CSC4200/5200 – COMPUTER NETWORKING

Instructor: Susmit Shannigrahi

ARP AND DHCP

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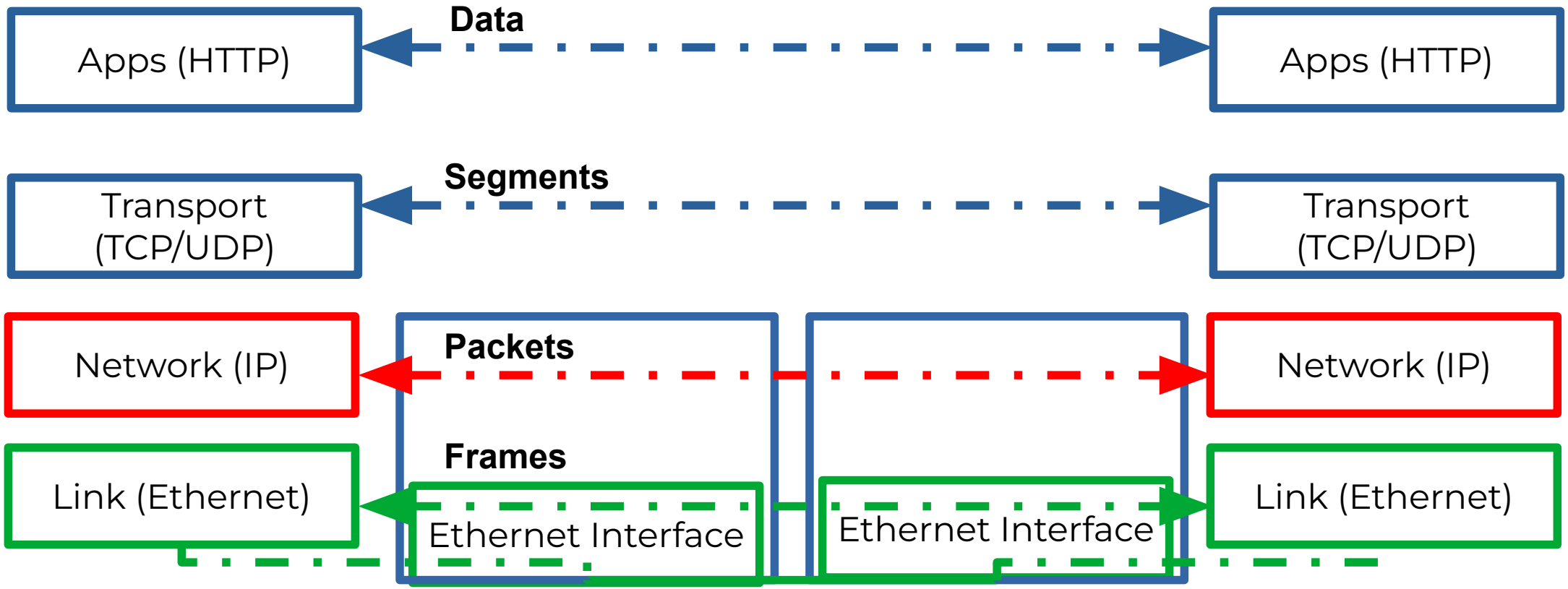
Tennessee TECH



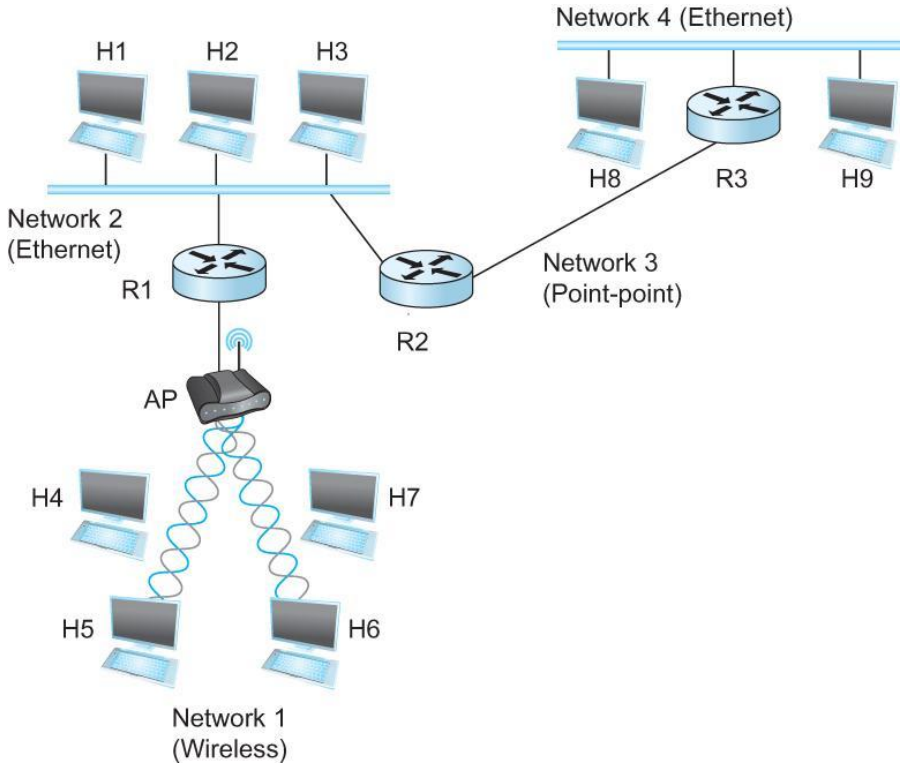
Bits (1010001)

So far...

- We now know how to address hosts and networks!
- Subnetting for scale

Internetworking Protocol (IP)

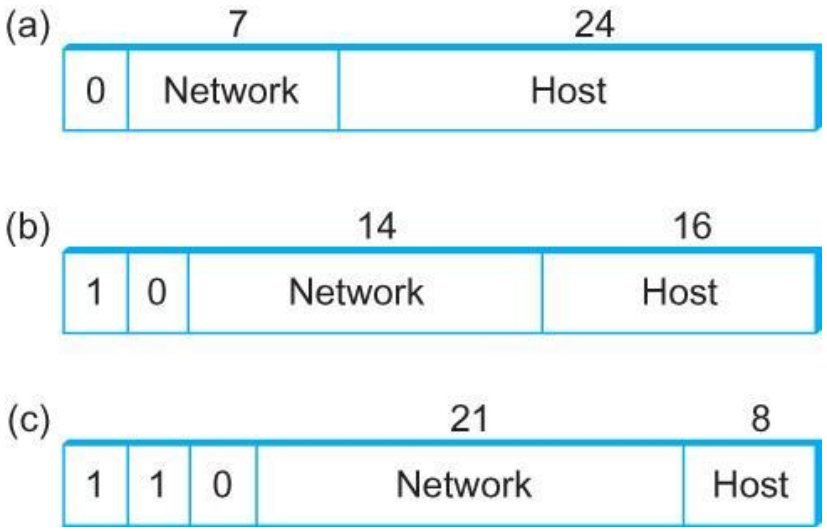
- What is an internetwork?
  - An arbitrary collection of networks
  - provide some sort of host-host to packet delivery service



Global Address in IP – Each node has an unique address

- A 32 bit number in quad-dot notation
- Identifies an ***Interface***
  - ***A host might have several interfaces!!!***
- *129.82.138.254*

  10000001.01010010.10001010.11111110



IP addresses are in Network + Host

- 1.1.2.1 →
  - 1.1 → Network part
  - 2.1 → host part
- Each octet can range from 1- 255

- Hierarchical address

129.82.138.254

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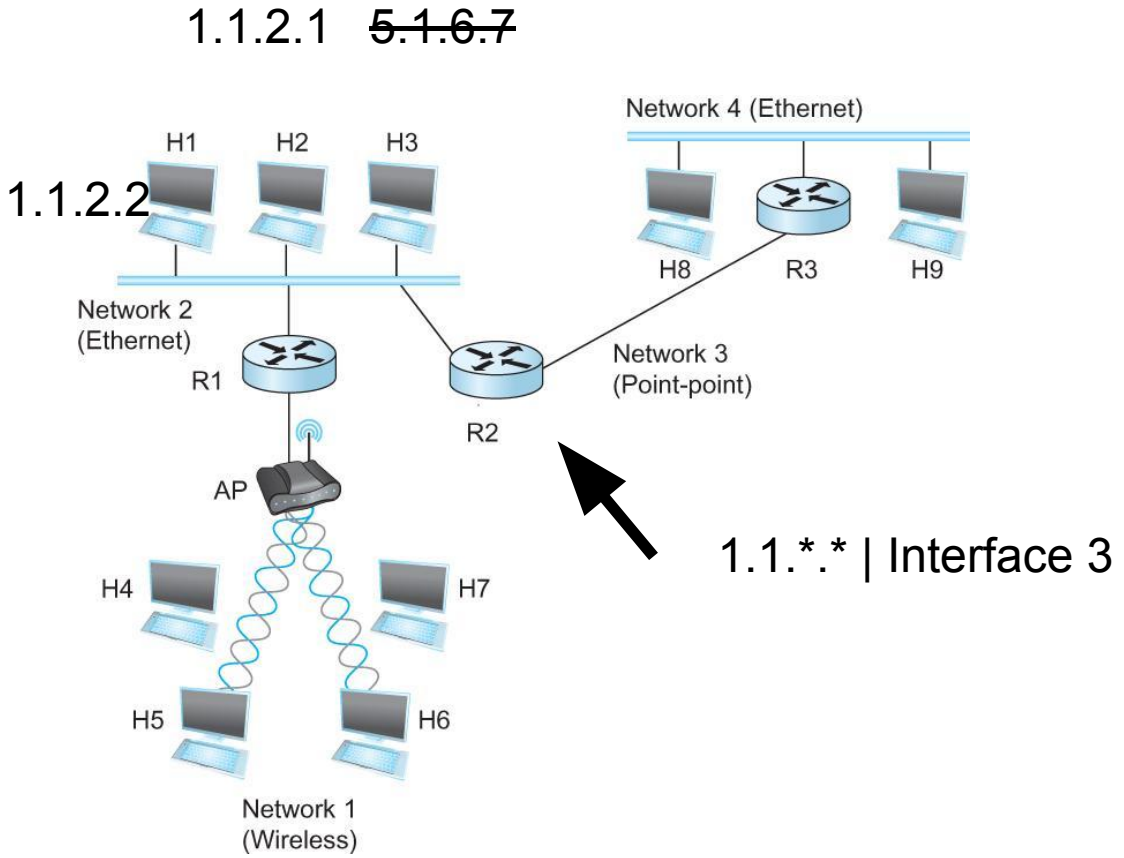
Network part (24 bits). Host part(8 bits)



Calculate the first and the last IP address of a subnet

129.82.138.254/27

First host - host bits 0

10000001.01010010.10001010.11111110
11111111.11111111.11111111.11100000 (LOGICAL AND)

10000001.01010010.10001010.11100000 → 129.82.138.224

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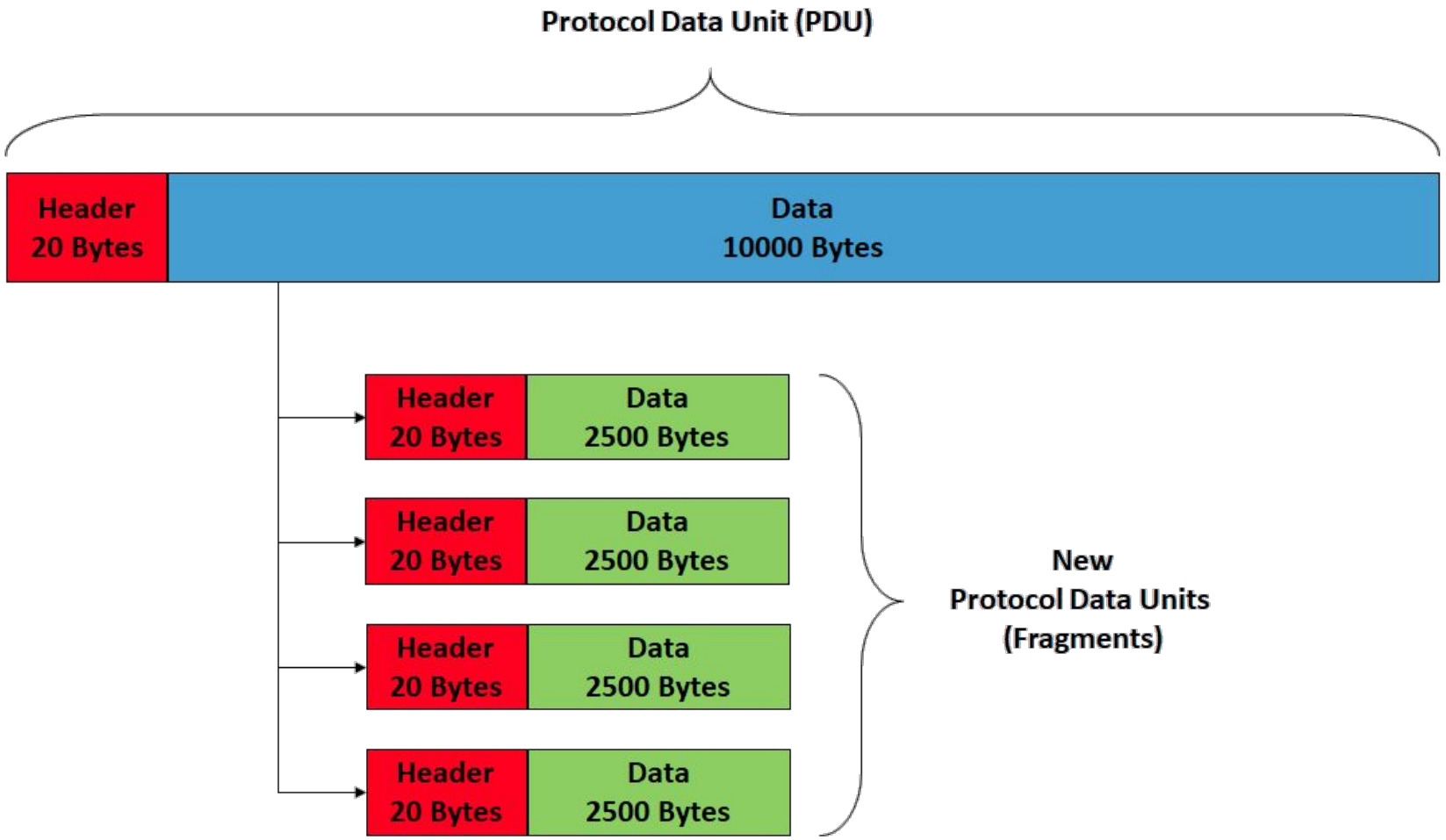
Perform logical AND to get the network part = 129.82.138.224
Available addresses – 129.82.138.225-129.82.138.254
Broadcast address – 129.82.138.255

IP Fragmentation and Reassembly



wikipedia

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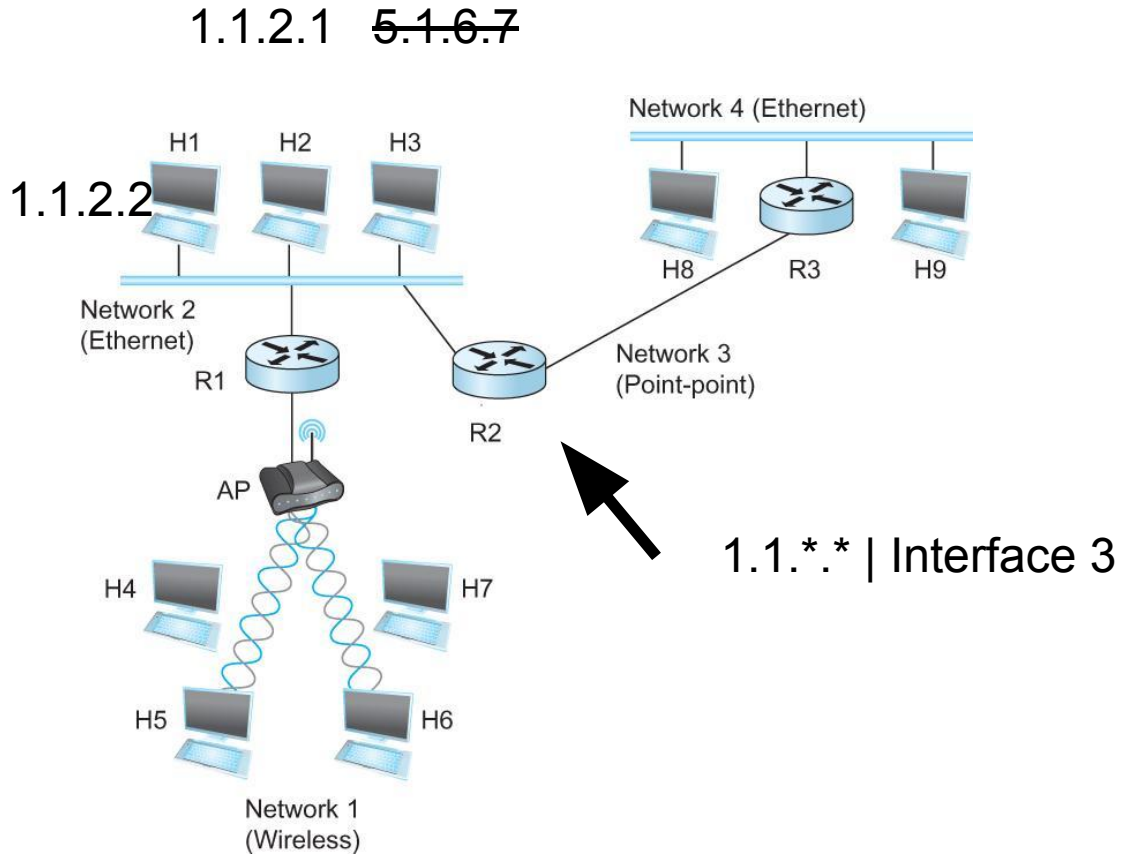
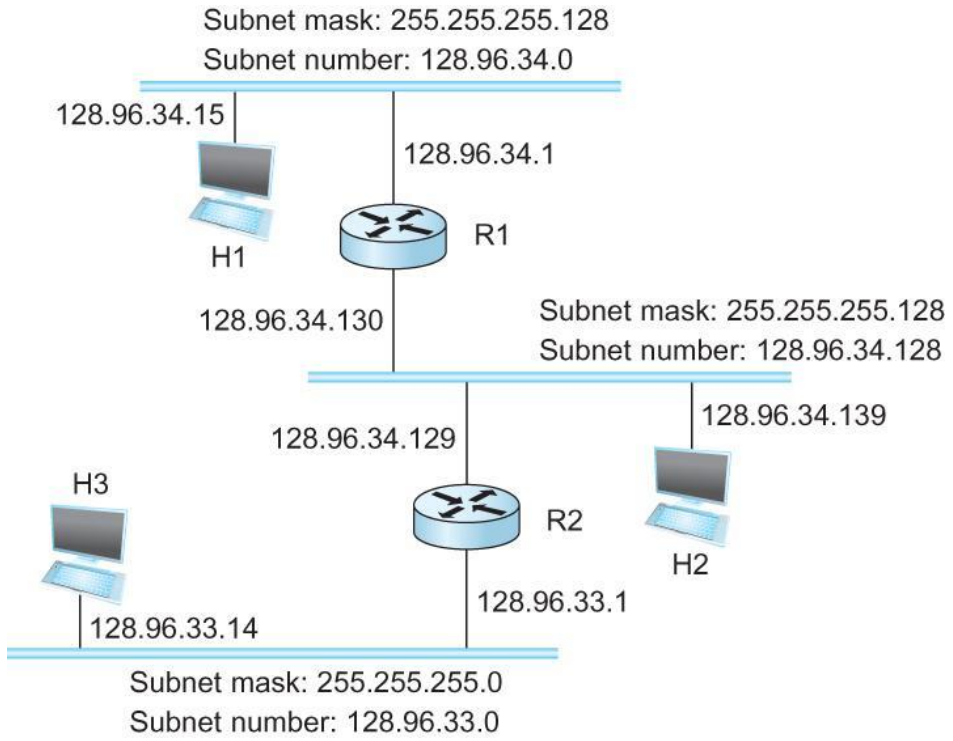


Subnetting



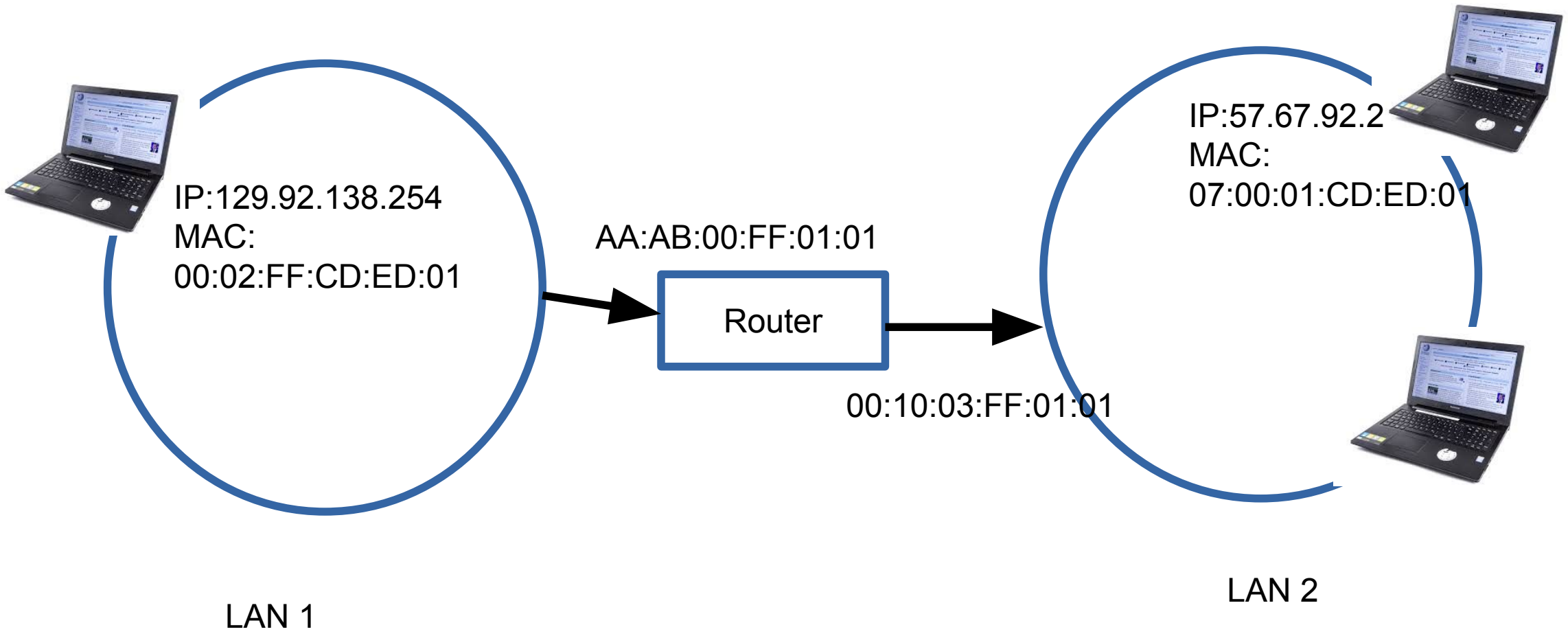
Forwarding Table at Router R1

SubnetNumber	SubnetMask	NextHop
128.96.34.0	255.255.255.128	Interface 0
128.96.34.128	255.255.255.128	Interface 1
128.96.33.0	255.255.255.0	R2

Now let’s map that to MAC address

- Adaptors only understand MAC addresses
- Source: 129.82.138.254, Destination: 129.82.138.5
- You machine does not know what that means:
  - Routers for getting you to the room
  - In the room, you still need to use the MAC address
- Put IP packet in a frame → **Encapsulation**

IP ↔ MAC mapping: Address Resolution Protocol (ARP)



IP ↔ MAC mapping: Address Resolution Protocol (ARP)

- Important concept → Broadcast
  - Shout in the room → Who here is Rachel?

ARP table

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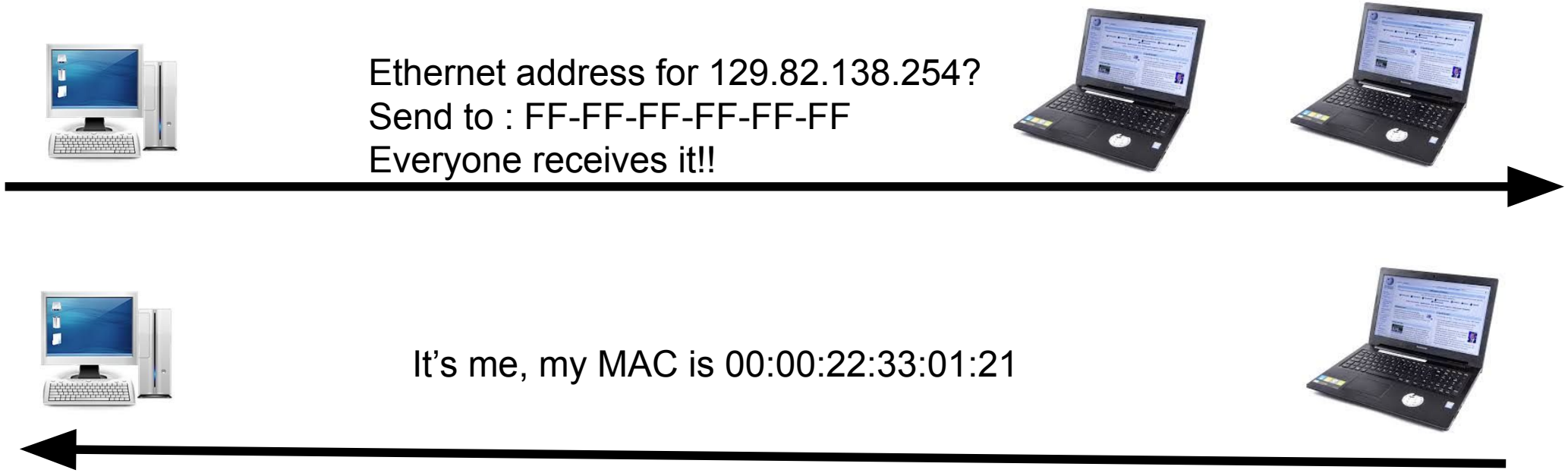
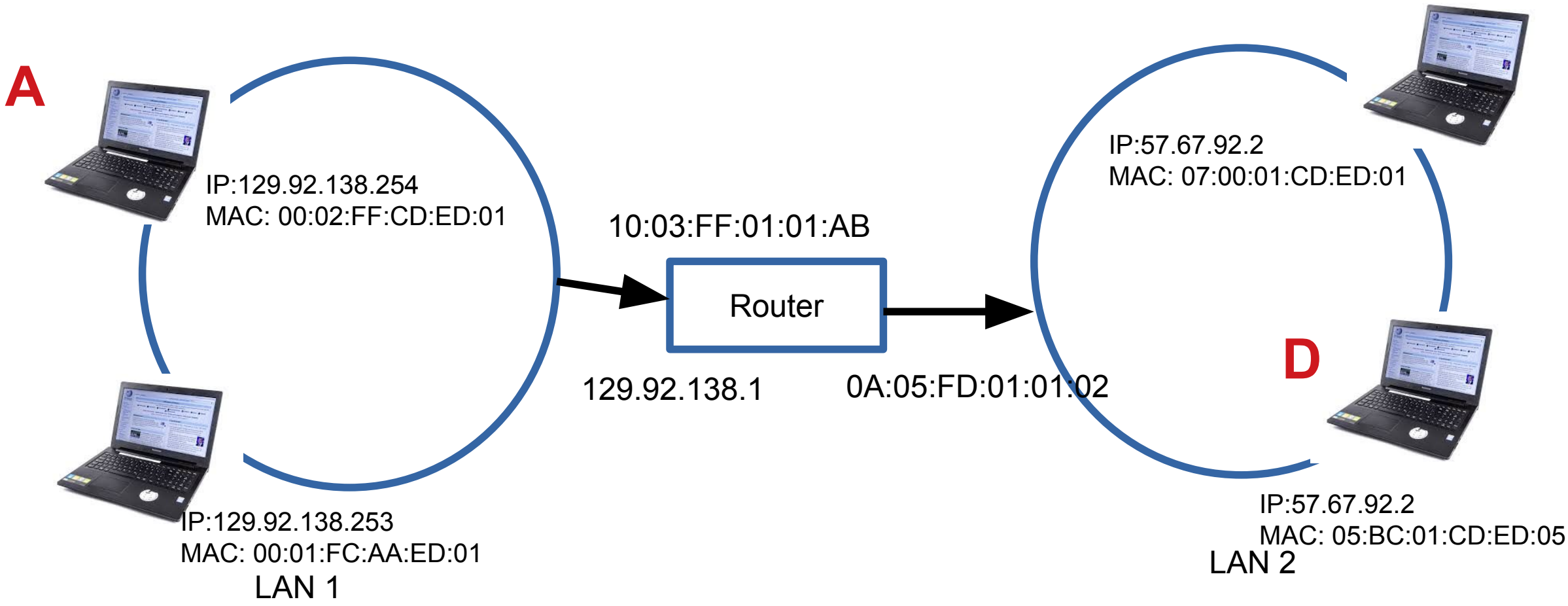


IP ↔ MAC mapping: Address Resolution Protocol (ARP)

- Every node maintains an ARP table
  - <MAC, IP> mapping
- Consult this table when sending IP packets
- Encapsulate with the MAC address, send it the address
- If address is not known, broadcast!
- Cache the response for some time, and eventually forget
  - **Why not broadcast the IP packet?**

How does A talk to D?



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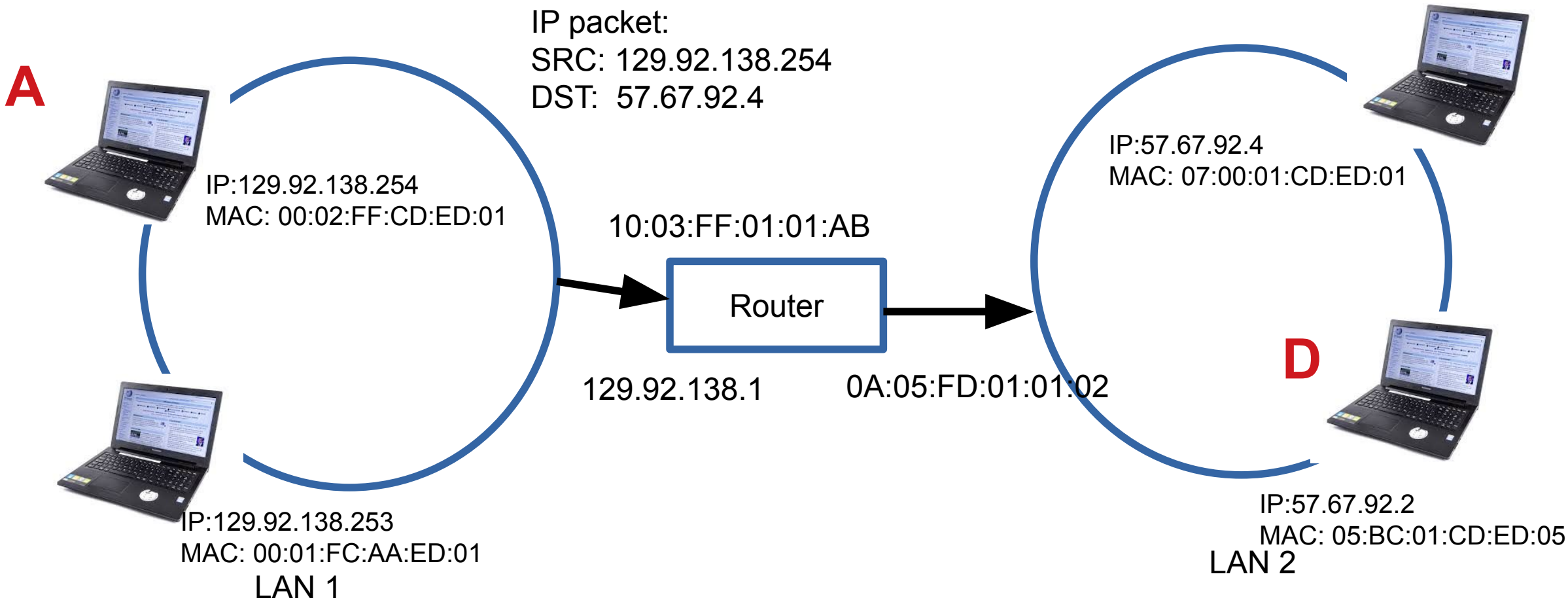

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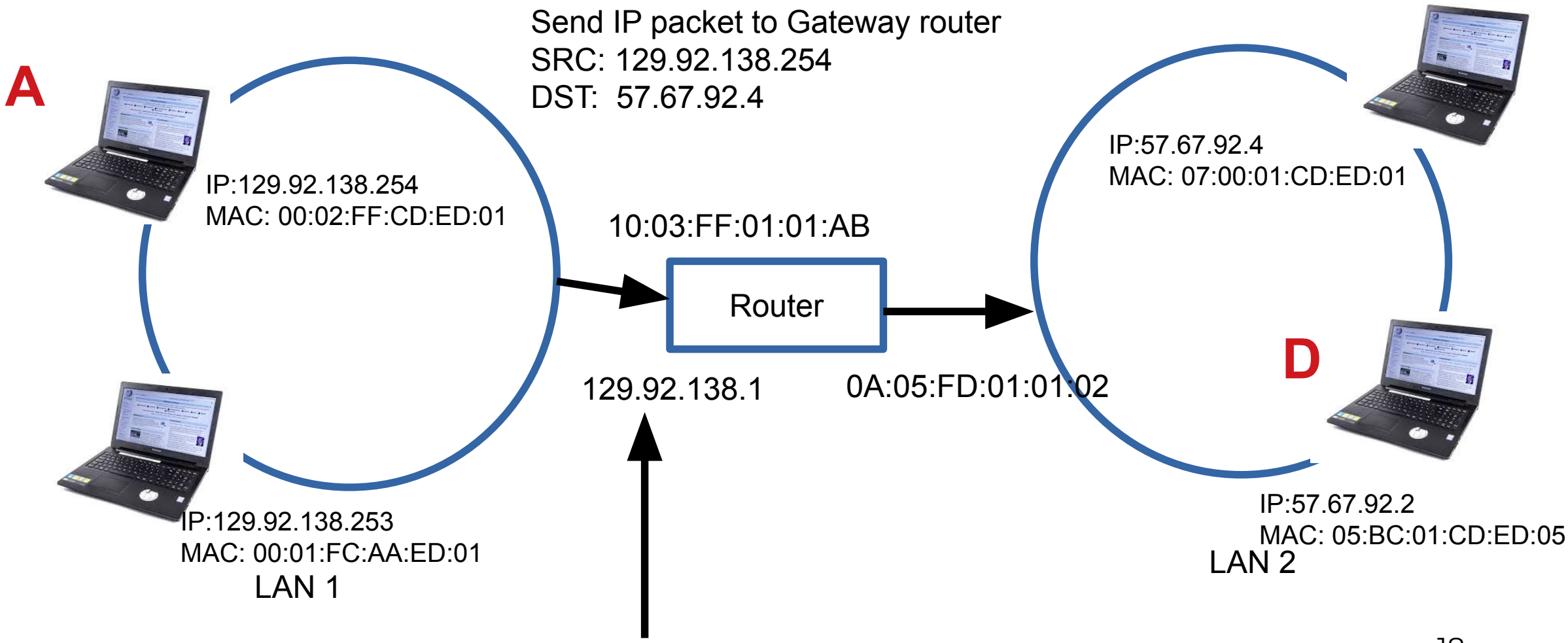

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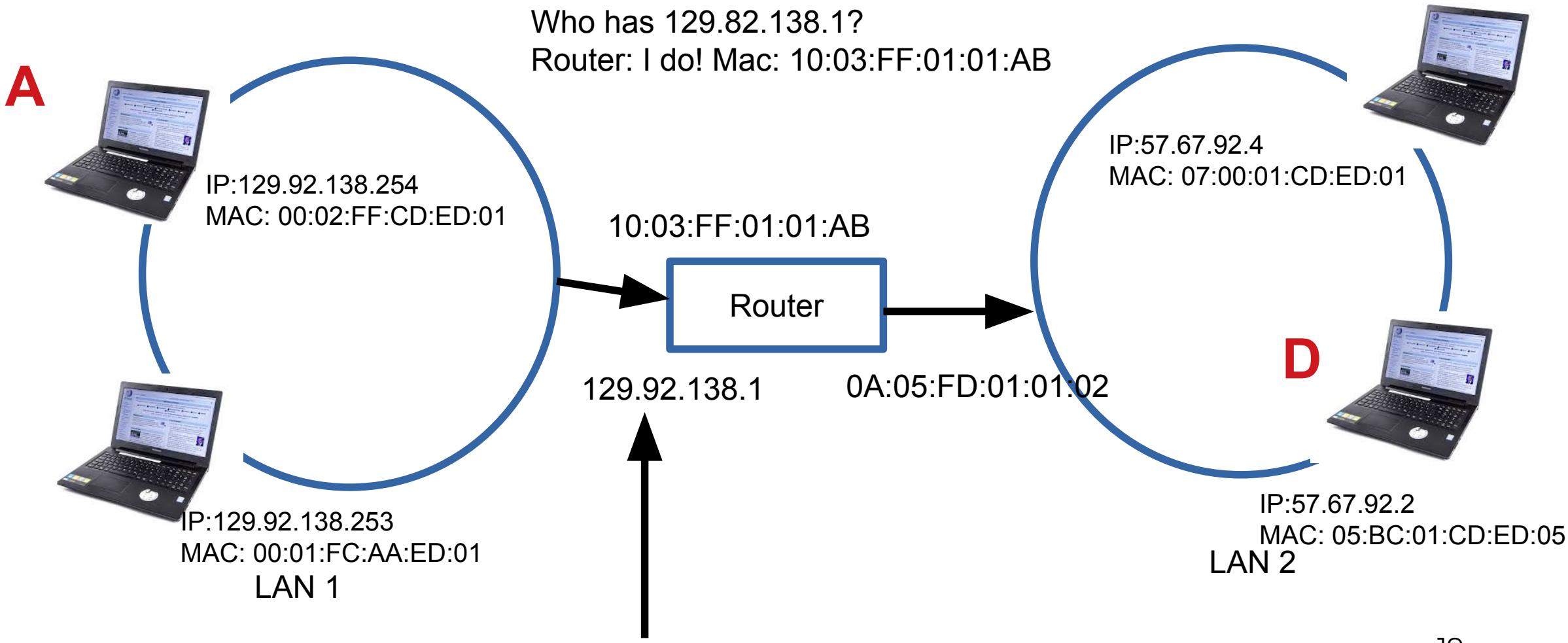

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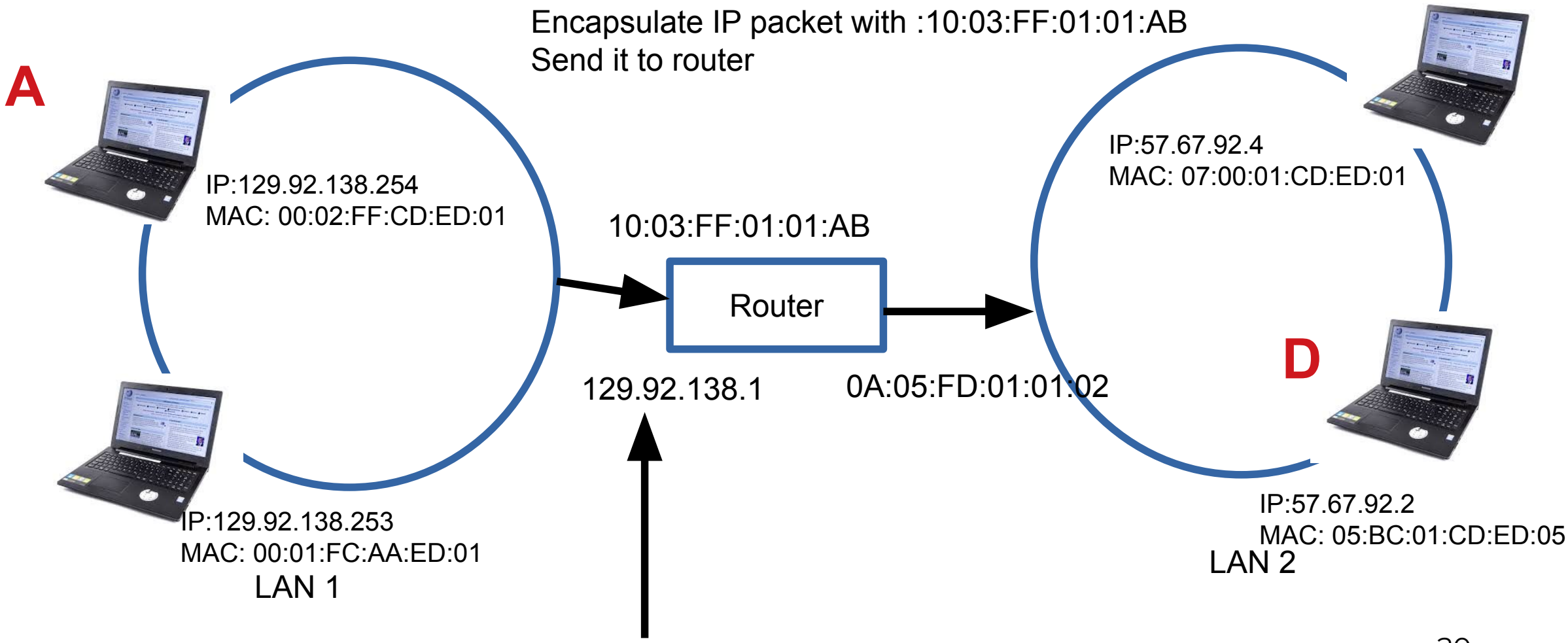

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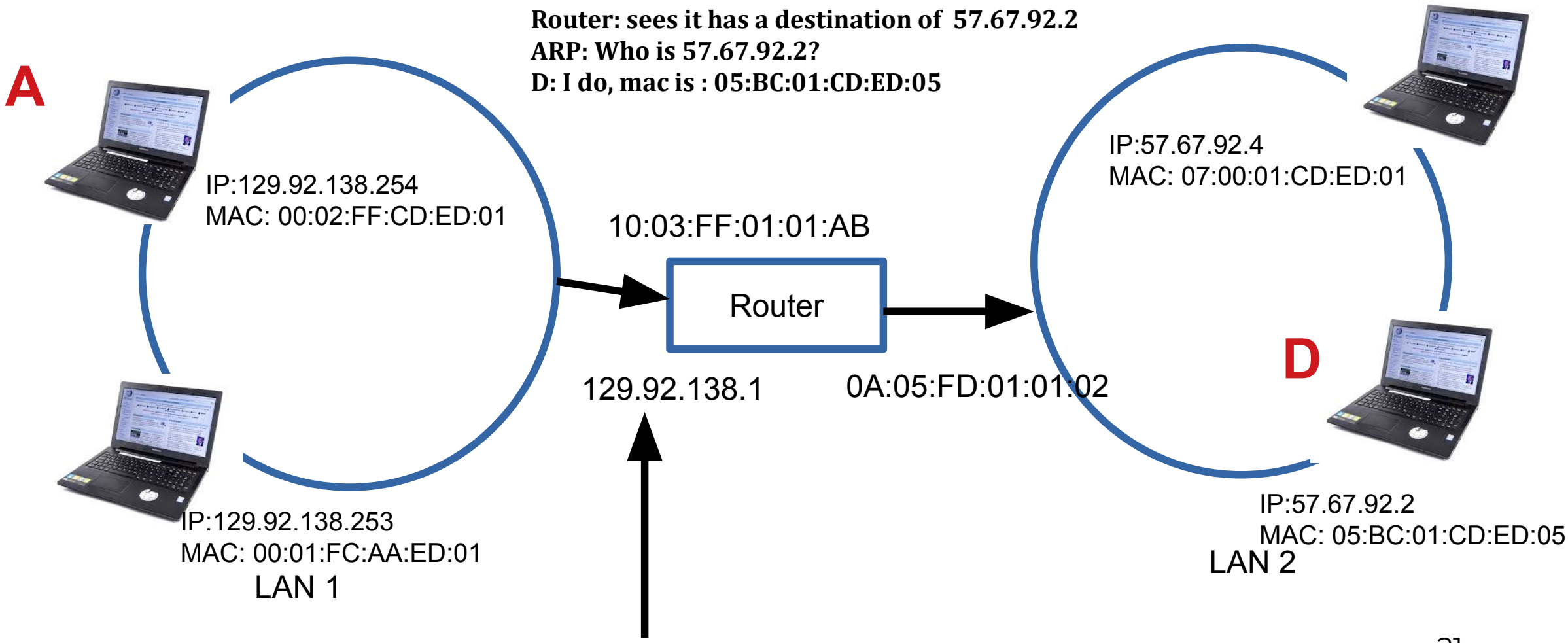

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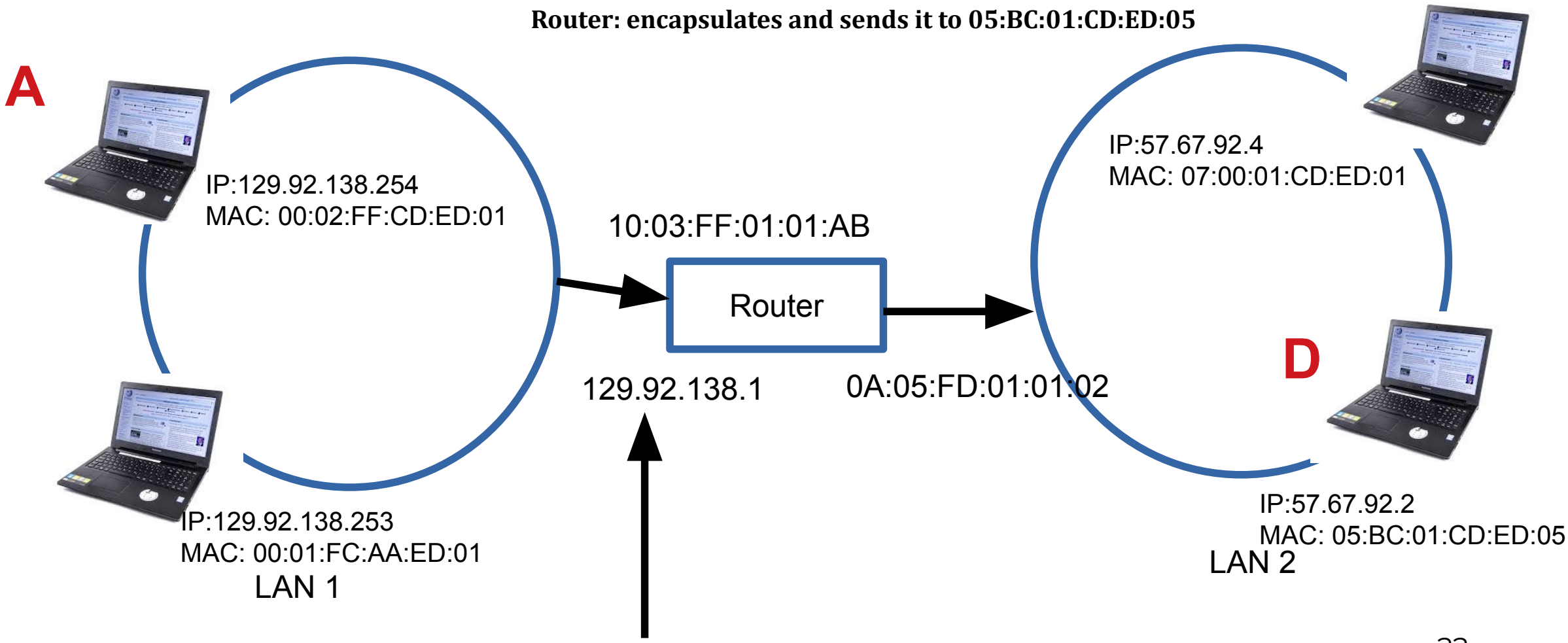
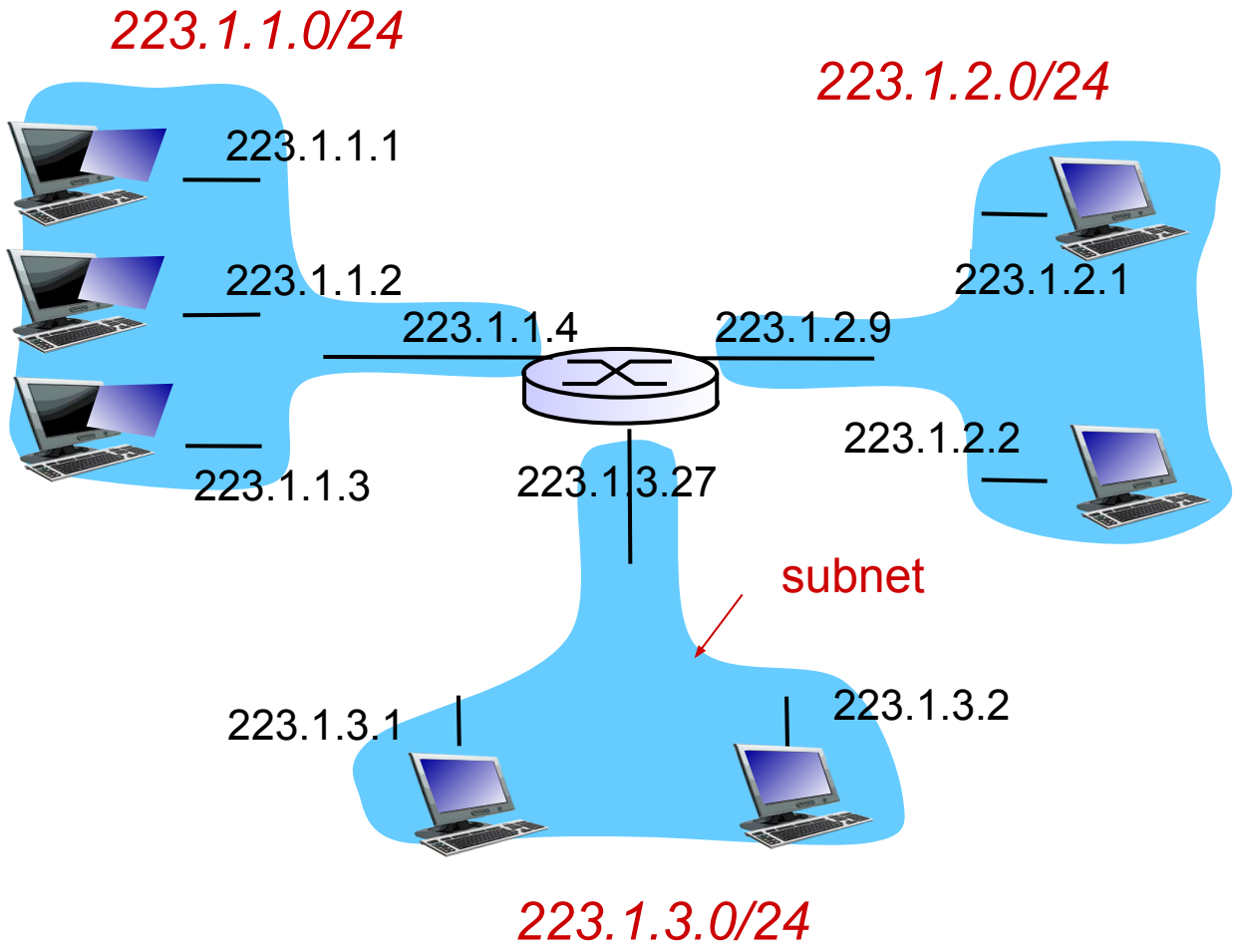


Subnets Revisited

recipe

- to determine the subnets, detach each interface from its host or router, creating islands of isolated networks
- each isolated network is called a *subnet*



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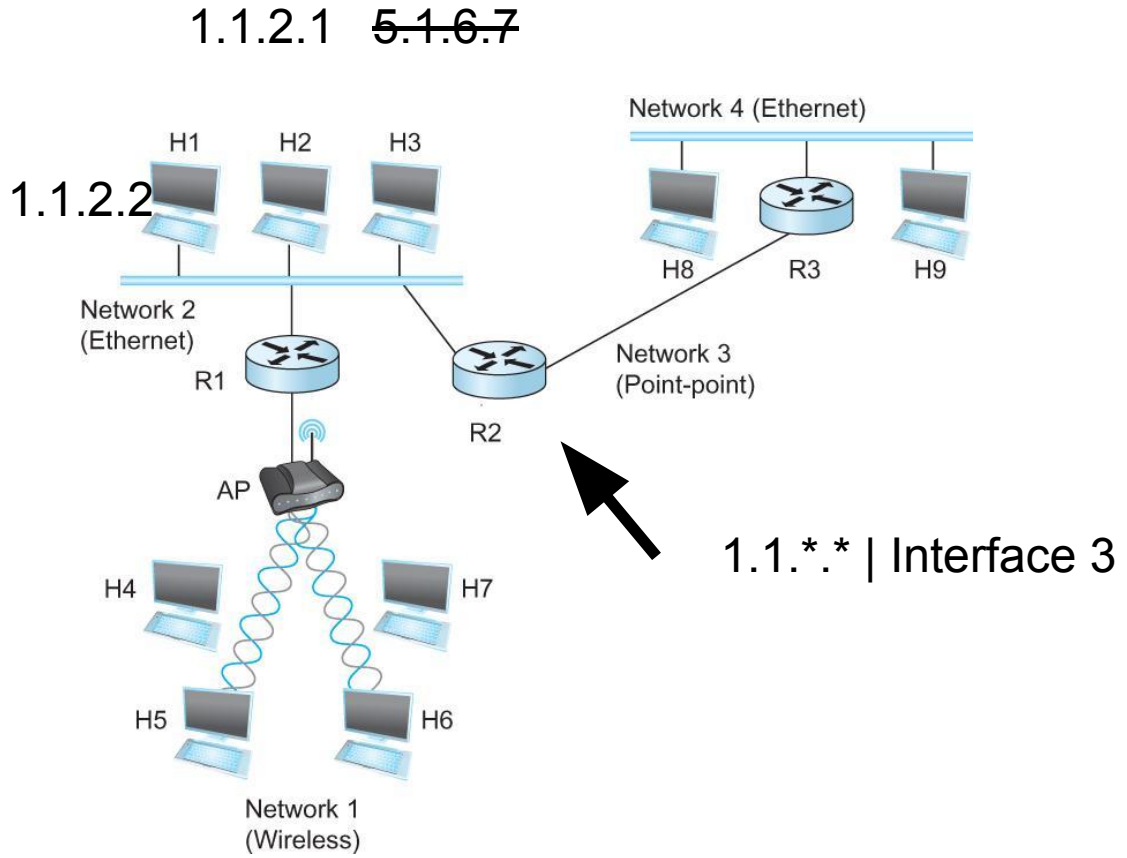

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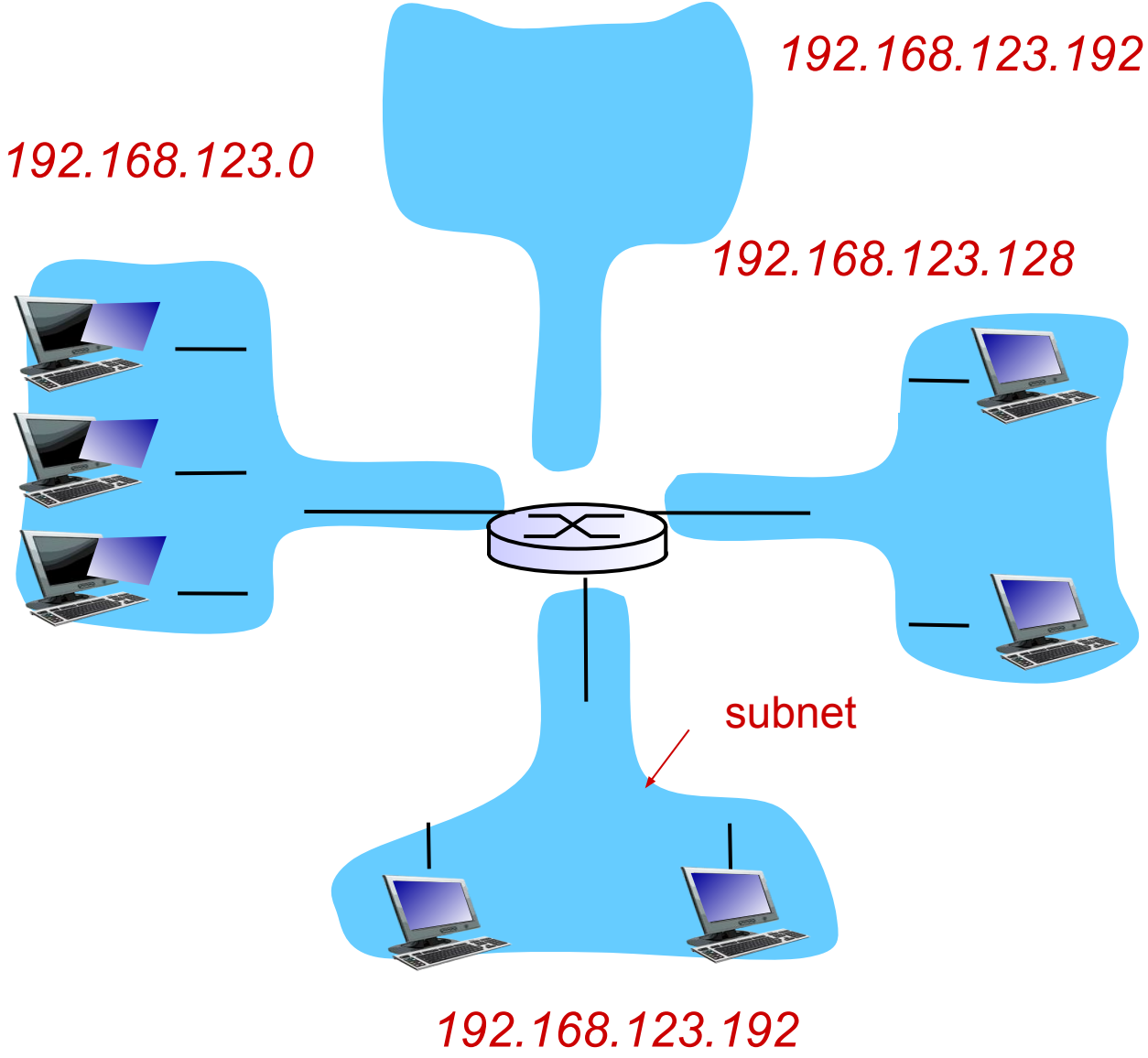
- **Problem**

You have an address block: 192.168.123. /24

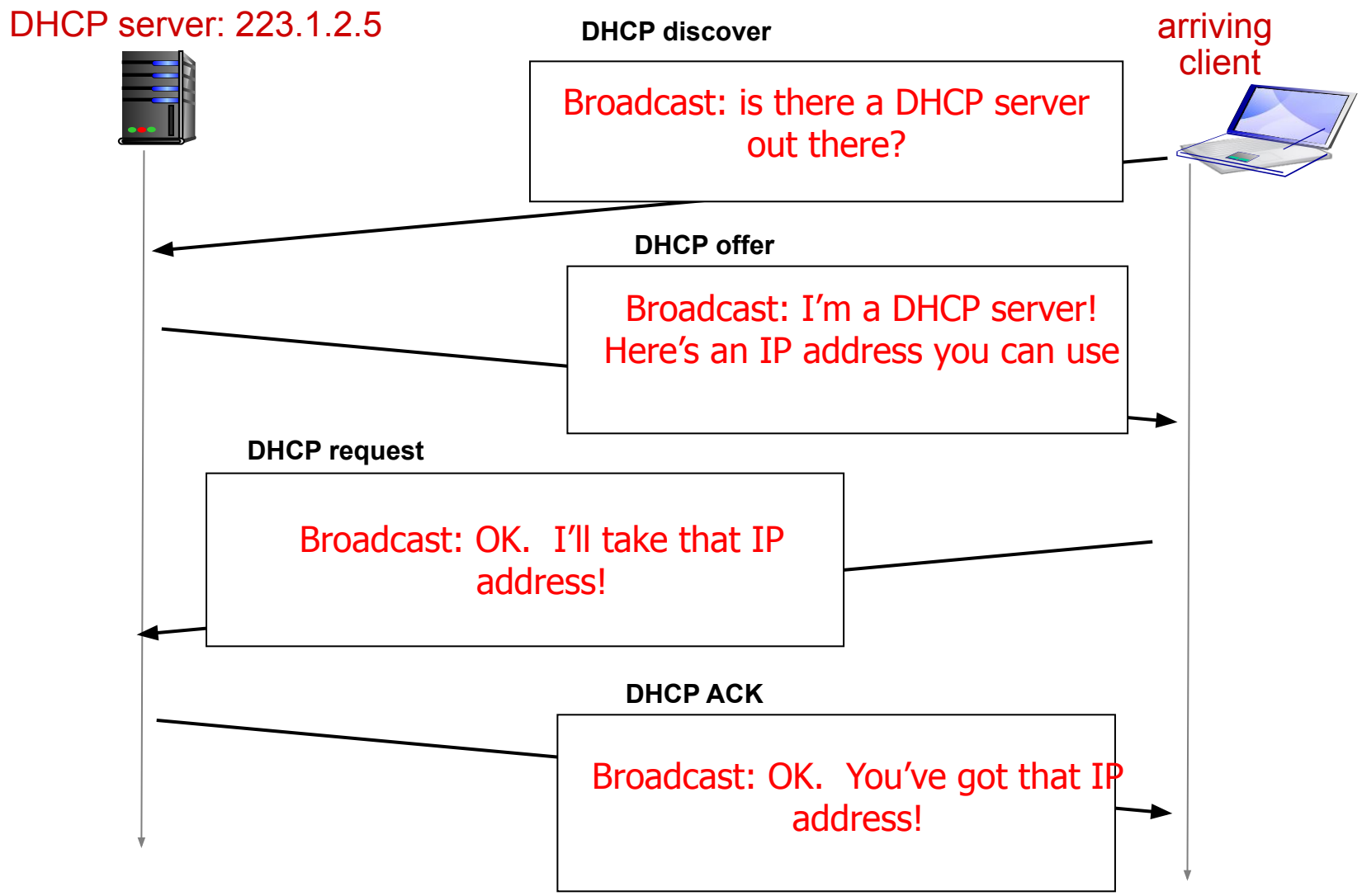


subnet mask: /26

DHCP

- **New laptop joins a network**
- Does not have source address
- Does not know who to ask
- Does not know other network parameters like DNS or Gateway router information

DHCP client-server scenario



kurose/ross

DHCP Server

- A local central database with a list of IP addresses
- 10.0.0.1/8

- Offers an available IP to a client for a period of time
- Lease time – 24 hours, 1 hour, configurable ← ***Soft State***

- Multiple servers might coexist and offer IP to the same request
- Broadcast medium
- Client decides which one to accept

-

DHCP Client – Keep refreshing!

- IP address provided expires after time ***t***

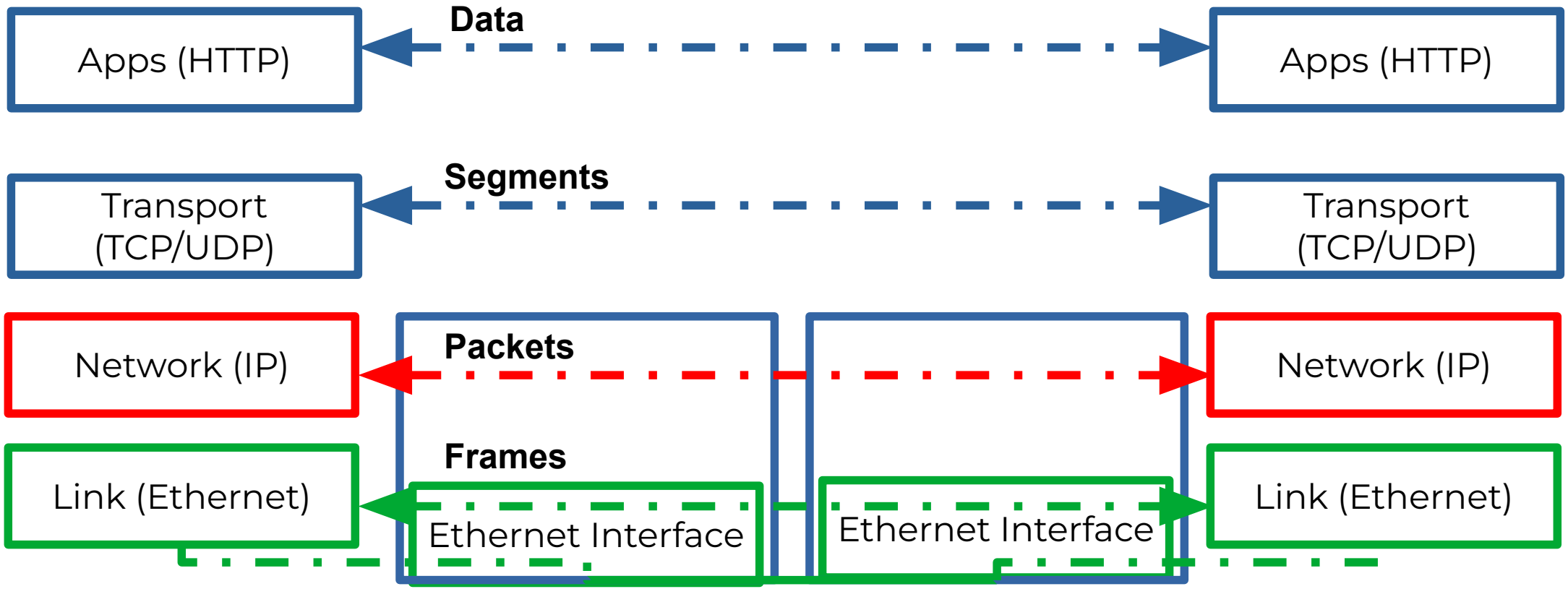
- Client can release DHCP lease
- Shutdown the laptop

- If you walk away from the building
- Crash

- Performance trade off
- Short time – too many broadcasts, quick recovery of addresses
- Long time – less network traffic, longer recovery of addresses

Reading Assignment

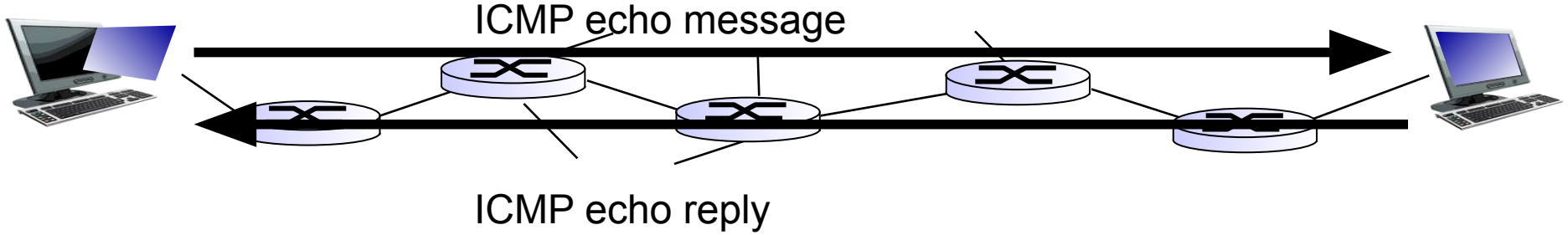
- ARP
  - Chapter 3.2.6
- DHCP
  - Chapter 3.2.7



Bits (1010001)

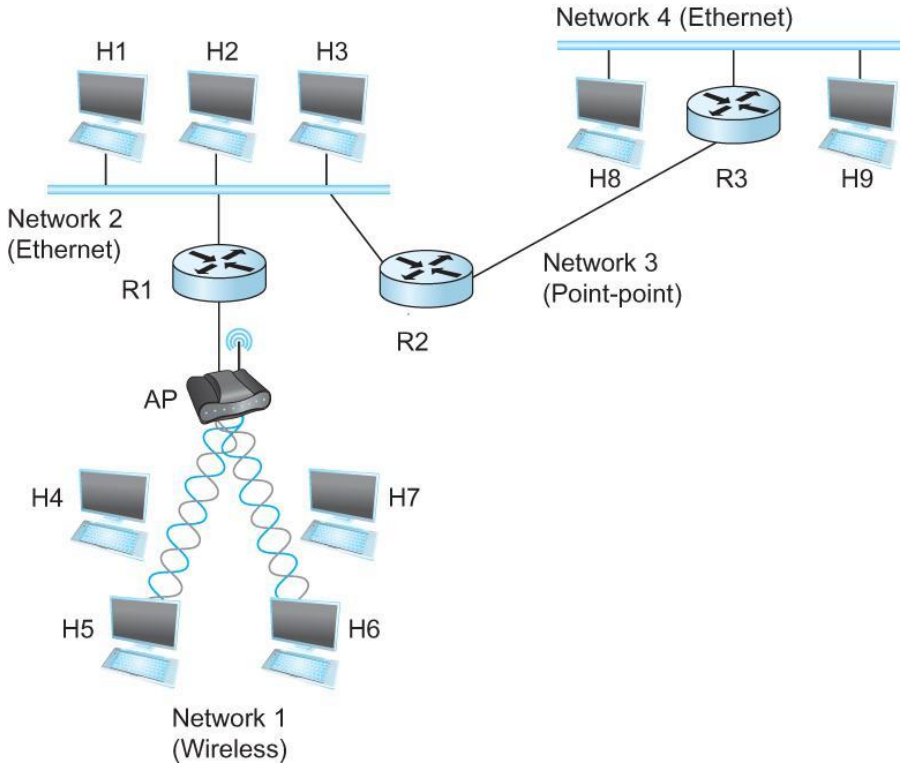
Ping and ICMP

- source sends an ICMP echo message
- Destination sends an ICMP echo reply



. Tying it all together in the network layer

Internetworking Protocol (IP)



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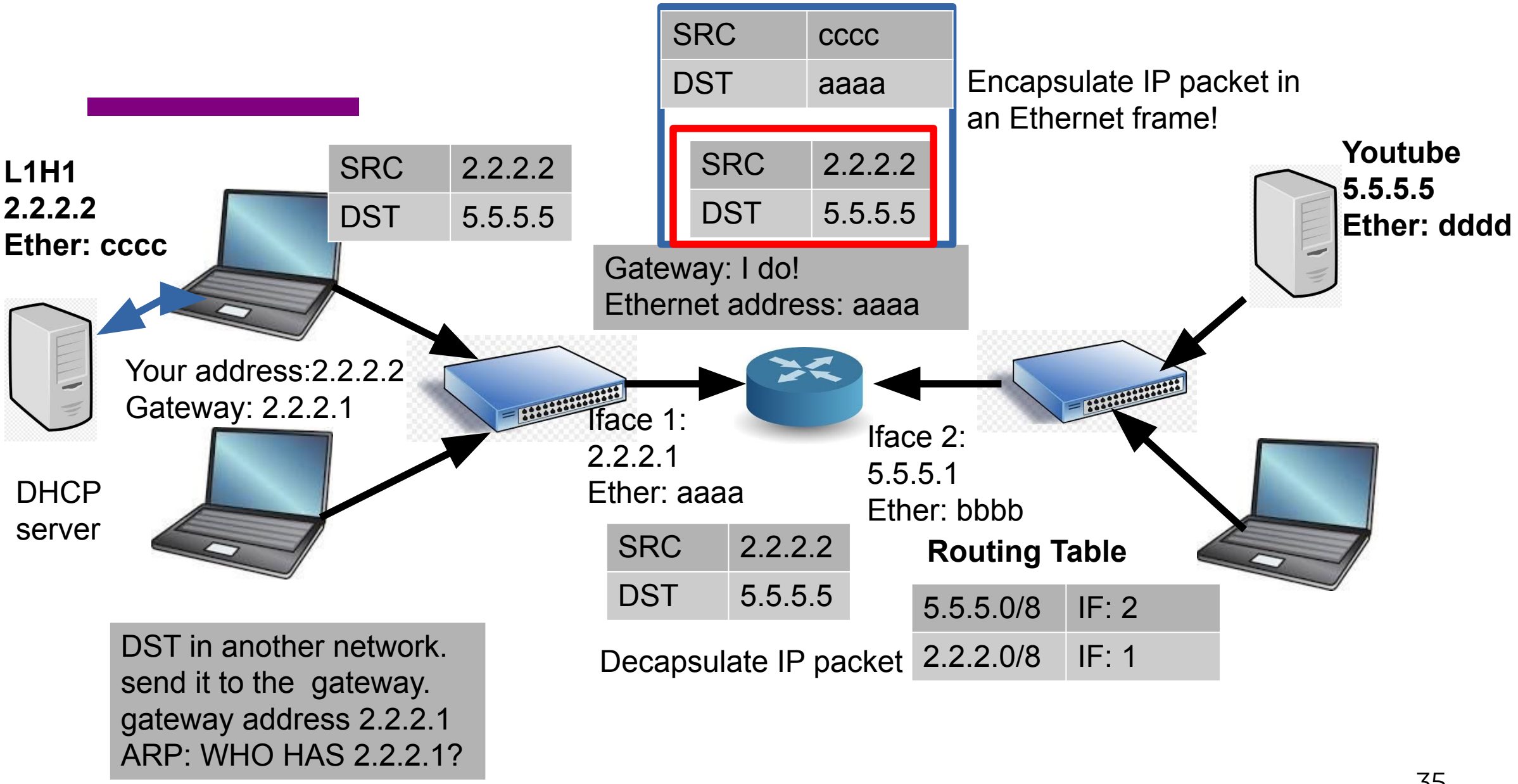

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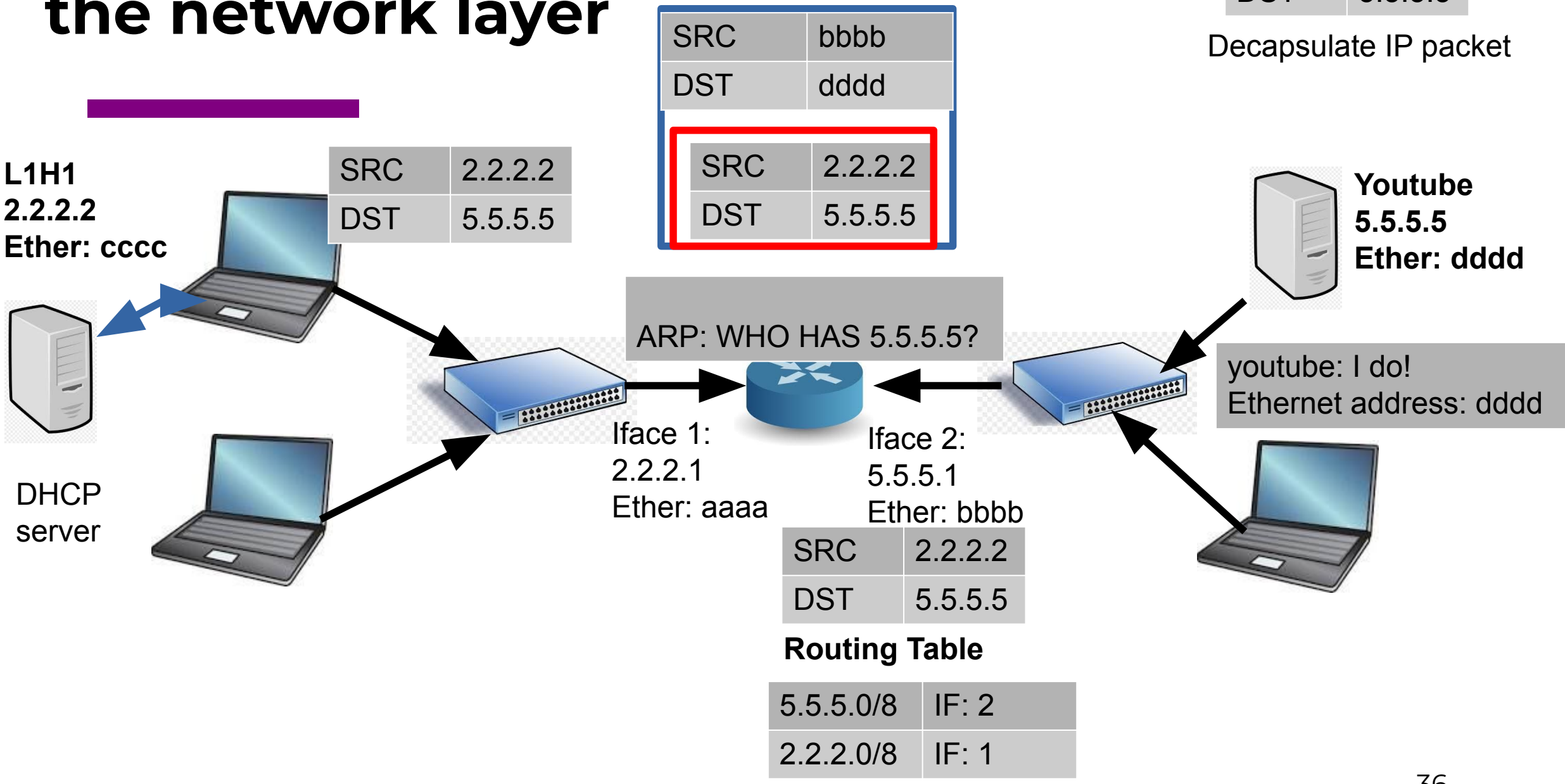

Next Steps

Wait - how are the routing tables populated?
Read through chapter 3.2.

Very useful video: https://www.youtube.com/watch?v=rYodcvhh7b8