

IEEE Standards

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Network Interface Card

A number of computers and devices interconnected by a shared transmission medium (wired or wireless) may be arranged in

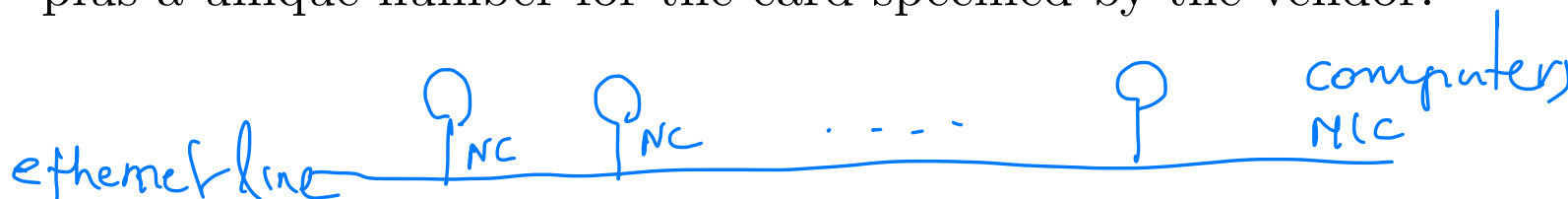
- a bus, *Delay Tolerant Network*
- ring,
- star topology.
• line ethernet

Regardless of the connection topology the stations need to “communicate to the network”.

The device achieving this goal is called “Network Interface Card”.

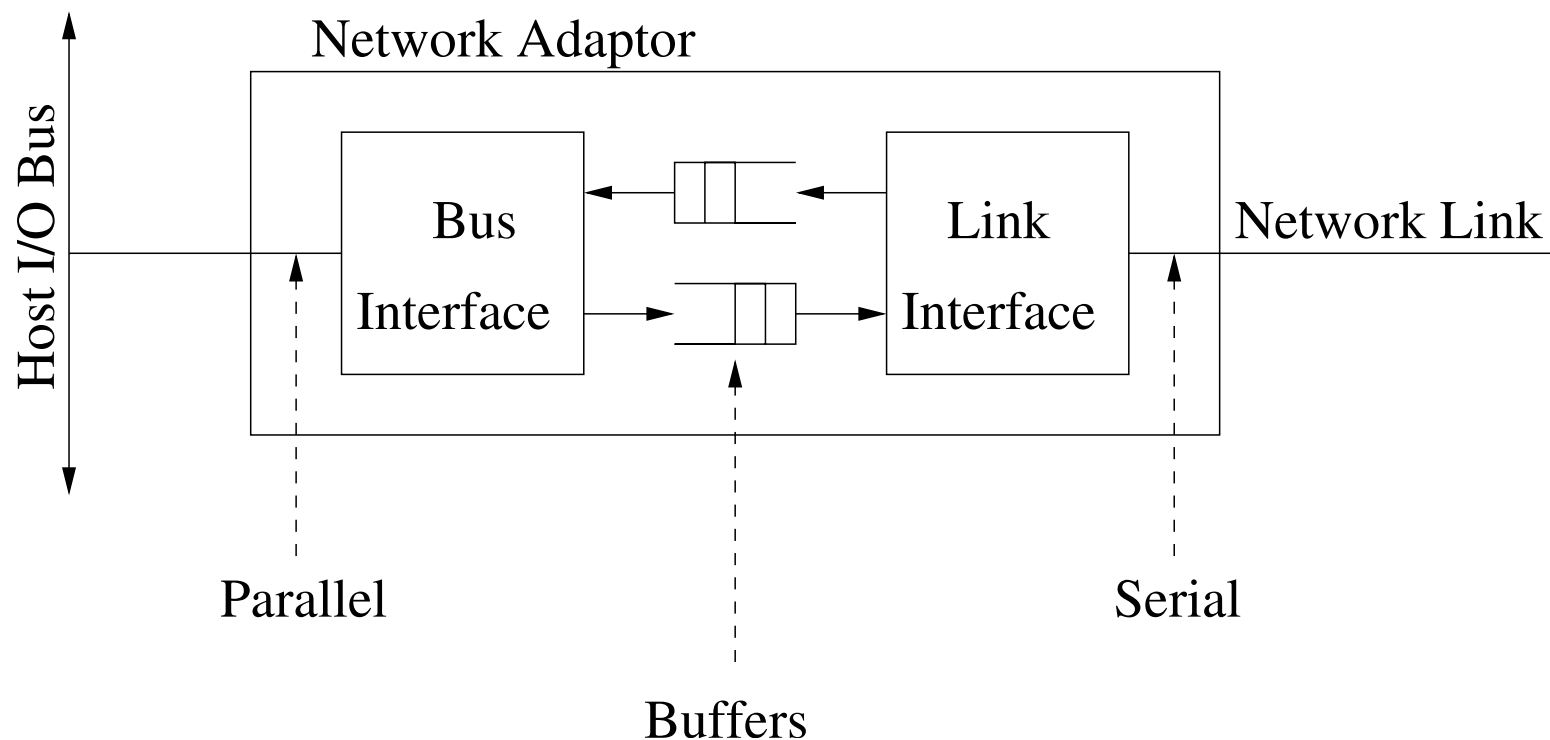
IEEE 802: The Network Interface Card

- Computers and devices connected to the system via a NIC (Network Interface Card) or LAN adaptor card which coordinates information transfer between computer and network.
- The NIC communicates in parallel with computer RAM and serially with network. Parallel/Serial conversion as well as buffering are necessary.
- NIC cards have a port meeting connector specs, and ROM allowing implementation of MAC standards. The NIC physical address is burned into the ROM: and consists of the vendor ID plus a unique number for the card specified by the vendor.



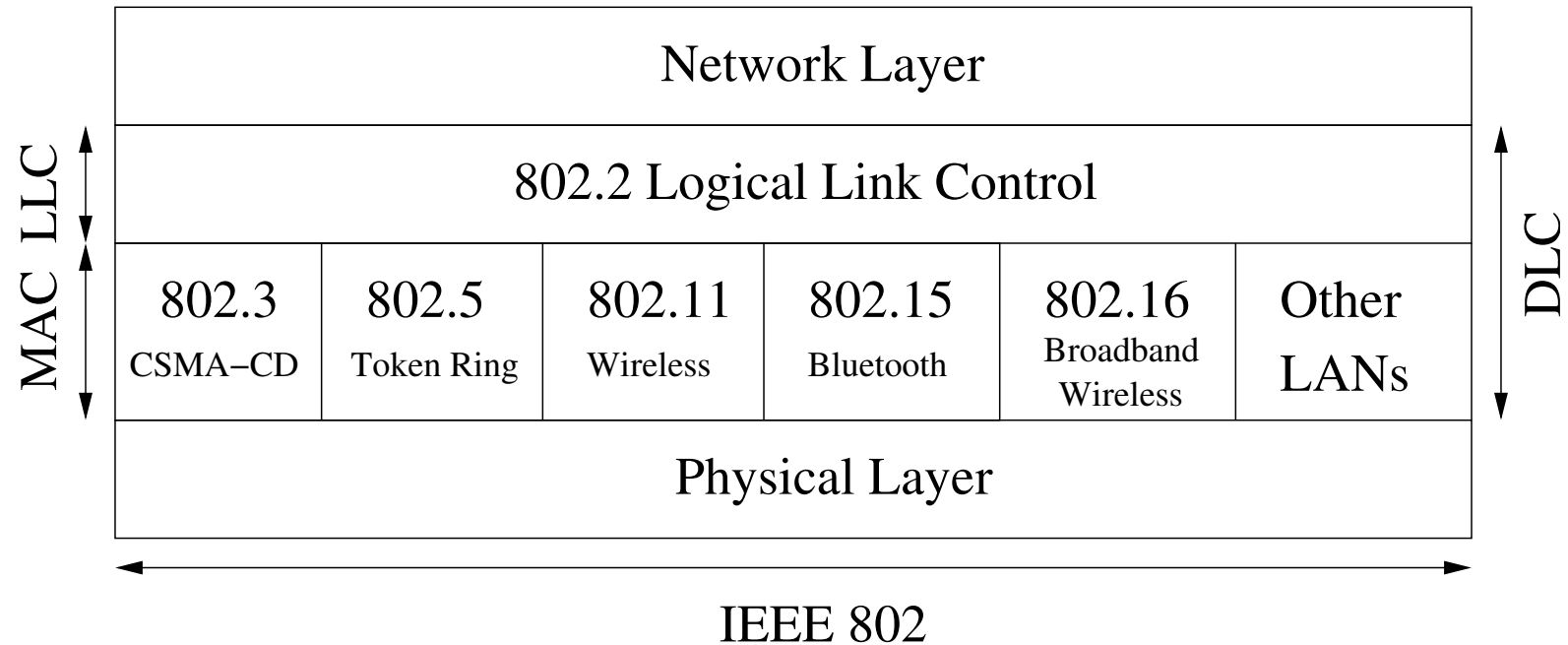
Network Adaptors

Network adaptors programmed by software running on host's CPU.



Adaptor exports [^]Control Status Register (CSR) that can be read and written by CPU. e.g., CPU writes to CSR to instruct it to transmit and/or receive frame. CPU reads CSR to learn adaptor's status.

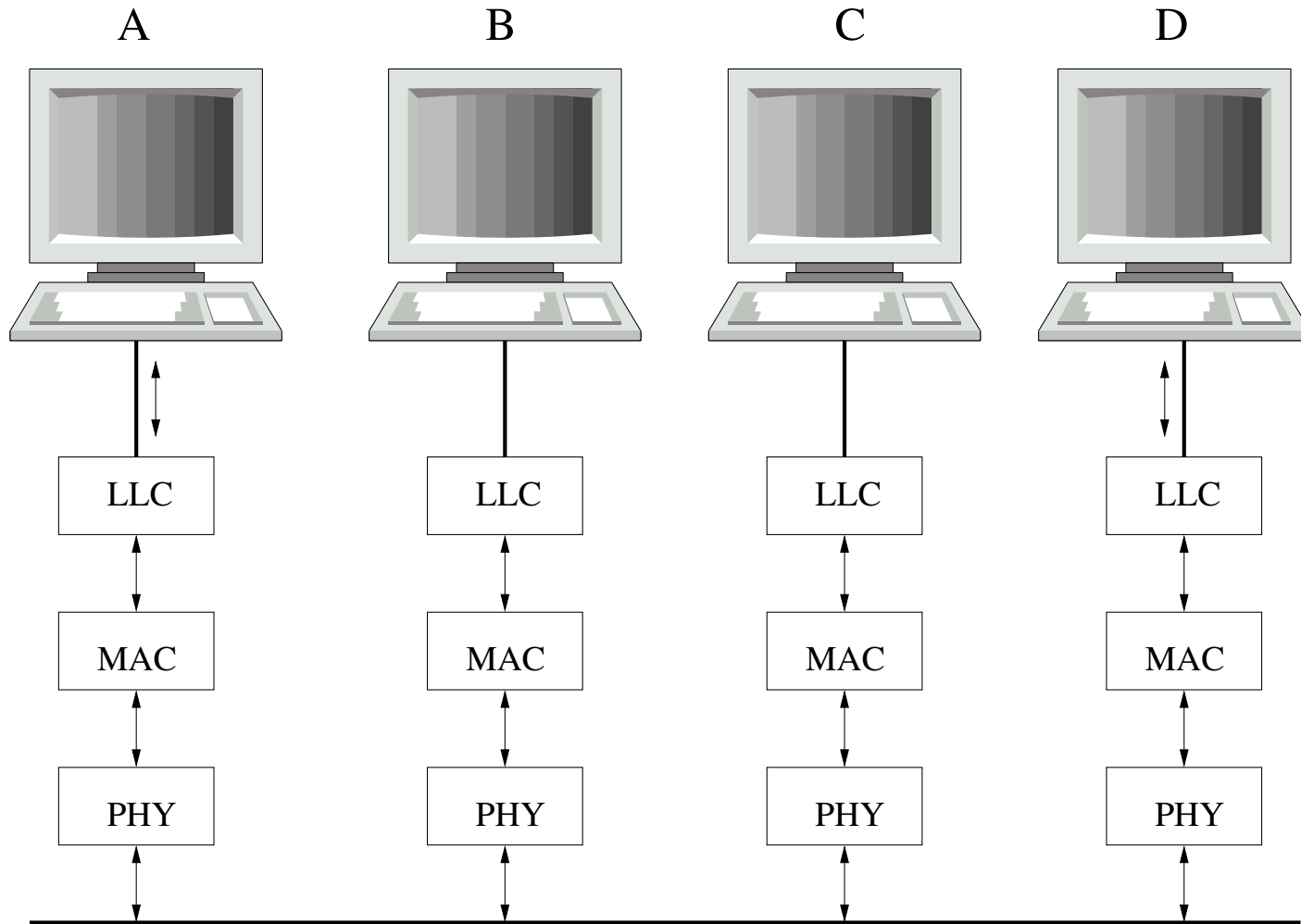
IEEE 802 Layering Standards



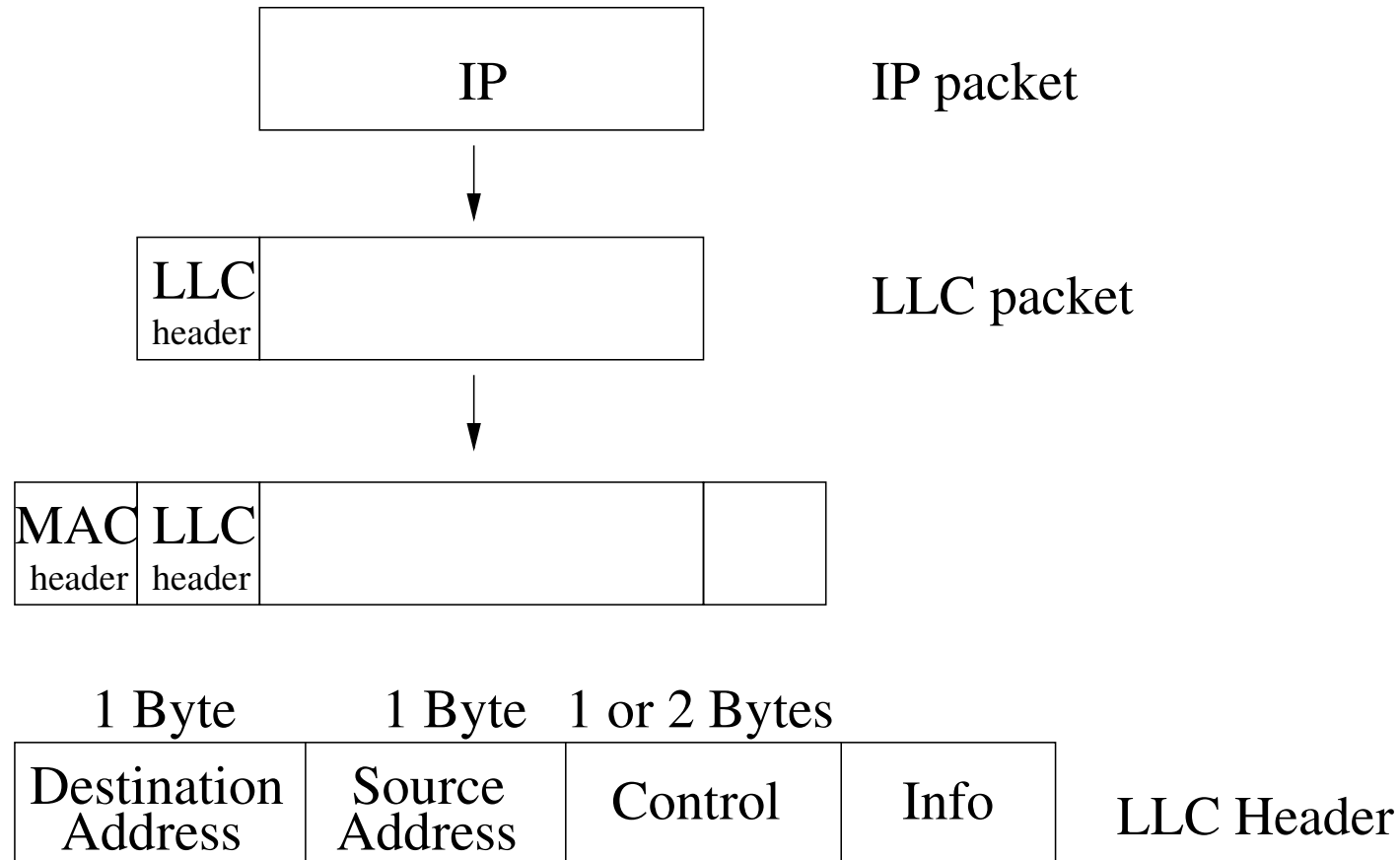
IEEE 802 Layering Standards (up to 802.25)

802.4 (Token Bus),
802.6 (Dual Queue, Dual Bus),
802.7 (Broadband Advisory Group),
802.8 (Fiber Optics Advisory Group),
802.9 (Isochronous Networks),
802.10 (VPNs, Security),
802.11 (Wireless),
802.12 (AnyLan from HP),
802.13 (Unlucky),
802.14 (Cable Modems),
802.17 (Resilient Ring).

IEEE 802 Layering Standards



IEEE 802 Packetization



IEEE 802.3: Ethernet Standard

- Developed by Xerox in the 1970s.
- In the 1980s, DEC, Intel, and Xerox completed the “DIX Ethernet” standard for a 10 Mbps LAN based on coaxial transmission.
- “DIX Ethernet” became the basis for the IEEE 802.3 Standard.
- IEEE 802.3 Standard frequently revised and expanded over the years.
- Specifications have been issued for running the protocol on coaxial cable, twisted pair, single-mode and multi-mode optical fiber.
- High-speed versions for Fast Ethernet (100 Mbps) and Gigabit Ethernet (1000 Mbps) have also been approved.

IEEE 802.3: Ethernet Protocol (1/2)

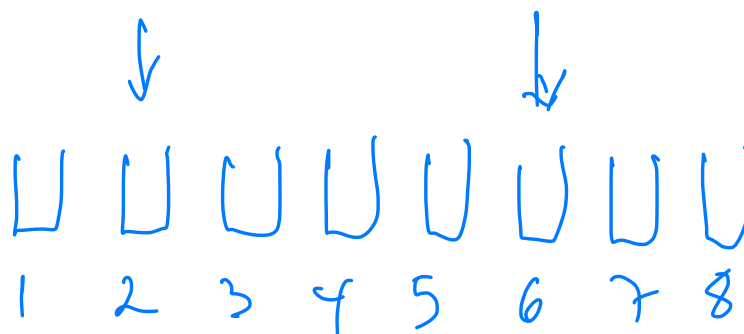
- CSMA/CD being used on bus based coaxial-cable.
- A node with a frame to transmit waits until channel is silent.
- When channel silent, node transmits but continues to listen for collisions.
- If collision occurs station aborts transmission and schedules a later random time when it will reattempt to transmit.
- If no collision occurs node knows it has captured the channel.

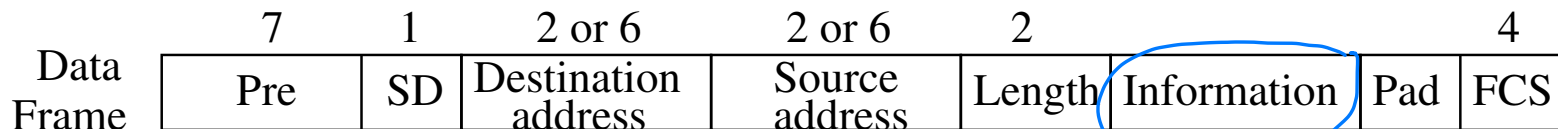
IEEE 802.3: Ethernet Protocol (2/2)

- Binary exponential backoff is being used for retransmission:
if a frame is about to undergo its n th retransmission attempt then it reschedules transmission by selecting at random an integer in the range

$$1 \dots 2^{\min\{n,10\}} - 1.$$

- Up to sixteen retransmissions will be attempted after which the system gives up.



IEEE 802.3: Frames

packet

0	Single address
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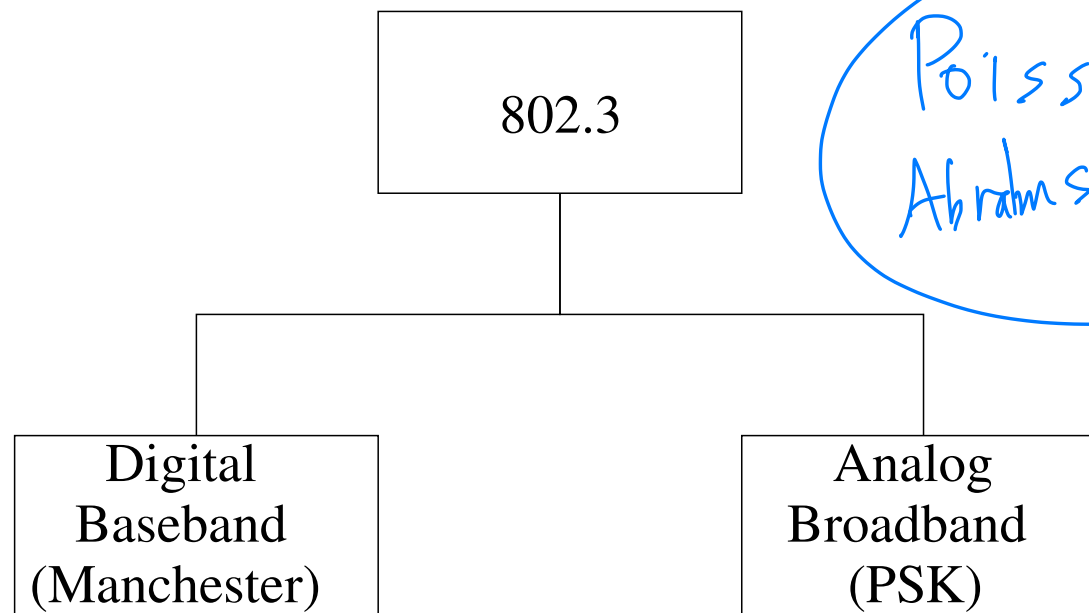
1	Group address
---	---------------

0	Local address
---	---------------

1	Group address
---	---------------

Pre(amble) used for synchronization, SD is Frame Start. Addresses are either single or global, as well as local or universal. The number of possible global addresses is 2^{46} .

Ethernet (802.3)



Poisson
Abramson-Metcalfe

Ethernet
traffic
resembles
Poisson
Distribution

The baseband category has five varieties: 10Base5, 10Base2, 10Base-T, 1Base5, 100Base-T (first number is speed in Mbps, last number or letter is max cable length/type).

The broadband category has only one specification: 10Broad36 (10 is data rate, 36 max cable length).