Wireless IP and TCP layer

- Internet allocates a fixed address to each and every mobile user
- messages sent to a mobile user are first delivered to its permanent address located in the mobile's home network
- mobile moves to a foreign network without changing its IP address, unable to receive information at the new site
- Main issues
  - the delivery of messages from the internet to the mobile at its current location
  - traffic control to protect network integrity and to satisfy end-to-end QoS
- Mobile IP as an interface between the mobile's home network and the foreign network; keeps track of the mobile's whereabouts and delivers message to the mobile

Terminology

- Mobile node or Mobile station or Mobile host - having home address that is long-term IP address and when away from home network , care-of address is assigned
- Correspondent node - peer host with which a mobile host communicates
- Home address - unchanged regardless of where the node resides
- Care-of address - termination point of tunneling datagrams destined to a mobile node
- Collocated care-of address - externally obtained local IP address temporarily assigned to an interface of the mobile node
- Home agent - router with an interface on the mobile node's home network link, MS keeps informing about its current location, it intercept packets destined to the mobile node's home address and tunnel them to the mobile node's current location
- Foreign agent - router with an interface on a mobile node's visiting network, assists mobile node in informing its home agent of its current care-of address

- Foreign care-of address - IP address of a foreign agent
- Home network, Foreign network, Virtual network
- Link-layer address - MAC address
- Mobile node's home link - link which has been assigned the same network-prefix as the network prefix of the mobile node's home address
- Mobile node's foreign link - link that the mobile node is visiting having same network prefix as the network prefix of the mobile node's care-of address
- Agent advertisement - foreign agents advertise their presence by using a special message
- Agent solicitation - message sent by a mobile node to request agent advertisement
- Tunnel - path followed by a datagram while it is encapsulated
- Binding entry - entry in the home agent's routing table; Mobile IP maps the mobile node's home address into its current care-of address

- Mobile IP deliver message in a seamless manner using two addresses: fixed address and care-of address
- Mobile IP uses agent - HA and FA
- HA and FA make themselves known by sending agent advertisement
- after receiving an agent advertisement the mobile determines whether it is in home network or in a foreign network
- when mobile moves away it obtains care-of address by soliciting or listening for agent advertisement
- mobile node registers each new care-of address with its home agent
- Datagrams sent to mobile node's home address are intercepted by its home agent and tunneled by its home agent to the care-of address
- in reverse direction, datagrams are delivered using standard IP routing mechanisms
- Three major processes: agent discovery, registration and tunneling

- Agent discovery: determine new attachment point or IP address as mobile moves
  - determine whether it is connected to its home link or foreign link
  - detect whether it has changed its point of attachment
  - obtain care-of address (DHCP)
  - carried by ICMP payload portion
- if mobile does not receiver any agent advertisement, the mobile node can send an agent solicitation to request an agent advertisement from the agent to which it is attached
- Registration: request and reply, multiple simultaneous care-of addresses, carried by UDP
- Tunneling (routing): encapsulates the message from IP host for delivery to mobile via its foreign agent and it involves shielding the mobile's home address
- Deregistration

Routing approaches

- triangle routing
  - datagram from CH for the mobile is sent to the mobile's home address using standard IP routing
  - at home network, the datagram is intercepted by the home agent and tunnels the datagram to the mobile's care-of address
  - at foreign agent, the datagram is detunneled and delivered to the mobile
  - datagrams sent by the mobile, standard IP routing is used to deliver each datagram to its destination, foreign agent is the mobile's default router
  - simple, limited control message and binding highly consistent
  - drawback - the destination home agent is a fixed redirection point for exchanging every IP packet, even if a shorter route is available between source and destination; causes end-to-end packet delay
  - network link overloaded even if adjacent network links are idle

- Optimized routing
  - mobile host informs the correspondent host of its care-of address and has the packets tunneled directly to the mobile host bypassing the home agent
  - allows every traffic source to cache and use binding copies
  - local bindings enable most packets to be delivered by direct routing, increases QoS
  - quite complex and overhead incurred by message exchanges and processing (cache queries)
  - cached binding are possibly inconsistent because they are kept in a distributed fashion
  - security issue - hostile environment: intruder can do bogus registration