Week 5 – MAC Contd

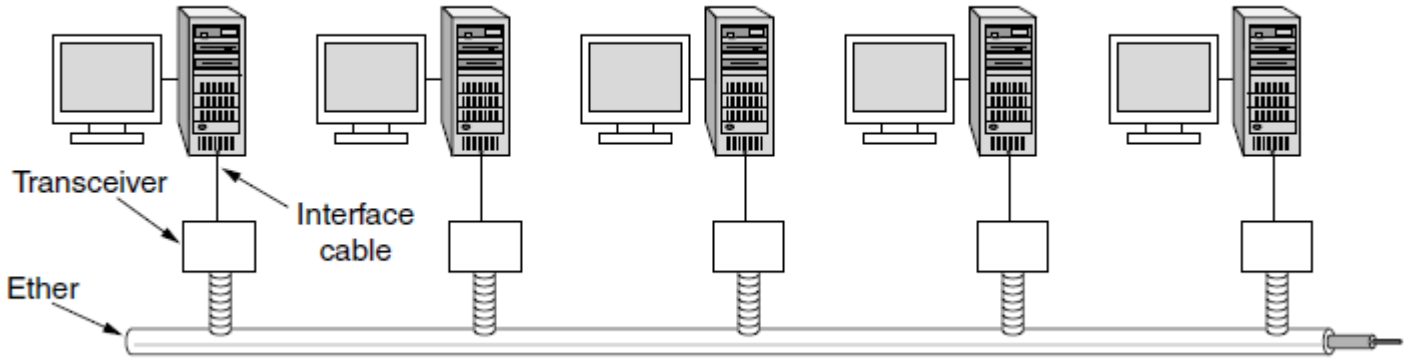
Internet Technologies
COMP90007

Ethernet: A Famous MAC Sub-Layer Case Study

- Classical Ethernet
- Switched Ethernet

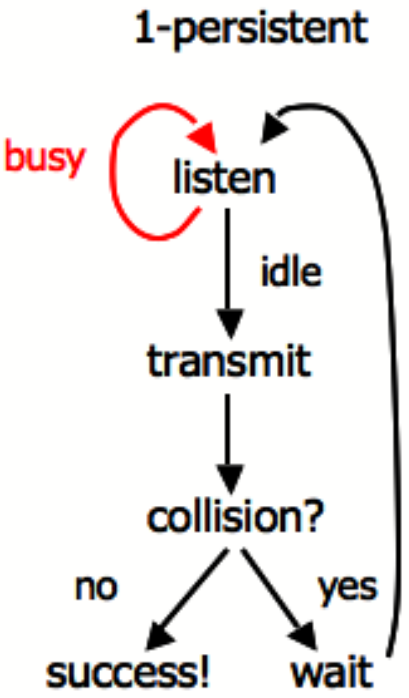
Classic Ethernet

- Each type of Ethernet has a maximum cable length per segment.
  - Multiple cable lengths can be connected by repeaters (a physical device which receives, amplifies and retransmits signals in both directions.)



Ethernet MAC

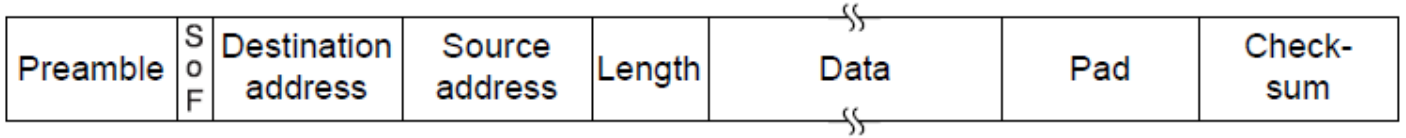
- MAC protocol is 1-persistent CSMA/CD
  - Random delay (backoff) after collision is computed with BEB (Binary Exponential Backoff, i.e., random number 0 and $2^i - 1$)



Ethernet Frame Format

- Frame format is still used with modern Ethernet

IEEE 802.3

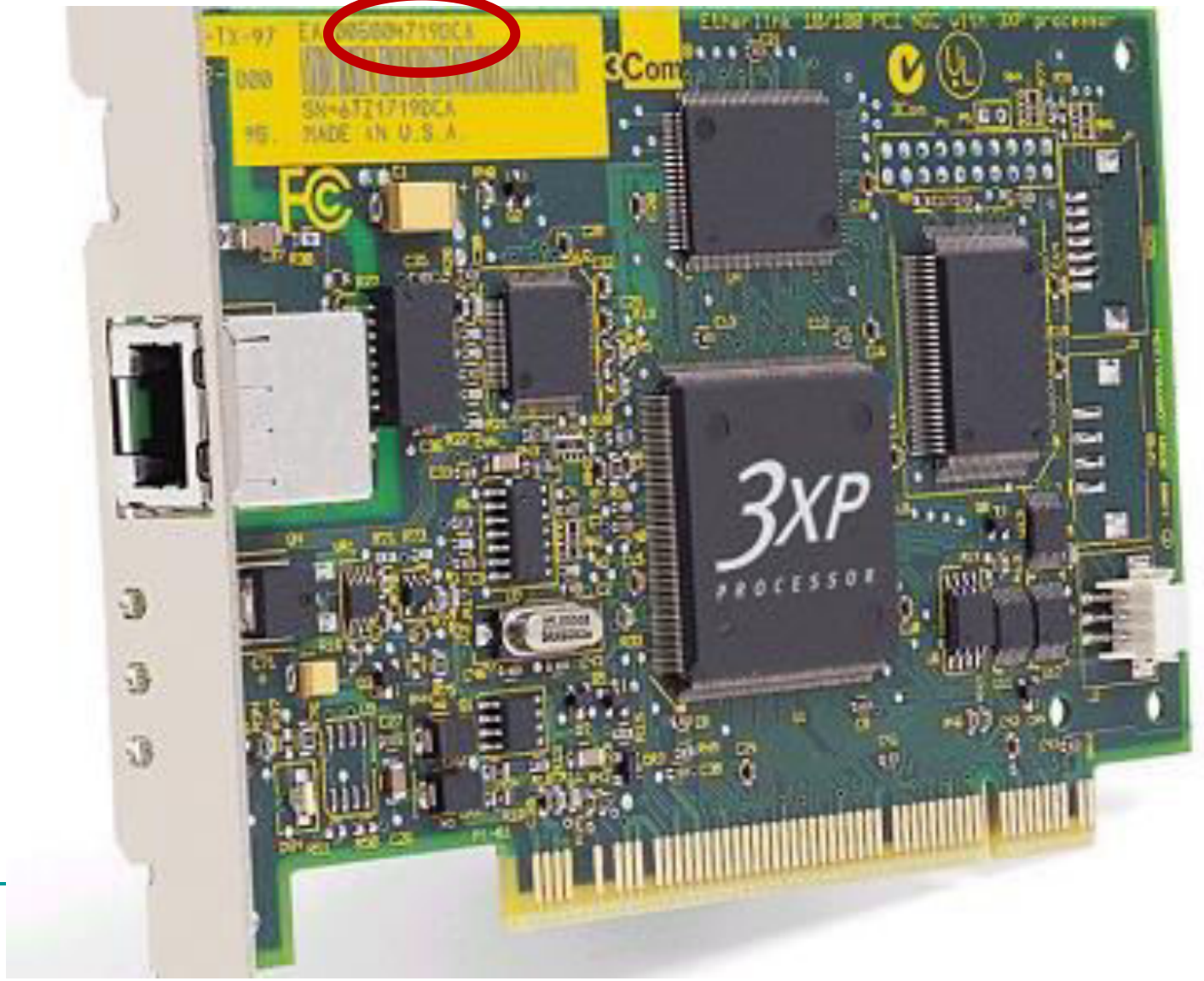


Preamble (7B) – synchronisation between sender and receiver
Start of Frame (1B) – FLAG bytes
Dest. & Source addresses – to identify who send, who receive
Type & Length (2B) – specifies which process to give the frame to (0x0800 means data contains IPv4)
Pad(0~46B) – Minimum size of the message of the Ethernet – 64 Bytes
CRC (4B) – 32 bits checksum

MAC ADDRESSING

- Source and Destination Addressing can be done at a local or global levels
- The MAC Address provides the unique identifier for a physical interface
- MAC Address is a 48-bit number encoded in the frame
  - eg 00:02:2D:66:7C:2C

MAC ADDRESS



Ethernet Performance

Definition

$$\text{Channel Efficiency} = \frac{1}{1 + 2BLe/cF}$$

- F : frame length
- B : bandwidth
- L : cable length
- c : speed of light
- optimal case of e contention slots per frame

- When cF is large, the channel efficiency will be high.
- Increasing network bandwidth or distance (BL) reduces the efficiency for a given frame size!!

Switched Ethernet

- Hubs wire all lines into a single CSMA/CD domain
- Switches isolate each port to a separate domain
  - Much greater throughput for multiple ports
  - No need for CSMA/CD with full-duplex lines