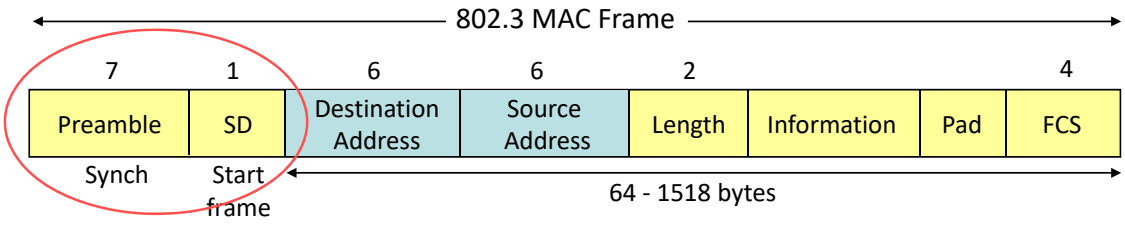
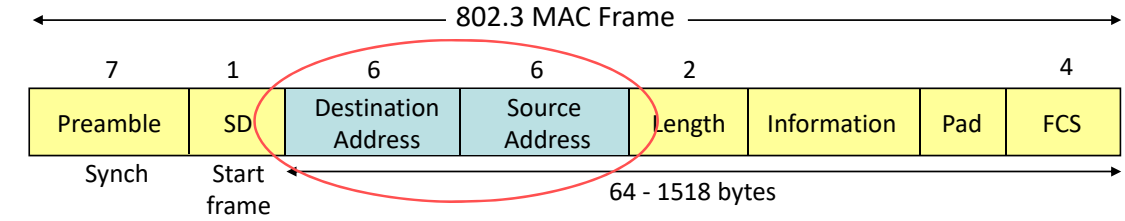
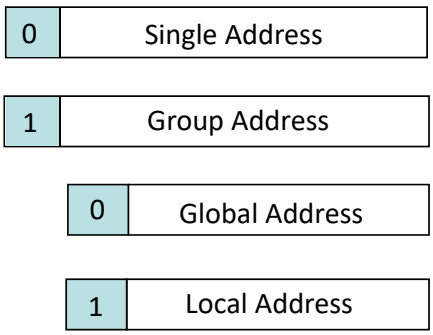
IEEE 802.3 MAC Frame



- Preamble helps receiver synchronize its clock to transmitter clock
  - 7 bytes of 10101010 generate a square wave
- Start frame byte changes to "10101011"
- Receiver looks for change in "10" pattern

IEEE 802.3 MAC Frame

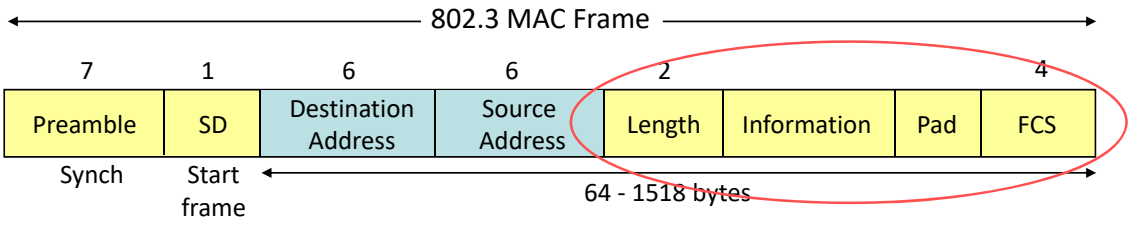




- Addresses
  - Single or Group (1st bit transmitted)
  - Global or Local (2nd bit transmitted)
- Global Addresses
  - 2^{46} global addresses
  - 2^{22} vendors, 2^{24} addresses per vendor
  - E.g., Cisco 00-00-0C

http://standards-oui.ieee.org/oui.txt

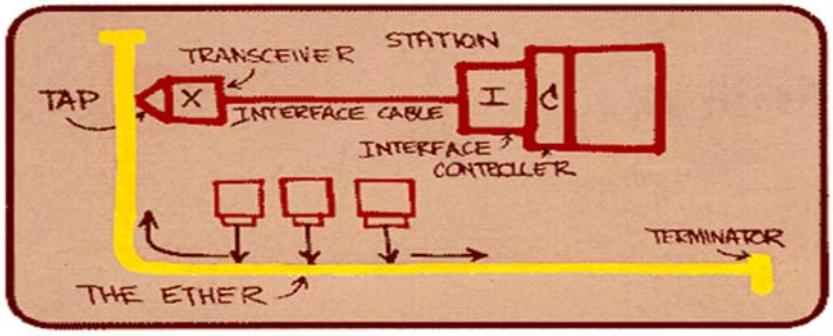
IEEE 802.3 MAC Frame



- Length: # of bytes in the information field
  - Max frame 1518 bytes, excluding preamble & SD
  - Max information 1500 bytes: 05DC
- Pad: ensures minimum frame size of 64 bytes
- FCS: CCITT-32 CRC, covers addresses, length, information, and pad fields
  - NIC discards frames with improper lengths or failed CRC

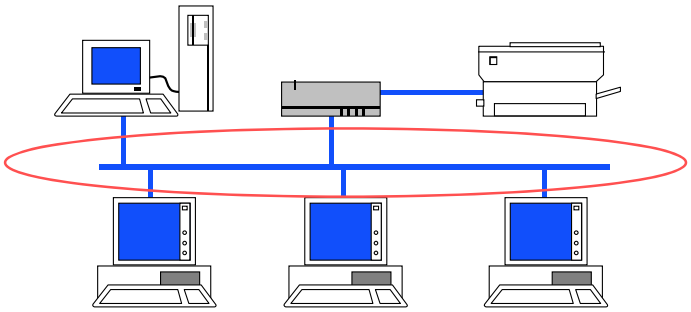
Ethernet LAN Evolution

- 1970 ALOHAnet radio network deployed in Hawaiian islands
- 1973 Metcalf and Boggs invented Ethernet: *random access in wired net*
- 1985 IEEE 802.3 LAN Standard (10 Mbps)
- 1995 Fast Ethernet (100 Mbps)
- 1998 Gigabit Ethernet
- 2002 10 Gigabit Ethernet
- 2007 100 Gigabit Ethernet
- Ethernet is the dominant LAN standard

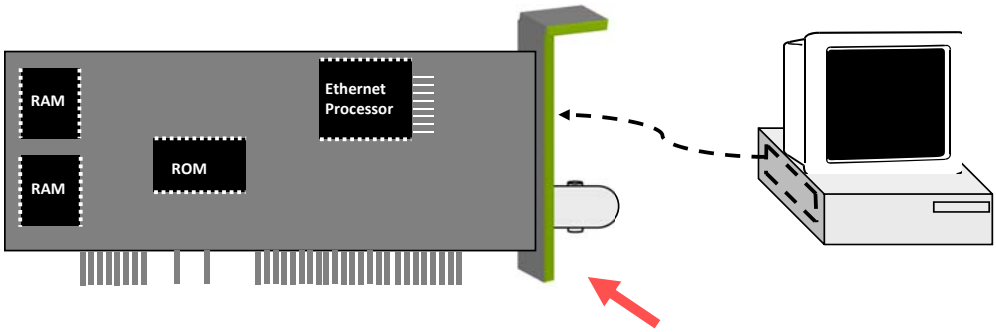


Metcalf's Famous Sketch

Typical Ethernet LAN Structure



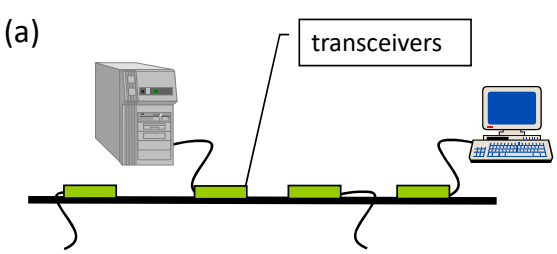
- Shared Transmission Medium (Bus Topology)
- Network Interface Card (NIC)



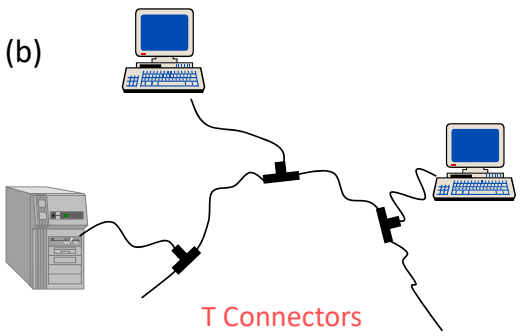
Ethernet Physical Layers

Hubs & Switches

	10base5	10base2	10baseT	100baseT
Medium	thick coax	thin coax	twisted pair	CAT5
Max Segment Length	500 m	200 m	100 m	100 m
Topology	bus	bus	star	star



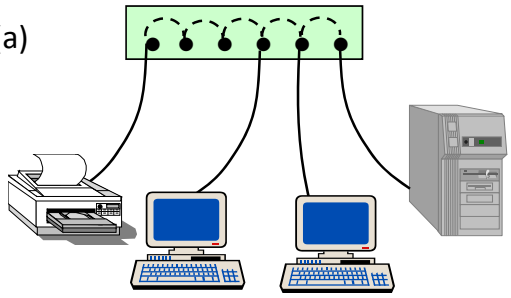
Thick Coax: stiff, hard to work with



T Connectors

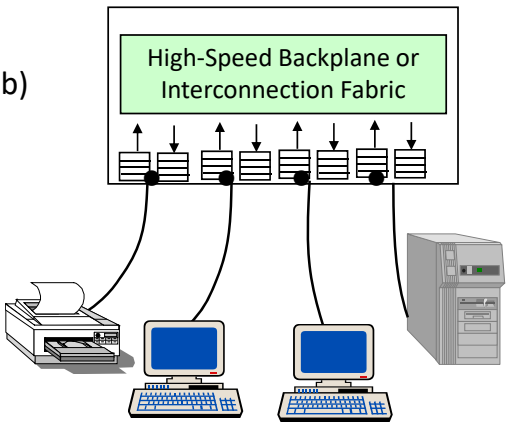
Ethernet Hubs & Switches

(a)



- Twisted pair, cheap
- Easy to work with
- Star-topology CSMA/CD
- Same collision domain

(b)



- Separate collision domains

Repeaters, Bridges, Routers, Gateways

- Several ways of interconnecting networks:
  - Repeater at the physical layer
  - Bridge at the MAC or data link layer
  - Router at the network layer
  - Gateway at a higher layer