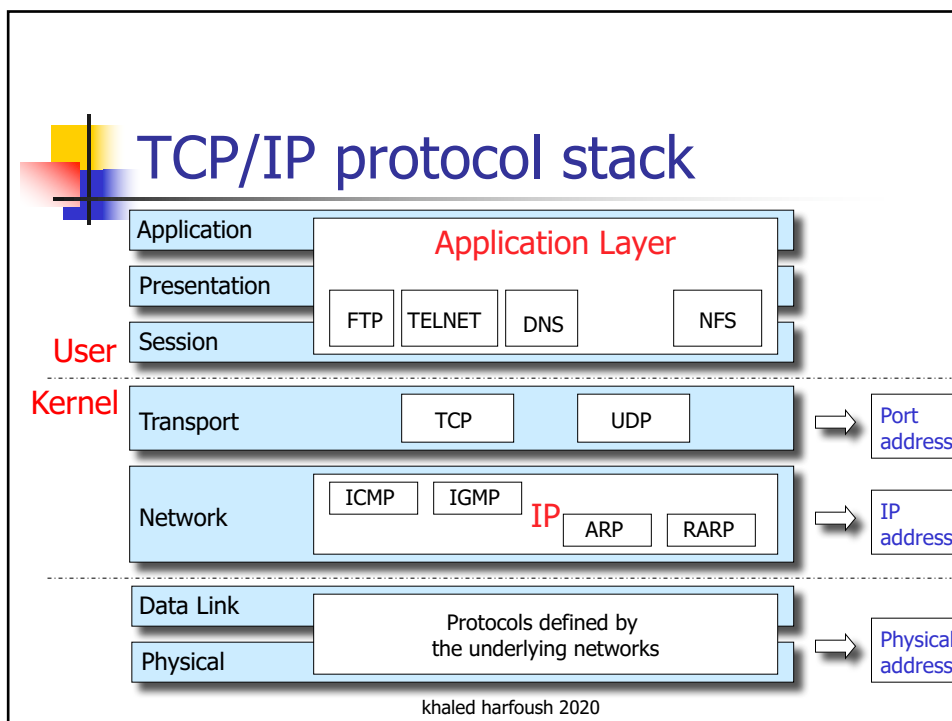


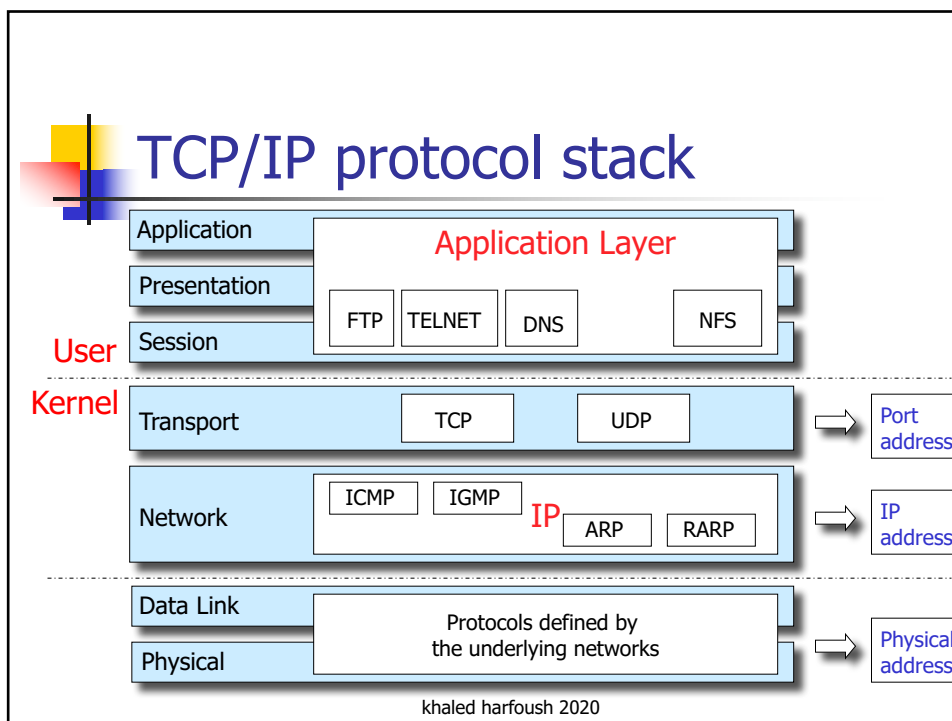
# Address Resolution: ARP and RARP

CSC/ECE 573 Internet Protocols  
Fall 2020



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CSC/ECE 573 Internet Protocols  
Fall 2020





## Facts

- IP addresses (**logical**) are unique **universally**
- MAC addresses (**physical**) are unique **locally** (within the same network)
- Applications use IP addresses to specify destinations
- Link layers only recognize MAC addresses

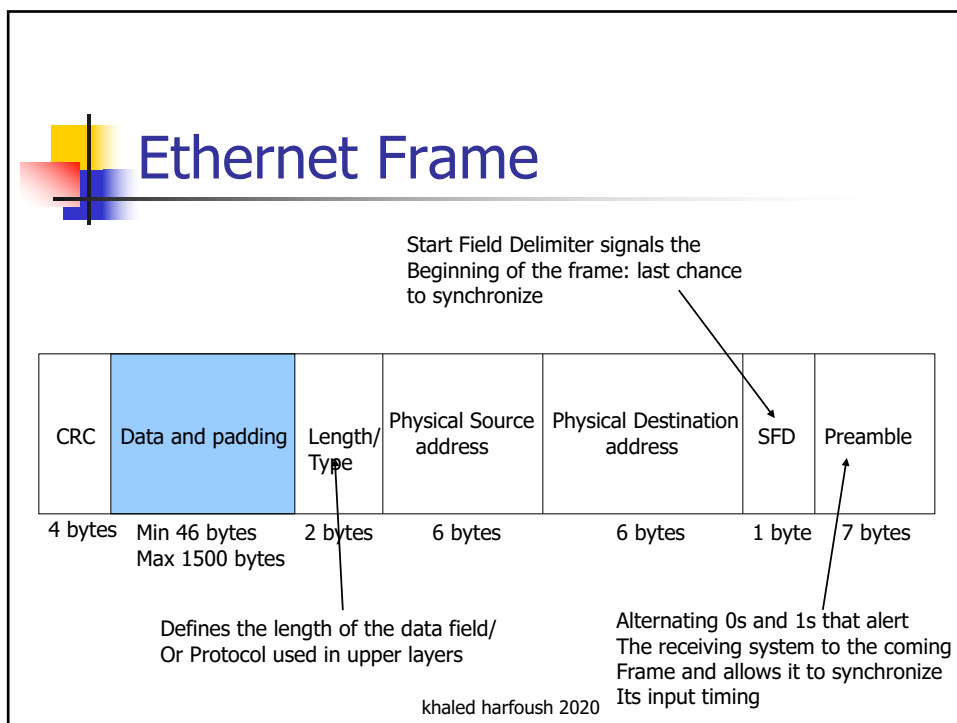
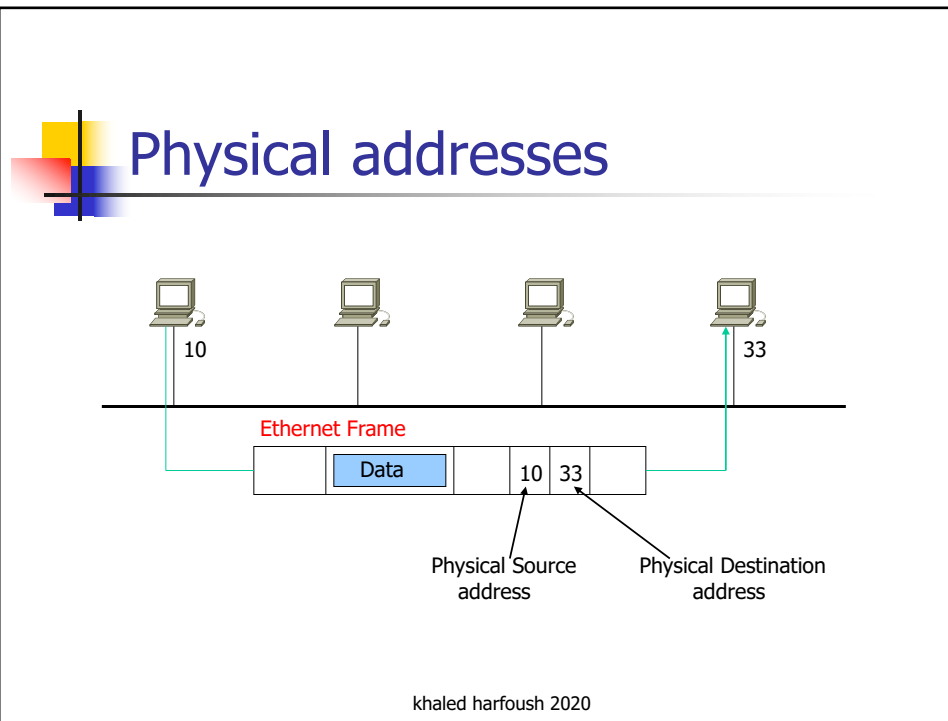
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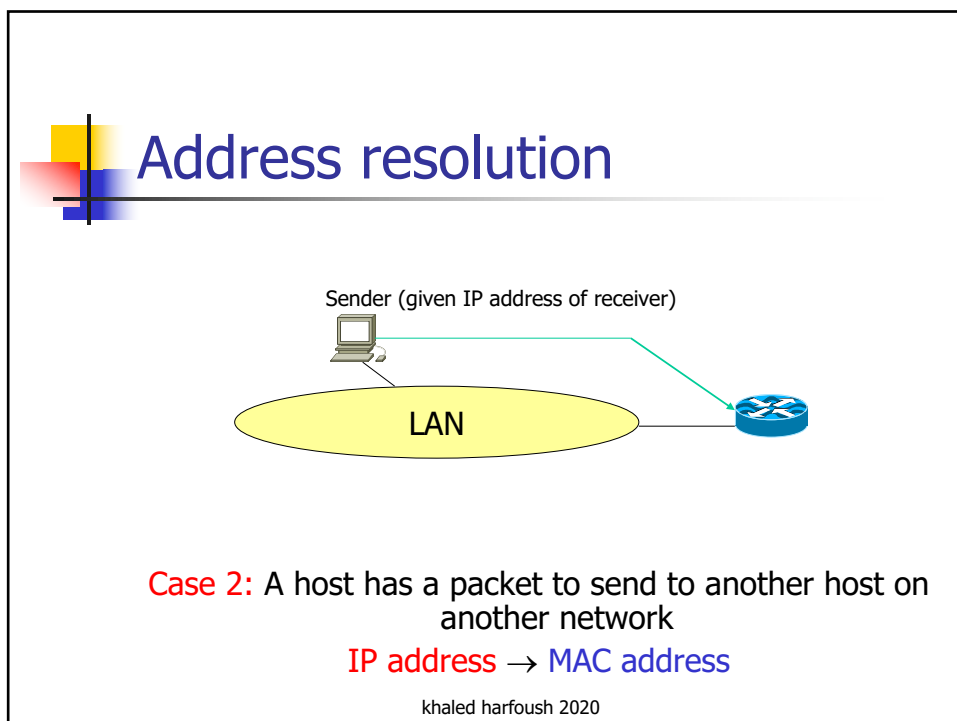
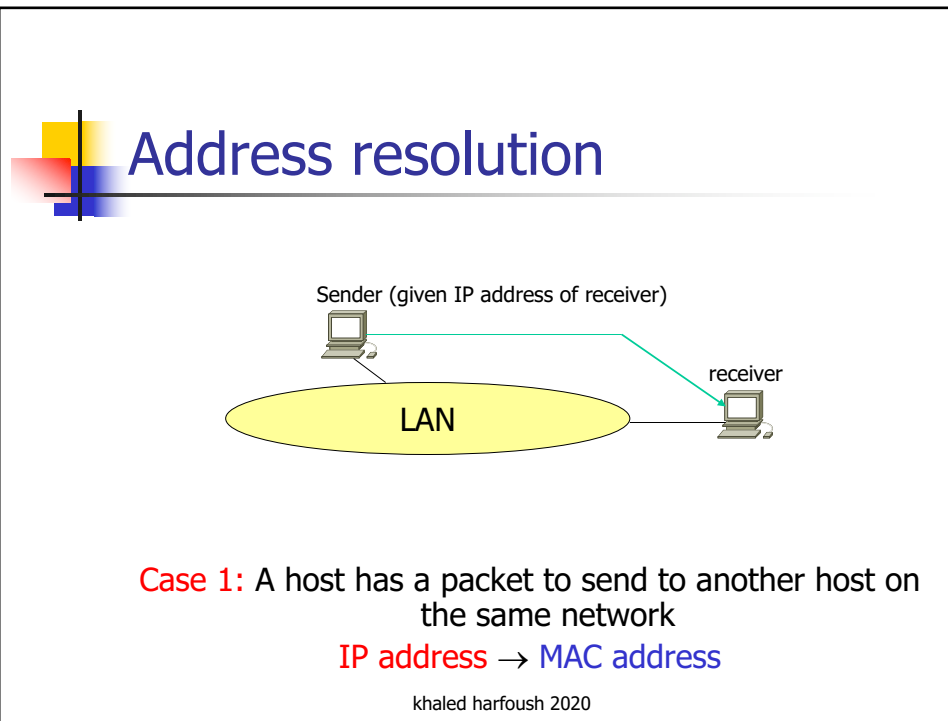


## Physical addresses

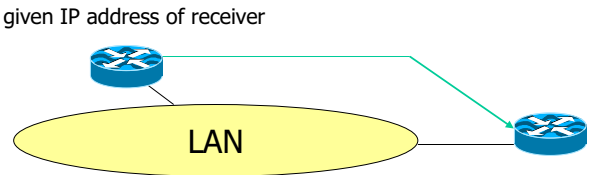
- Size and format depend on the network
  - Ethernet: 6 bytes imprinted on the NIC
  - LocalTalk: 1 byte dynamic address that changes each time the machine comes up
- Can be:
  - Unicast (one recipient)
  - Multicast (a group of recipients)
  - Broadcast (to be received by all systems in the network)Some networks do not support the multicast or broadcast physical addresses

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## Address resolution



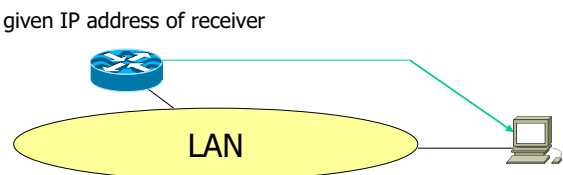
given IP address of receiver

LAN

**Case 3:** A router receives a packet to be sent to a host on another network  
IP address → MAC address

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## Address resolution



given IP address of receiver

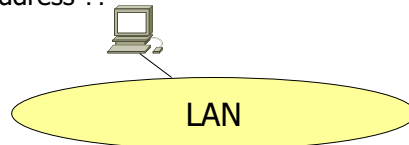
LAN

**Case 4:** A router receives a packet to be sent to a host on the same network  
IP address → MAC address

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## Address resolution

At boot time (given own MAC address printed on the NIC card)  
Own IP address ??



**Case 5:** Determining own IP address at startup  
MAC address → IP address

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## Q:

- Why not store IP address information on disk?
  - Diskless machines boot from ROM (installed by the manufacturer who does not know IP information)
  - Flexibility of assigning IP addresses to hosts dynamically from a pool of IP addresses.

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## The address resolution problem

- How to map:
  - IP address → MAC address?
  - MAC address → IP address?
- Analogy:
  - Mail addressed to employee@company is translated to <building,office#>
  - An employee@company is allocated a <building,office#>

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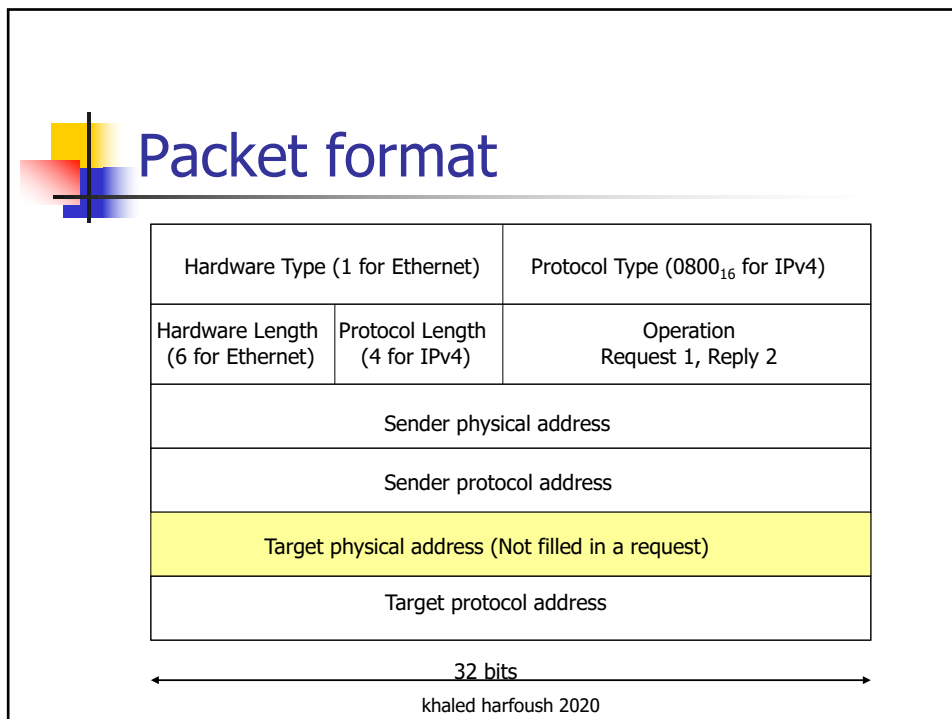
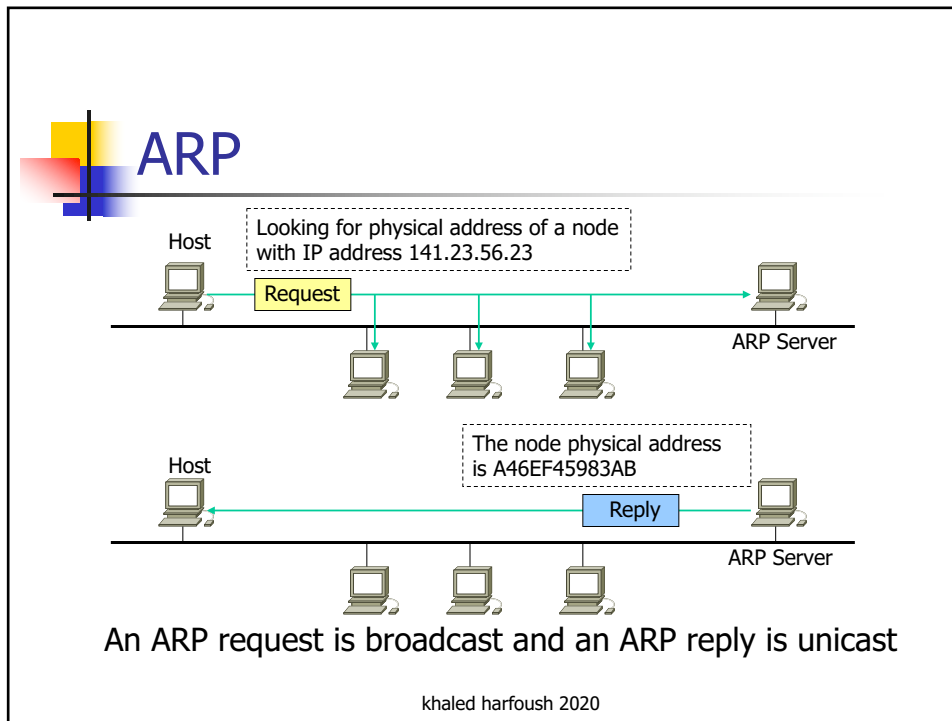


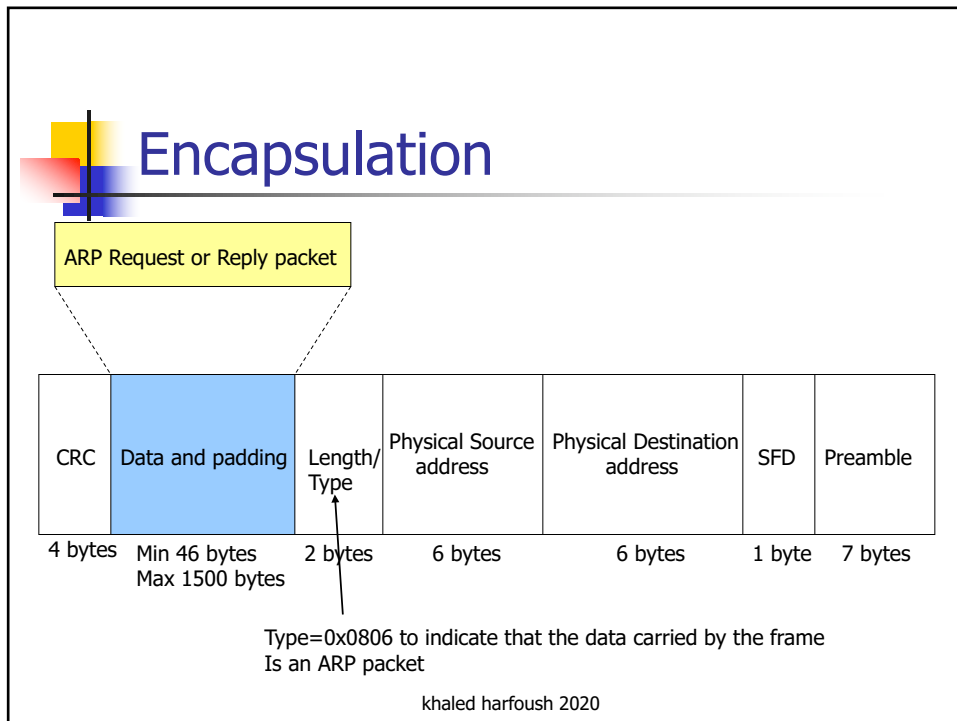
## Today's lecture

- Mapping IP address → MAC address (ARP)
- Mapping MAC address → IP address (RARP)

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## ARP cache

- Problem: Sending one ARP request for each data packet
- Solution: Cache mapping info for later use
- Problems with caching:
  - Cache space may be limited
  - Hosts move or change IP addresses

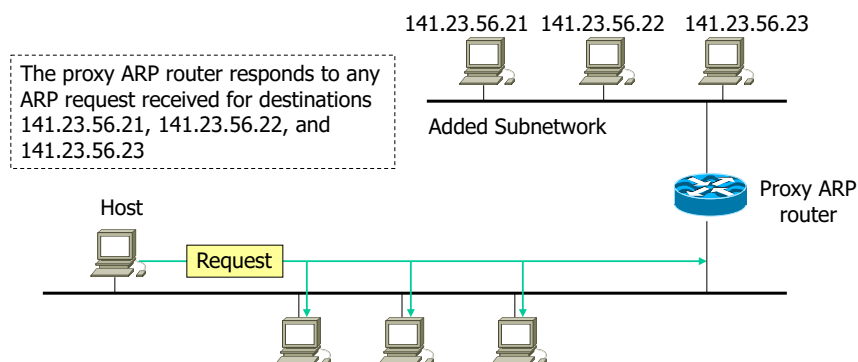
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## Gratuitous ARP

- Every machine broadcasts its mapping when it boots to update ARP caches in other machines
- Example: A sends an ARP Request with its own IP address as the target IP address
  - Sender MAC=MAC<sub>A</sub>, Sender IP=IP<sub>A</sub>
  - Target MAC=??, Target IP=IP<sub>A</sub>
- What if a reply is received?

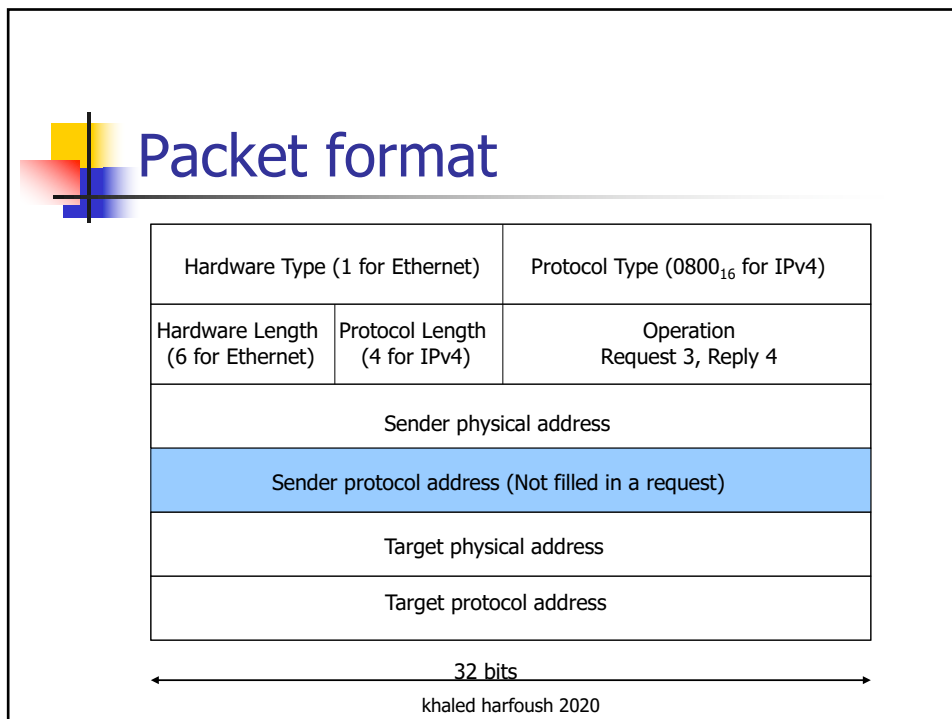
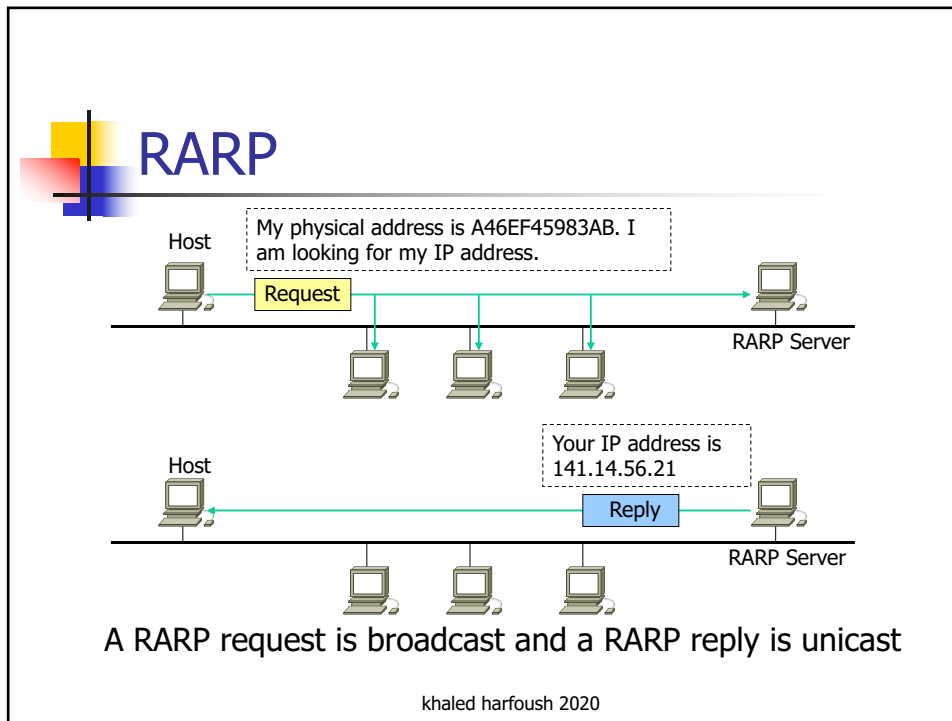
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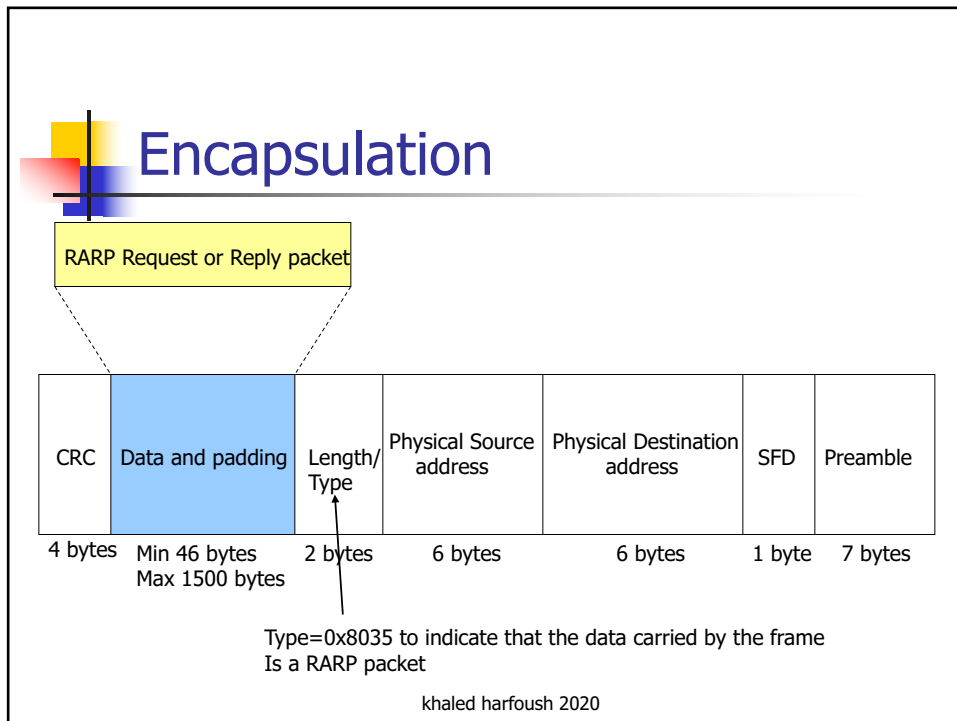
## Proxy (promiscuous) ARP



When lying (spoofing) is good

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## Next Lecture

- The Internet protocol (IP)

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