Lecture 07-02: Network Layer Mobile IP

CS 356R

Intro to Wireless Networks

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Internet Reference Model

Example Protocols		Responsible for
FTP, HTTP, SMTP	Application	application specific needs
TCP, UDP	Transport	process to process data transfer
IP	Network	host to host data transfer across different network
Ethernet, WiFi	Link	data transfer between physically adjacent nodes
802.3 PHY	Physical	bit-by-bit or symbol-by-symbol delivery

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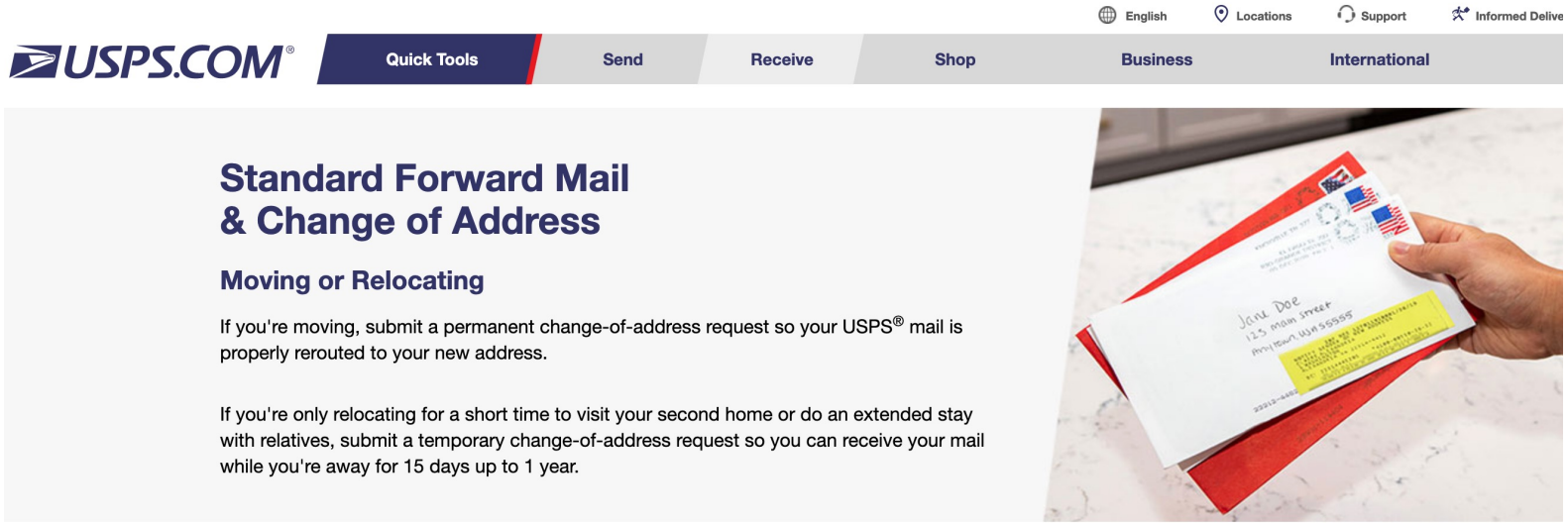
Outline

1. Motivation for Mobile IP

Say you just moved from Dallas to Austin

- What changed?
- What do you to prevent your mails are going to your old address in Dallas?
  - Option 1: Call/message everyone you know about address change
  - Option 2: Address forwarding via post office!



In wireless networks nodes are mobile

- What problems can arise when it comes to routing?
- Mobile nodes may move from one subnet to the other subnet, then what would change?
  - The IP address!
  - Why?

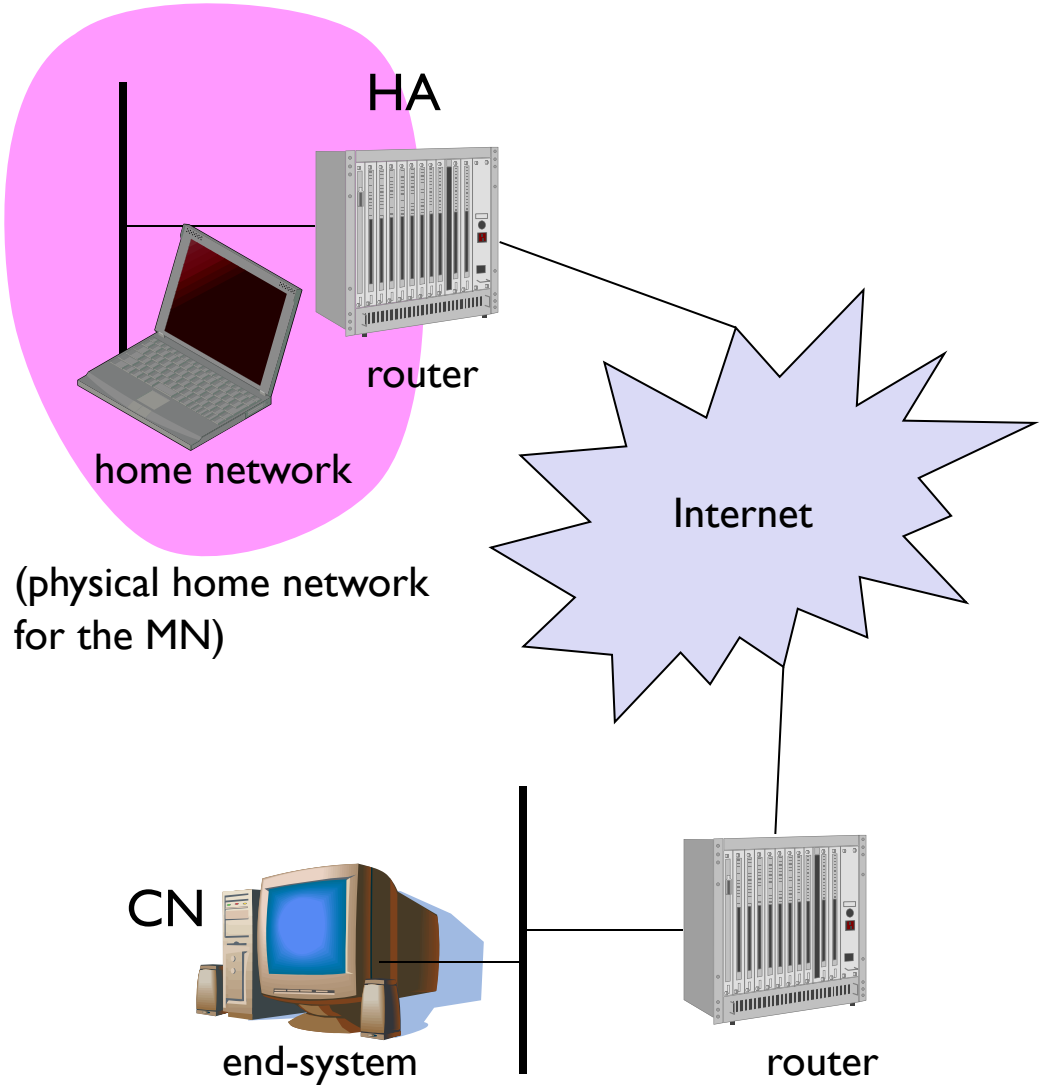
Terminology

- Mobile Node (MN): You moving in the analogy
  - system (node) that can change the point of connection to the network without changing its IP address
- Correspondent Node (CN): Your friend sending mail to old address
  - communication partner
- Care-of Address (COA): Your new address in the analogy
  - address of the current tunnel end-point for the MN (at FA or MN)
  - actual location of the MN from an IP point of view
  - can be chosen, e.g., via DHCP
- Home Agent (HA): Your old post office in the analogy
  - system in the home network of the MN, typically a router
  - registers the location of the MN, tunnels IP datagrams to the COA
- Foreign Agent (FA): Your new post office in the analogy
  - system in the current foreign network of the MN, typically a router
  - forwards the tunneled datagrams to the MN, typically also the default router for the MN

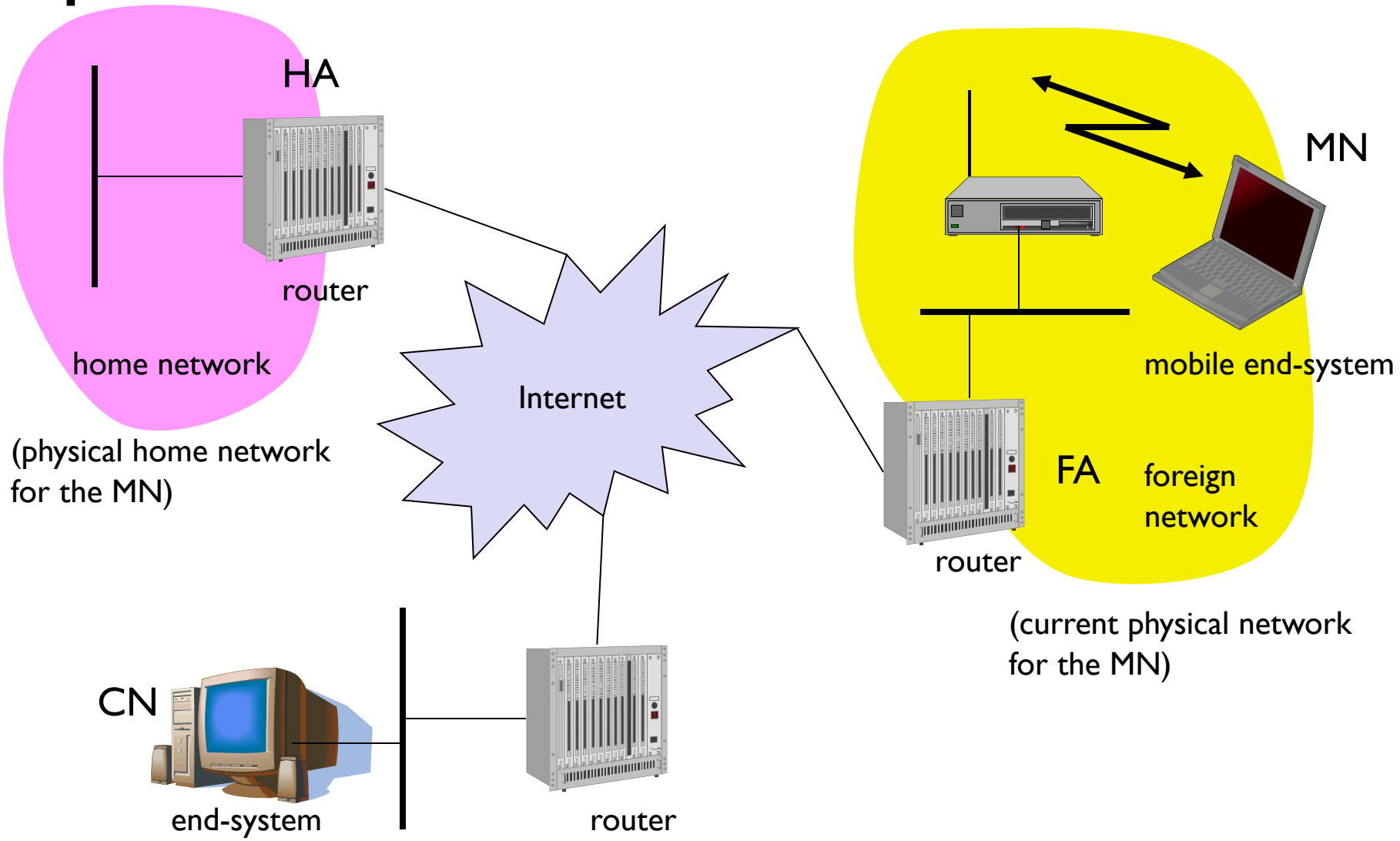
Outline

1. Motivation for Mobile IP
2. How Mobile IP works

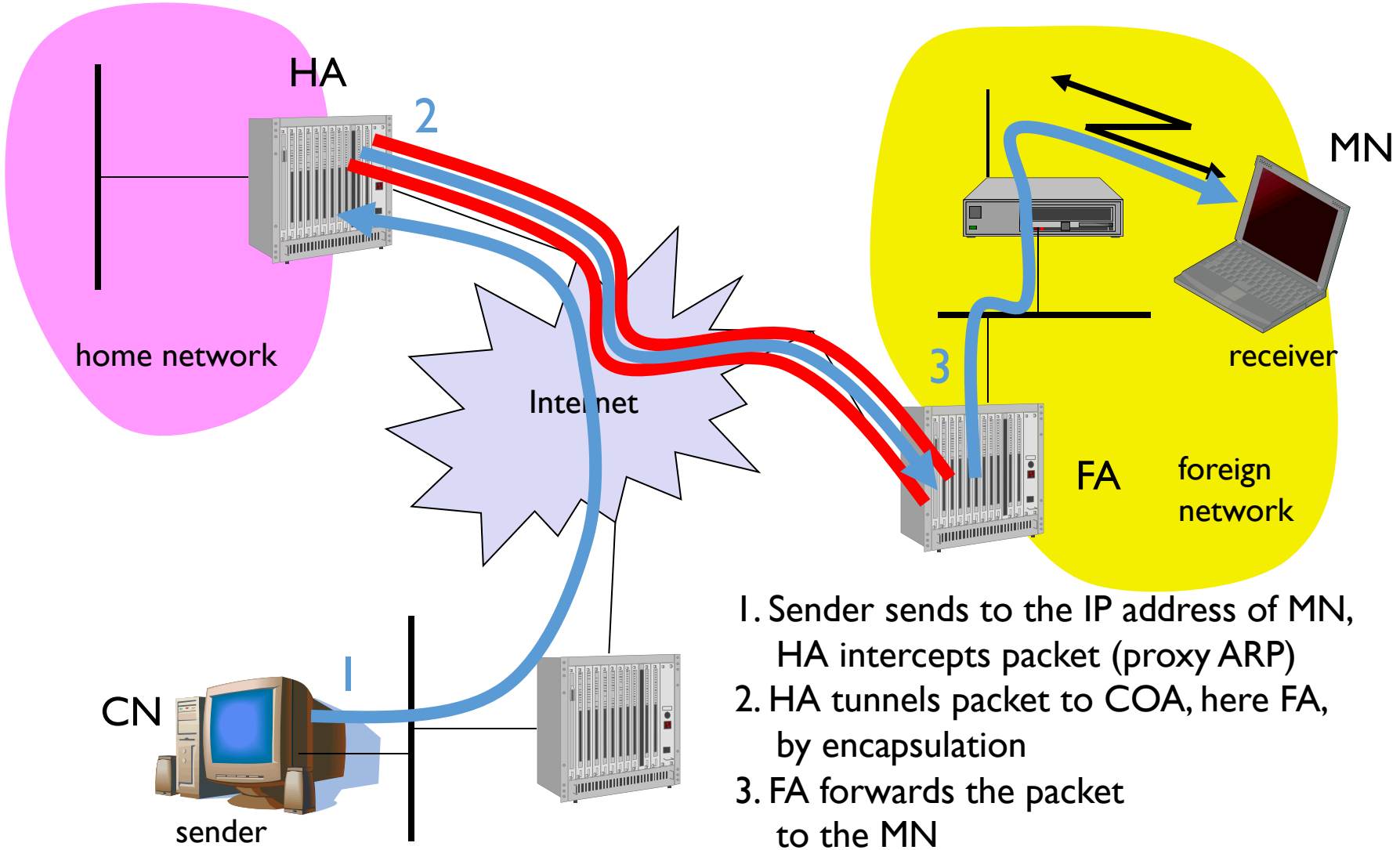
Example network 1



Example network 2

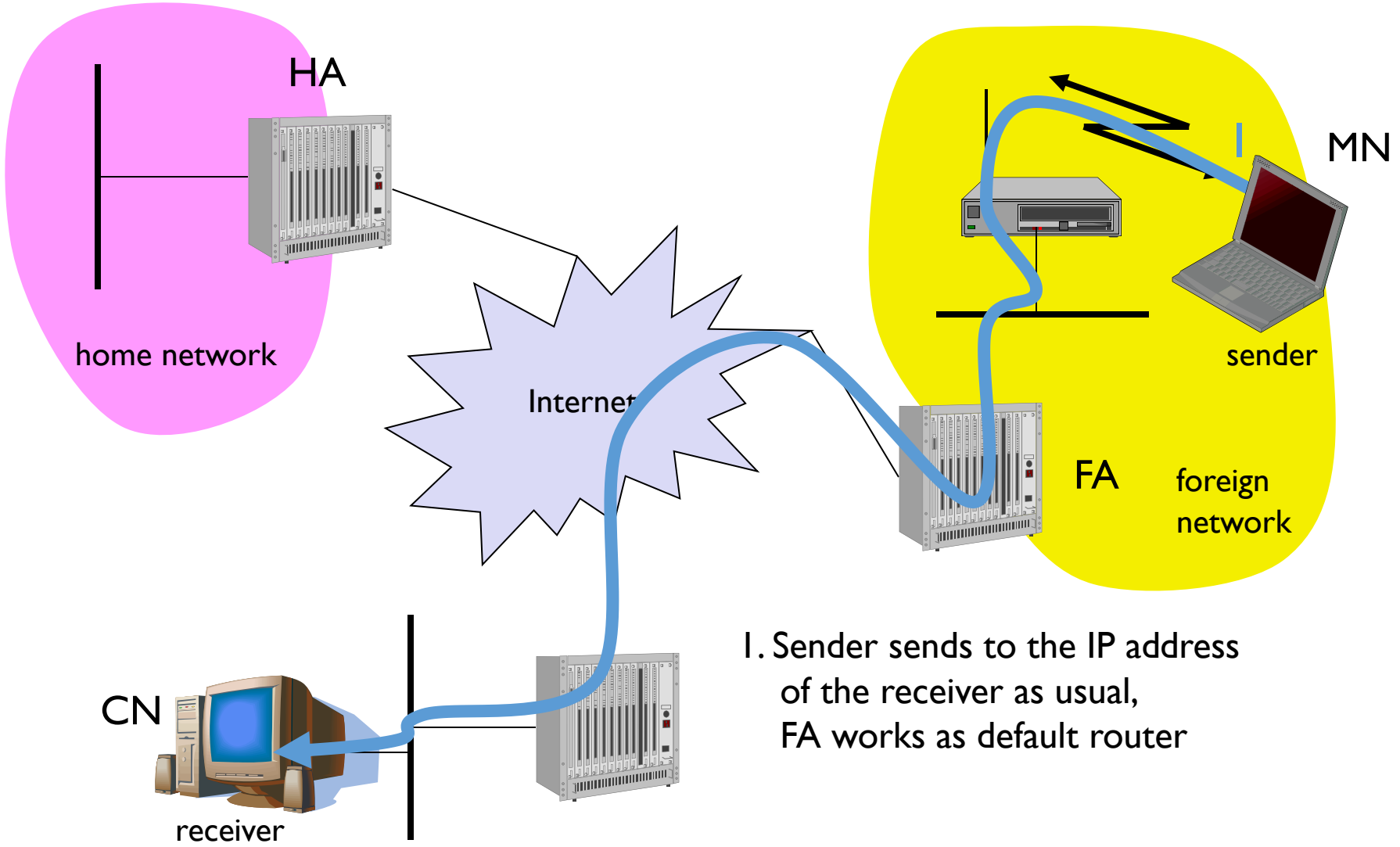


Forward Path: Data transfer to the mobile system



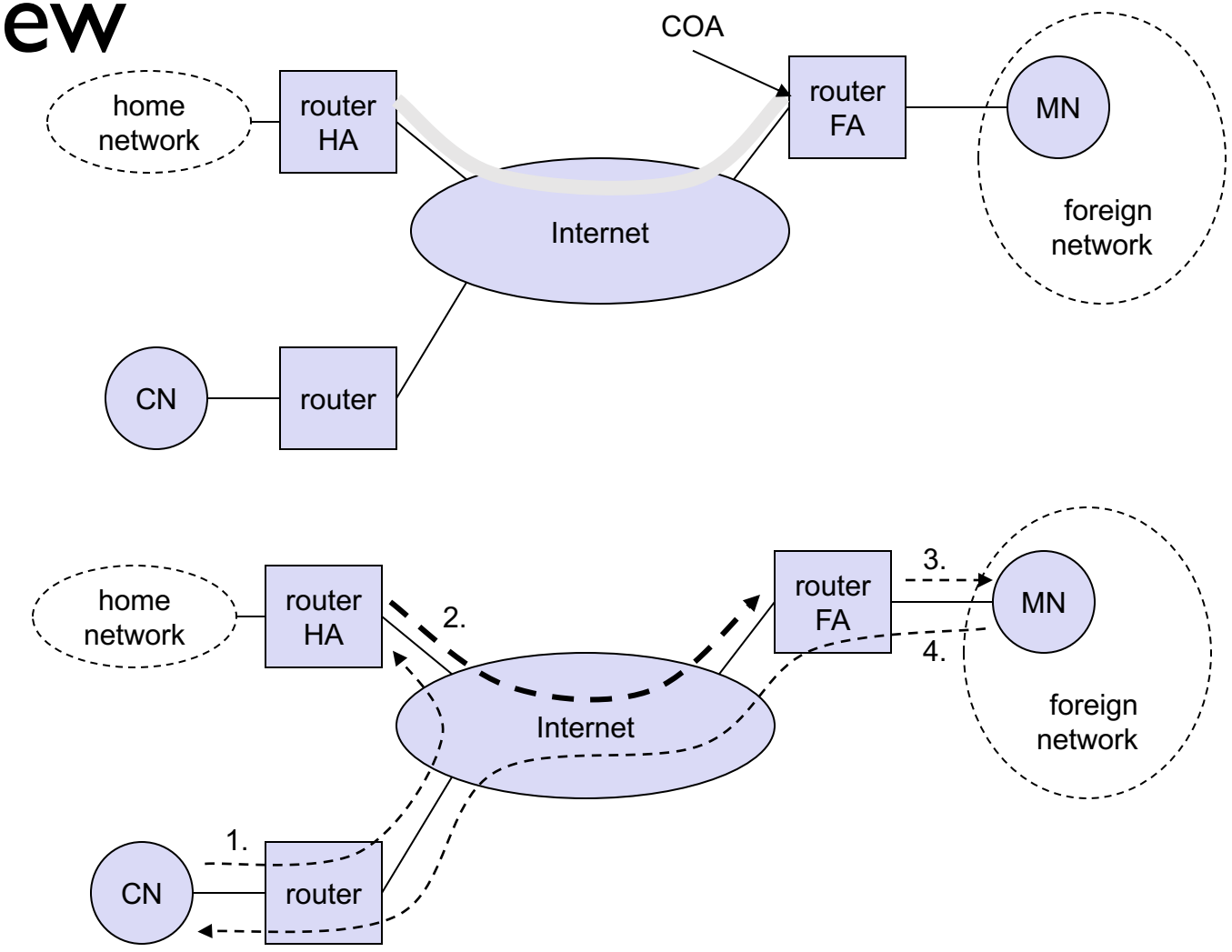
1. Sender sends to the IP address of MN, HA intercepts packet (proxy ARP)
2. HA tunnels packet to COA, here FA, by encapsulation
3. FA forwards the packet to the MN

Reverse Path: Data transfer from the mobile system



1. Sender sends to the IP address of the receiver as usual, FA works as default router

Overview


COA
home network
router HA
router FA
MN
Internet
foreign network
CN
router
home network
router HA
2.
router FA
3.
MN
4.
Internet
foreign network
1.
CN
router

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Registration

- Each mobile node has two IP addresses
  - Permanent home address
  - Care-of Address
- Mobile node registers with Home Agent
- Home Agent maintains a "mobility binding table"

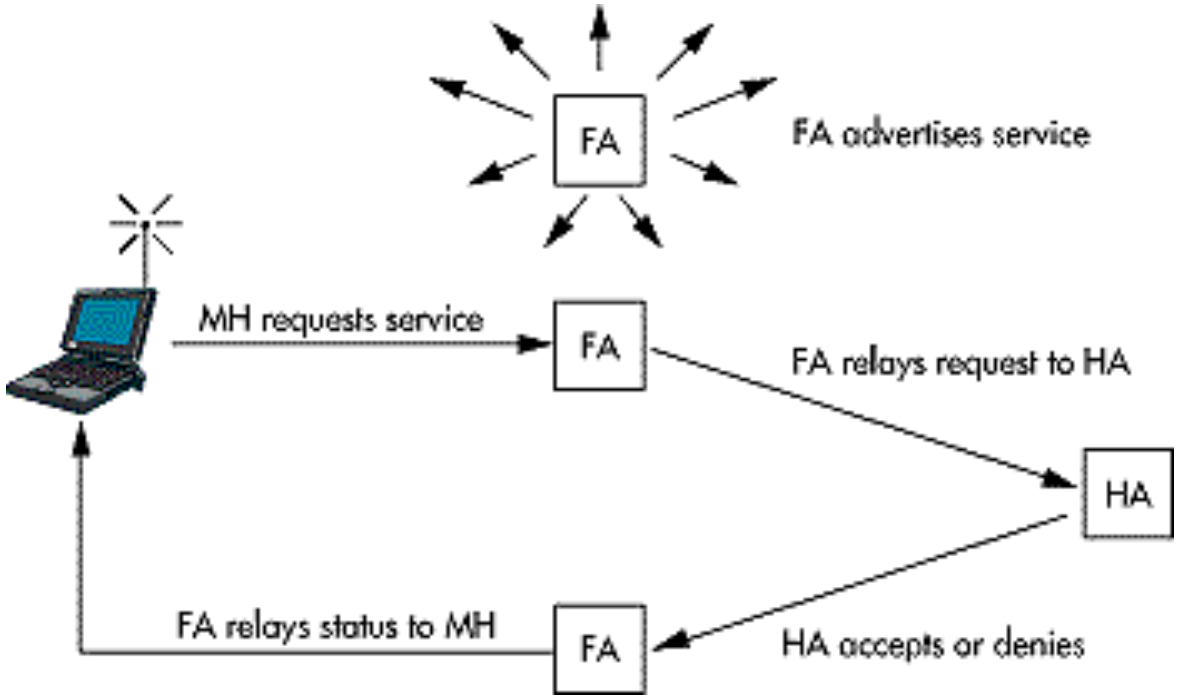
Home Address	Care-of Address	Lifetime (in sec)
131.193.171.4	128.172.23.78	200
131.193.171.2	119.123.56.78	150

Registration

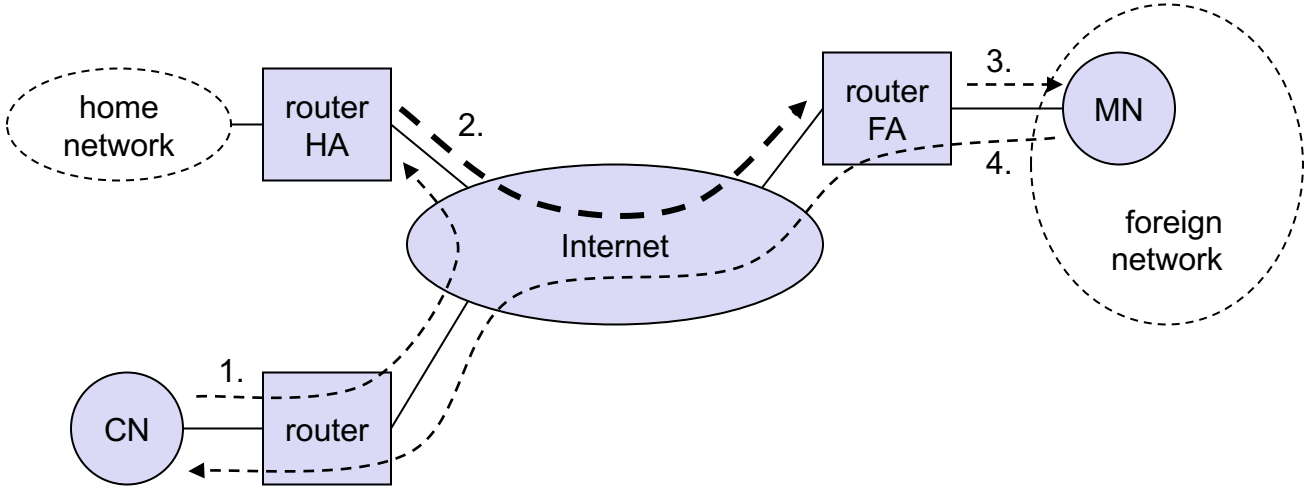
- Each mobile node has two IP addresses
  - Permanent home address
  - Care-of Address
- How does MN obtains Care-of-Address?
  - Foreign agent advertises periodically
- Once MN receives care-of address, it registers it with HA
  - Via Foreign agent
- Home Agent maintains a "mobility binding table"

Home Address	Care-of Address	Lifetime (in sec)
131.193.171.4	128.172.23.78	200
131.193.171.2	119.123.56.78	150

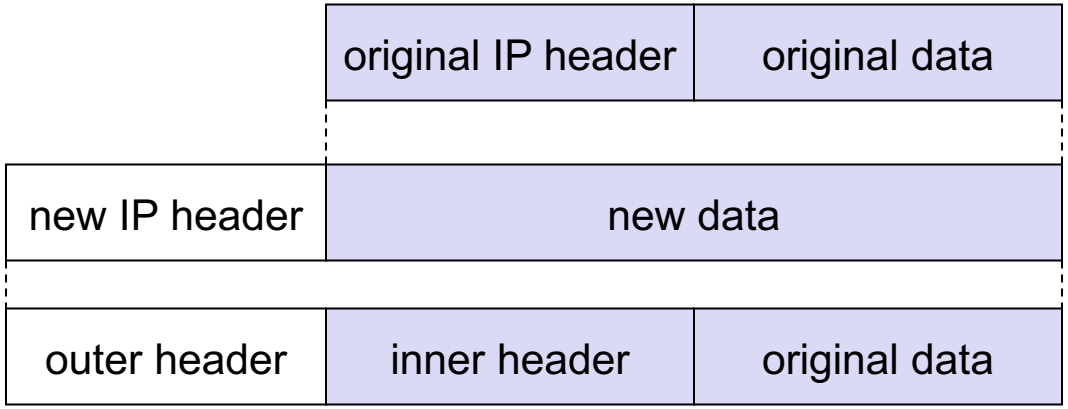
Illustration



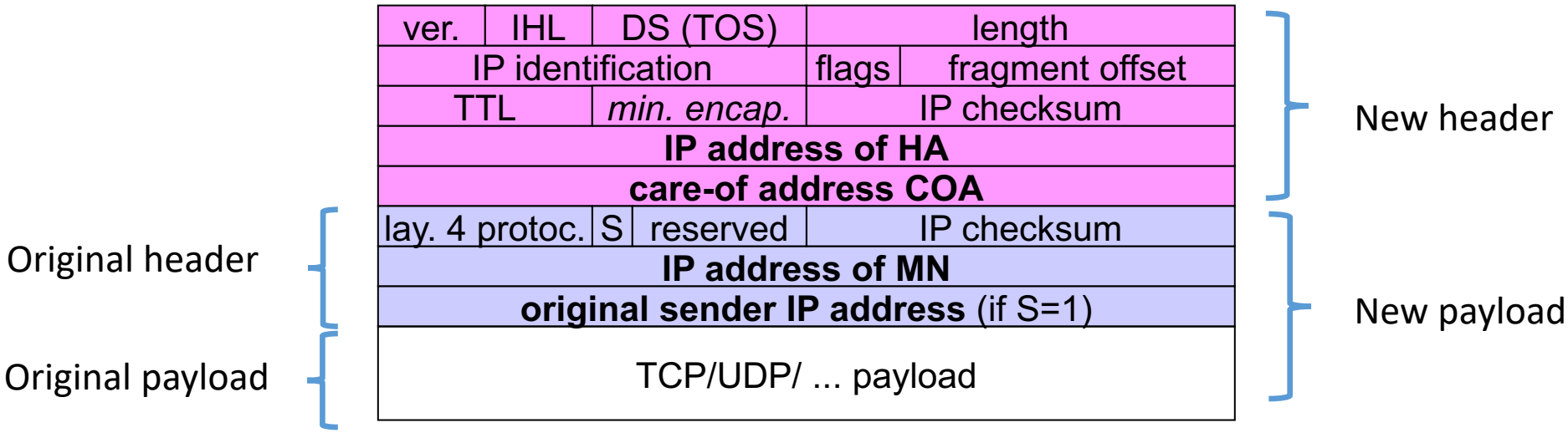
Mobile IP uses encapsulation



- Packet in 1 has original IP header original payload
  - CN as src and IP address of MN
- Packet in 2 would encapsulate it with new header



Encapsulated packet



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Outline

1. Motivation for Mobile IP
2. How Mobile IP works
3. Limitations of Mobile IP

Problems with mobile IP

- Security
  - authentication with FA problematic, for the FA typically belongs to another organization
  - no protocol for key management and key distribution has been standardized in the Internet
  - patent and export restrictions
- Firewalls
  - typically mobile IP cannot be used together with firewalls, special set-ups are needed (such as reverse tunneling)
- QoS
  - many new reservations in case of RSVP
  - tunneling makes it hard to give a flow of packets a special treatment needed for the QoS

Security, firewalls, QoS etc. are topics of research and discussions