

MOBILE IP NETWORK LAYER

Lesson 05

Agent Discovery, advertisement, Solicitation and Registration

HANDOVER MANAGEMENT PROTOCOLS

- Mobile node (MN)
- Visits foreign networks quite often
- Handover management— managing the transfer of service-availability to the new location in foreign network

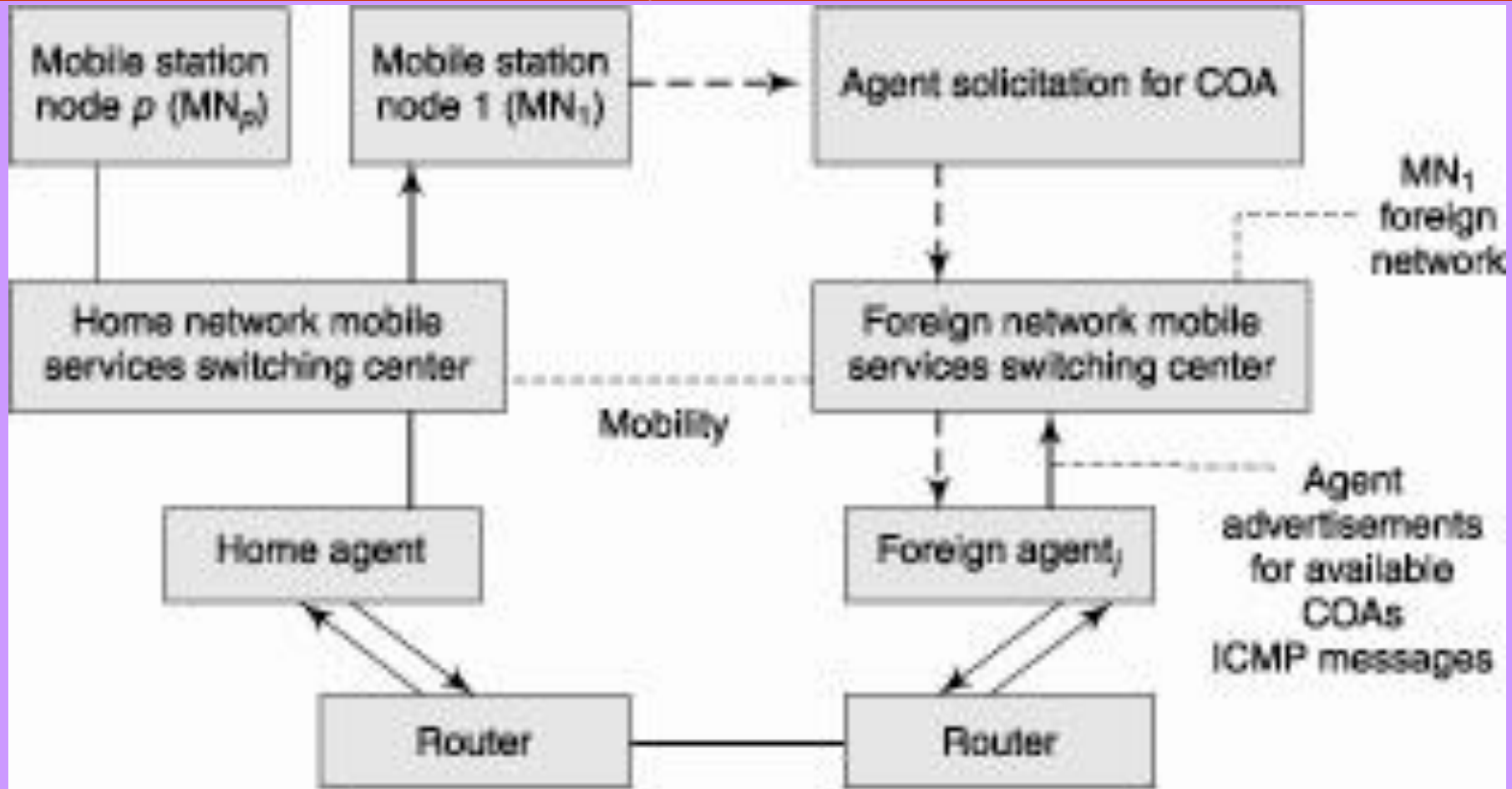
USE OF APPROPRIATE LOCATION MANAGEMENT PROTOCOLS

- The network for management of the MNs location
- Home Agent (HA) for data transfer between Router and MN
- Preparing for the services (packet receiving and packet transmitting) at the new network

USE OF APPROPRIATE LOCATION MANAGEMENT PROTOCOLS

- Agent discovery through agent advertisement
- Agent solicitation
- Foreign Agent (FA) for data transfer between Router and MN at the foreign network

FA DISCOVERY BY MN BY RECEIVING COA DURING ADVERTISEMENT IF NOT THEN BY SOLICITATION



AGENT DISCOVERY

- MN must discover (find) a foreign agent (FA) when visiting a foreign network
- Agent discovery by a mobile node MN_i — receiving the COA (care-of-address)

AGENT DISCOVERY

- COA enables FA to get messages for MN_i
- Home agent (HA) of MN_i transfers the messages from sender
- Uses COA

STEPS 1 AND 2 IN THE PROTOCOL FOR DISCOVERING AN AGENT

1. Listen to an advertisement (ICMP message) from an agent
2. Proceed to step 3 if an advertisement found, else solicit the agent from the routers
 - If agent found then proceed to step 3, else repeat the step

STEPS 3 AND 4 IN THE PROTOCOL FOR DISCOVERING AN AGENT

3. If the COA discovered from the message is found to be the same as the previous COA, go back to step 1, else proceed to step 4
4. If the discovered COA is the same as the home network, deregister at this network and go back to step 1, else if the current COA is a new COA then register with the new COA

AGENT ADVERTISEMENTS

- Agent advertisements— essentially ICMP messages
- Sent to number of addresses

ICMP MESSAGE

- options and words added mobility extension fields in ICMP header

HEADER EXTENSION

- One 32-bit word format — First byte = 00010000
- Second byte for length

HEADER EXTENSION

- Length = 2 words + number of COAs specified in the extension to which the ICMP message is to be sent + two bytes for the 16-bit sequence number (for the ICMP message advertised)

HEADER EXTENSION NEXT WORD FORMAT

- Two-byte lifetime in second plus 8 bits for flags
- Remaining byte is not used — reserved for any future requirements of modifications or specification expansion in ICMP
- Lifetime— During which the MN can register with the new COA (step 4 in

HEADER EXTENSION NEXT SET OF WORDS

- For the COA addresses for the MN at that agent

CO-LOCATED COA

- COA when the MN acquires temporarily an additional IP address while on visit to a new network
- Else the COA is the same IP address for that MN while on visit and when at home

FA

- Obtains the co-located COA using the dynamic host configuration protocol (DHCP)

HEADER FLAGS FOR ACTIONS

- flag1— whether the COA is a co-located COA
- flag2— whether the advertising agent is the HA
- flag3— whether the advertising agent is an FA

FLAGS

- flag4— specifies whether there is reverse tunnelling support by the FA for encapsulation and sending packets by tunnelling to the HA
- flag5— specifies whether the encapsulation method is generic

FLAGS

- flag6— specifies whether the encapsulation method is a minimal mandatory method
- flag7—specifies if the agent is busy and cannot register the visiting MN

AGENT SOLICITATION

- A method by which an MN visiting a network discovers the FA and the COA in case COA not found from advertisements

AGENT SOLICITATION

- If an advertisement is not listened to, solicitation can be done three times at 1 s intervals
- Later this interval can be increased

REGISTRATION AFTER AN MN DISCOVERING FA

- Needed for the service of receiving and transmitting of IP packets with the new agent FA
- For creating a tunnel between HA_i and FA_j

FUNCTION OF HA AFTER REGISTRATION

- To encapsulate the IP packets and transmit them to the discovered FA (through tunnelling), whenever a CN (corresponding node) communicates with the MN

DEREGISTRATION

- From receiving and transmitting of IP packets
- Also needed with the HA (step 4 of agent discovery in the protocol)

REGISTRATION STEPS

- Requests and replies are made by the MN, FA, and HA using a UDP datagram
- Let us assume that the MN has IP address of the HA

REGISTRATION STEPS

- If not, then the MN broadcasts the registration request to a paging area
- The HAs then send the registration replies
- The MN requests one of the HAs (out of those which reply) for registration

STEP 1 FOR REGISTRATION AT AN AGENT

1. The MN sends a registration request to FA
 - FA sends that request to the HA
 - When the COA is a co-located COA, then the request sent directly to the HA

STEP 2 FOR REGISTRATION AT AN AGENT

2. The HA binds itself for mobility (binds itself for encapsulating and tunnelling the packets to the MN through a new FA)
 - The binding period equals the lifetime of the COA

STEP 3 FOR REGISTRATION AT AN AGENT

3. The MN registers again before the binding period expires
 - when it moves to another foreign network
 - when it returns back to the home network

STEP 4 FOR REGISTRATION AT AN AGENT

4. The HA sends a registration reply to the FA and the FA to the MN
 - The MN checks whether the reply shows successful registration

REGISTRATION

- Success— mobility binding now exists from the HA to FA

REGISTRATION

- Failure — when there are too many tunnels created at the HA and the HA does not have the resources to handle new requests or there is an authentication failure or the HA not reachable to the FA

WORDS AFTER UDP HEADER IN THE REGISTRATION REQUEST

- One 32-bit word with first byte = 00000001, 8 bits for flags, and two bytes for the lifetime (in seconds)
- Next 32-bit word for the home IP address of the MN

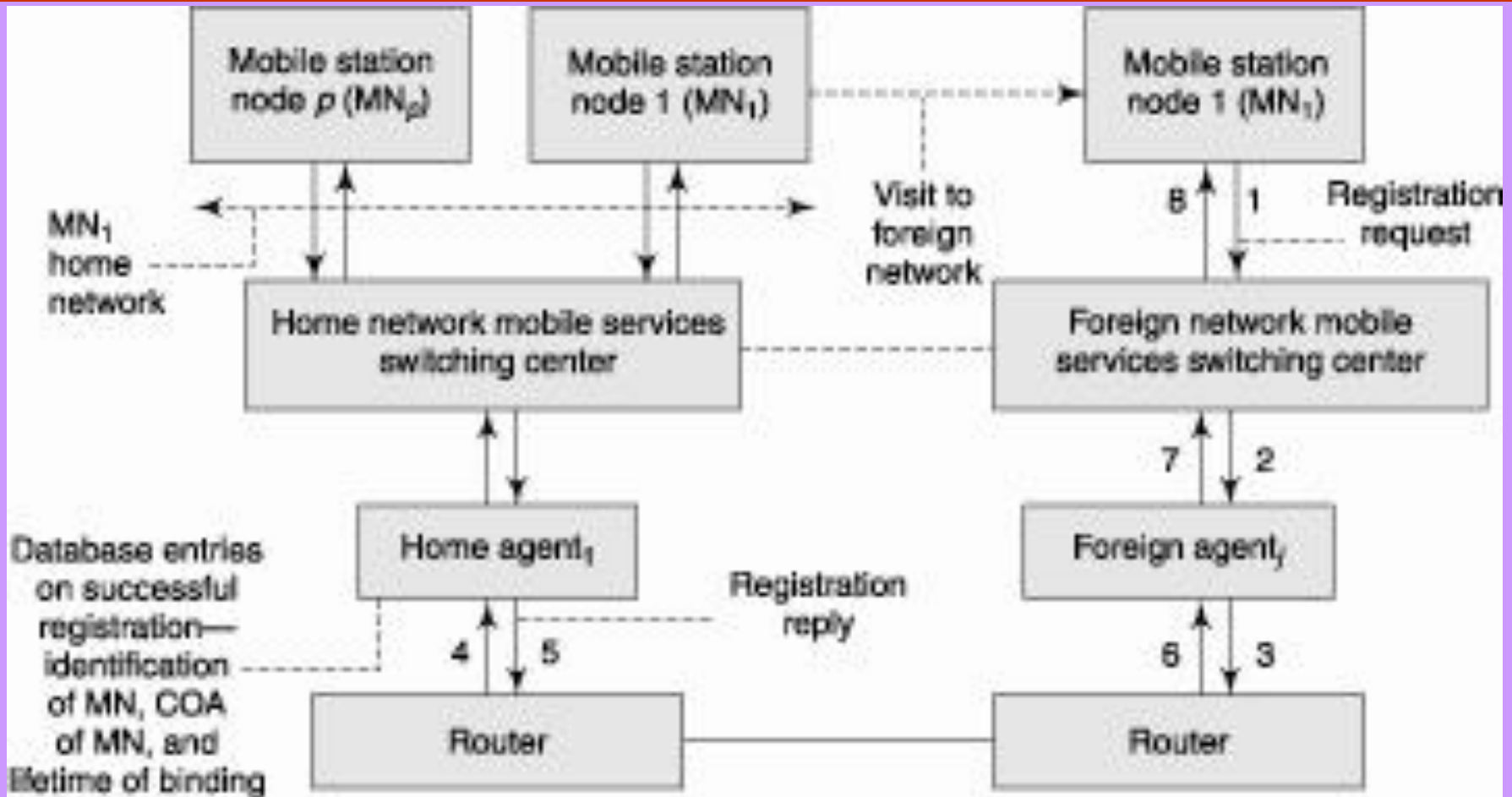
WORDS AFTER UDP HEADER IN THE REGISTRATION REQUEST

- Next 32-bit word for the home agent IP address of the MN
- Next 32-bit word for the COA of the MN at the new agent

WORDS AFTER UDP HEADER IN THE REGISTRATION REQUEST

- Next 32-bit word for the identification of the MN
- Next— A set of words for extensions

MN_k AFTER DISCOVERY OF FA_j, SEEKING REGISTRATION FOR CREATING TUNNEL



Tunnel between HA₁ and FA_j

8 FLAG BITS

- flag1— specifies whether the COA is a co-located COA
- flag2— whether the advertising agent is the HA

8 FLAG BITS

- flag3— whether the advertising agent is the FA
- flag4—specifies whether the MN requests previous mobility binding to be retained. This permits both—the new and previous mobility bindings

8 FLAG BITS

- flag5— specifies whether the encapsulation method is generic.
- flag6— specifies whether the encapsulation method is a minimal mandatory method

8 FLAG BITS

- flag7— specifies whether the MN wishes to receive broadcast (multicast) messages, which the HA receives for tunnelling to the new FA. If not, then the broadcast messages are filtered at the HA

8 FLAG BITS

- flag8— specify if there is reverse tunnelling support from the FA

WORDS AFTER UDP HEADER IN THE REGISTRATION REPLY

- 32-bit word with first byte = 00000011, 8 bits for a code specifying the result of registration, and two bytes for the lifetime (in seconds)
- Next 32-bit word for the home IP address of the MN

WORDS AFTER UDP HEADER IN THE REGISTRATION REPLY

- Next 32-bit word for the home agent IP address of the MN
- Next 32-bit word for identification of the MN
- Next a set of words for extensions

NEW DATABASE ENTRY FIELDS AFTER REGISTRATION AT THE HA

1. ID for identification of MN
 2. COA of the MN
 3. Lifetime of binding to tunnel the packets to the MN's COA
- When the binding life expires the tunnel is not forwarding from the HA to the FA using the COA

DATABASE ENTRIES IN THE FIELDS AT THE FA AFTER REGISTRATION AT THE HA

- (a) MN identification field
- (b) home IP address of the MN
- (c) IP address of the HA
- (d) MN link layer address for sending and receiving packets and messages to and from the MN

DATABASE ENTRIES IN THE FIELDS AT THE FA AFTER REGISTRATION AT THE HA

- (e) UDP source port of the registration request
- (f) received identification of the MN
- (g) COA of the MN and lifetime of binding to tunnel the packets to the MN's COA
- (h) remaining lifetime

SUMMARY

- Handover management
- Location management by agent discovery using agent advertisements and then solicitation if COA not found
- Registration of MN at HA after finding COA and FA

... SUMMARY

- ICMP messages for mobility binding
- Registration request words
- Registration reply words
- Database entries at HA and FA

End of Lesson 05

Agent Discovery, advertisement, Solicitation and Registration