Mobile IP & Managing Mobility in Cellular Networks

Wireless and mobile networks

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What is mobile IP?

- Mobile IP supports seamless mobility across different networks while maintaining a constant IP address
- Defined Primarily in RFC 5944 for IPv4
- Handles mobility at network layer
- Key Features:
  - Supports both with or without a *foreign agent*
  - Allows *agent and mobile node* discovery
  - Uses *care-of addresses* (COA) and multiple forms of encapsulation

Key components of mobile IP?

Home Agent	Foreign Agent	Care-of Addresses	Encapsulation & Decapsulation
Manages the permanent IP of the mobile node.	Assists the mobile node in foreign network.	Temporary IP address of the mobile node in a new network	Tunneling of datagrams to keep the mobile node connected

Mobile IP Process Flow

Agent Discovery

Mobile node learns about foreign or home agents in a new network.

Registration with Home Agent

Mobile node registers its COA with the home agent via the foreign agent.

Indirect Routing

Datagrams sent to the mobile node are forwarded by the home agent to the COA.

Agent Discovery

- Agent Advertisement: Home/Foreign agents broadcast ICMP messages (type 9).
- Agent Solicitation: Mobile nodes can request advertisements via ICMP message (type 10).
- Important Fields in ICMP message:

Home Agent Bit (H Bit)	Foreign Agent Bit (F Bit)	Registration Required (R Bit)	COA List
Tells the mobile node that it is in its home network	Indicates a foreign network	Indicates that mobile user in this network must register with a foreign agent.	Offers list of potential addresses for the mobile node to use

Registration with Home Agent

Registration request

The Mobile Node (MN) sends a registration message to the Foreign Agent (FA) including the COA, MA, HA, requested lifetime, and registration ID.

Forwarding registration

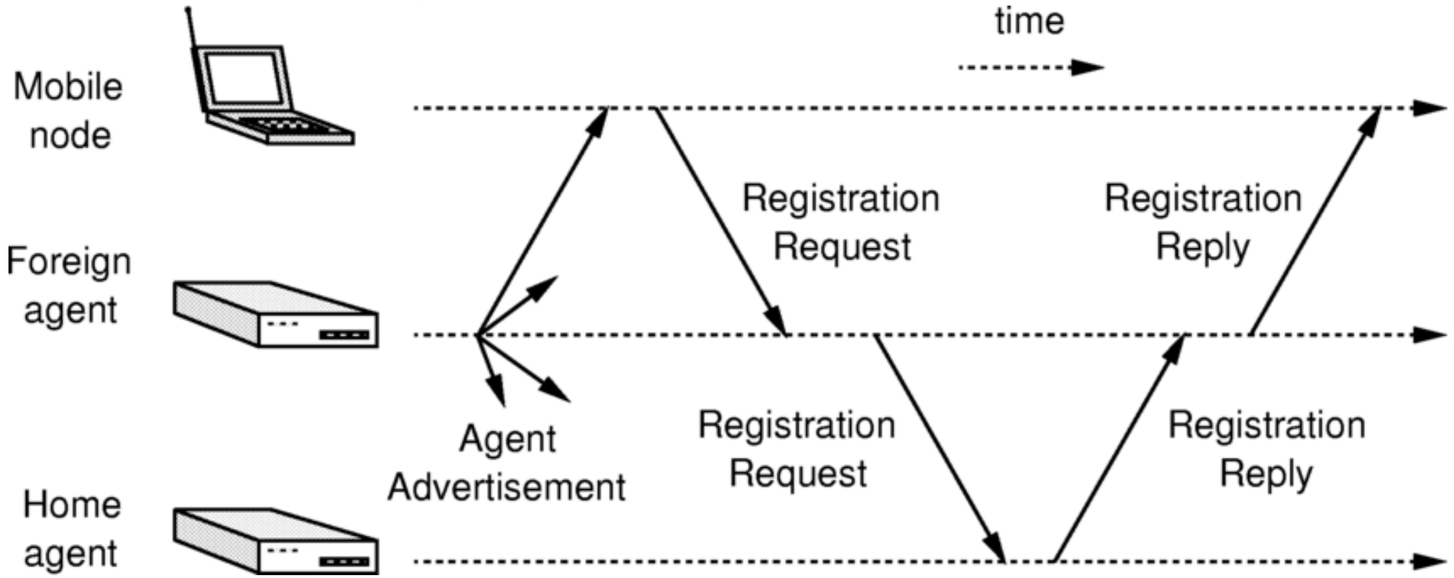
The Foreign Agent (FA) forwards the registration message to the Home Agent (HA), carrying the COA, MA, and registration details.

Home agent processing

The Home Agent (HA) verifies the registration, binds the MN's permanent IP address with the COA, and prepares to tunnel datagrams.

Registration reply

The Home Agent (HA) sends a registration reply to the Foreign Agent (FA), which is then forwarded to the Mobile Node (MN).



GSM Mobility and network overview

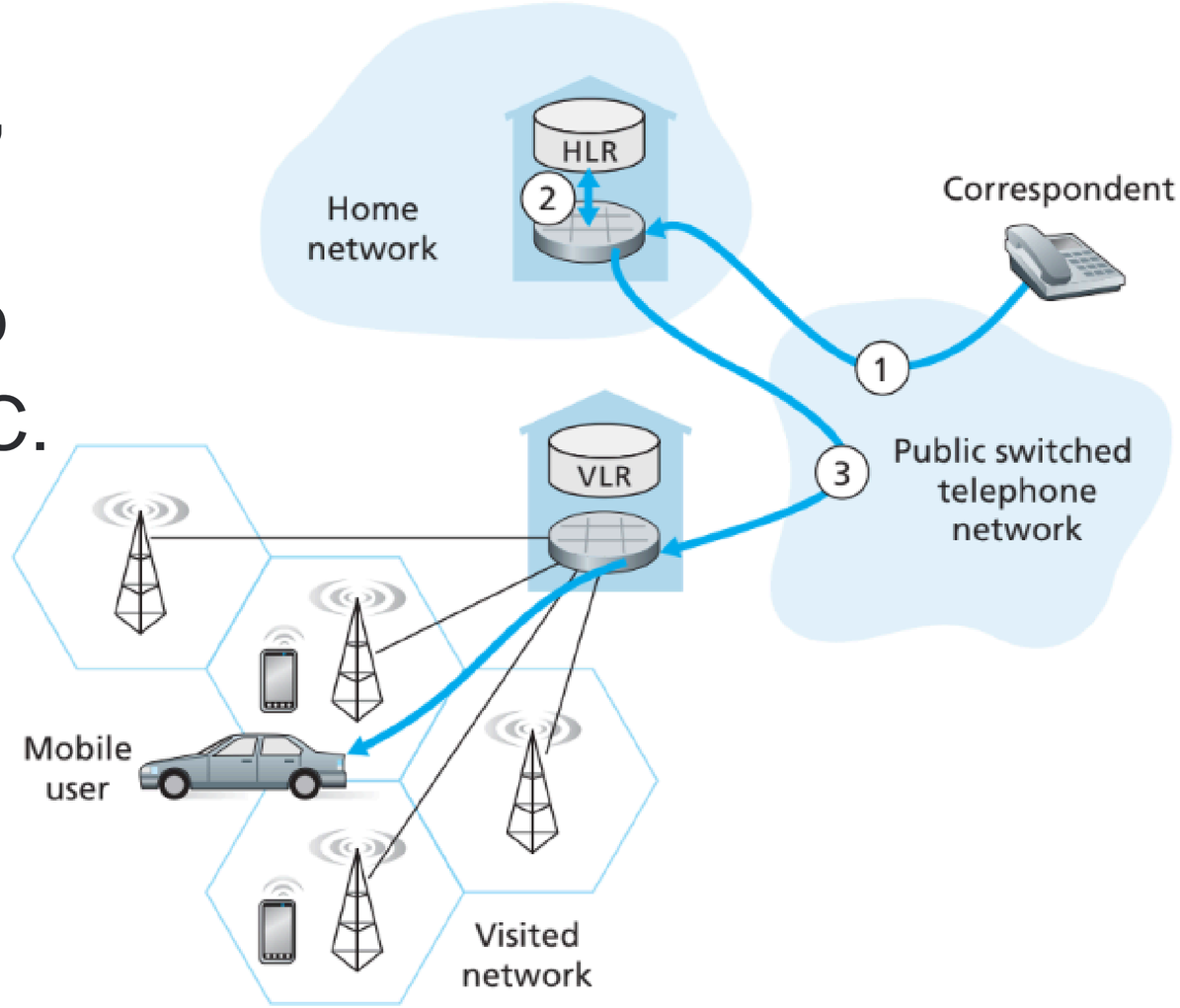
- GSM uses indirect routing to manage mobility.
- Key concepts: Home Network (HLR), Visited Network (VLR).
- Calls are routed through the home network before being forwarded to the visited network.

Home and visited networks in GSM

- Home Network: Home Location Register (HLR) stores permanent user info.
- Visited Network: Visitor Location Register (VLR) temporarily stores user info.
- HLR retrieves the Mobile Station Roaming Number (MSRN) for call routing.

Routing calls to a mobile user

- Calls first go to the home MSC, which queries the HLR.
- The roaming number is used to route the call to the visited MSC.
- Two-step call routing: Home MSC to Visited MSC.



Mobile registration & location updates

- Mobile registers with the VLR when entering a new network.
- VLR updates the HLR with the roaming number or its own address.
- Subscriber info is exchanged between the HLR and VLR.

Handoffs in GSM

- Handoffs occur when a user moves from one base station (BS) to another.
- If the handoff is between two BSs in the same MSC, the process is simple.
- When moving to a new MSC, the call is rerouted through the new MSC.
- Anchor MSC concept: The call is always routed through the initial MSC where the call started.

Conclusion and Comparison with Mobile IP

comparison

- GSM and Mobile IP both use indirect routing for mobility management.
- Key differences: GSM uses voice-oriented infrastructure; Mobile IP is data-oriented.
- Both have Home and Visited Networks but use different technologies.

Thank you!