

Networking



Pronesis
THE PRACTICAL CHOICE

What we will learn?

- What is Network
- Types of Networks
- OSI Model
- TCP/IP Model



What is Network?

- Communication between 2 computers/devices which allows them to share or share resources between them, connect them by a network cable that connects to the network card used in the computer, With the help of the communication protocols we pass the information through the cables between the first computer and the second.



Types of Networks

- ▶ **Personal area network(PAN):** A personal area network (PAN) is the smallest and simplest type of network. PANs connect devices within the range of an individual and are no larger than about 10 meters (m). Because PANs operate in such limited areas of space, most are wireless and provide short-range connectivity with infrared technology.
- ▶ **Local area network(LAN):** A local network, its size can vary from one to another, can be a network of a single room or a laboratory, it can be our whole house, so it is our home network.
- ▶ **Wireless Local Area Network(WLAN):** If I have a local network that is completely wireless, that I work on, it can be considered a wireless LAN connected to a wireless access point that is a cable and from there everything is wireless.
- ▶ **Campus Area Network(CAN):** A network that deals with a campus, for example, a network of a school, or a business center.
- ▶ **Wide Area Network(WAN):** A wide net, a net that expands according to distance.



Networking

The OSI Model



Pronesis
THE PRACTICAL CHOICE

Introduction

The Open Systems Interconnection (OSI) model is a reference tool for understanding data communications between any two networked systems.

It divides the communications processes into 7 layers.

Each layer performs specific functions to support the layers above it and offers services to the layers below it.

The three lowest layers focus on passing traffic through the network to an end system.

The top four layers come into play in the end system to complete the process.

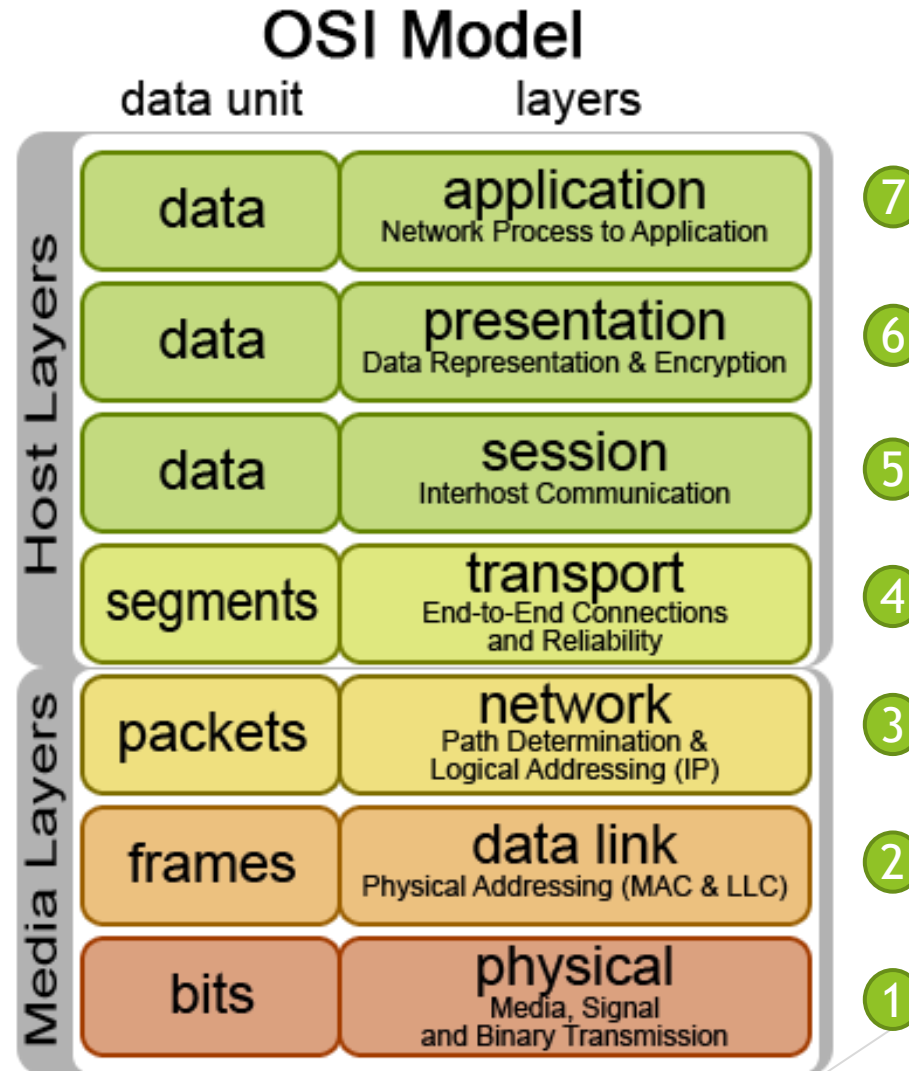


Intro OSI Model

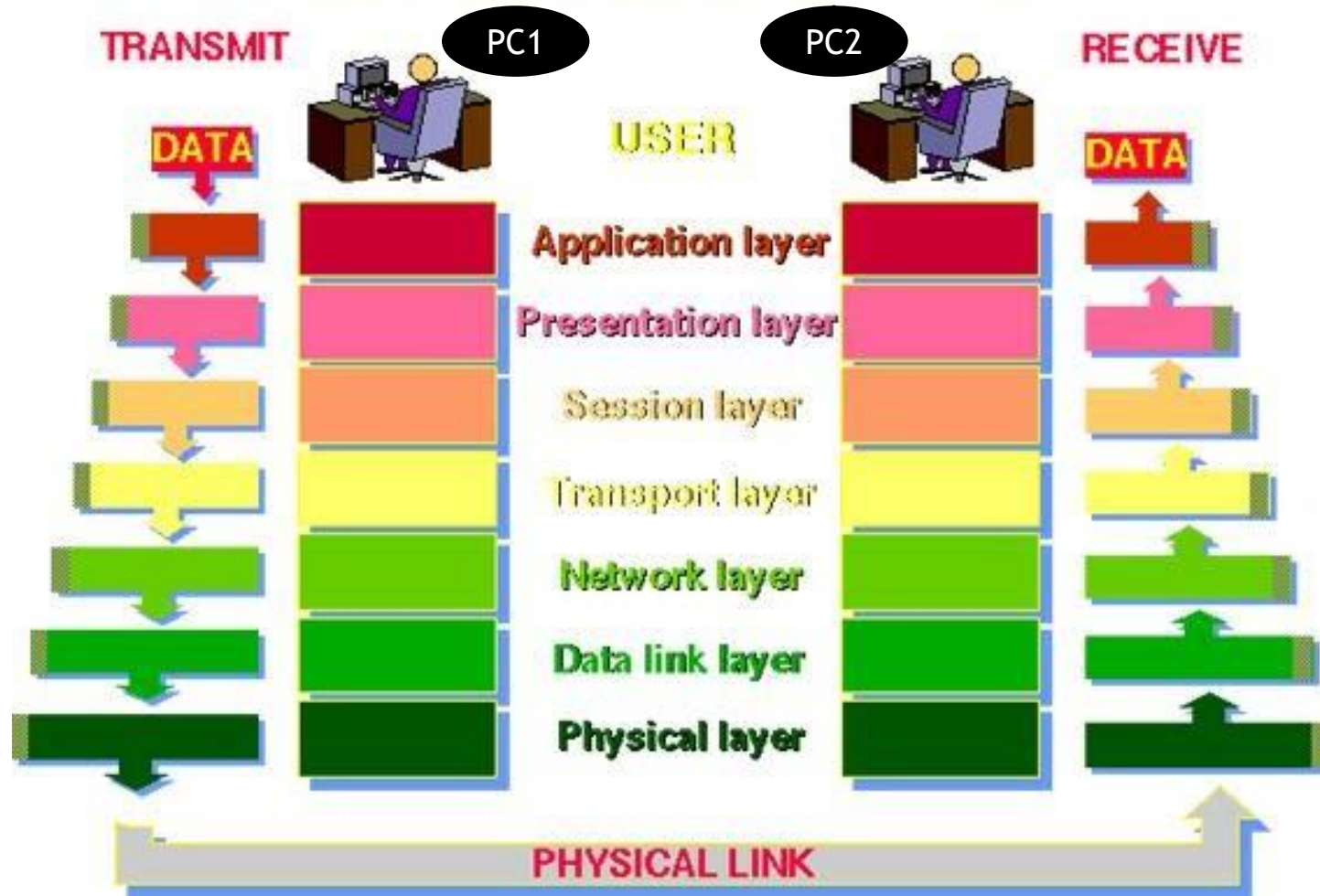
- OSI Model breaks the complex task of computer to computer network communication Into 7 layers
- Upper Layers(Host Layers)
 - Handled by the host computer and performs application-specific functions, such as data formatting, encryption, and connection management.
- Lower Layers(Media Layers)
 - Provide network-specific functions, such as routing, addressing, and flow control.



An Overview of the OSI Model

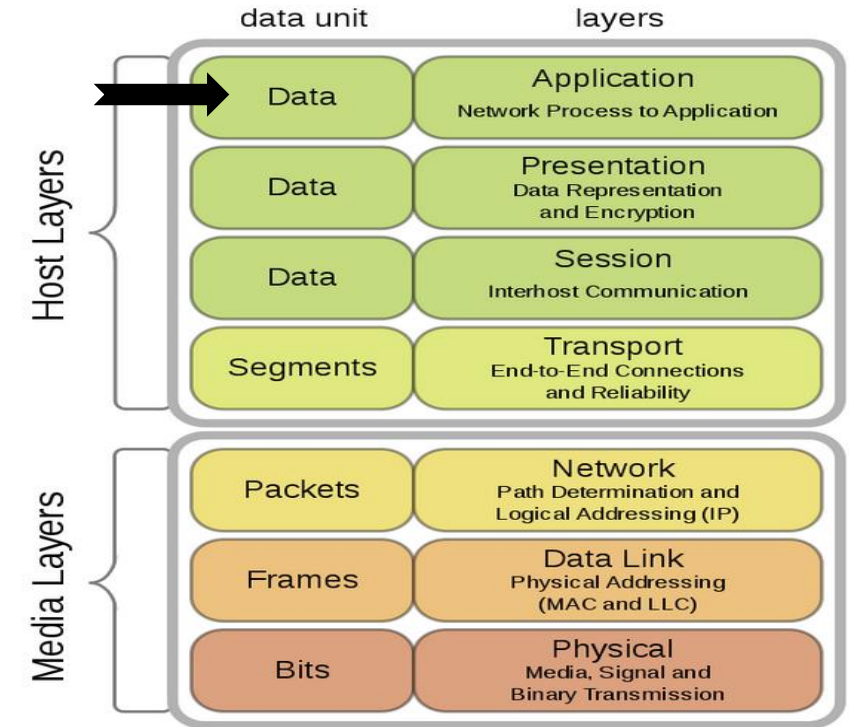


THE 7 LAYERS OF OSI



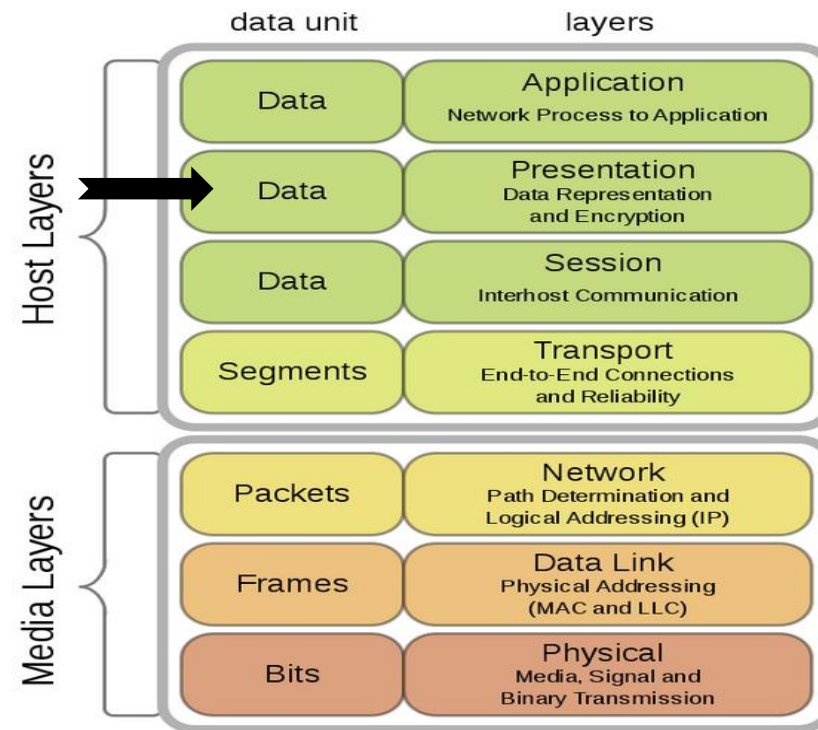
7. Application Layer

- ▶ The application layer is used by end-user software such as web browsers and email clients. It provides protocols that allow software to send and receive information and present meaningful data to users. A few examples of application layer protocols are the Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Post Office Protocol (POP), Simple Mail Transfer Protocol (SMTP), and Domain Name System (DNS).



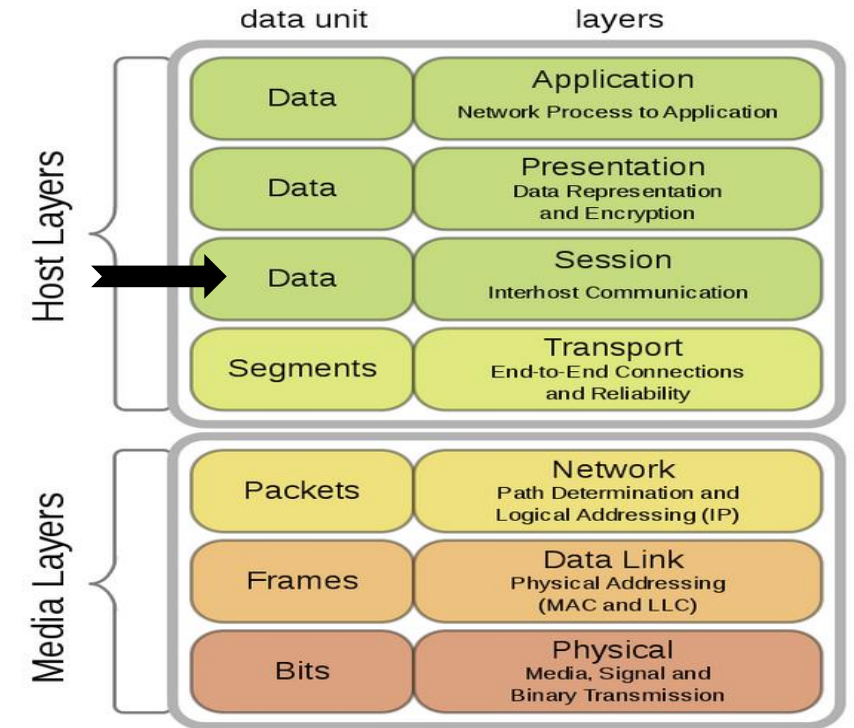
6. Presentation Layer

- The presentation layer prepares data for the application layer. It defines how two devices should encode, encrypt, and compress data so it is received correctly on the other end. The presentation layer takes any data transmitted by the application layer and prepares it for transmission over the session layer.



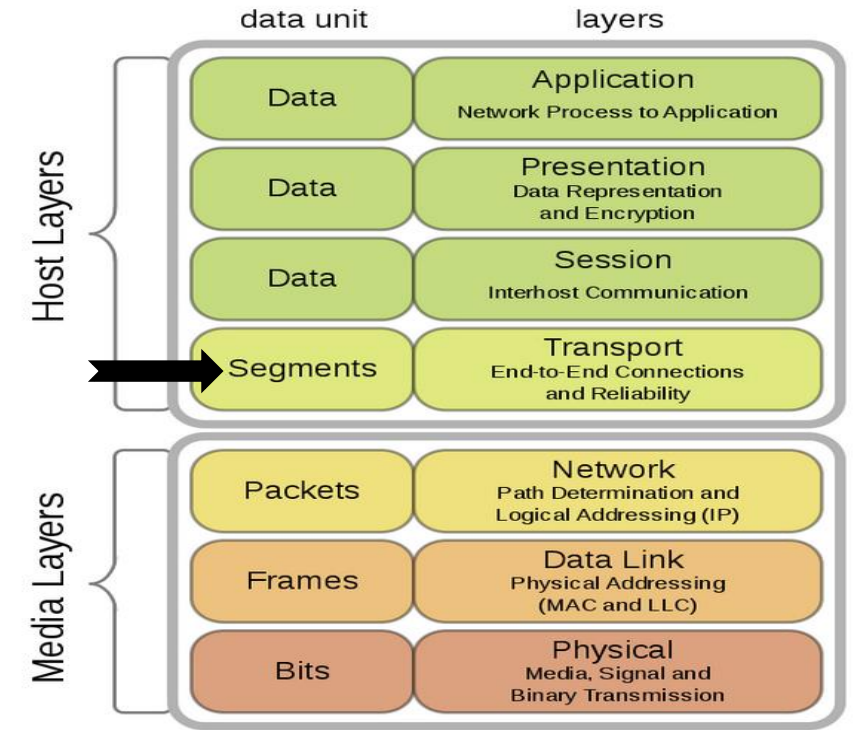
5. Session Layer

- The session layer creates communication channels, called sessions, between devices. It is responsible for opening sessions, ensuring they remain open and functional while data is being transferred, and closing them when communication ends. The session layer can also set checkpoints during a data transfer—if the session is interrupted, devices can resume data transfer from the last checkpoint



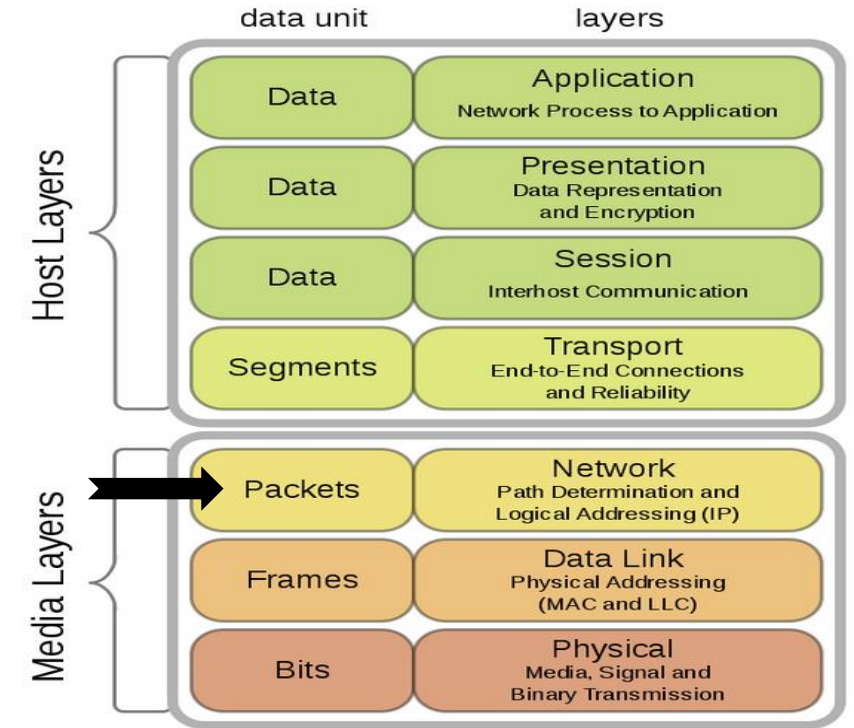
4. Transport Layer

- ▶ The transport layer takes data transferred in the session layer and breaks it into “segments” on the transmitting end. It is responsible for reassembling the segments on the receiving end, turning it back into data that can be used by the session layer. The transport layer carries out flow control, sending data at a rate that matches the connection speed of the receiving device, and error control, checking if data was received incorrectly and if not, requesting it again.



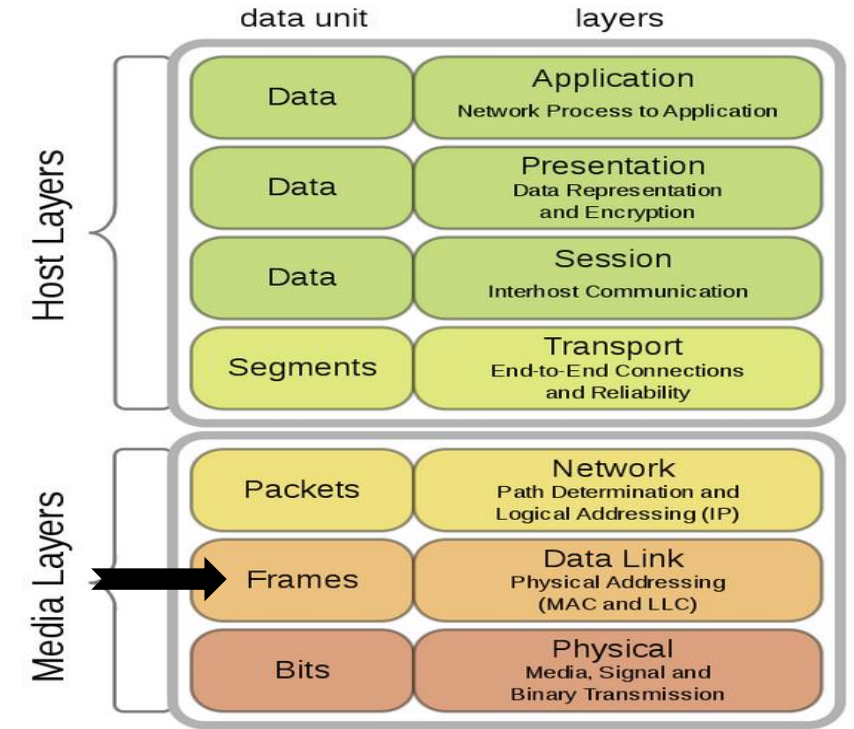
3. Network Layer

- The network layer has two main functions. One is breaking up segments into network packets, and reassembling the packets on the receiving end. The other is routing packets by discovering the best path across a physical network. The network layer uses network addresses (typically Internet Protocol addresses) to route packets to a destination node.



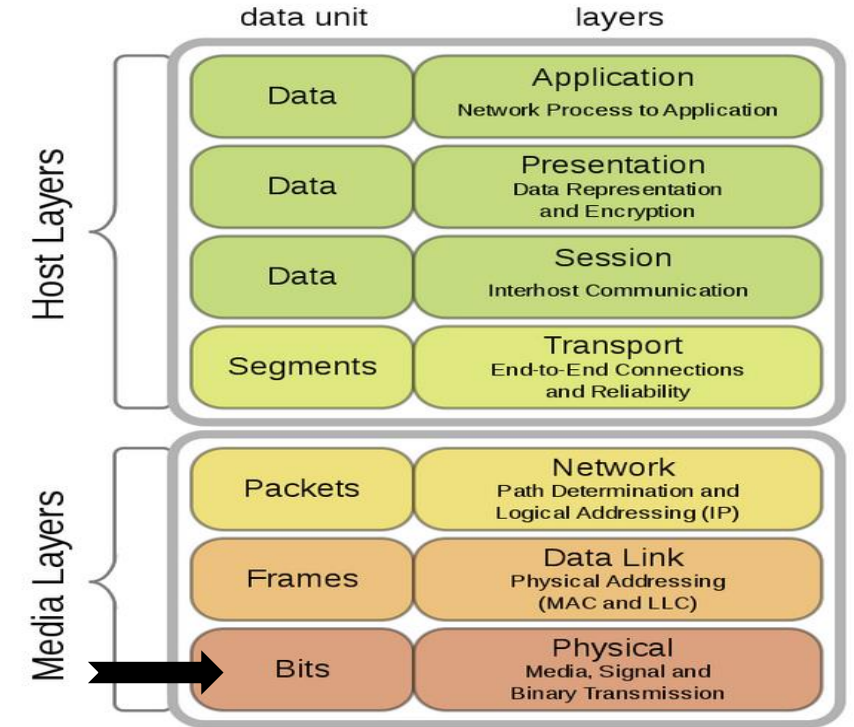
2. Data Link Layer

- ▶ The data link layer establishes and terminates a connection between two physically-connected nodes on a network. It breaks up packets into frames and sends them from source to destination. This layer is composed of two parts—Logical Link Control (LLC), which identifies network protocols, performs error checking and synchronizes frames, and Media Access Control (MAC) which uses MAC addresses to connect devices and define permissions to transmit and receive data.



1. Physical Layer

- ▶ The physical layer is responsible for the physical cable or wireless connection between network nodes. It defines the connector, the electrical cable or wireless technology connecting the devices, and is responsible for transmission of the raw data, which is simply a series of 0s and 1s, while taking care of bit rate control.



OSI Module protocols

OSI LAYERS	EXAMPLE PROTOCOLS
APPLICATION LAYER	HTTP, FTP, IRC, SSH, DNS
PRESENTATION LAYER	SSL, FTP, IMAP, SSH
SESSION LAYER	VARIOUS API'S, SOCKETS
TRANSPORT LAYER	TCP, UDP, ECN, SCTP, DCCP
NETWORK LAYER	IP, IPSec, ICMP, IGMP
DATA-LINK LAYER	Ethernet, SLIP, PPP, FDDI
PHYSICAL LAYER	Coax, Fiber, Wireless



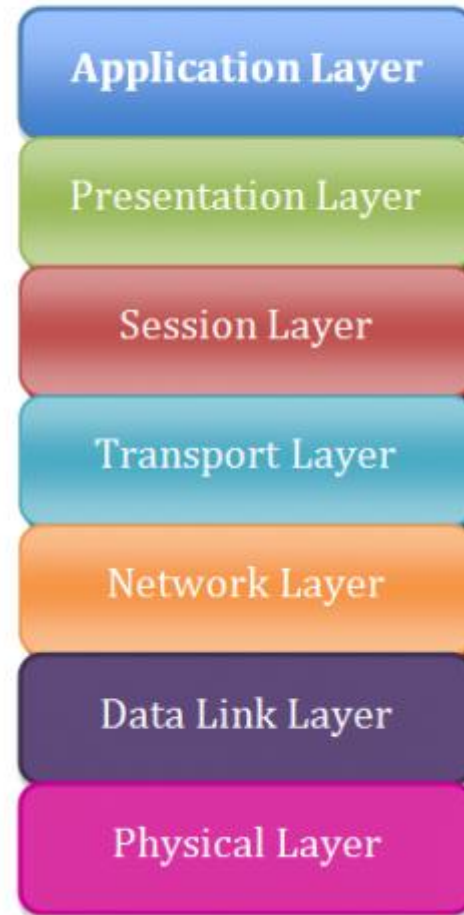
Networking

The TCP/IP Model

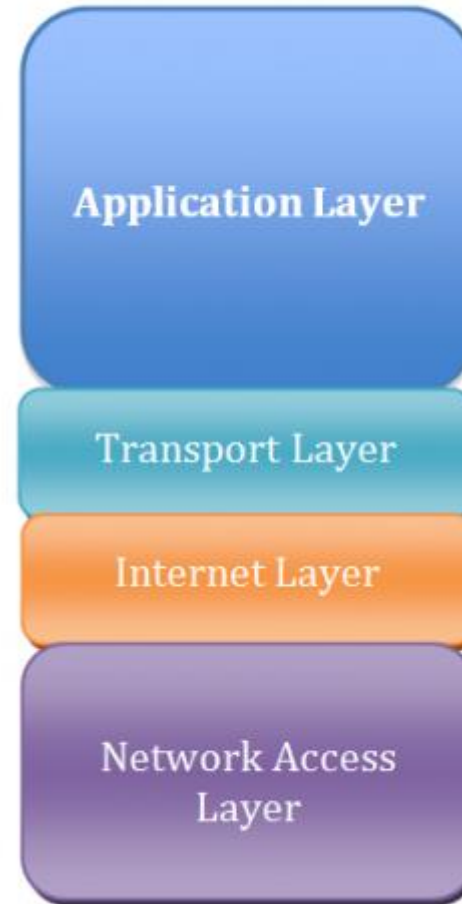


Pronesis
THE PRACTICAL CHOICE

OSI Model

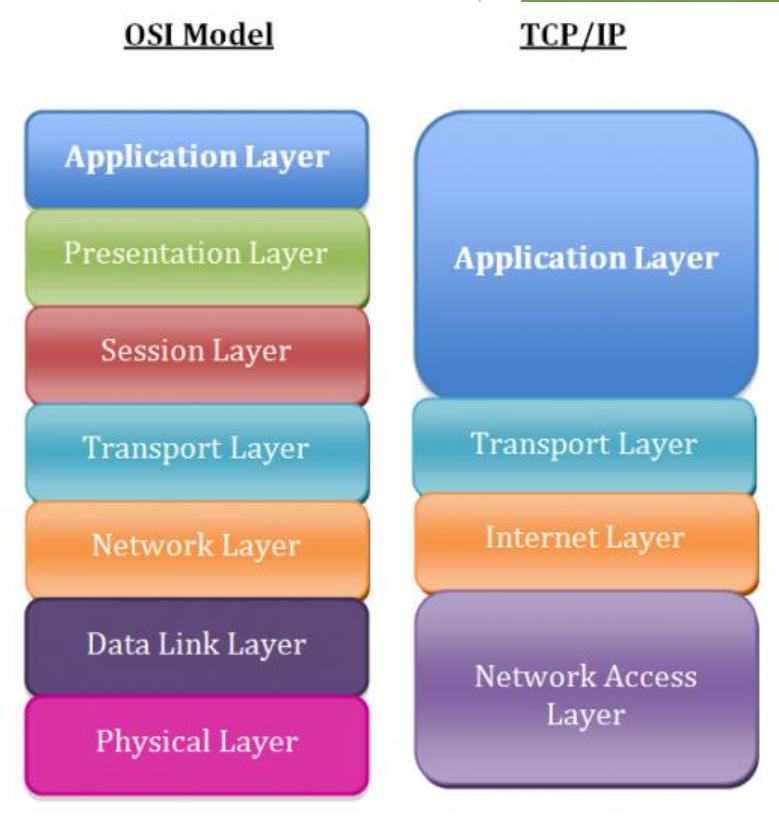


TCP/IP



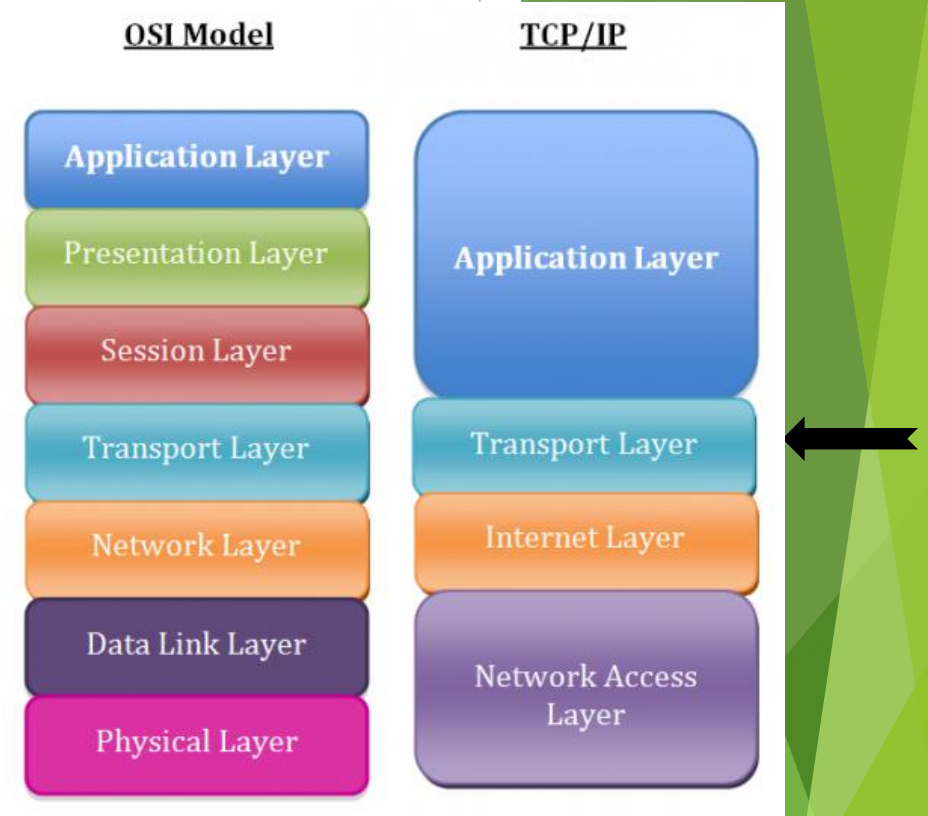
4. Application Layer

- It contains the last three OSI Model layers, the Session layer, the Presentation layer, and the Application layer



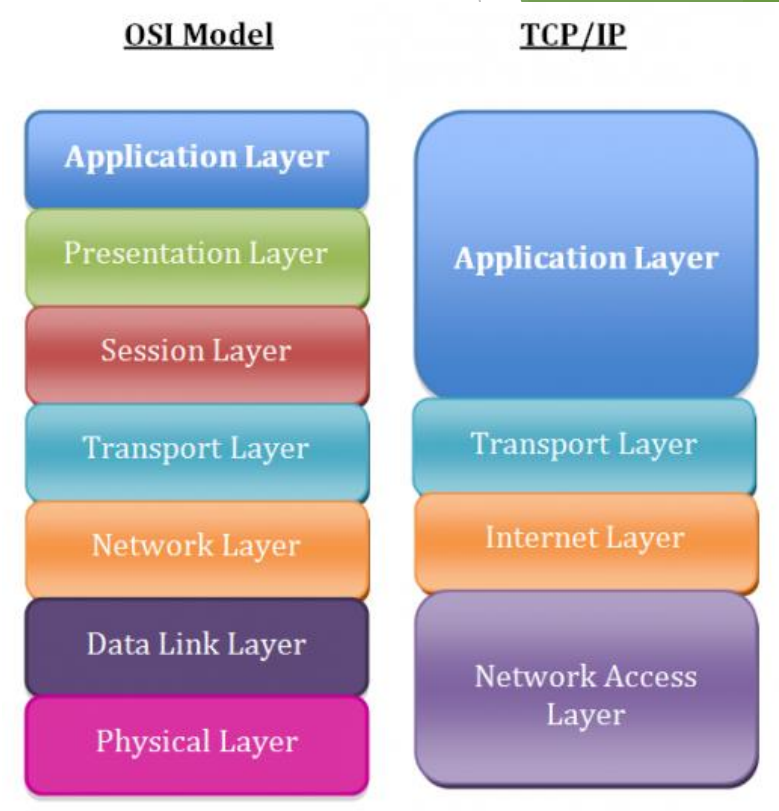
3. Transport Layer

- It contains the Transport layer as in the OSI Model.



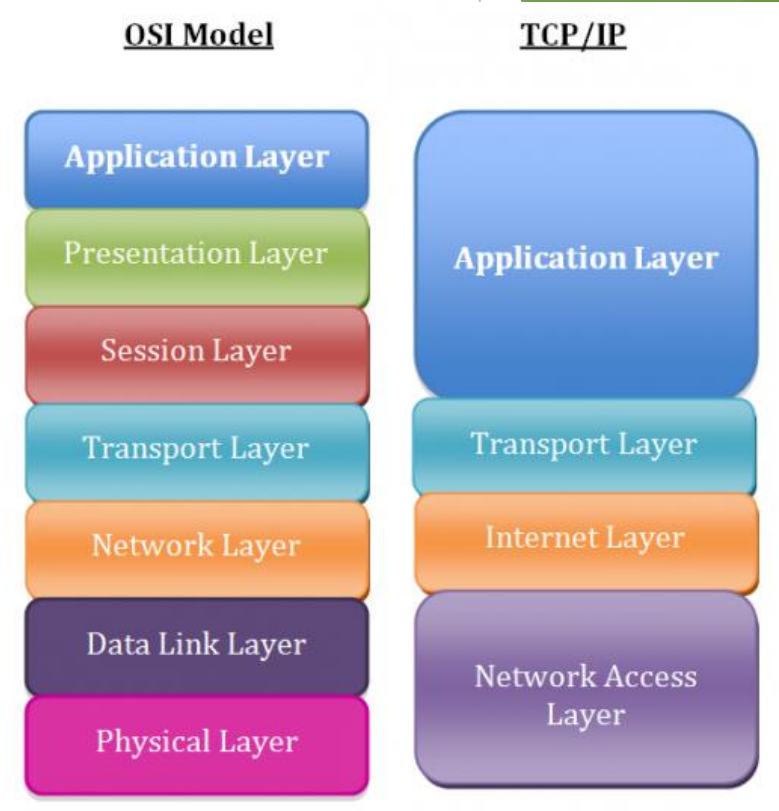
2. Internet Layer

- It contains the Network layer of the OSI Model layer and refers to the IP address.



1. Network Access Layer

- ▶ Compared to the OSI Model, it contains the Physical layer and the Data Link layer



TCP/IP module protocols

<i>TCP/IP Model</i>	<i>Protocols and Services</i>	<i>OSI Model</i>
<i>Application</i>	<i>HTTP, FTTP, Telnet,NTP, DHCP, PING</i>	<i>Application</i> <i>Presentation</i> <i>Session</i>
<i>Transport</i>	<i>TCP,UDP</i>	<i>Transport</i>
<i>Network</i>	<i>IP, ARP,ICMP, IGMP</i>	<i>Network</i>
<i>Network Interface</i>	<i>Ethernet</i>	<i>Data Link</i> <i>Physical</i>

