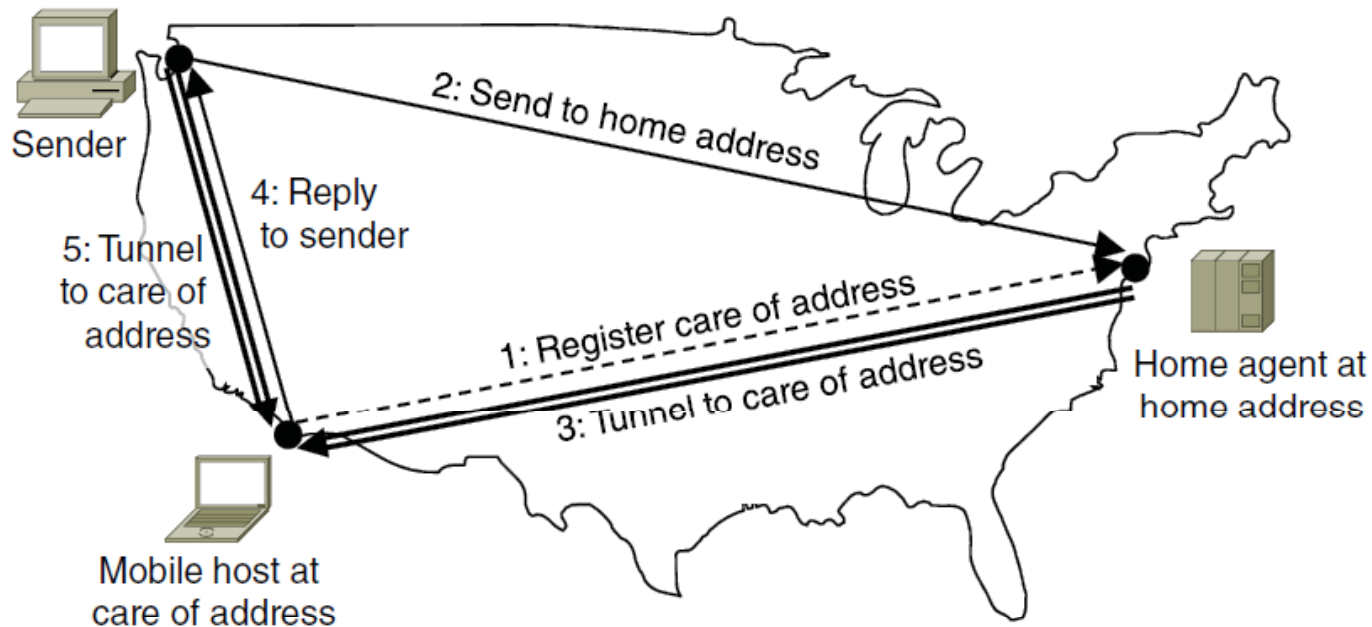
Mobility issues

- Routing scalability
 - Who knows where the mobile is now?
 - How much work does everyone need to do?
- Route quality
 - How often do we find mobiles?
 - How circuitous are routes?

Basic solution for mobile host scenario

- Hide mobility from most of the network
 - Address reflects location (e.g., phone number)
 - Send packet to home location; it will know where the mobile is
 - Mobile at foreign location must register with home
- Pros: scales well, works for mobile-to-mobile
- Cons: triangle (circuitous) routes to optimize

Mobile IP



- Mobile IPv6 supersedes mobile IPv4; it needs no “foreign agent” and optimizes triangles by default

Mobility in cellular networks

- Details differ, but analogous design
- Home agent → Home Location Register (HLR)
- Foreign agent → Visitor Location Register (VLR)

- Also: mobile IP starting to be used for mobility across cellular and other networks (as well as inside some cellular networks, CDMA2000?)

Mobile IP – question on scalability

- The design is very scalable:
 - Router table size is not increased at all
 - Bandwidth for control packets (registrations) looks small
 - Bandwidth for mobile data < 2X non-mobile data
 - IP addresses < 2X non-mobile IP addresses
 - All of these costs are spread out and borne by the mobiles and the home/foreign sites that they use
- But arguably the result is only good while a small fraction of the hosts are mobile.

Mobile IP – question on route optimization

- Route optimization removes circuitous paths and would seem to be highly desirable for performance. But:
 - Performance will often be acceptable without it
 - It introduces many complexities (security, sender upgrades)
- This is why the IPv4 scheme does not mandate it
 - IPv6 has more built in support for it

Mobile IP – question on compatibility

- One key point of compatibility:
 - All existing hosts can talk to mobile hosts
 - Cost is potentially degraded performance
- Another key point:
 - Routers do not need to be upgraded
 - Again, cost is performance (e.g., tunneling)
- Also uses various existing mechanisms
 - Encapsulation for tunneling, discovery of foreign networks
 - But using any non-widespread mechanism causes issues
 - e.g., route optimization causes address security checks to fail
- Also
 - Mobile IPv4 requires a foreign agent; Mobile IPv6 does not