CMPE 150: Introduction to Computer Networks

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Homework Assignments

Homework assignment #3

Chapter Four

Due Thursday..!!

Homework Assignments

Homework assignment #4

Chapter three

Due May 29 – NEXT WEEK!!

(Optional) Class Project

- Network programming project
  - In lieu of taking final examination
  - Or, just a wildcard – for mid-term or final
- Goal:
  - Build an FTP client/server from scratch
  - Using 'C' language
- Details on web page.. now…

Due by June 4th…

CMPE 150: Introduction to Computer Networks Set 14:

Mobility in The Internet

Mobility Management

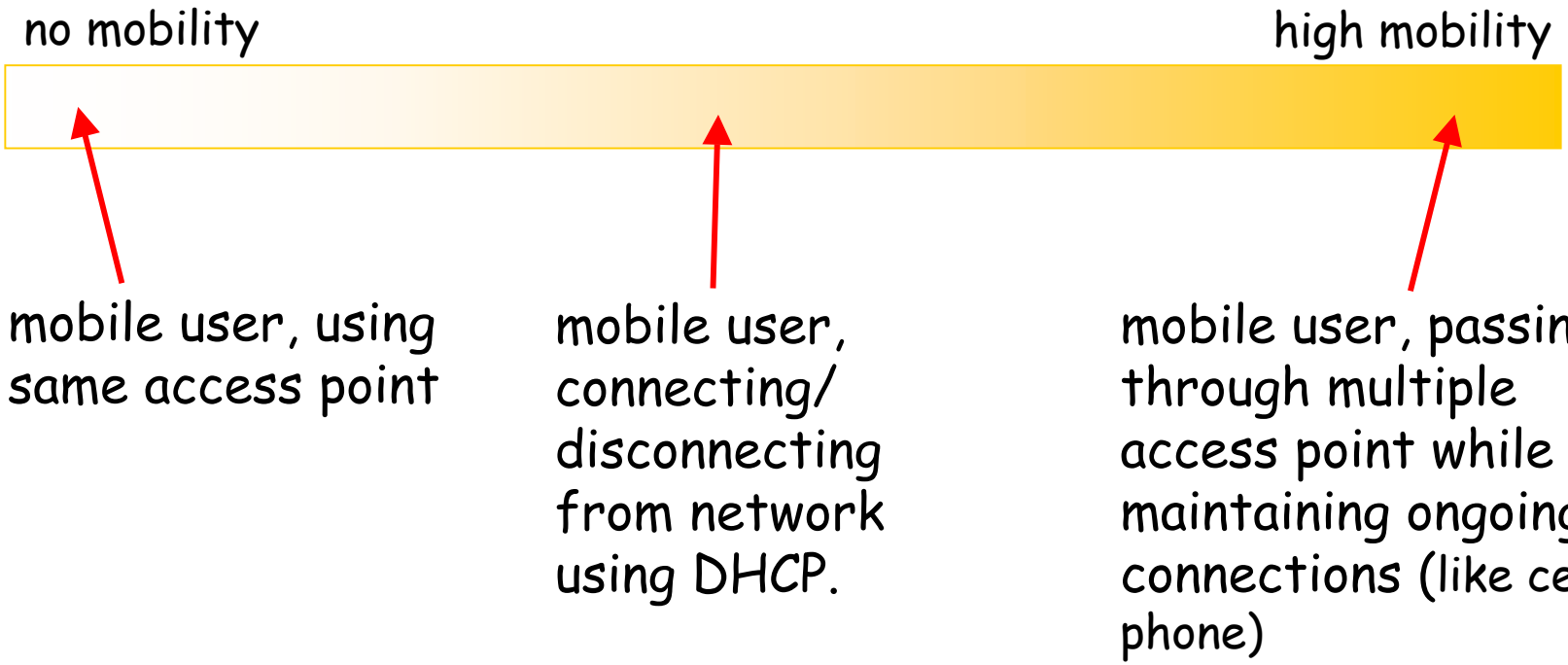
- Nodes can receive datagrams no matter where they attach to the Internet.
- Problems:
  - Internet is designed with the assumption that networks are wired by a cable and hence could be localized.
  - IP network address allocation assumes that there is a close relationship between a computer's IP address and its physical address.

Mobility Management

- Each network is identified by the network prefix part of the IP address.
- When a node moves from one network to another network, the IP address should change according to the network prefix of the new network.
- All the connections are identified by the IP address and the port number of the host.

What Is Mobility?

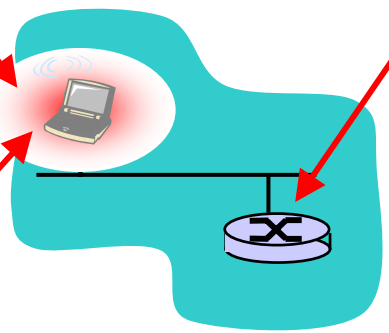
- Spectrum of mobility, from the *network* perspective:

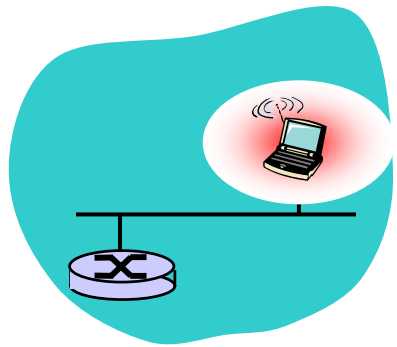


Mobility: Vocabulary

home network: permanent "home" of mobile (e.g., 128.119.40/24)

home agent: *entity that will perform mobility functions on behalf of mobile, when mobile is remote*





wide area network

correspondent

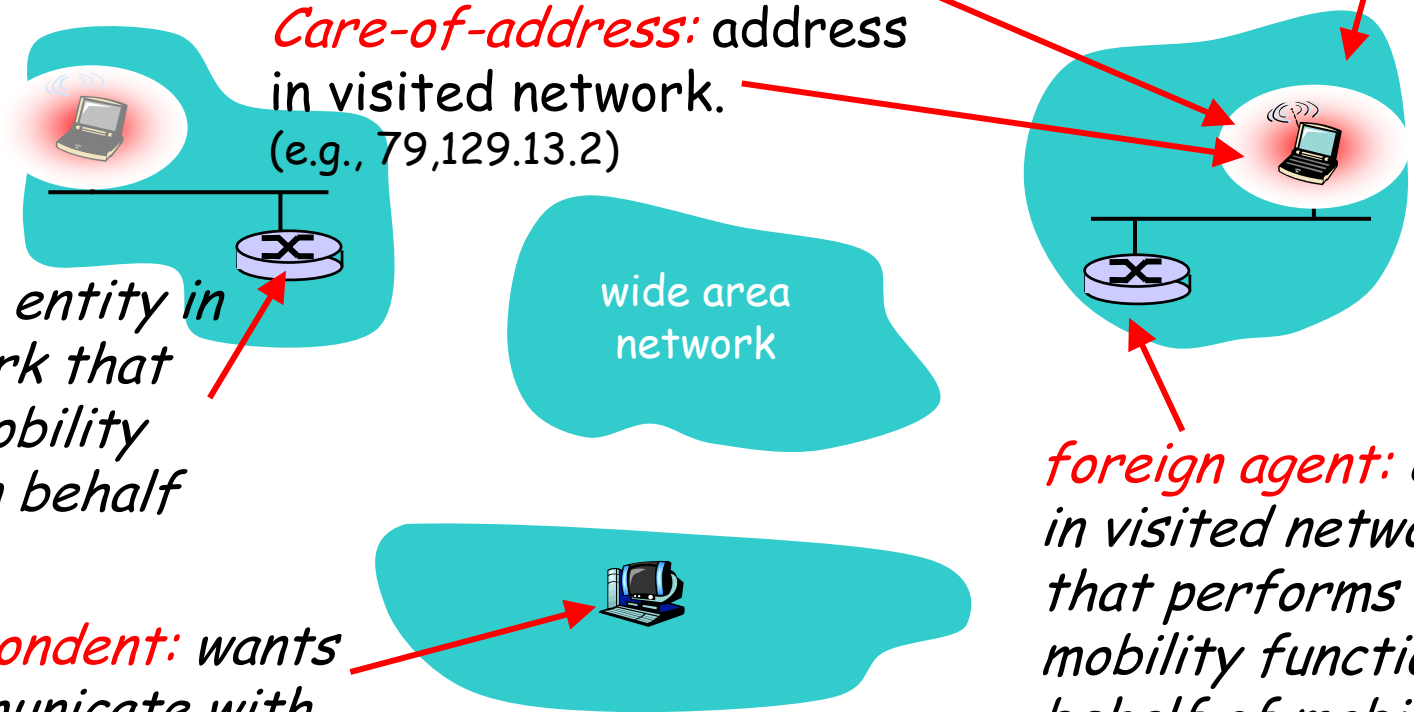
Permanent address: address in home network, *can always* be used to reach mobile e.g., 128.119.40.186

Mobility Vocabulary

Permanent address: remains constant (e.g., 128.119.40.186)

visited network: network in which mobile currently resides (e.g., 79.129.13/24)

Care-of-address: address in visited network. (e.g., 79,129.13.2)



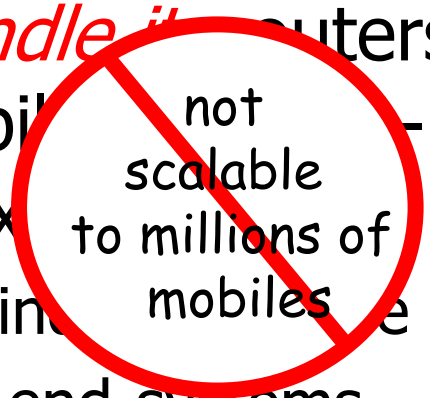
home agent: entity in home network that performs mobility functions on behalf of mobile.

foreign agent: entity in visited network that performs mobility functions on behalf of mobile.

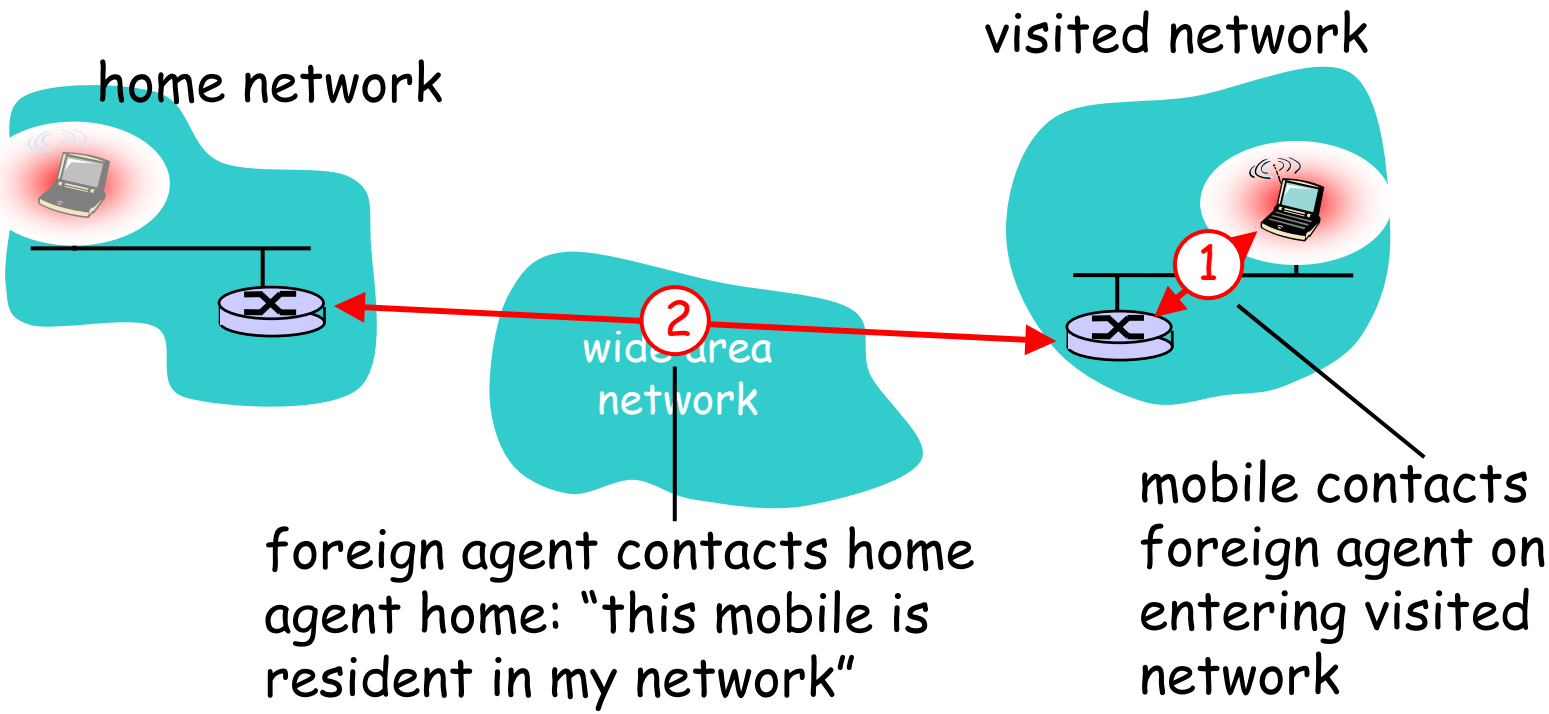
correspondent: wants to communicate with mobile

Mobility Approaches

- *Let routing handle it:* routers advertise permanent address of mobile-residence via usual routing table exchange
  - routing tables indicate each mobile located
  - no changes to end-systems
- *Let end-systems handle it:*
  - *indirect routing:* communication from correspondent to mobile goes through home agent, then forwarded to remote
  - *direct routing:* correspondent gets foreign address of mobile, sends directly to mobile



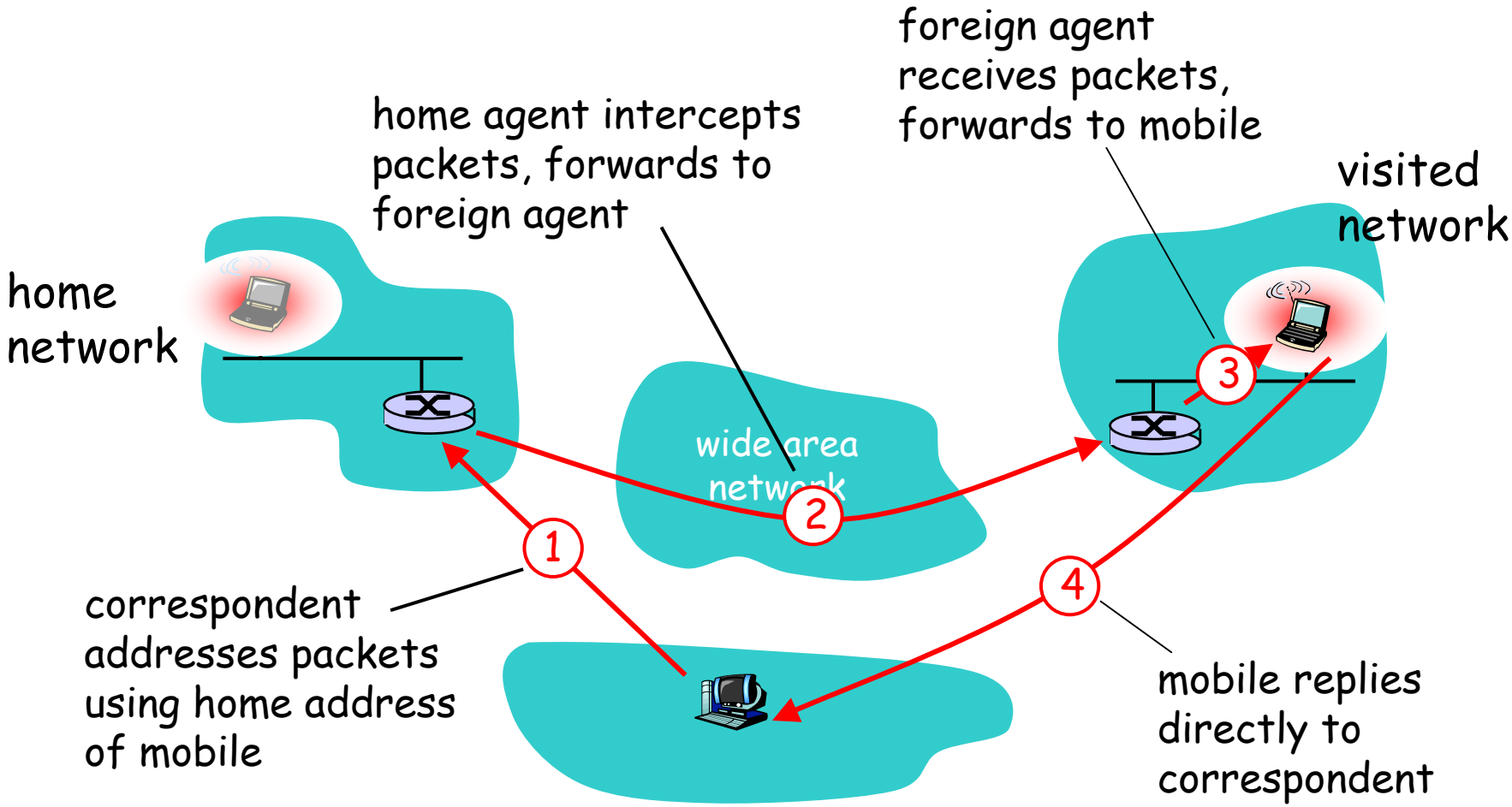
Mobility: Registration



End result:

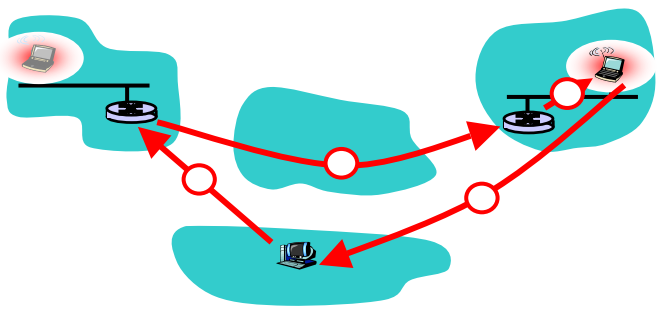
- Foreign agent knows about mobile
- Home agent knows location of mobile

Mobility Support via Indirect Routing

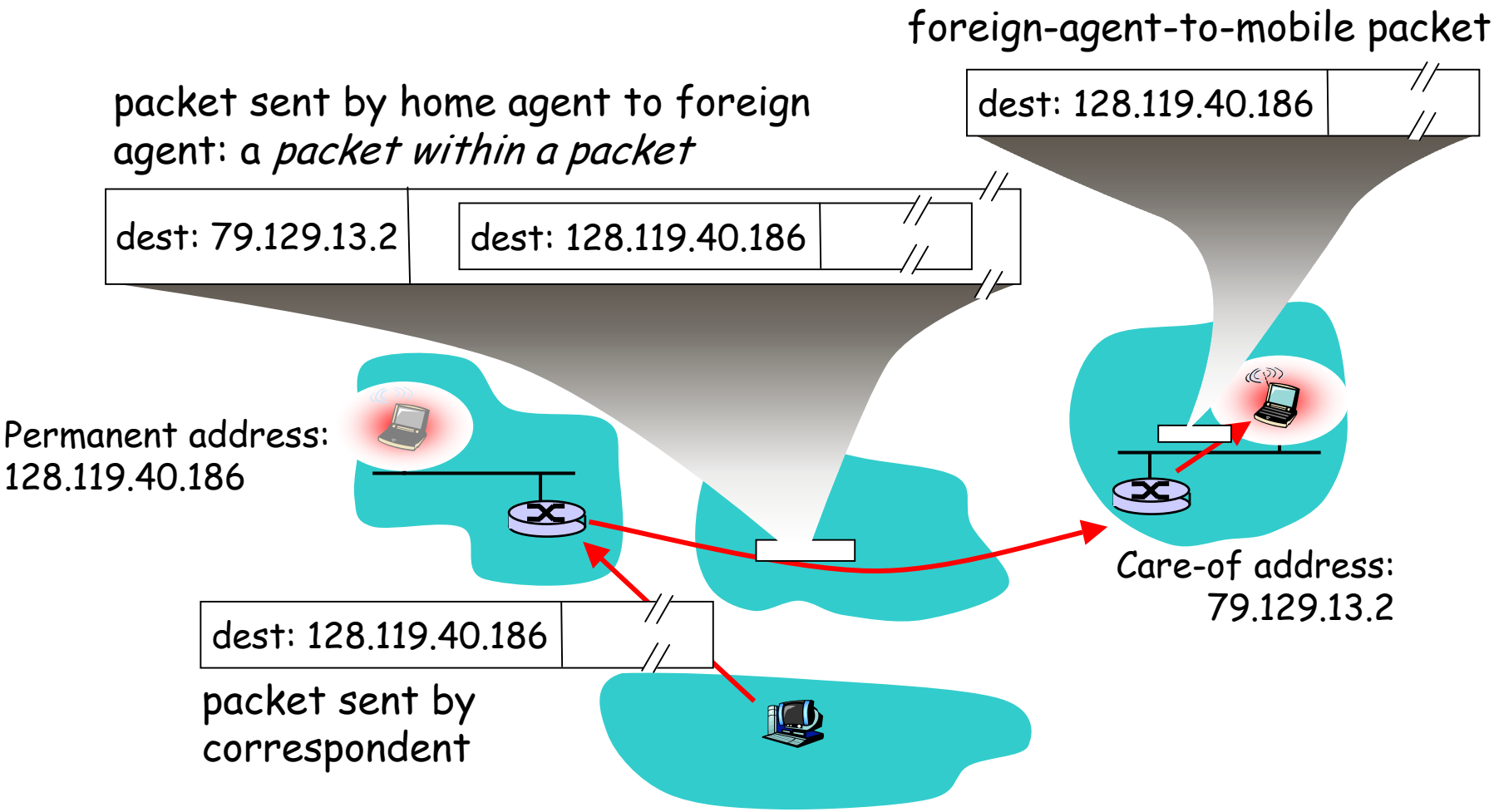


Indirect Routing: Comments

- Mobile uses two addresses:
  - permanent address: used by correspondent (hence mobile location is *transparent* to correspondent)
  - care-of-address: used by home agent to forward datagrams to mobile
- foreign agent functions may be done by mobile itself
- triangle routing: correspondent-home-network-mobile
  - inefficient when correspondent, mobile are in same network



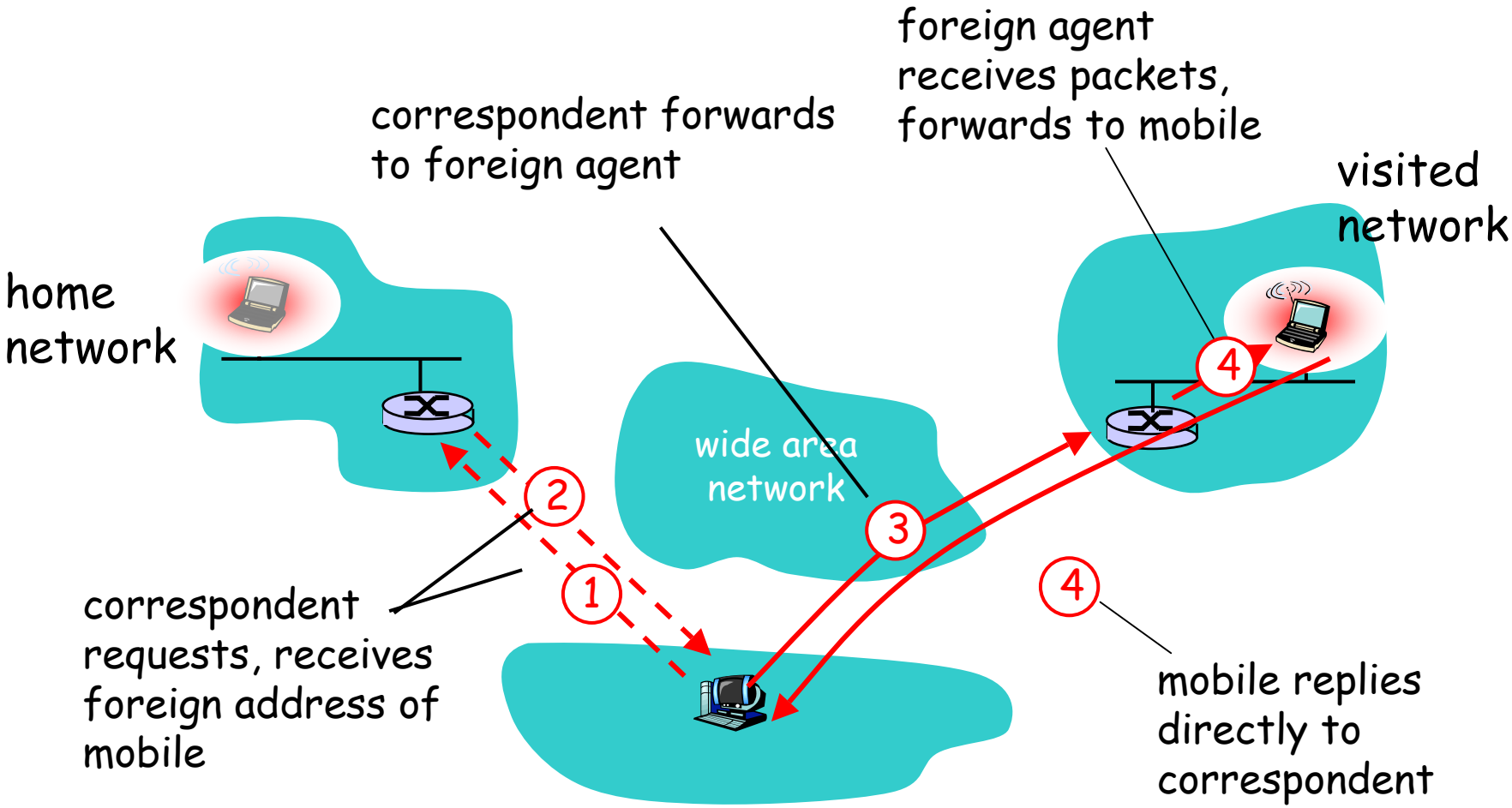
Forwarding datagrams to remote mobile



Indirect Routing: Moving between Networks

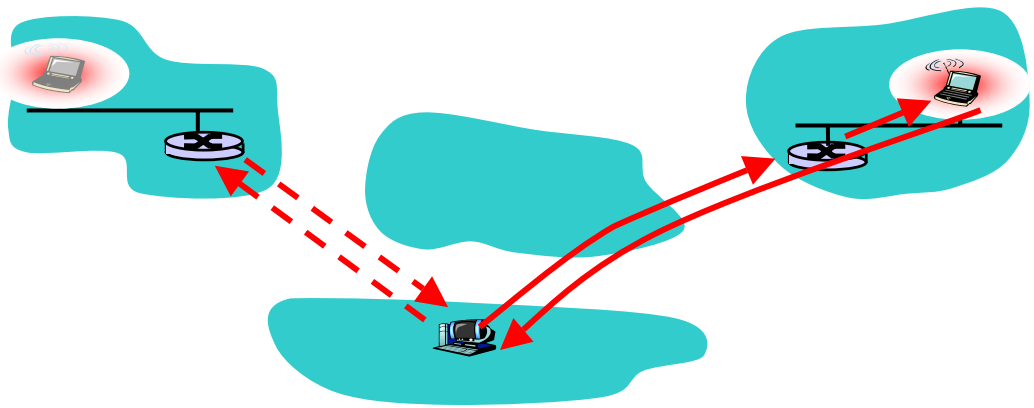
- Suppose mobile user moves to another network
  - registers with new foreign agent
  - new foreign agent registers with home agent
  - home agent update care-of-address for mobile
  - packets continue to be forwarded to mobile (but with new care-of-address)
- Mobility, changing foreign networks transparent: *on going connections can be maintained!*

Mobility via Direct Routing



Mobility via Direct Routing: comments

- overcome triangle routing problem
- non-transparent to correspondent: correspondent must get care-of-address from home agent
  - What happens if mobile changes networks?

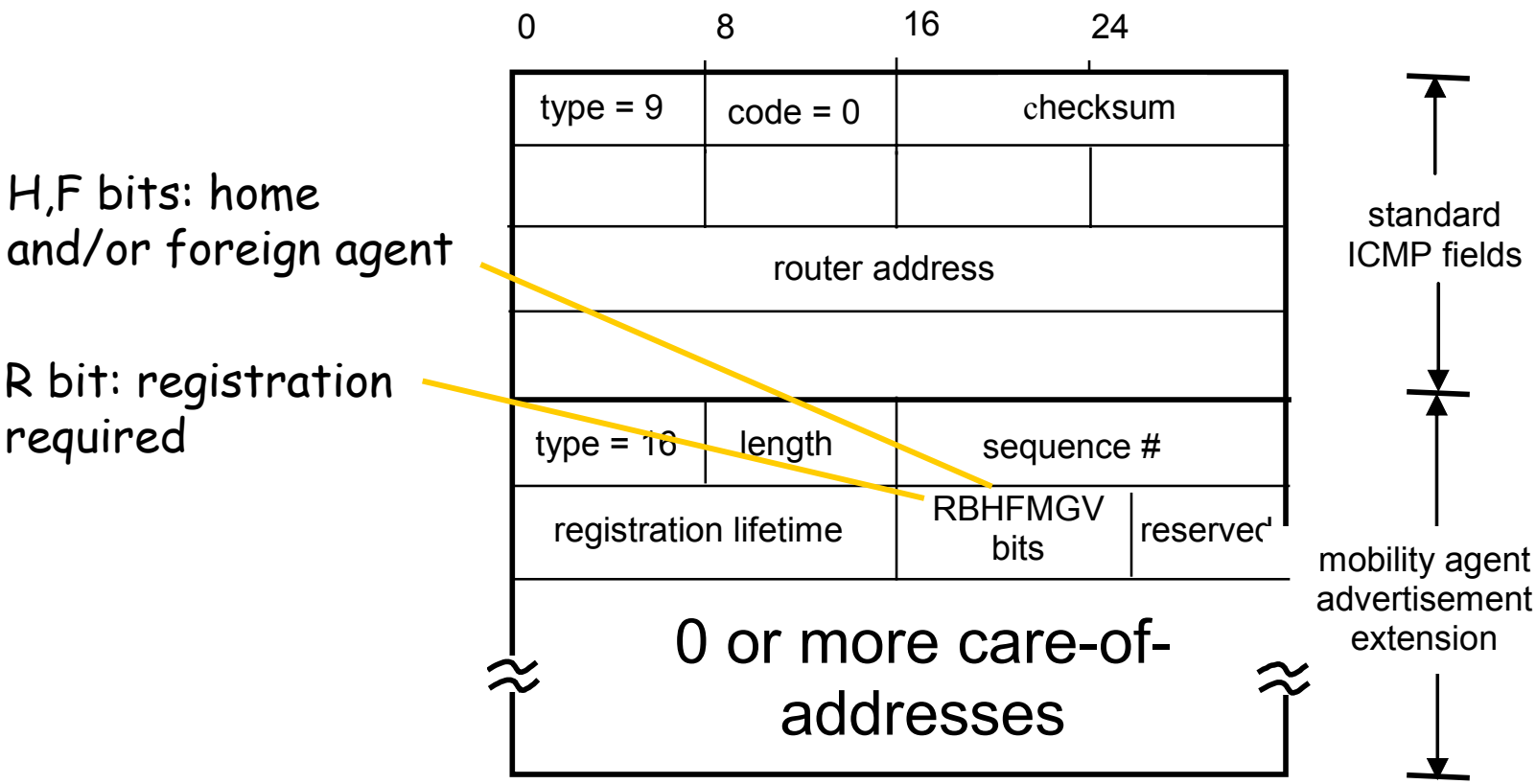


Mobile IP

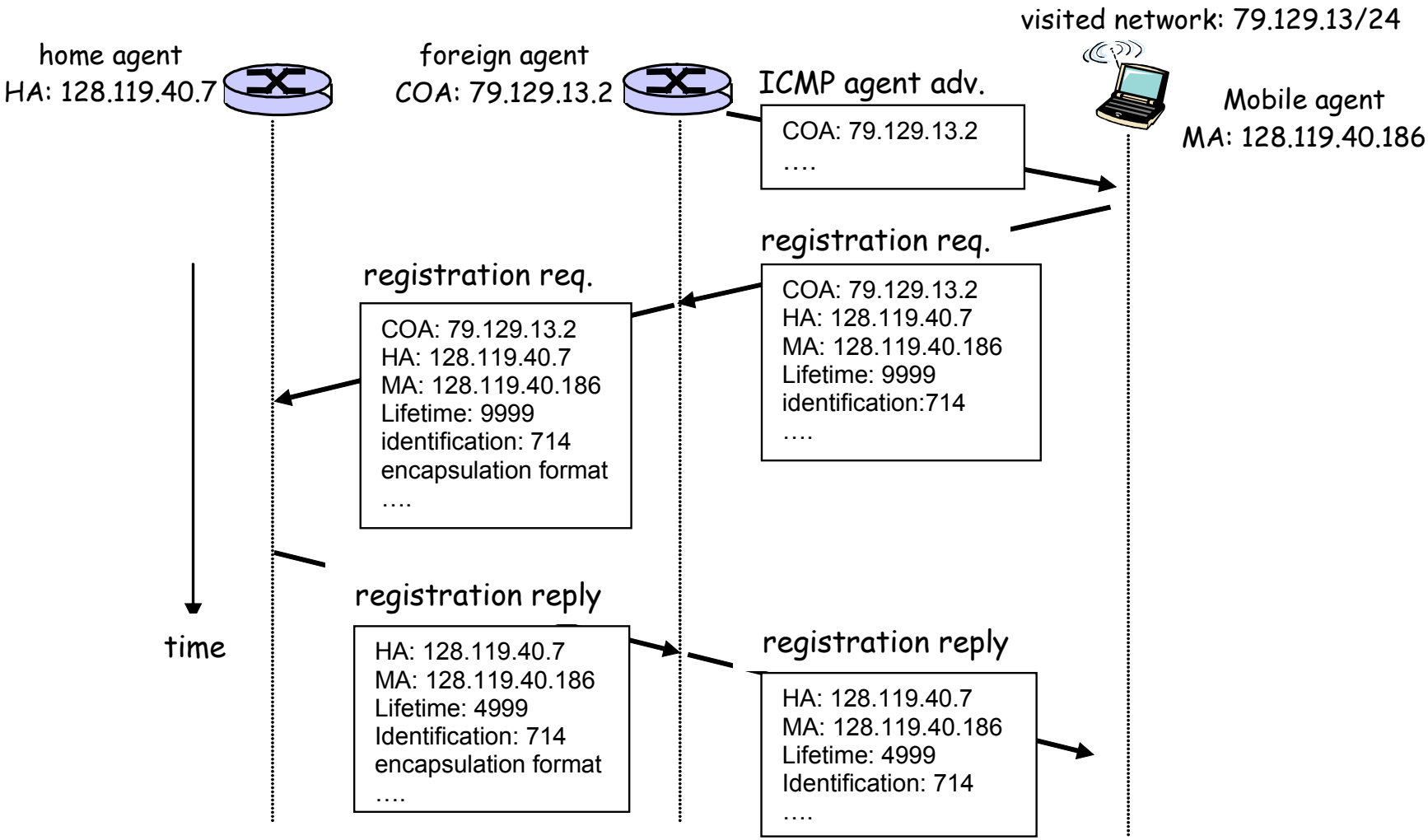
- RFC 3220
- Has many features we have discussed:
  - Home agents, foreign agents, foreign-agent registration, care-of-addresses, encapsulation (packet-within-a-packet)
- Three components to standard:
  - Agent discovery
  - Registration with home agent
  - Indirect routing of datagrams

Mobile IP: Agent discovery

- Agent advertisement: foreign/home agents advertise service by broadcasting ICMP messages (typefield = 9)



Mobile IP: registration example



Resources

- 1. "IP Mobility Support," C. Perkins, ed., IETF RFC 2002, Oct. 1996.
- 2. C. Perkins, *Mobile IP: Design Principles and Practice*, Addison-Wesley Longman, Reading, Mass., 1998.
- 3. C. Perkins, "Mobile IP," *IEEE Comm.*, Vol. 35, No. 5, 1997, pp. 84-99
- Mobile IP Tutorial: http://www.computer.org/internet/v2n1/perkins.htm

Acknowledgements

- Thanks to Chane for providing me the lecture slides.


Have a
nice day...