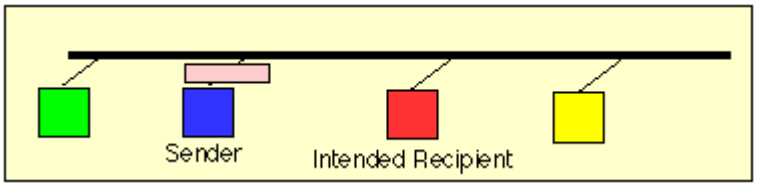
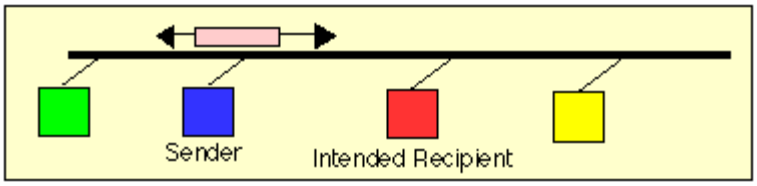
Lecture 5

In this lecture we will discuss the IEEE standards for LAN. IEEE has produced several standards for LAN. These standards are collectively known as **IEEE 802**. These standards are IEEE 802.3 (CSMA/CD), IEEE 802.4 (Token Bus), and IEEE 802.5 (Token Ring). Each standard covers the physical layer and MAC sub layer protocol.

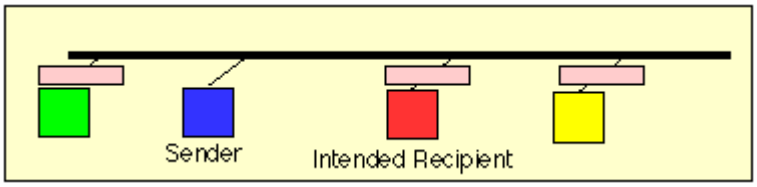
The Ethernet network may be used to provide shared access by a group of attached nodes to the physical medium which connects the nodes. These nodes are said to form a Collision Domain. All frames sent on the medium are physically received by all receivers, however the Medium Access Control (MAC) header contains a destination address which ensures only the specified destination actually forwards the received frame (the other computers all discard the frames which are not addressed to them). Consider a LAN with four computers, all connected by a common Ethernet cable:



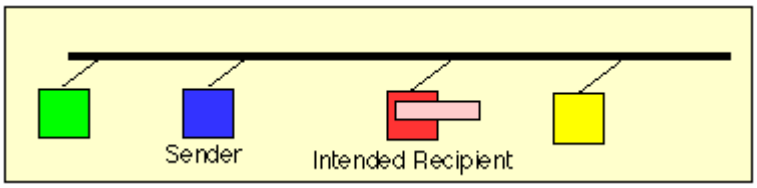
One computer (Blue) sends a packet to the shared medium, which has a destination address corresponding to the source address of the red computer.



The cable propagates the signal in both directions, so that the signal (eventually) reaches all four of the computers. Termination resistors at the ends of the cable absorb the frame energy, preventing reflection of the signal back along the cable.



All computers receive the frame and each examines it to check its length and checksum. The header destination address is next examined, to see if the packet should be accepted by the computer.



Only the red computer recognises the destination address as valid, and therefore this computer alone forwards the contents of the frame to the network layer. The other computers discard the unwanted frame.

The shared cable allows any computer to send whenever it wishes, but if two computers happen to transmit at the same time, a collision will occur, resulting in the data being corrupted.

IEEE 802.3 or Ethernet

The most popular standard proposed by IEEE 802.3, known by carious names Ethernet, CSMA/CD. The physical specification for IEEE 802.3 is

Name	Cable	Max. seg.	Nodes/seg.	Advantages
10Base5	Thick coax	500 m	100	Original cable; now obsolete
10Base2	Thin coax	185 m	30	No hub needed
10Base-T	Twisted pair	100 m	1024	Cheapest system
10Base-F	Fiber optics	2000 m	1024	Best between buildings

Fig. 4-13. The most common kinds of Ethernet cabling.

10 Base 5 cabling is also called as **Thick Ethernet.** The notation 10 Base 5 means that it operates at 10 Mbps, uses base band signaling, can support segments of up to 500 meters, and there can be 100 nodes per segment.

10 Base 2 cabling is also called as **Thin Ethernet**. The notation 10 Base 2 means that it also operates at 10 Mbps, uses base band signaling, can support segments of up to 185 meters, and each segments in turn may consist of 30 nodes.

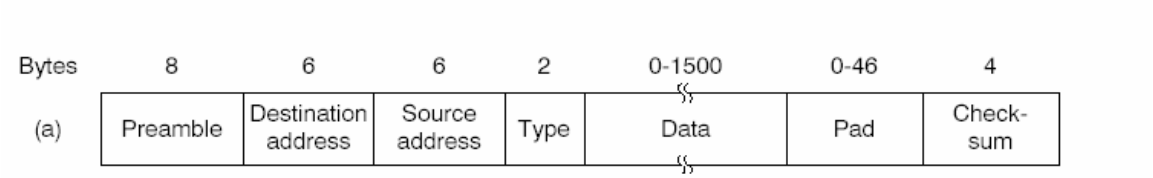
10 Base T cabling is the most popular one because it supports the use of twisted pair cable, usually these wires are telephone company twisted pairs, since most office buildings are already wired this way, and there are normally plenty of spare parts available. The notation 10 Base T means, it operates at 10 Mbps, base band signaling, and twisted pair cable is supported. It can support segments of length 100 m, and there can be 1024 nodes per segment.

10 Base 5, the above table gives the complete description about it.

IEEE 802.3 uses Manchester encoding for converting digital bit to digital signal, this encoding is done before actual transmission of data signals.

As told above, In 802.3 access method used is CSMA/CD and supports the data rate between 1 and 100 Mbps.

Frame Format:



Frame formats IEEE 802.3.

Preamble: It consists of 8 bytes, which informs the receiver about the incoming data frame, and it also does the synchronization between the sender and receiver. It consist of alternation 1's and 0's.

Destination Address: The destination field is allocated 6 bytes and contains the physical address of the receiver. A system physical address is a bit pattern encoded on its NIC (Network Interface Card or LAN Card). Each NIC has a unique address that distinguishes it with from any other NIC. If a packet crosses from one LAN to another LAN to reach its destination, the DA field contains the physical address of the router connecting the current LAN to the next one. When the packet reaches the destination network, DA field contains the address of the destination node.

Source Address: The Source Address field is 6 bytes, and it contains the address of the source machine, means the machine who is sender.

Length: The length field tells how many bytes are present in the data field.

Pad: The frame has to maintain a minimum size of the frame, means a frame should not be less than some minimum size, in case a frame is less than that minimum size, some extra bits are added in the padded field, to achieve the minimum length of the frame.

Checksum: This field is meant for error control. It contains the CRC.