OSI Model

• ISO Standard 7489
• Composed of seven layers
• Each layer can be viewed as a protocol
  – Protocol: a set of rules that govern communications between hardware and/or software components
• OSI model is both hardware & software
OSI Layers

- **Application**
  - Network (not user) applications

- **Presentation**
  - Ensures that information sent from one system will be readable by another system.

- **Session**
  - Manages, communication sessions (program to program logical link)

- **Transport**
  - End to end network reliability

- **Network**
  - Network to network link. Uses logical addresses

- **Datalink**
  - Provides transport of data across a local physical network link. Uses physical addresses

- **Physical**
  - Specifications for the physical link between systems
Physical Layer

• The physical layer is concerned with:
  – The electrical, mechanical and procedural specifications for a point-to-point data transmission.
  – Many type of media can be used as long as it follows the specifications:
    Coax       Optical
    Fiber     Other
Data-Link Layer

- Provides a protocol that delivers reliability to upper layers for the point-to-point connections established by the physical layer.
- Builds upon the capabilities of the lower layer.
• Note the Data-Link layer is split
  – MAC layer. This is hardware dependent
  – LLC layer. This is hardware independent

<table>
<thead>
<tr>
<th>Logical Link Control</th>
<th>Specified by 802.X protocols</th>
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<tbody>
<tr>
<td>Media Access Control</td>
<td>Assures reliability of point-to-point data links</td>
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Is This always true?
Network Layer

• The protocol responsible for the establishment, maintenance and termination of end-to-end network links.

• In the TCP/IP stack, provides the IP to IP communications

• This layer is protocol STACK dependent.
  – IP to IP
  – IPX to IPX
Layer to Layer Communications

7 APPLICATION LAYER

6 PRESENTATION LAYER

5 SESSION LAYER

4 TRANSPORT LAYER

3 NETWORK LAYER

2 DATA LINK LAYER

1 PHYSICAL LAYER

0 MEDIA

Server running back-end engine application.

Client running front-end application.

Network Layer Transport
MAC Layer Transport
Physical Transport
Connection Media

COMMUNICATIONS PATH
Client to Server Communication

KEY:
H header
T trailer

GOLDMAN & RAWLES: LAN 2e
FIG. 02-02
Transport Layer

• Responsible for providing reliability for the end-to-end network layer connections
  – Error Recovery
  – Flow Control
  – Sequence Control
• Protocol stack dependent
  – SPX for Netware
  – TCP for TCP/IP
Session Layer

- Responsible for establishing, maintaining, and terminating sessions between user applications programs
- Application programs are referred to as Middleware.
  - Low level links through the Web, to database programs, etc.
Presentation Layer

• Provides an interface between user application and various presentation-related services. (Not user interface related)

• Provides encoding transparency.
  – ASCII can talk to an EBCDIC
  – FYI, uses a common intermediate code
Application Layer

- Network applications such as:
  - Mail (SMTP)
  - FTP
  - HTTP

- Not to be confused with user applications!
  - Network Utilities
OSI Layers

• IP Protocol Supported Layers
  – Layers 1 & 2 match
  – Layers 3, & 4 are functionally present
  – No layers 5 & 6
  – Layer 7 is present

• IP predates the OSI model
  – more on this when we look at IP