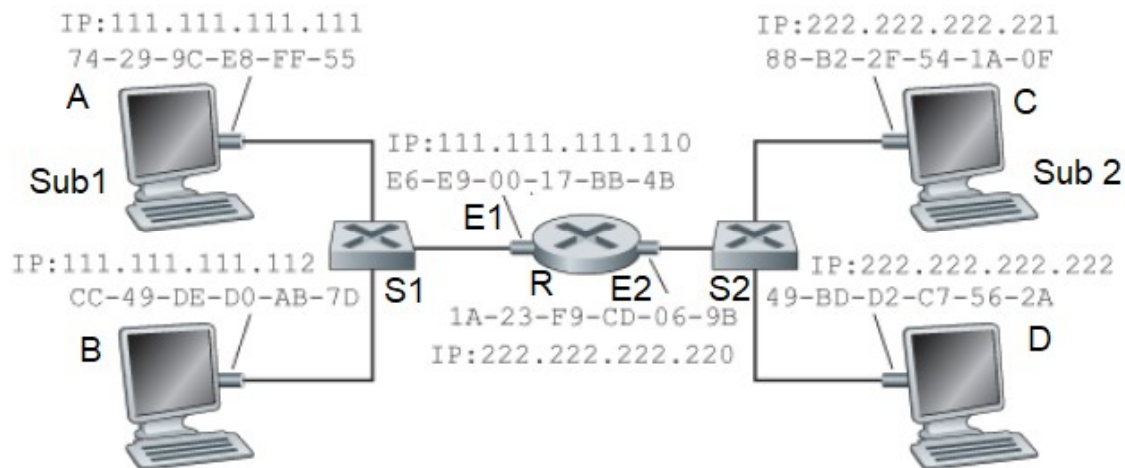# COMPUTER COMMUNICATION NETWORK

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COMPUTER COMMUNICATION NETWORK

Forwarding frames, Ethernet protocol and frame format, Ethernet flavours

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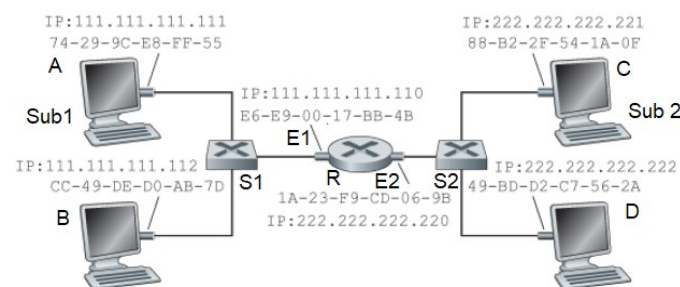
Forwarding frames across subnet

- Each host has one adapter with one IP address , one MAC address and one ARP module running on it
- Interconnecting router R has two interfaces with two MAC address , two IP addresses and two ARP modules

- Sub 1 has the network address 111.111.111/24 and that Sub 2 has the network address 222.222.222/24. A wants to send IP datagram to D.

- Routers interconnects different LANs though its interfaces in the Network layer activity. So routers do not forward data link layer broadcast of one LAN to other LAN.

- So device in Sub 1 can not send an ARP request to Sub 2 and hence MAC resolution across subnet is not possible

- Even A somehow got to know MAC address of D and send packet to that MAC, there will be no one in Sub 1 network to receive the packet
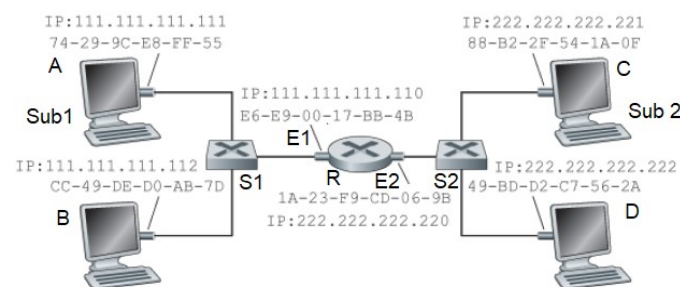
- As router R has two interfaces connected to two networks, it can help to transfer packet.

- A can handover packet to E1 interface of R and then R can resend the packet to D through E2 interface

- Usual ARP process will take place at two ends of R

- If a router has multiple interfaces routing table will help to find right interface to forward the packet

- The router that helps packet to move out of a LAN is called Gateway Router

- Each node like A, B, C, D are manually configured for its appropriate Gateway Router

Ethernet

- Emerged in the mid-1970s

- Both physical layer and link layer specification

- Provides access to shared physical medium for LAN users

- Based on CSMA/CD protocol
  - ❖ CSMA with binary exponential backoff

- Coaxial cables were replaced by twisted pair copper wires

- Initial bus topology was replaced with star topology

- Hubs were replaced with switches
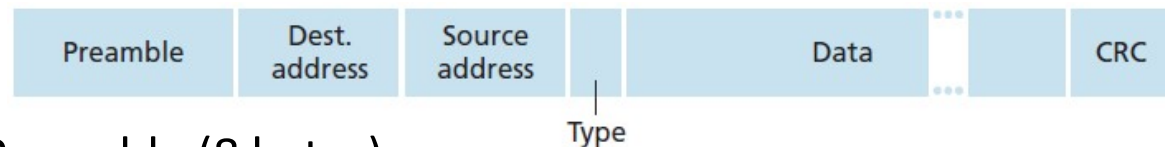
- Preamble (8 bytes)
  - ❖ First 7 bytes of the preamble has a value of 10101010 serve to "wake up" the receiving adapters and to synchronize their clocks to that of the sender's clock
  - ❖ The last byte is 10101011 - The last 2 bits (the first two consecutive 1s) alert adapter as end of preamble

- Destination address (6 bytes)
  - ❖ contains the MAC address of the destination adapter
  - ❖ When adapter receives an Ethernet frame whose destination address is either its MAC or the MAC broadcast address, it passes the contents of the frame's data to the network layer;
  - ❖ if it receives a frame with any other MAC address, it discards the frame

Preamble	Dest. address	Source address		Data		CRC
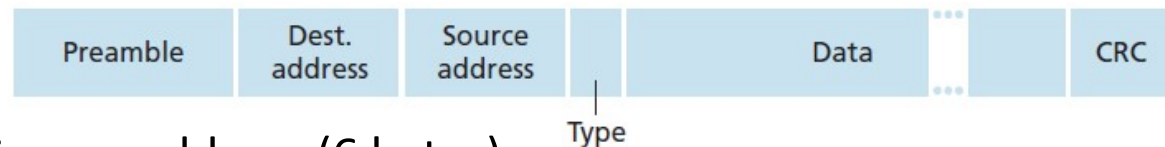
Type

- Source address (6 bytes)
  - ❖ Contains the MAC address of the adapter that transmits the frame onto the LAN

- Type field (2 bytes)
  - ❖ Permits Ethernet to multiplex network-layer protocols
  - ❖ IP and other network-layer protocols (for example, Novell IPX or AppleTalk) each have their own, standardized type number.
  - ❖ ARP protocol has its own type number. ARP packet will be demultiplexed up to the ARP protocol

| Preamble | Dest. address | Source address | | Data | | CRC |

Type

- Data field (46 to 1,500 bytes)
  - ❖ This field carries the IP datagram.
  - ❖ The maximum transmission unit (MTU) of Ethernet is 1,500 bytes. This means that if the IP datagram exceeds 1,500 bytes, then the host has to fragment the datagram
  - ❖ If the IP datagram is less than 46 bytes, the data field has to be "stuffed" to fill it out to 46 bytes. When stuffing is used, the network layer uses the length field in the IP datagram header to remove the stuffing

- Cyclic redundancy check (CRC) (4 bytes)
  - ❖ The purpose of the CRC field is to allow the receiving adapter to detect bit errors in the frame

Ethernet Flavours

- Ethernet comes in many flavors standardized by IEEE
  - ❖ 10BASE-T, 100BASE-T, 1000BASE-LX, 10GBASE-T

- The first part of the acronym refers to the speed of the standard: 10, 100, 1000, or 10G, for 10 Megabit, 100 Megabit, Gigabit, and 10 Gigabit Ethernet

- "BASE" refers to baseband Ethernet, meaning that the physical media only carries Ethernet traffic; almost all of the 802.3 standards are for baseband Ethernet

- The final part of the acronym refers to the physical media itself; Generally, a T refers to twisted-pair copper wires, LX,SX,BX refers to fiber

Alternative of Ethernet LAN

- In network protocol / standard of any layer can replace each others

- There are alternatives of Ethernet those are used

  ❖ PPP -A point-to-point link consists of a single sender at one end of the link and a single receiver at the other end of the link

  ❖ WiFi - Wi-Fi is a family of wireless network protocols, which are commonly used for local area networking

  ❖ PON - A passive optical network (PON) is a fiber-optic telecommunications technology for delivering broadband network access

  ❖ Mobile data network – Data packet communication over mobile communication channel

THANK YOU

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