

CSC411: Advanced Networks

Addressing: ARP and RARP

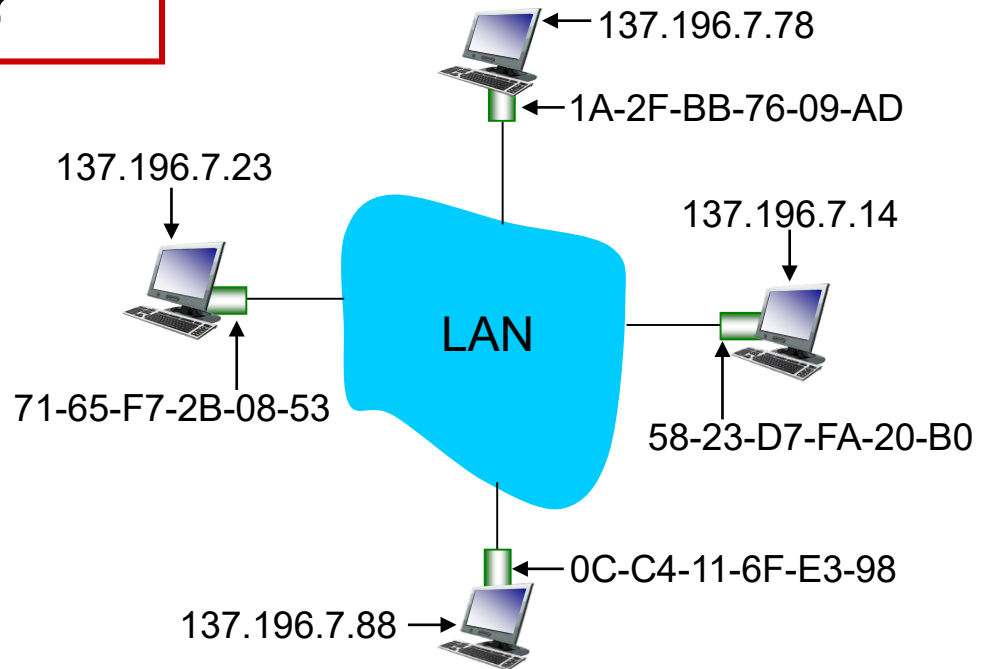
Note: This class lecture will be recorded!

If you do not consent to this recording, please do not ask questions via your video, audio or public chat; send your question to the instructor using the private chat.

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Address Resolution Protocol

Question: how to determine interface's MAC address, knowing its IP address?

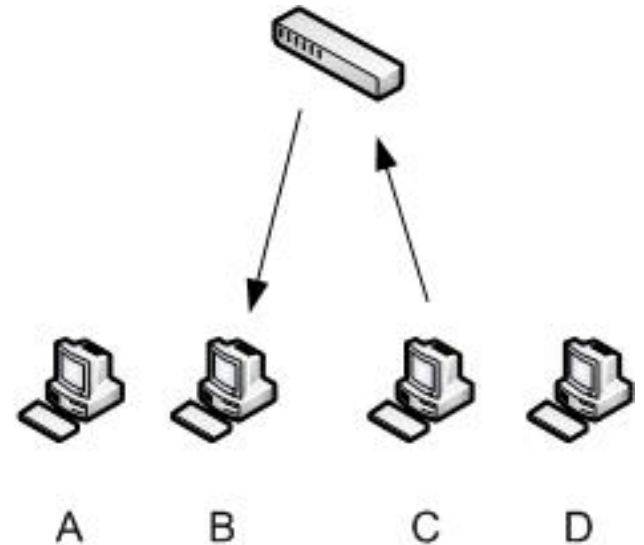
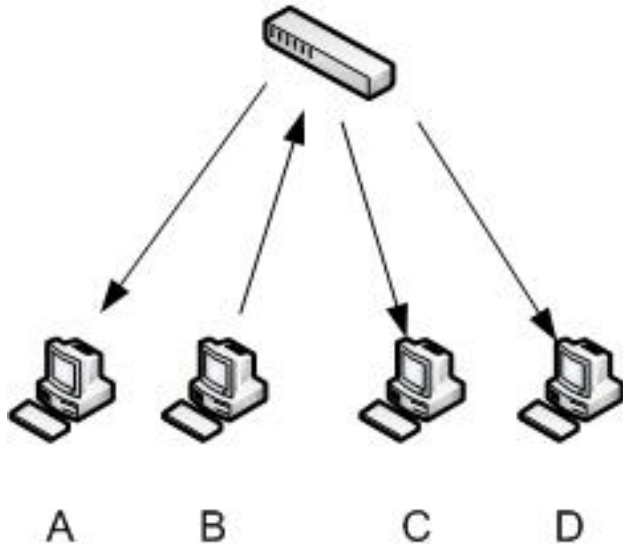


ARP

- ▶ Address Resolution Protocol
- ▶ Network–layer addresses to link–layer addresses
- ▶ Same LAN only
- ▶ ARP broadcast
 - ARP reply
- ▶ Since use a broadcast to find MAC address, why not just broadcast the IP datagram?

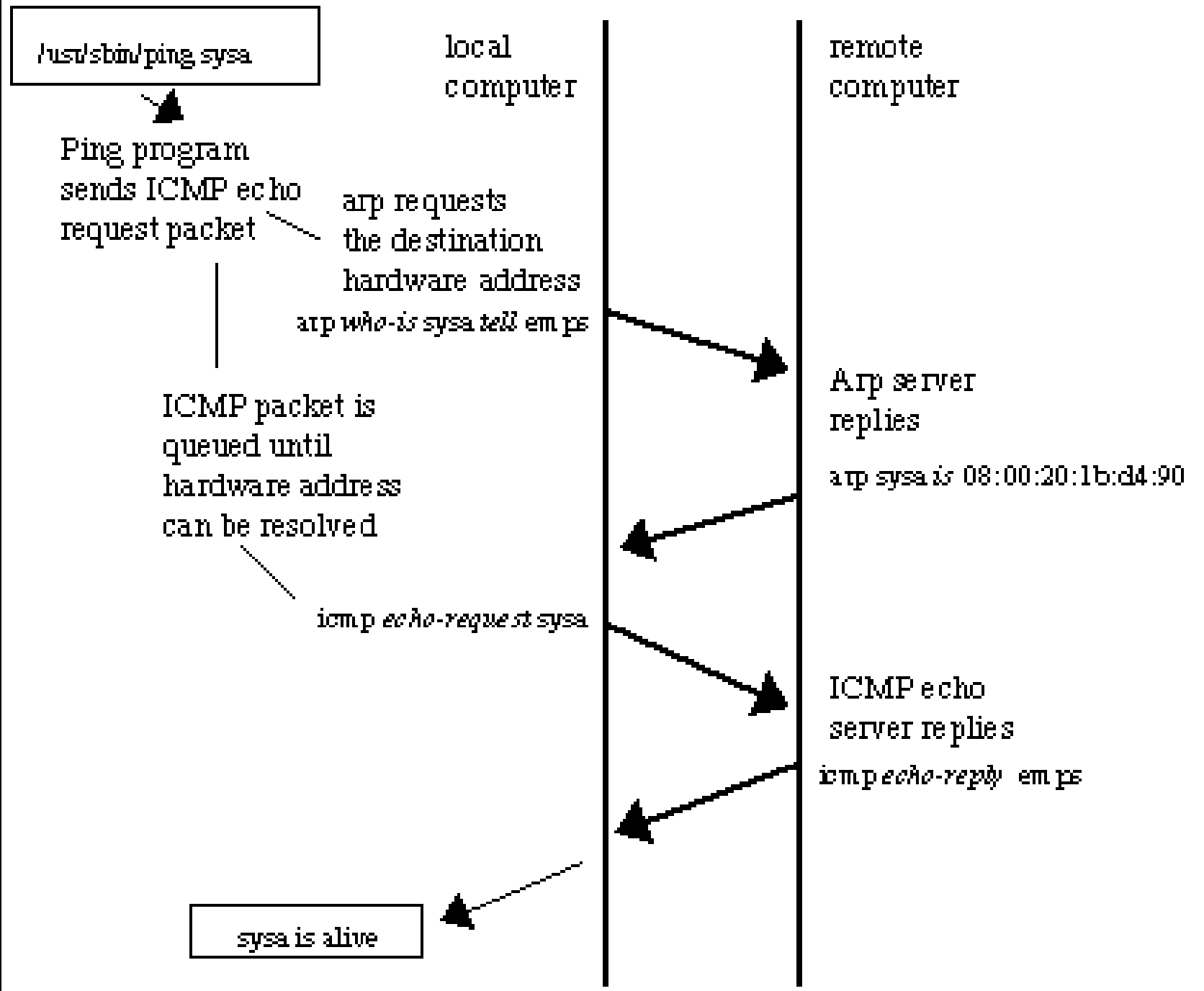
ARP Refinement

- ▶ Source's MAC address included in ARP broadcast

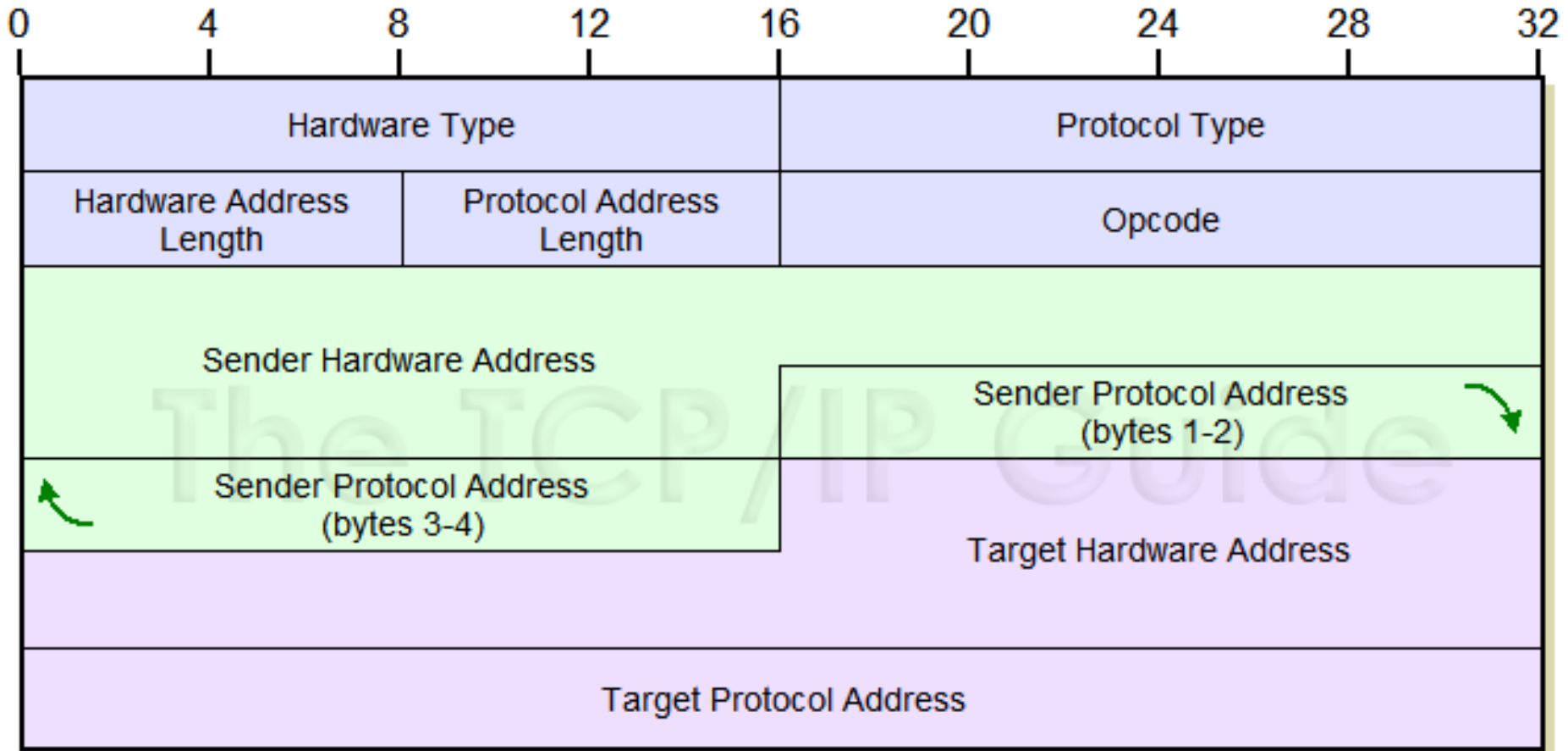


ARP Functions

- ▶ Map IP address to physical address when sending a packet → straightforward
- ▶ Answer ARP requests from other hosts → more complex
 - Ethernet – best-effort delivery



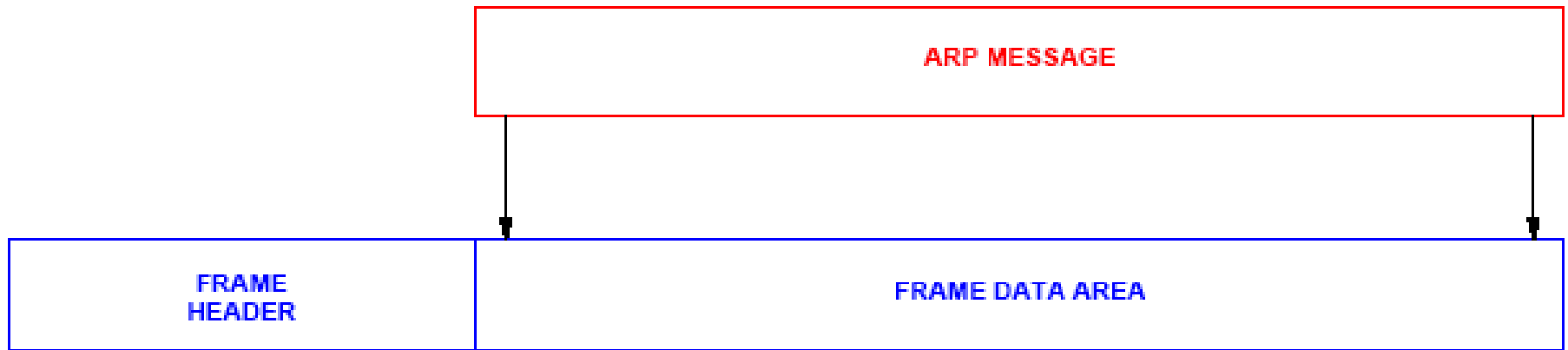
ARP Message Format



ARP Message with Ethernet

0	8	16	31
ETHERNET ADDRESS TYPE (1)		IP ADDRESS TYPE (0800)	
ETH ADDR LEN (6)	IP ADDR LEN (4)	OPERATION	
SENDER'S ETH ADDR (first 4 octets)			
SENDER'S ETH ADDR (last 2 octets)		SENDER'S IP ADDR (first 2 octets)	
SENDER'S IP ADDR (last 2 octets)		TARGET'S ETH ADDR (first 2 octets)	
TARGET'S ETH ADDR (last 4 octets)			
TARGET'S IP ADDR (all 4 octets)			

ARP Encapsulation



ARP Algorithm

Given: An incoming ARP message (either a request or response)

Perform: Process the message and update the ARP cache

Method:

Extract the sender's IP address, I and MAC address, M

If (address I is already in the ARP cache) {

 Replace the MAC address in the cache with M

}

If (message is a request and target is "me") {

 Add an entry to the ARP cache for the sender
 provided no entry exists;

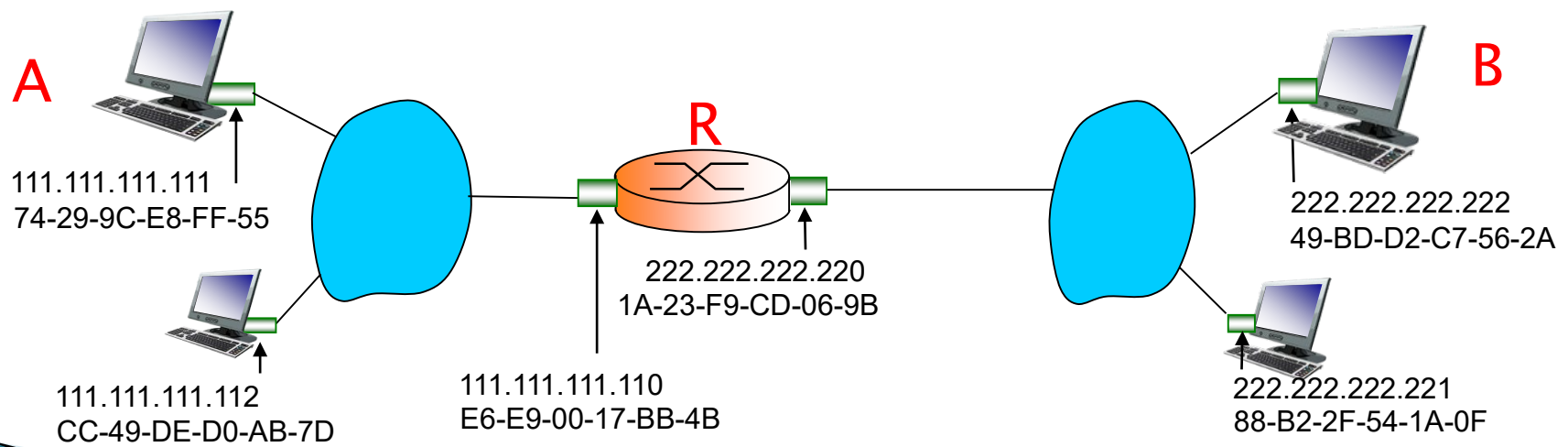
 Generate and send a response;

}

Addressing: routing to another LAN

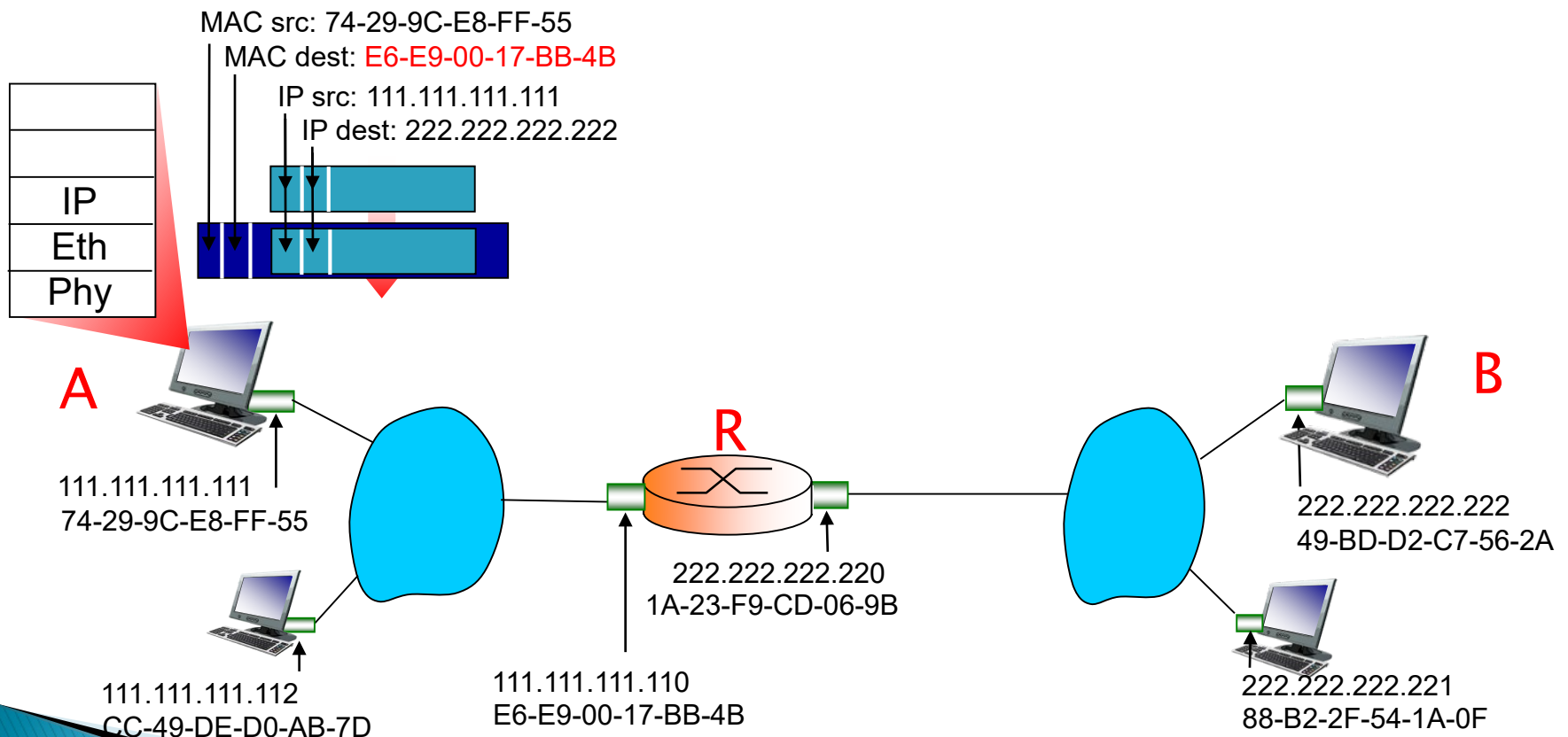
walkthrough: send datagram from A to B via R

- focus on addressing – at IP (datagram) and MAC layer (frame)
- assume A knows B's IP address
- assume A knows IP address of first hop router, R (how?)
- assume A knows R's MAC address (how?)



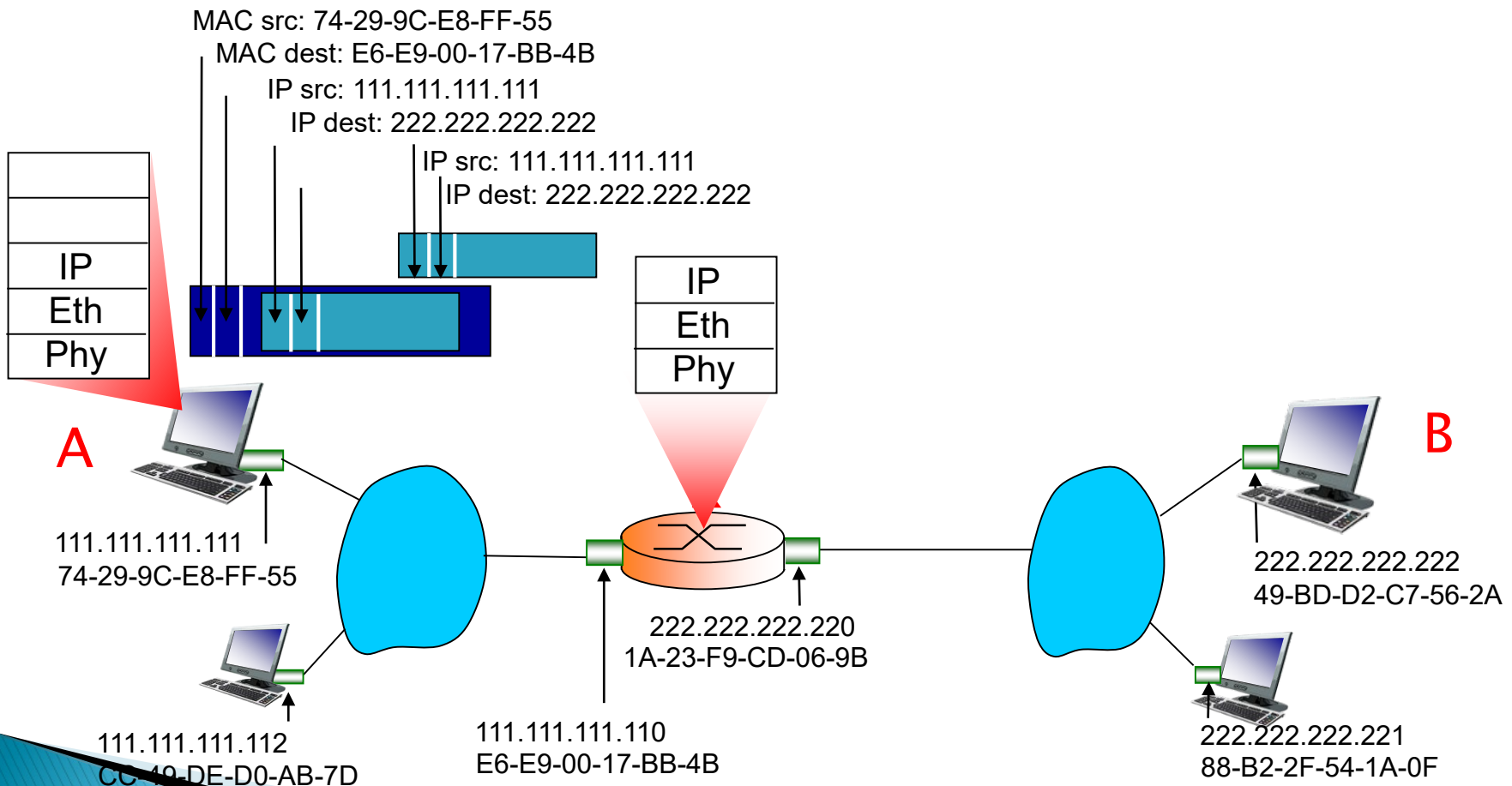
Addressing: routing to another LAN

- ❖ A creates IP datagram with IP source A, destination B
- ❖ A creates link-layer frame with R's MAC address as dest, frame contains A-to-B IP datagram



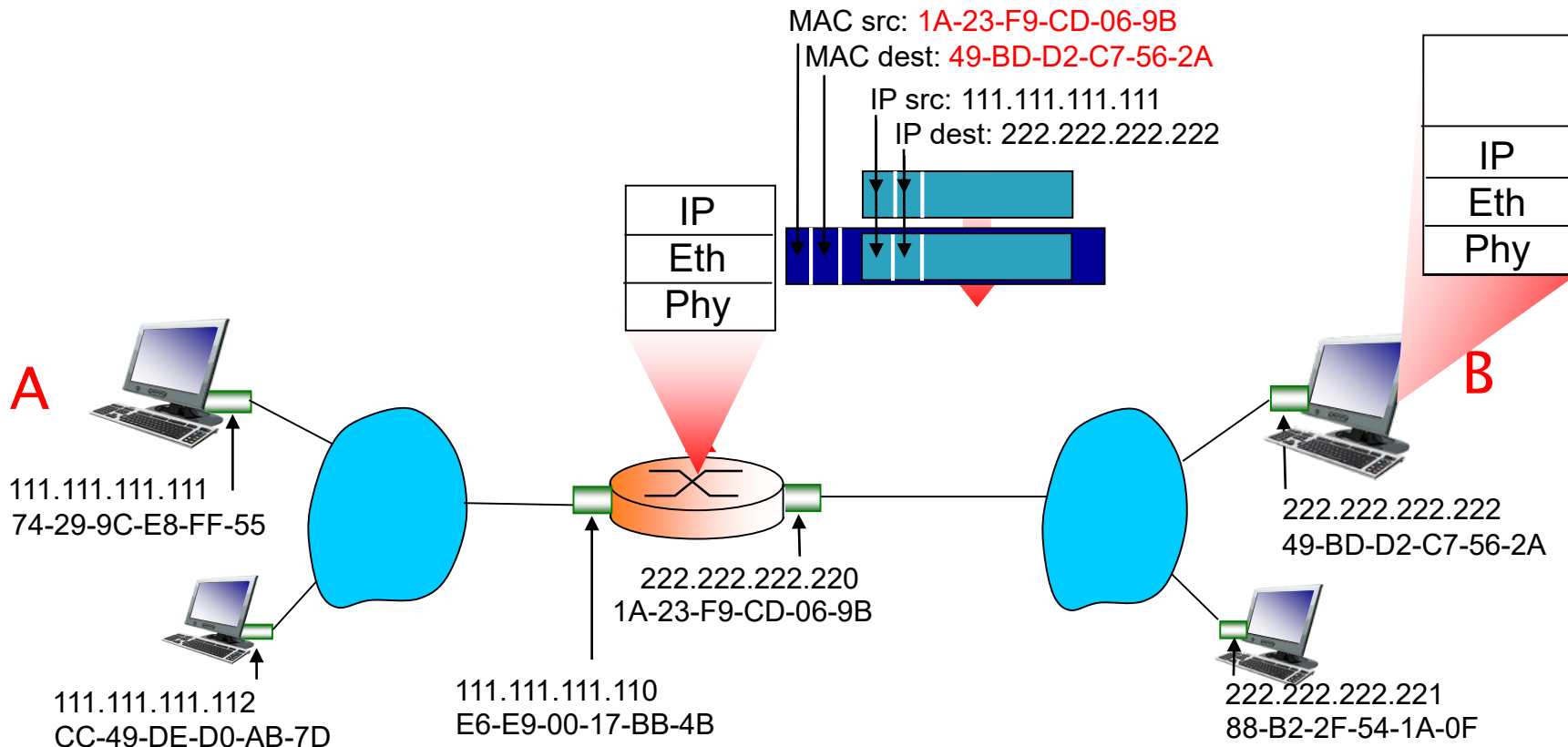
Addressing: routing to another LAN

- ❖ frame sent from A to R
- ❖ frame received at R, datagram removed, passed up to IP



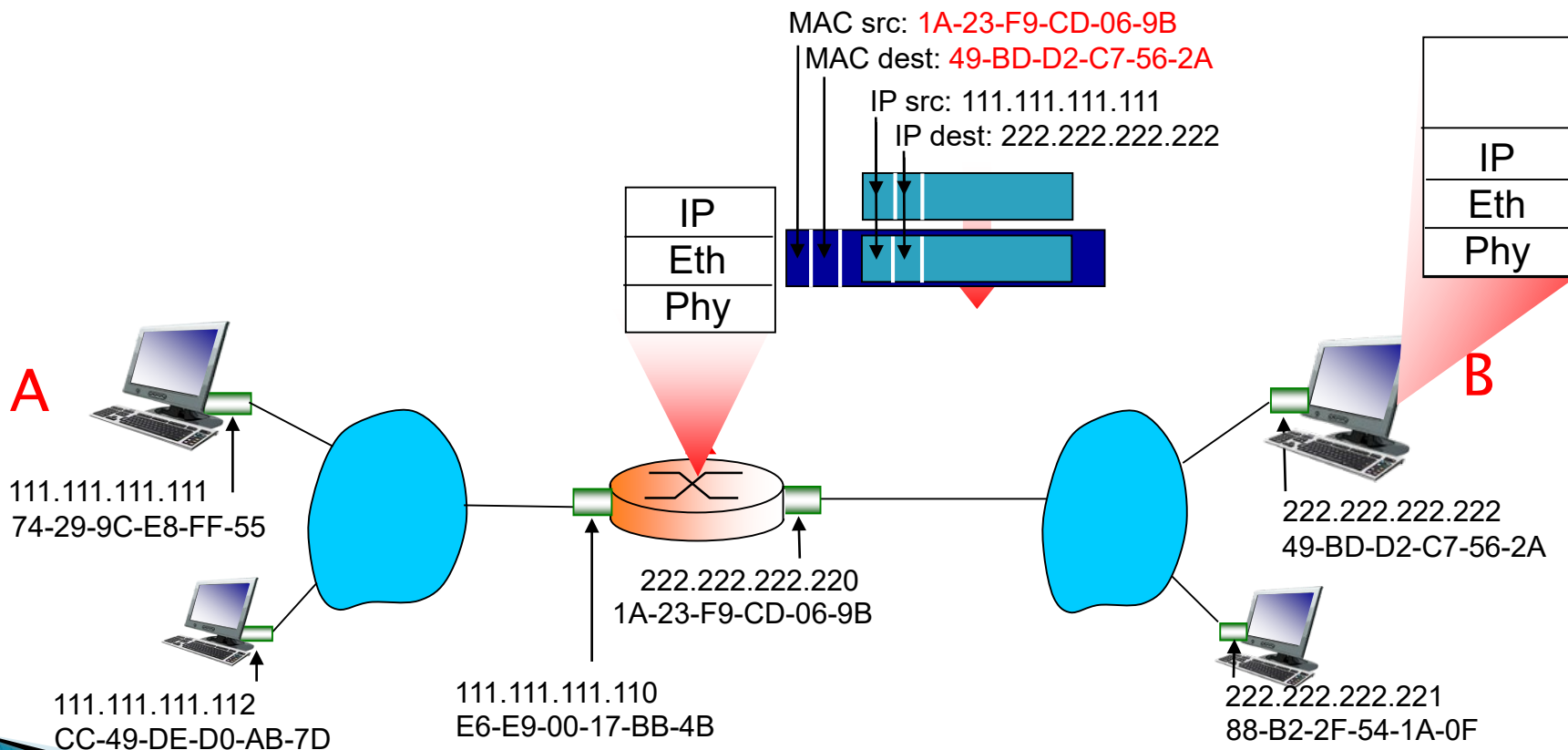
Addressing: routing to another LAN

- ❖ R forwards datagram with IP source A, destination B
- ❖ R creates link-layer frame with B's MAC address as dest, frame contains A-to-B IP datagram



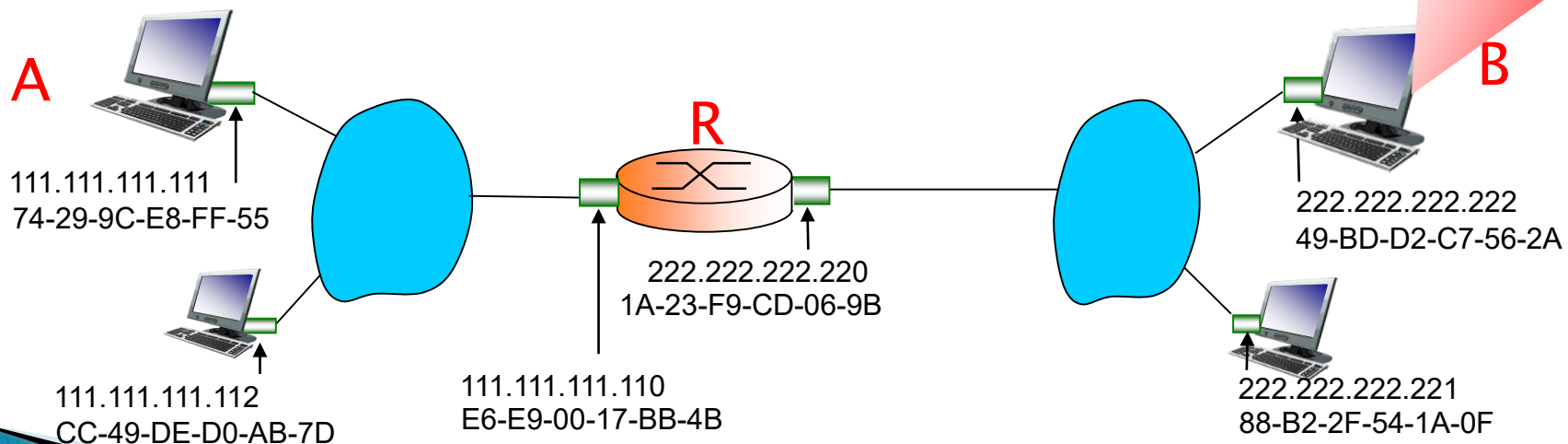
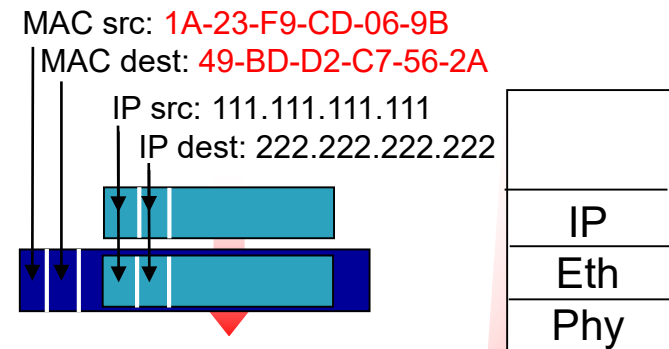
Addressing: routing to another LAN

- ❖ R forwards datagram with IP source A, destination B
- ❖ R creates link-layer frame with B's MAC address as dest, frame contains A-to-B IP datagram



Addressing: routing to another LAN

- ❖ R forwards datagram with IP source A, destination B
- ❖ R creates link-layer frame with B's MAC address as dest, frame contains A-to-B IP datagram



RARP

- ▶ Reverse ARP
- ▶ Same message format as ARP
- ▶ Obtain an address from a server (RARP Server)
- ▶ Diskless clients