Mobile Networking Through Mobile IP

Charles E. Perkins

Slides by Chris Fleizach

Mobile computing circa 1998

- Mobile networking –the ability to maintain network connectivity despite changes in the point of attachment to the Internet
- Unfortunately, IP addresses are not mobile, meaning transparent mobility is hard
- Mobile IP RFC – allow a mobile node to have two IP addresses – a home and a care-of address

How Mobile IP works

- Routers forward packets based on a common assumption of where IP addresses are located
- To keep network connectivity, mobile nodes need to keep the same IP address as it moves
- Home address – a static IP that Internet packets are routed to
- Care-of address – changes when the node moves
- Home-agent - responsible for forwarding packets from the home-address to the care-of address

How Mobile IP works

- When the home-agent receives a packet, it does some modifications, like… before sending it out to the care-of
- Then when the care-of address sends data out, it changes some more information in packets, like …

But what about the protocol stack?

- A goal of mobile IP was to handle mobility at layer…
- Mobile IP also relies of layer 4 applications to help establish a beachhead in a new network. Applications, like…
- The author suggests that applications should be context aware so as to present an appropriate amount of data depending on the connection

What Mobile IP really does

- Discover the care-of address
- Register the care-of address
- Tunnel to the care-of address

Discovering Care-of Addresses

- Mobile IP discovery processes uses an existing protocol (…) to piggyback needed care-of addresses.
- These are then called “agent advertisements” and are sent periodically unless specifically requested by the node
- When a node can no longer hear these requests, it’s time to move on

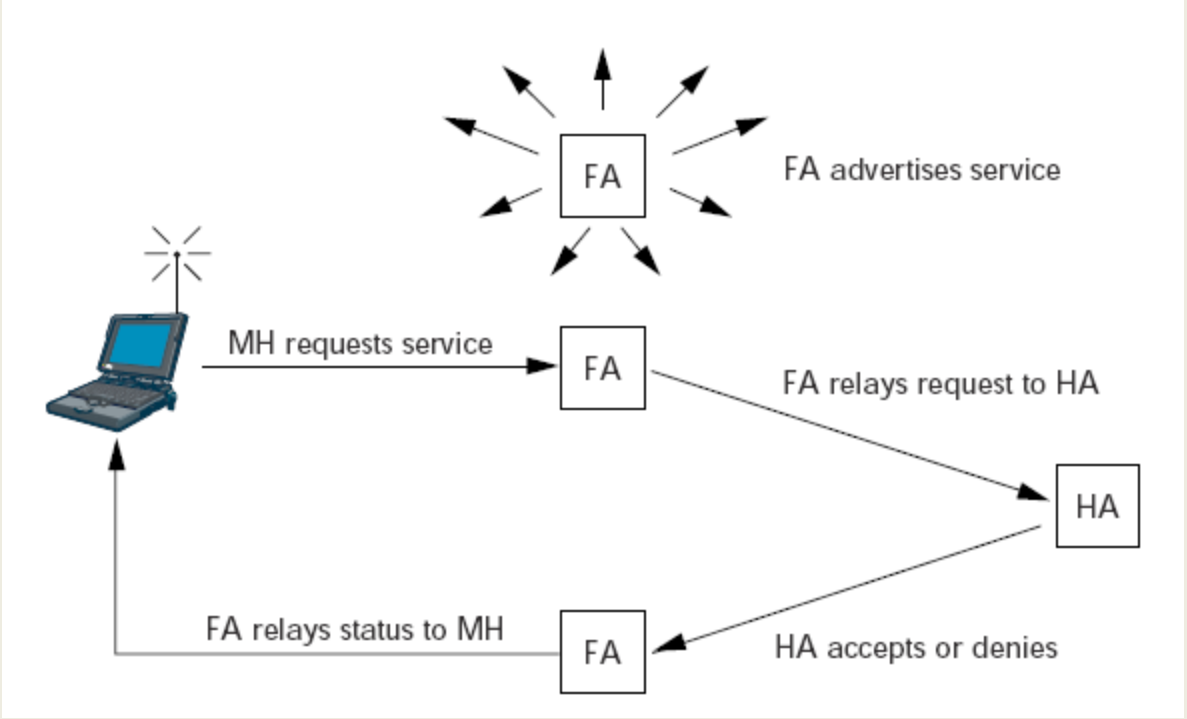
Agent advertisements

- Agent advertisements perform the following:
  - Allows nodes to detect home and foreign agents
  - Lists available care-of addresses
  - Informs the mobile node about connectivity, other service info and the status of the agent and network (whether it's home or foreign)

Registering Care-Of

- With a care-of IP address, now the node needs to tell it's home agent.
- This process happens by…

Registering Care-Of Addresses



Registering Care-Of

- When the mobile node registers, the home agent stores state.
- The state is a three-tuple comprised of … , … , … to form a “binding”
- Because a binding update changes a routing table, we need authentication, otherwise …

Security

- The home agent and the mobile node need to share a “security association” (a what?)
- Then MD5 hash the registration request.
- Make sure to add some unique data to each request otherwise…
- Mobile IP can use two types of unique data …
- But timestamps have problems because …

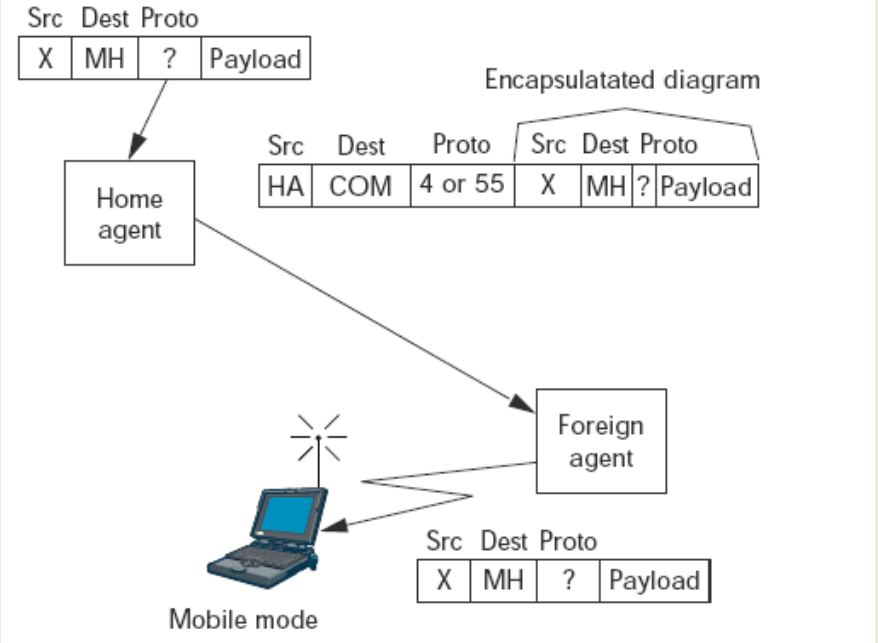
Malicious foreign agents?

- Foreign agents are supposed to de-encapsulate encapsulated IP-in-IP packets
- What if a foreign agent was malicious…

Tunneling to the Care-Of Address

- IP-in-IP – the home agent adds a IP header around the IP packet. The care-of address is the destination address in the new IP packet

- The new packet can have a proto type of 4 or 55…



Mobile IP and IPv6

- Basically the same, but mobile nodes can configure themselves using autoconf and neighbor discovery protocols in IPv6. The consequence is that foreign agents…
- IPv6 is supposed to have authentication built in, so Mobile IPv6 doesn't need any
- IPv6 packets aren't tunneled because they use IPv6 source routing headers
- Source routing wasn't done in IPv4 for 2 reasons…

Open Questions

- Triangle Routing effect…
- Firewalls are no friend of mobile IP…
- Ingress filtering…
- Mobile IP makes the claim that we all need transparent TCP hand-off. Do we really…
- Can DNS be used to encode mobile node IP addresses…

Conclusion

- "Of course, everything depends heavily on the willingness of platform and router vendors to implement Mobile IP, but indications are strong that most major vendors already have implementations either finished or underway."