CSC0056: Data Communication

Lecture 02:
Layered Network Architecture

Reading assignment: Sections 1.3; 2.1-2.2.2; 2.2.6
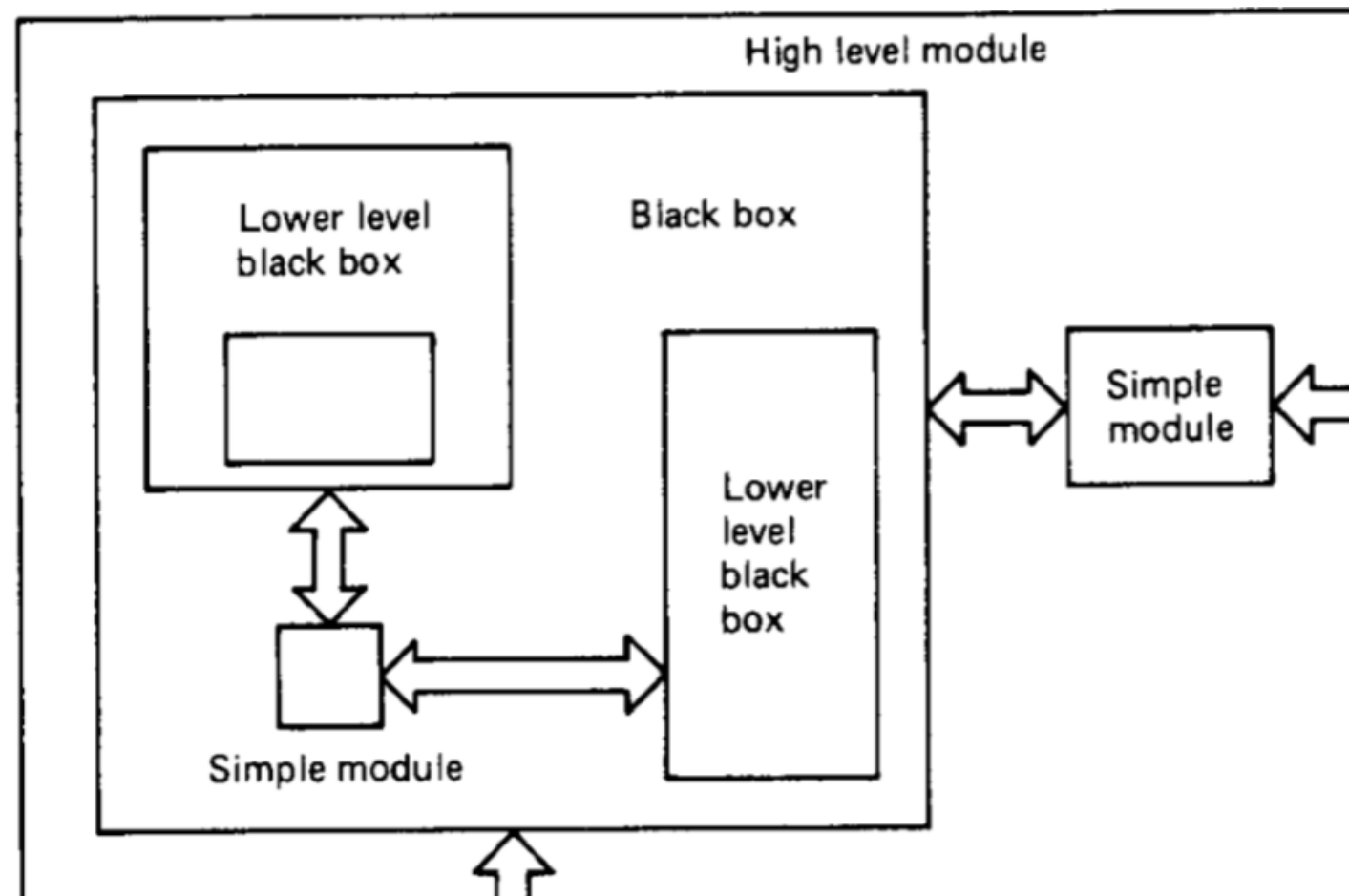
Department of Computer Science and Information Engineering

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Layered *system* architecture

- Module: a device/process that perform a function

- Black-box view of modules

- Communication between modules
  - Protocol
  - Interface

Layered system architecture (cont.)
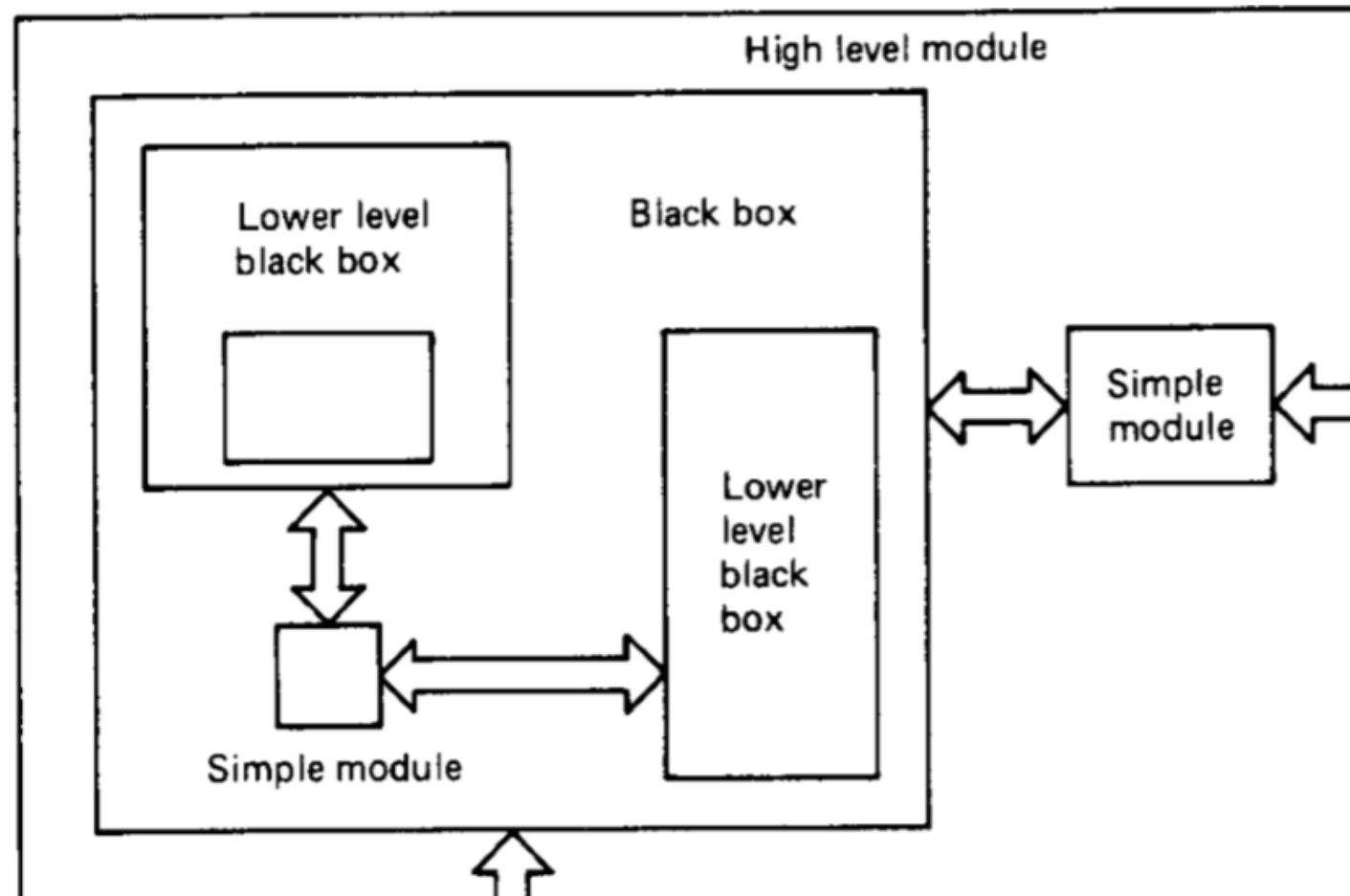
- Advantage
  - Simplicity of design
  - Easy to understand
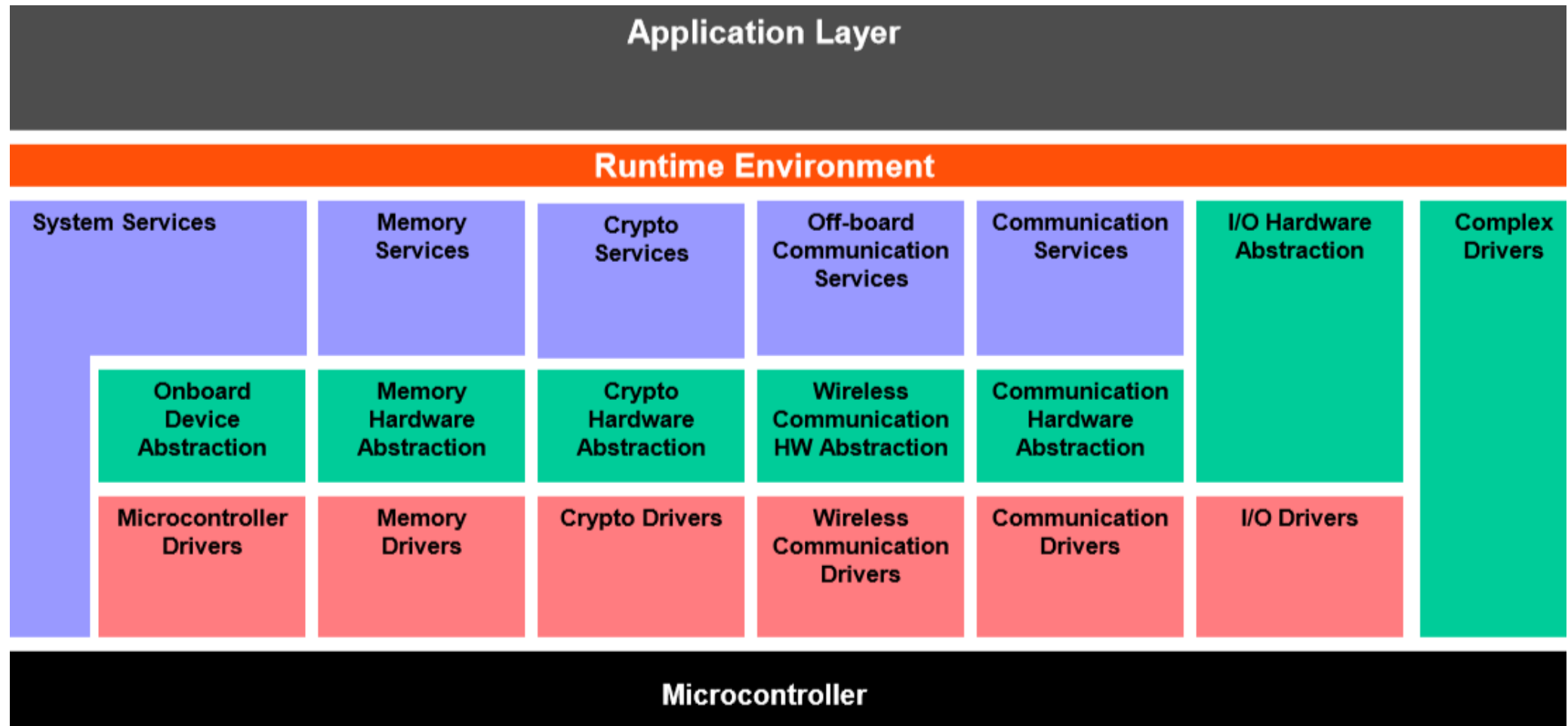 - Standard, interchangeable modules

- Disadvantage

  (if too many layers)
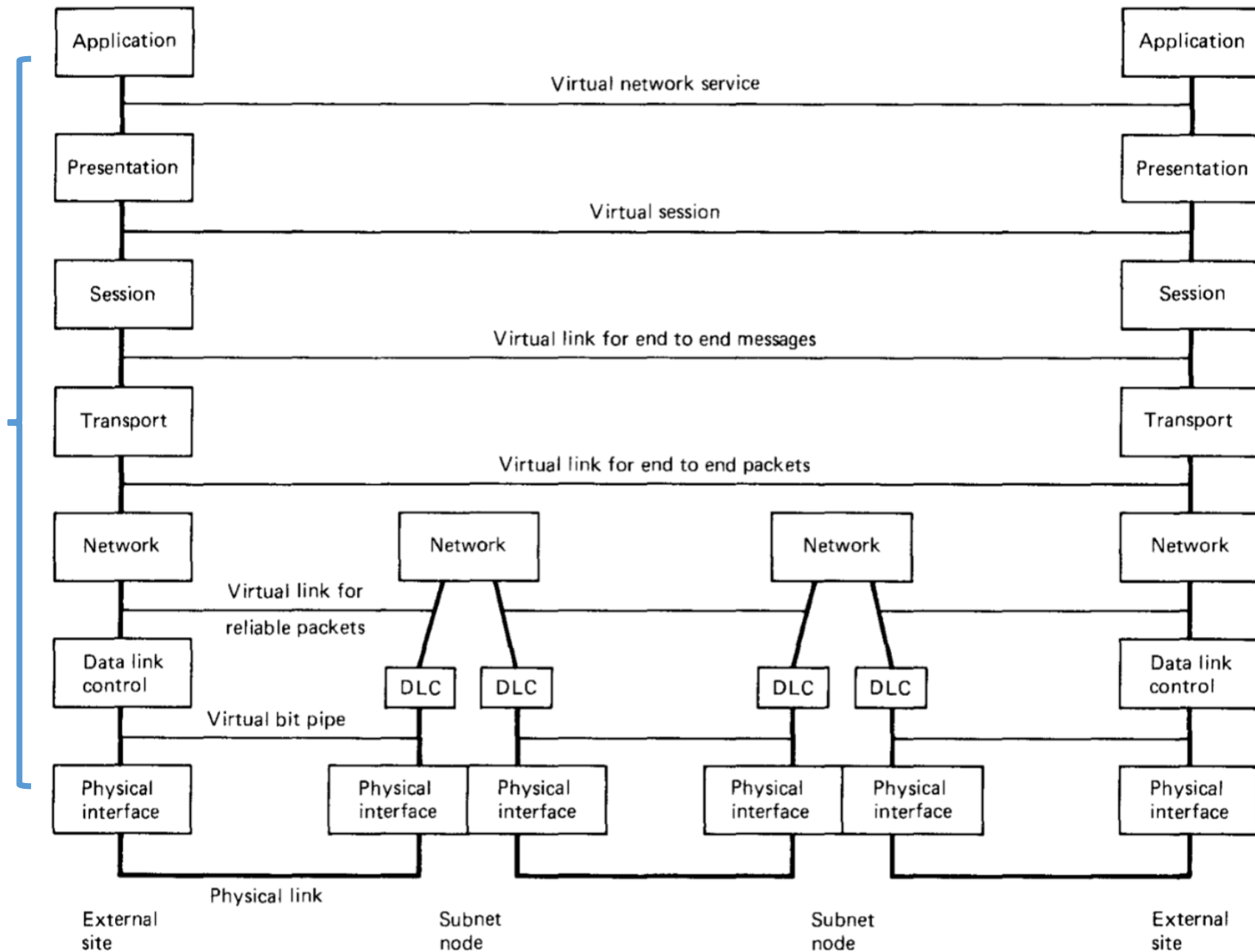 - Duplicated functionality
  - Additional latency

Example of layered system architecture: AUTOSAR (Automotive Open System Architecture)
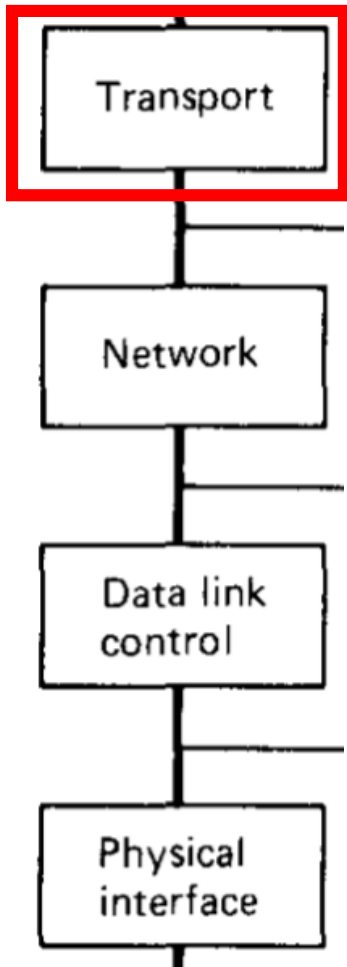
Layered network architecture

- The OSI model[1]
  - Seven layers
  - In this course, we will focus on the ones beneath the Session layer

- The CAN bus[2]
  - More on this later

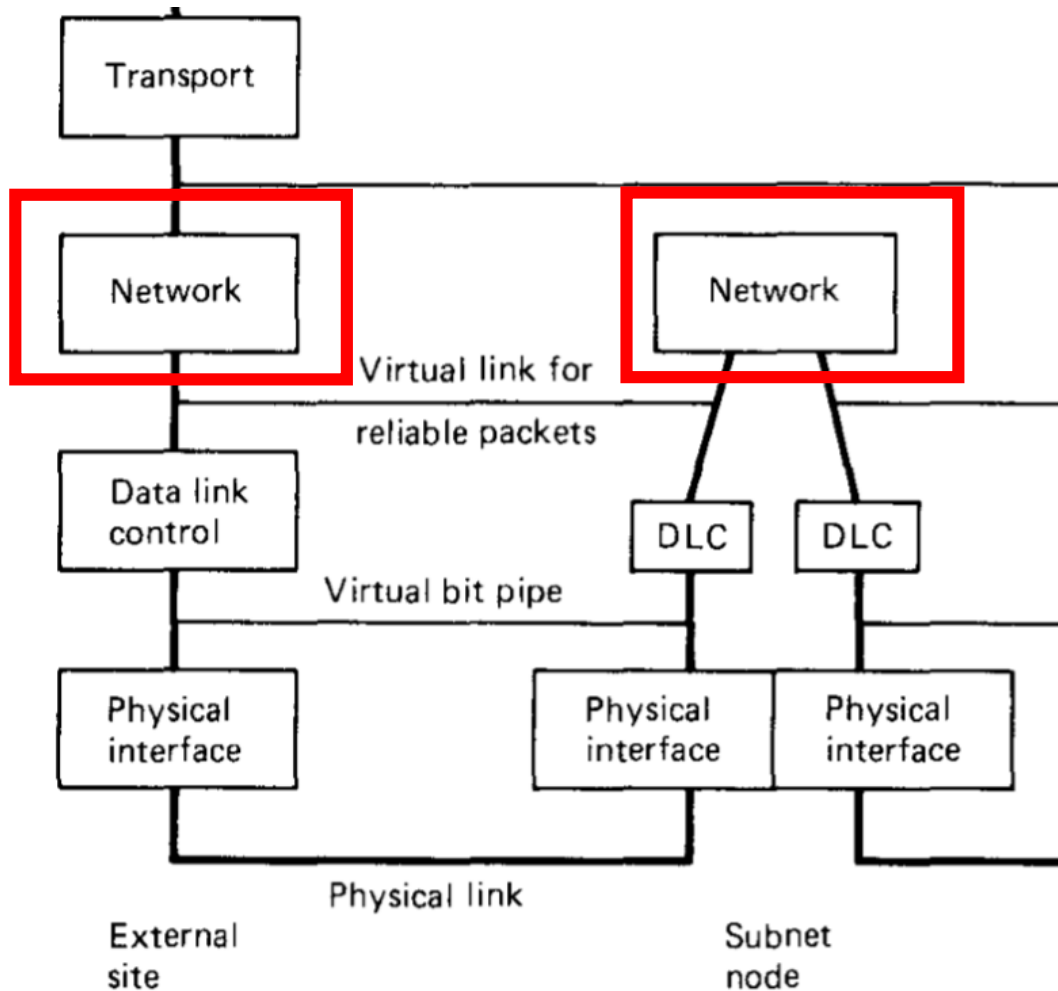1 https://en.wikipedia.org/wiki/OSI_model
2 https://en.wikipedia.org/wiki/CAN_bus

Transport layer

- Virtual <u>end-to-end</u> *message* service
- Functions
  - Break each message into packets (at the transmitting end)
  - Reassemble packets into a message (at the receiving end)
  - Re-order packets at destination
  - Recover from errors and failures
  - Provide end-to-end flow control

Network layer

- Virtual <u>host-to-host</u> *packet* service
  - Each host contains one network layer module
  - Provide routing and flow control for the network
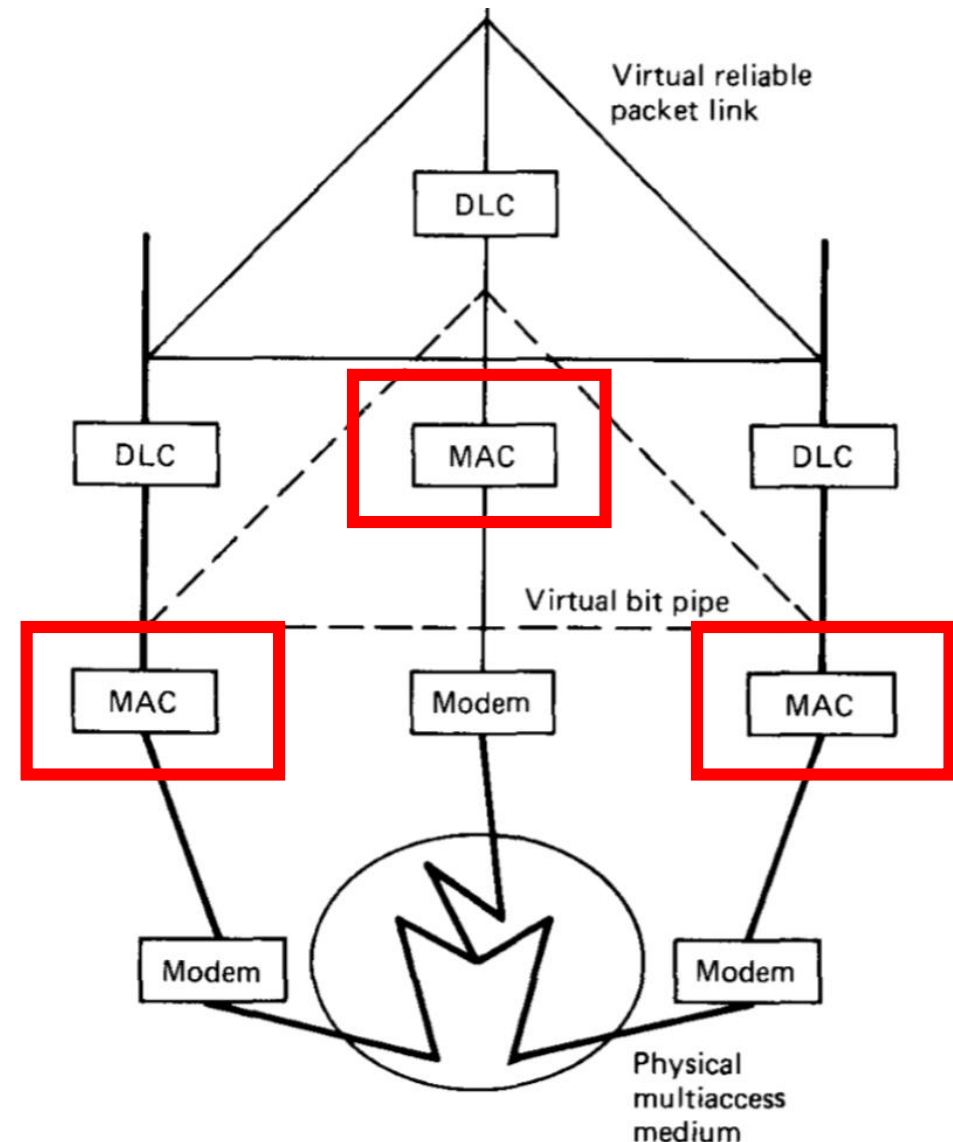
Data link control layer
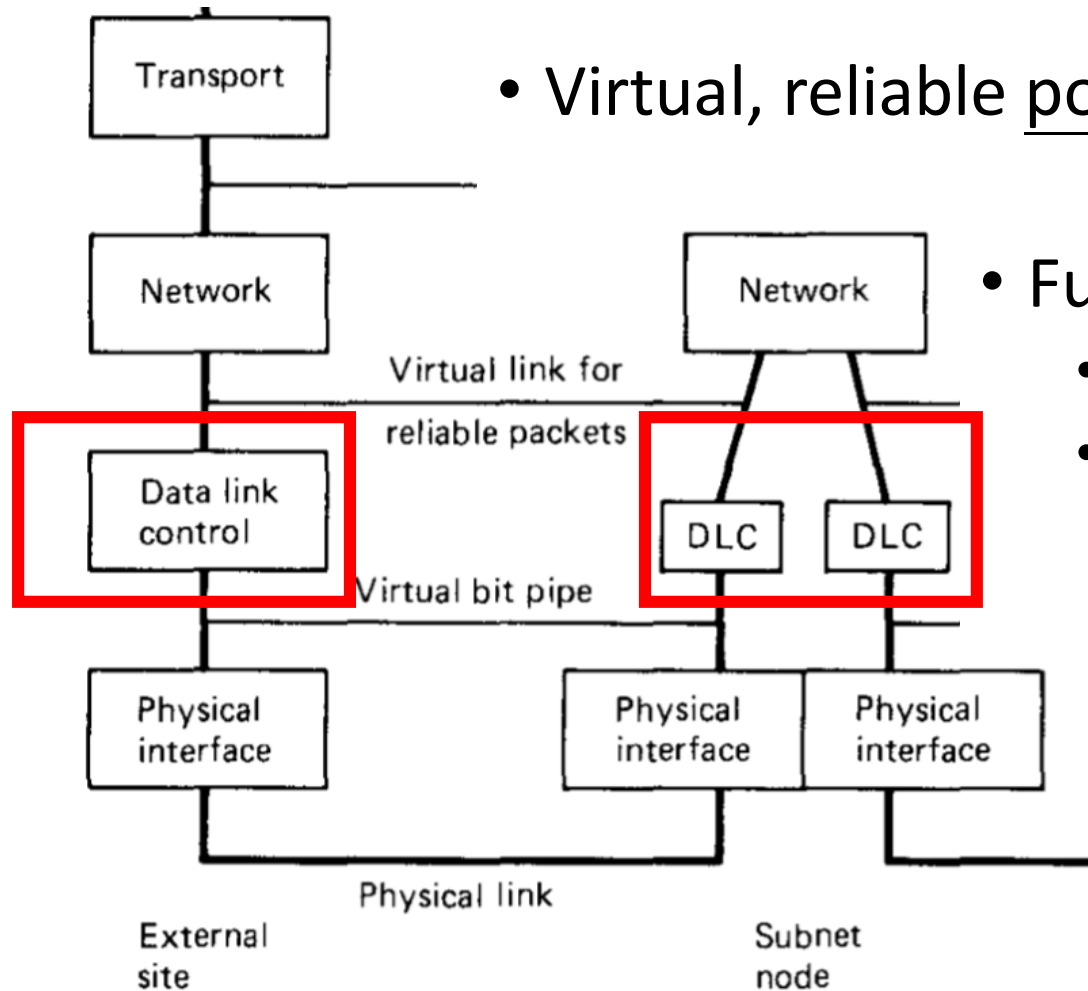
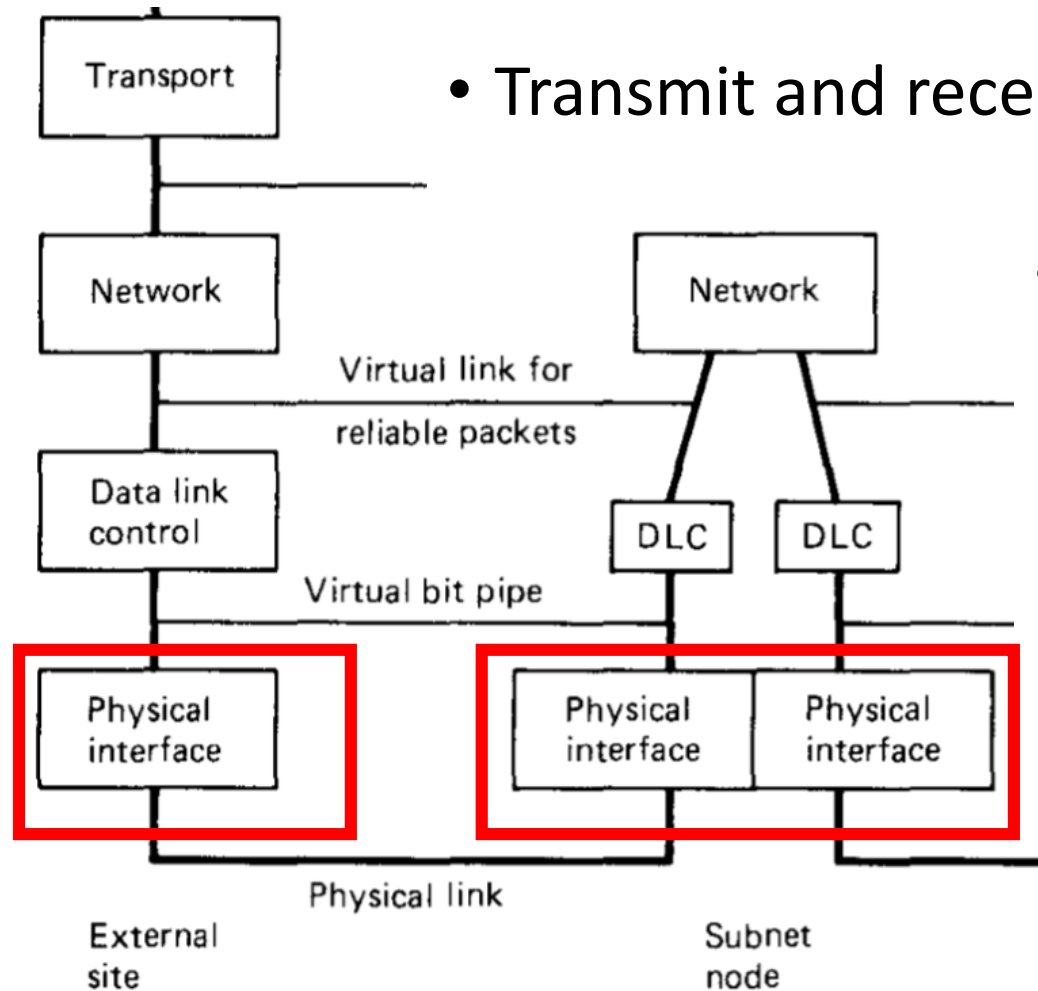- Virtual, reliable <u>point-to-point</u> communication

- Functions
  - Break each *packet* into *frames*
  - Error detection and correction

The MAC sublayer

- ## MAC (Medium access control)
  - Allocate a multi-access channel, so that each end point can successfully transmit its frames with less interference from others
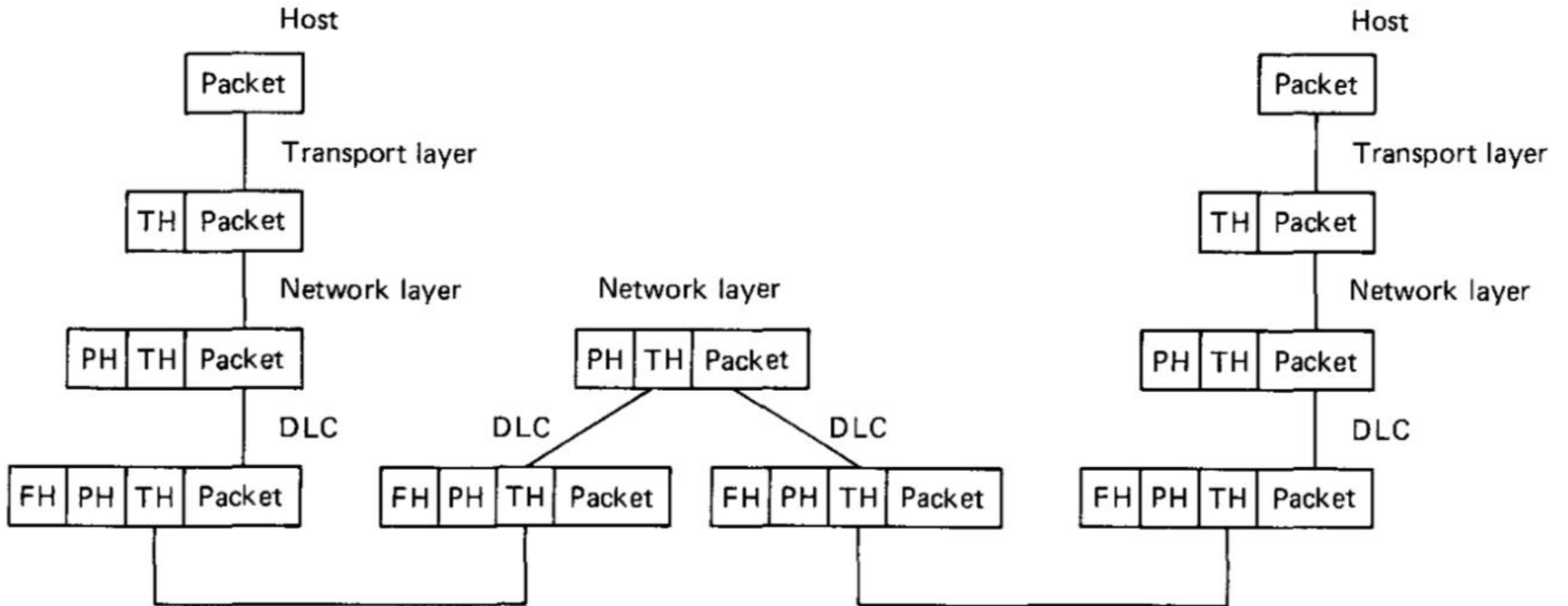
Physical layer

- Transmit and receive *bits* of a frame over a physical link

- Functions
  - Encoding – transform bits into signals
  - Filtering – reduce signal noises
  - Modulation – reduce noise, increase transmission range, etc.

Encapsulation of data

Take a breath …

… and let's dive into the physical layer

(For this part, we will use the whiteboard)