

Mobile Network Layer

- The most important service at the network layer is routing
- IP (internet protocol) is a network layer protocol
- The most widely known feature of IP is the IP address: a unique number assigned to every computer attached to the internet
- E.g., red.cse.yorku.ca = 130.63.96.21
- In multi-hop routing, routers maintain routing tables to ensure that data is passed along the correct route

(Fig. 1)

- Problems with mobile routing:
 - o An IP address is assigned on the assumption that the host will remain connected to the same subnet for the entire communication session
 - o This allows routing to occur hierarchically, by subnet
 - o E.g., 130.63.96.21 is in the 130.63.96 subnet, and routing is handled accordingly (i.e., in a simplistic sense, there is a router assigned to handle all 130.63.96.* traffic)
 - o However, this may not be true in mobile networks

(Fig. 2)

- abandoning the subnet structure of the internet is not practical – every device connected to the internet would need a routing table for every other device, AND that table would need to be constantly updated

- mobile devices require a “topologically correct address” to ensure packets are sent to the right place

(Fig. 3)

- protocols like Dynamic Host Configuration Protocol (DHCP) do this already
- problem: what if the IP address changes in the middle of a session? Using DHCP, the connection is basically reset and remaining packets are dropped – not good if you’re downloading a large file or receiving a stream
- So we really need two addresses:
 - Care-of address (COA): This is the topologically correct address, representing the location of the mobile node from an IP perspective
 - Home network address (HNA): A permanent IP address from the perspective of the outside world, so that IP addresses don’t change in the middle of a session
- Two agents are needed, one for each address:
 - The foreign agent (FA), located in the foreign network, corresponds to the mobile node’s current location. For our purposes, the COA will be the IP address of the FA.
 - The home agent (HA), located in the home network, keeps track of the HNA. It also maintains a location registry: for each HNA, it keeps track of the current COA.
 - As the mobile node moves through different foreign networks, the foreign agent communicates the new COA to the HA. The HA then updates its location registry.

- Example. Internet-enabled smart phone. HA=cell provider's server; FA=server located on cell tower.

IP packet delivery

(Fig. 4)

- Suppose we set up a session with some "corresponding node" (CN) on the internet (e.g., YouTube)
- The process:
 - Packet starts out at CN, destined for HNA; home agent is on the path from CN to HNA.
 - Home agent sees the packet destined for HNA. Home agent looks up the HNA's entry in the location registry to find the COA.
 - Home agent repackages the packet as the data in a new IP packet, with the COA as the destination.
 - Packet arrives at the foreign agent (COA). Foreign agent examines the original header of the packet to determine the true destination in the foreign network.