

OSI Model  
Open Systems Interconnection Model  
Chapter objectives

- Explain layers of the OSI Model
  - Describe specific networking services within each layer
  - Explain how two systems communicate through OSI model
  - Discuss structure and purpose of data frames
  - Describe two types of addressing contained in the OSI Model
- Standards & Organizations
- Documented agreements of technical specifications covering specific activities performed by products
  - ANSI- American National Standards Institute; voluntary compliance; [www.ansi.org](http://www.ansi.org)
  - EIA – Electronic Industries Alliance; trade organization; [www.eia.org](http://www.eia.org)
- More Standards Organizations
- IEEE (often referred to as I triple E) Institute of Electrical and Electronic Engineers; standards -- see page 52. Important to recognize what each standard covers. 802 standard covers physical aspects of networking; [www.ieee.org](http://www.ieee.org)
  - ISO – International Organization for Standardization; establishes international technological standards; [www.iso.ch](http://www.iso.ch)

OSI Model

- ISO developed to ensure that computer platforms would be able to communicate without vendor specific equipment

7 Layers of OSI

Physical

Data Link

    Logical Link Control

    Media Access Control

Network

Transport

Session

Presentation

Application

Physical Layer

- Contains cabling, connectors, repeaters, hubs, NICs
- Sets data transmission rate and monitors data error rates
- Does not provide error correction services
- Protocols generate and detect voltage

## Physical Layer Standards

- Denoted by IEEE
- 802
  - 802.1: covers routing, bridging, and internetwork communications
  - 802.3: covers all forms of Ethernet media and interfaces
  - 802.4: covers all forms of token bus media and interfaces
  - 802.5: covers all forms of token ring media and interfaces

### Data Link Layer

- Controls communications between the Network layer and the Physical layer
- Divides data received from the Network layer into distinct frames to be transmitted by Physical layer
- Independent of Physical layer
- Connectivity devices work – bridges, switches, NIC

### Functions of Data Link Layer

- Acknowledgment from the receiver that data was received correctly – error checking requesting retransmitting of message
- Controls flow of information
- Codes, addresses, and transmits information

### Simplified Data Frame

- Structured package
- Destination Address
- Source Address
- Control Information
- Data
- Error Checking Information

### Data Link Layer

- Data blocks packaged into individual frames
- Frame Check Sequence (FCS)
  - Error checking algorithm
- Header
  - Destination address assigned by Network layer
  - Source address assigned by Network layer

### Frame Types

- Unique for each type
- Will not interact with different frame types on the network
- Routers cannot support more than one frame type per physical interface

### Ethernet Frame: IEEE 802.3

- Header
  - Preamble – marks beginning of frame
  - Start of Frame Delimiter (SFD)

- Beginning of addressing frame
- Destination Address
- Source Address
- Length – length of packet

#### More on Ethernet Frame

- Control Information
  - SFD
  - Addresses – source & destination
  - Length
- Data
- Trailer
  - Pad (may be used to meet minimum size requirement of 46 bytes)

#### Ethernet Frame

- Trailer
  - Frame Check Sequence
    - Performs error checking
    - CRC – Cyclical Redundancy Check

#### Token Ring Frame: IEEE 802.5

- Control Information
  - Start Delimiter – beginning of packet
  - Access Control – priority of frame
  - Frame Control – type of frame
- Destination Address
- Source Address
- Data

#### Token Ring Frame

- Frame Check Sequence – integrity of the frame – uses Frame Control data
- End Delimiter – end of frame
- Frame Status – was frame deliverable was destination node recognized & frame copied or not

#### LLC

- Sub-layer of Data Link Layer
  - upper
- Logical Link Control
  - Provides Data Link functions of flow control

#### MAC

- Media Access Control
- Sub-layer of Data Link layer

- Provides physical addresses of network hardware
- Each NIC has unique physical identification number so can be assigned on network
- NOTE: physical address not logical

#### Network Layer

- Function: translate network addresses into physical counterparts & route data
- Devices utilized: routers

#### Transport Layer

- Responsibility: reliability and integrity of data transferred
- Ensures data transferred correctly
  - ACK
- Flow Control
  - Segmentation -- sequencing
  - Reassembly

#### Session Layer

- Connection responsibilities
  - Establishing
  - Maintaining
  - Monitors identification of session participants – per authorization for access to session

#### Presentation Layer

- Translator between application and network
- Formats data – either for network or application depending upon direction of communication
- Data encryption and decryption occur at this layer
- Decodes and codes graphics and file format information

#### Application Layer

- Interfaces to software
- Refers to services to support software not actual application
- File transfer, file management, message handling, print, etc.
- API – application program interface – interact with operating system