CH. 5: Protocol Architecture

- OVERVIEW
  - Protocol reference model
  - Logical link layer (LLC)
  - Medium Access Control (MAC)
  - Bridges and Routers

CH. 5: Protocol Architecture

- Layer 1: Physical Layer
  - Encoding/decoding of signals
  - Preamble generation/removal (for synchronization)
  - Bit transmission/reception

Layer 2: Data Link Layer

- Provides reliable data transfer across the physical layer
  - » Provides one or more service access points (SAPs)
    - – In IEEE 802 this task is provided by LLC
  - » Provides Flow Control
  - » Assemble data into frames with address and error-detection fields
  - » Provides Error Control
  - » Provides and controls access to transmission media

Flow Control

- Sender does not flood the receiver, but maximizes throughput
- Sender throttled until receiver grants permission
- Example: Sliding Window

Error Control

- Deliver frames without error, in the proper order to network layer
- Error control Mechanisms:
  - Ack/Nak: Provide sender some feedback about other end
  - Time-out: for the case when entire packet or Ack is lost
  - Sequence numbers: to distinguish retransmissions from originals
- Example: Automatic Repeat Request (ARQ)

IEEE 802 Standards

- 802.1 Network management and bridging
- 802.2 Logical link control
- 802.3 Ethernet (CSMA/CD)
- 802.4 Token Bus
- 802.5 Token Ring
- 802.6 DQDB
- 802.7 Broadband technical advisory group
- 802.8 Fiber-optic technical advisory group
- 802.9 Integrated data and voice
- 802.10 Security and privacy
- 802.11 Wireless LANs
- 802.14 Broadband Wireless Access

IEEE LAN Standards

- **IEEE LAN defines two sublayers:**
  - Logical Link Control (LLC)
  - Medium Access Control (MAC)
- **Why?**
  - To support different transmission medium
  - To support different data rate
  - To allow control accesses to share channels among autonomous computers

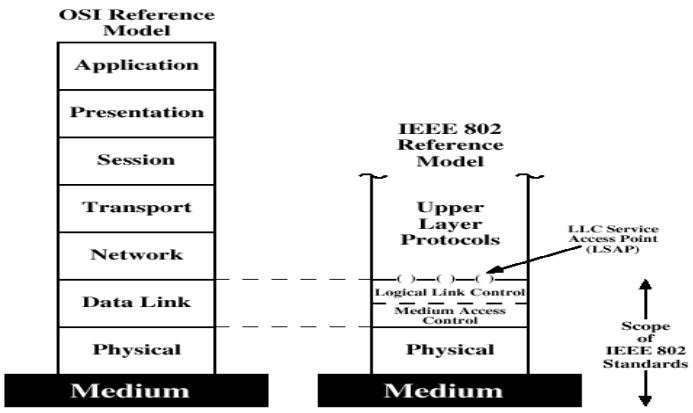

Figure 5.1 IEEE 802 Protocol Layers Compared to OSI Model

LLC	IEEE 802.2 LLC Services: »Unacknowledged Connectionless »Acknowledge Connectionless »Connection-Oriented				
MAC	CSMA/CD MAC IEEE 802.3	Token-Bus MAC IEEE 802.4	Token-Ring MAC IEEE 802.5	MAN MAC IEEE 802.6	Token-Ring MAC FDDI
Phy	802.3 physical	802.4 physical	802.5 physical	802.6 physical	Optical fiber 100Mbps

LLC Sublayer

- Provides interface between the network layer and MAC
- Offers a common service access point (SAP) to all MAC sublayer protocols
- Fundamental Services:
  - » Connectionless Service: No establishing overhead (real-time)
  - » Connection-Oriented: establishing overhead
  - » Multiplexing:

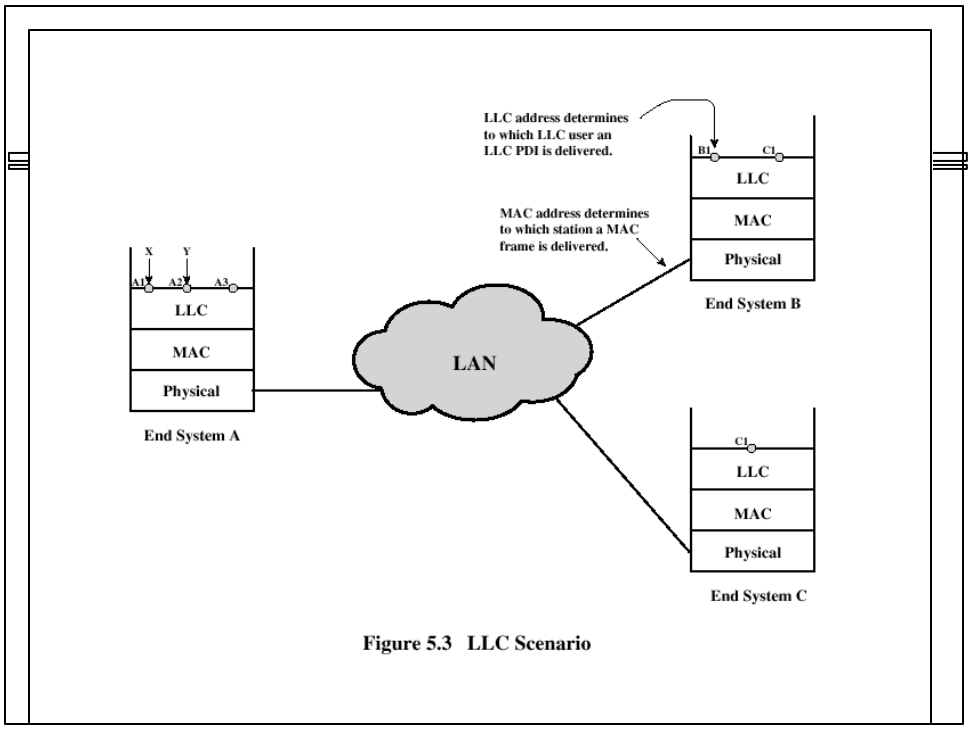

Figure 5.3 LLC Scenario