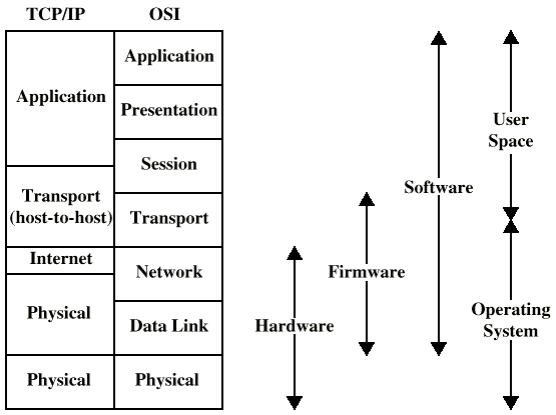
OSI Model



Physical Layer

- **Lowest layer** of OSI architecture provides services to the link layer, acquiring, maintaining and disconnecting the physical circuits that form the connecting communications path.
- Handles the **electrical and mechanical interface** as well as the procedural requirements of the interconnection medium.
- Responsible for **bit synchronization** and the **identification of a single element as a one or a zero**.
- This layer includes mechanical, electrical, functional and procedural **specifications**.

Physical Layer (cont.)

- The physical layer is the rough equivalent of the traditional data-terminal-equipment (DTE) to data-communications-equipment (DCE) interface.
- **Typical protocols** at the physical layer include the RS-232, the RS-449 family, CCITT X.25 and X.21 facility interfaces, other CCITT (V) and (X) series recommendations, and the physical aspects of the IEEE 802.X media access protocols for Local Area Networks.

Data Link Layer

- Link layer services relate to the **reliable interchange** of data **across a point-to-point or multipoint data link** that has been established at the physical layer.
- Link layer protocols **manage** establishment, control and termination of **logical link connection**. They control the **flow** of user data, supervise recovery from errors and abnormal conditions, and acquire and maintain character and block or frame synchronization.
- It attempts to **add reliability**, flow and error control, and communication management.

Data Link Layer (cont.)

- **Connectionless** vs. **Connection Oriented**
  - reliability issues
- Data link control protocols include character-oriented Binary Synchronous Communication (BSC), ANSI X3.28m,
- the more recent bit-oriented ADCCP (Advanced Data Communications Control Procedure) and its international counterpart HDLC, X.25, LAPB, ISDN, LAPD and IEEE 802.X logical link control.

Network Layer

- Responsible for **providing communication between two hosts** across a communication network. Services include routing, switching, sequencing of data, flow control and error recovery.
- It provides the interface such that higher layers need not know about the underlying topology.
- It provides **connection management**, **routing**, and **error** and **flow control**.
- The CCITT **X.25 packet layer** is the best known network layer protocol for packet- switched networks. X.21 is used for circuit-switched networks.
- **DoD** has developed the **IP** Internet control protocol.
- Other examples of network protocols include the CCITT Q.931 network layer and the ISO 8473 connectionless inter-network protocol.

Transport Layer

- **Highest layer** directly **associated with the movement of data** through the network.
- It provides a universal transparent mechanism for use by the higher layers that represent the users of the communications service.
- The transport layer is expected to **optimize** the use of available **resources** while meeting user requirements.
- Responsible for the **end-to-end integrity** of the edit exchange and must bridge the gap between services provided by the underlying network and those required by the higher layers.

Transport Layer (cont.)

- Classes of transport protocols have been developed that range from **extremely simple to very complex**.
- Quality of Service (**QOS**)
  - Simple transport layers can be used when the network provides a high quality, reliable service.
  - A complex transport protocol is used when the underlying service does not, or is assumed to be unable to, provide the required level of service.
- Examples:
  - The ISO has promulgated International **Standard 8073** as a transport protocol. This standard defines five (5) classes of protocols, ranging from a simple Class (0) to a complex Class (4).
  - Another transport protocol example is the Transmission Control Protocol (**TCP**) developed by the DoD and now finding wide application in commercial environments.

Session Layer

- A session **binds two application processes** into a cooperative relationship for a certain time.
- Provides administrative service that handles the **establishment** (binding) and **release** (unbinding) of a **connection** between two presentation entities.
- Half/full-duplex, **Synchronization** of long transactions, **Exception handling**
- Sessions are established when an application process **requests** access to another application process.
- Session protocols include ISO 8327, CCITT X.25, ECMA 75 and CCITT T.62 which is intended for use in teletex services.

Presentation Layer

- These services allow an application to properly **interpret the information** being transferred.
- This includes **translation**, **transformation**, **formatting** and **syntax** of the information.
- These functions may be required to adapt the information-handling characteristics of one application process to another.
- Examples include data **security**, **encryption**/decryption, **code translation**, structuring of data for display on screen, format control and virtual terminal protocols.
- The syntactical representation of data has been defined in DIS 8824 and 8825.
- CCITT has described the presentation protocol for message-handling systems in X.409 and for Telex in X.61.

Application Layer

- This layer provides management functions to **support distributed applications** utilizing the OSI environment.
- It is the window through which the applications gain access to the services provided by the communications architecture.
- These include **identification** of the cooperating processes, **authentication** of the communicant, **authority verification**, **agreement on encryption** mechanisms, determination of **resource** availability and agreement on **syntax**, e.g. character set, data structure.