

## Communication Protocols

- Describes the rules that govern the transmission of data over the communication Network.
- Provide a method for orderly and efficient exchange of data between the sender and the receiver.

## Roles of Communication Protocol

1. **Data Sequencing** – to detect loss or duplicate packets.
2. **Data Routing** – to find the most efficient path between source and a destination.
3. **Data formatting** – defines group of bits within a packet which constitutes data, control, addressing and other information.
4. **Flow control** – ensures resource sharing and protection against traffic congestion by regulating the flow of data on communication lines.

## Roles of Communication Protocol

5. **Error control** – detect errors in messages. Method for correcting errors is to retransmit the erroneous message block.
6. **Precedence and order of transmission** – condition all nodes about when to transmit their data and when to receive data from other nodes. Gives equal chance for all the nodes to use the communication channel.
7. **Connection establishment and termination** –
8. **Data security** – Prevents access of data by unauthorized users.

## The OSI Model

- OSI is short for Open Systems Interconnection.
- OSI model was first introduced by the International Organization for Standardization (ISO) in 1984
  - Outlines **WHAT** needs to be done to send data from one computer to another.
  - Protocols stacks handle how data is prepared for transmittal
- Contains specifications in 7 different layers that interact with each other.

## What is “THE MODEL?”

- Commonly referred to as the OSI reference model.
- Open system interconnection (OSI) model is a framework for defining standards for linking heterogeneous computer systems, located anywhere.
- The OSI model is a theoretical blueprint that helps us understand how data gets from one user's computer to another.
- It is also a model that helps develop standards so that all of our hardware and software talks nicely to each other.

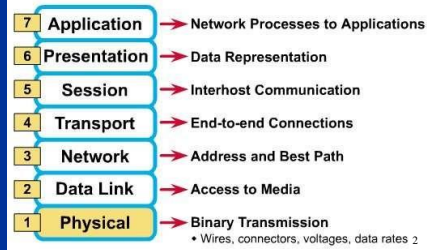
## 7 Layer OSI Model

- Why use a reference model?
  - Serves as an outline of rules for how protocols can be used to allow communication between computers.
  - Each layer has its own function and provides support to other layers.
- Other reference models are in use.
  - Most well known is the TCP/IP reference model.

## 7 Layer OSI Model

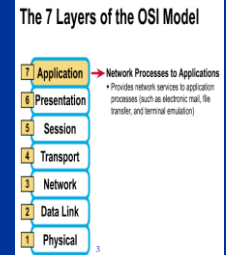
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## What Each Layer Does



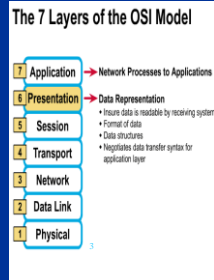
## Application Layer

- Gives end-user applications access to network resources
- Where is it on my computer?
  - Workstation or Server Service in MS Windows



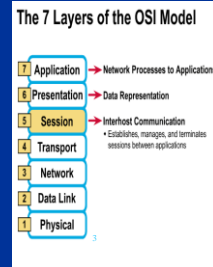
## Presentation Layer

- Provides common data formatting between communicating devices
- Components make sure the receiving station can read the transferred data



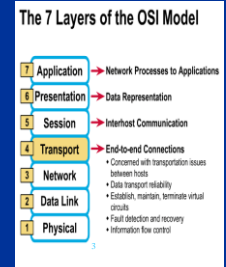
## Session Layer

- Allows applications to maintain an ongoing session
- Example – NetBIOS
- Where is it on my computer?
  - Workstation and Server Service (MS)
  - Windows Client for NetWare (NetWare)



## Transport Layer

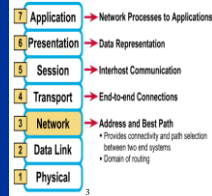
- Provides reliable data delivery
- It's the TCP in TCP/IP
- Receives info from upper layers and segments it into packets
- Can provide error detection and correction



## Network Layer

- Provides network-wide addressing and a mechanism to move packets between networks (routing)
- Responsibilities:
  - Network addressing
  - Routing
- Examples:
  - IP from TCP/IP
  - IPX from IPX/SPX

The 7 Layers of the OSI Model



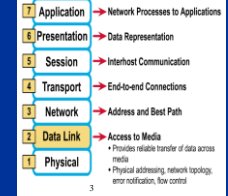
## Network Addresses

- Network-wide addresses
- Used to transfer data across subnets
- Used by routers for packet forwarding
- Example:
  - IP Address
- Where is it on my computer?
  - TCP/IP Software

## Data Link Layer

- Places data and retrieves it from the physical layer and provides error detection capabilities

The 7 Layers of the OSI Model



## Sub-layers of the Data Link Layer

- MAC (Media Access Control)
  - Gives data to the NIC
  - Controls access to the media through:
    - CSMA/CD Carrier Sense Multiple Access/Collision Detection
    - Token passing
- LLC (Logical Link Layer)
  - Manages the data link interface (or Service Access Points (SAPs))
  - Can detect some transmission errors using a Cyclic Redundancy Check (CRC). If the packet is bad the LLC will request the sender to resend that particular packet.

## Physical Layer

- Determines the specs for all physical components
  - Cabling
  - Interconnect methods (topology / devices)
  - Data encoding (bits to waves)
  - Electrical properties
- Examples:
  - Ethernet (IEEE 802.3)
  - Token Ring (IEEE 802.5)
  - Wireless (IEEE 802.11b)

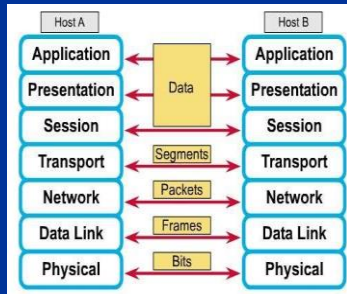
The 7 Layers of the OSI Model



## Physical Layer (cont'd)

- What are the Physical Layer components on my computer?
- NIC
  - Network Interface Card
  - Has a unique 12 character Hexadecimal number permanently burned into it at the manufacturer.
  - The number is the MAC Address/Physical address of a computer
- Cabling
  - Twister Pair
  - Fiber Optic
  - Coax Cable

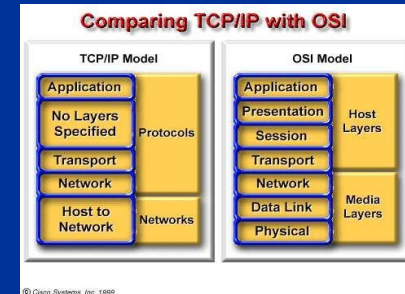
## How Does It All Work Together



## The TCP/IP Model

- Another Model is the TCP/IP Model.
- There is no universal agreement regarding how to describe TCP/IP with a layered model.
- Most descriptions present three to five layers.
- We use the four layer structure that incorporates the Presentation and Session layers with the Application layer.

## Comparing TCP/IP With OSI



## The TCP/IP Model (4 Layer)

- Application Layer
  - Interacts with user processes
- Transport Layer
  - TCP guarantees data is received and sent accurately
- Internet Layer
  - IP separates upper layers from the network and manages the connections across the network
- Network Access Layer
  - Incorporates the Network and Physical layers of the OSI model

## Remembering the 7 Layers

7 - Application	All
6 - Presentation	People
5 - Session	Seem
4 - Transport	To
3 - Network	Need
2 - Data Link	Data
1 - Physical	Processing