OSI MODEL

INTRODUCTION

- Developed by ISO - International Organization for Standardization
- Stands for - Open System Interconnect Model
- Idea was to develop vendor independent hardware & software
- Useful tool for network troubleshooting
- It just explains how internet works and how data flow in networks
- Has no physical appearance in the network
- Only used for teaching purposes

7-LAYERED ARCHITECTURE

7 – Application Layer

6 – Presentation Layer

5 – Session Layer

4 – Transport Layer

3 – Network Layer

2 – Data Link Layer

1 – Physical Layer

Just to Remember☺

“Asman_Pe_Sitare_The_Nahi_Dekh_Paye”

These 7 Layers are further divided into 2 more categories for the sake of simplicity:

> Upper Layers – closer to the user

> Lower Layers – closer to the network

UPPER LAYERS

7 – Application Layer

6 – Presentation Layer

5 – Session Layer

- These are the layers that generally deals with the applications only.
- They have no real involvement with the real data packaging or transportation.

LOWER LAYERS

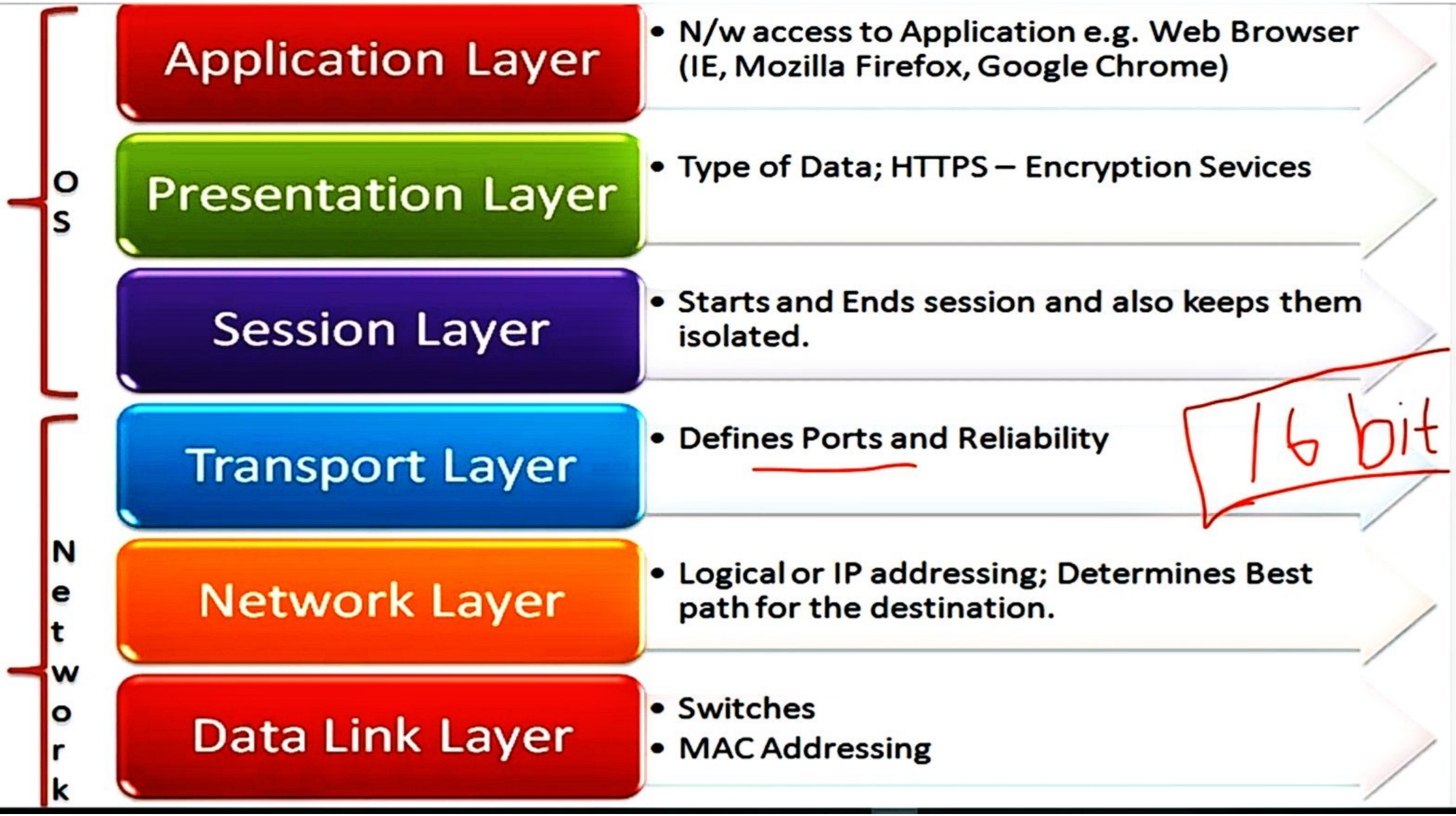
4 – Transport Layer

3 – Network Layer

2 – Data Link Layer

1 – Physical Layer

- These layers actually deals with how data is really being transferred through the network.
- Vast majority of network engineering is all about these lower layers.
- You would be focusing on upper layers if you are more of a programmer and writing applications.


OS
Application Layer
• N/w access to Application e.g. Web Browser (IE, Mozilla Firefox, Google Chrome)
Presentation Layer
• Type of Data; HTTPS – Encryption Sevices
Session Layer
• Starts and Ends session and also keeps them isolated.
Network
Transport Layer
• Defines Ports and Reliability
16 bit
Network Layer
• Logical or IP addressing; Determines Best path for the destination.
Data Link Layer
• Switches
• MAC Addressing

APPLICATION LAYER

- This layer provides an interface to the user to get on the network or to use the network.

  E.g. Browsers, WhatsApp etc.

- This is the layer which talks to the end hosts/devices.

  E.g. Mail, Telnet, FTP etc.

Remember:

Networking is all about using the applications over the network!

PRESENTATION LAYER

- This layer makes sure that 2 end devices on the network can talk to each other and understand each other regardless of the operating systems or encryption types they are using.

Other functions:

- Encryption
- Decryption
- Compression
- Decompression
- Synchronization

SESSION LAYER

- It handles the sessions between end hosts & web-servers
- Means to say it starts, maintain and terminates sessions between clients & servers.
- Everything on the web is handled by using sessions.

E.g.

As long as you are using Gmail or Facebook, you are maintaining the dedicated sessions with their servers. Once you logout, you have terminated that session. Now, if you have to login again, you have to create a new session all over.

Note:

Type 'NETSTAT' in your CMD and you will see the sessions I am talking about!

TRANSPORT LAYER...

It breaks up data between into smaller parts as complete data can't be send over the network as a single unit.

So, it has to be converted/divided into many smaller units (called Data Units) before transmission at sending side, which are then re-assembled at receiving side.

- This whole process is known as Segmentation & these smaller units are known as Segments at transport layer.

It establishes end-to-end connectivity using port numbers!

NETWORK LAYER

It provides connectivity & path selection

- Routing (Packet Switching)

Defines logical addressing

- IPv4
- IPv6

Devices & Protocol at this layer:

- Router
- IPv4, IPv6, ICMP

Note:

Type 'IPCONFIG' in your CMD and see the IP address details!

DATA LINK LAYER

It completes the Final Formatting of the data before actually sending it over the physical links.

Defines Physical Addressing:

- MAC addressing

Controls Error Detection:

- Cyclic Redundancy Check (CRC)

Devices & Protocols at L2:

- Switches, Bridges, Wireless Access Points, Ethernet, PPP

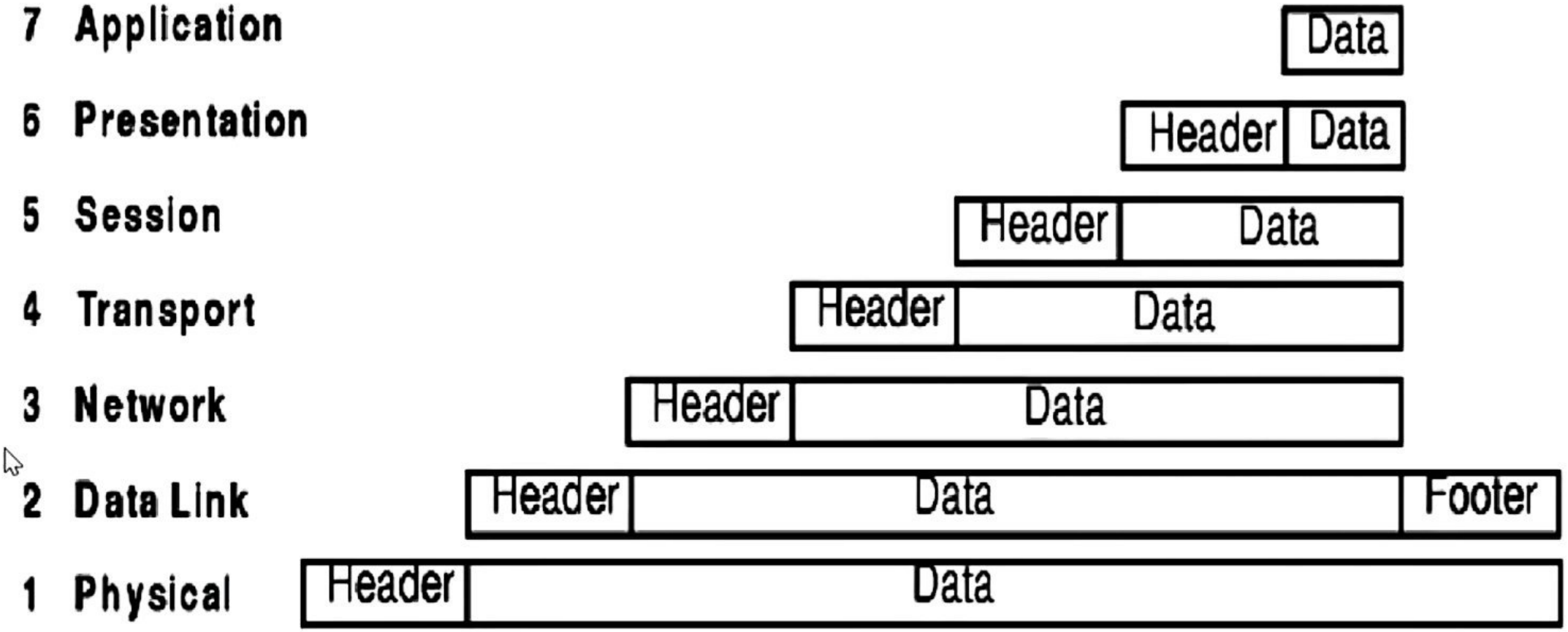
PHYSICAL LAYER

It defines physical media properties:

- electrical/ optical functions
- Physical data rates
- Physical connectors
- Cable distances
- Optical wavelengths
- Wireless frequencies

Devices & Protocols:

- Hubs, Repeaters, CAT cables, Fiber Optics etc.



OSI Reference Model

WHY USE LAYERED ARCHITECTURE?

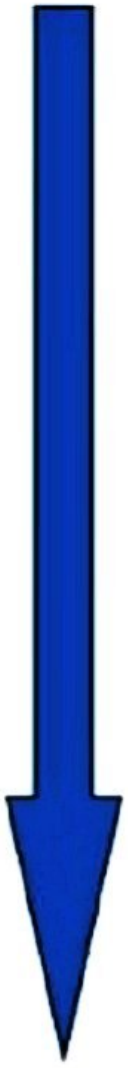
Devices only need to be aware of their own layer:

- Web-Servers don't care if the requests are coming from Wired cables or Wireless frequencies
- Switches don't care if they are sending either IPv4 or IPv6 as they have nothing to do with it

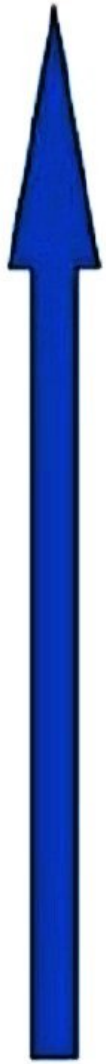
Allows inter-operability between devices & vendors:

- Google Chrome can freely talk to Apache Server as they both agree on HTML standards
- HUAWEI Ethernet switch can talk to D-Link Ethernet switch as they agree on Ethernet standards
- CISCO router can connect to Juniper router as they agree on IP routing standards

Encapsulation



Layer	PDU Name
7. Application	Data
6. Presentation	Data
5. Session	Data
4. Transport	Segment
3. Network	Packet
2. Data Link	Frame
1. Physical	Bits



Decapsulation

PROTOCOL DATA UNITS (PDU)

Transport Layer

- Segment

Network Layer

- Packet

Data Link Layer

- Frame

Physical Layer

- Bits

Encapsulation:

- Process of adding data formatting on the Sending Host to create a PDU
- It occurs when data moves down the OSI stack i.e. 7>6>5> and so on
- Data is passed to the layer below
- The process repeats until the physical layer is reached

De-Capsulation:

- Process of removing data formatting on the Receiving Host to retrieve information from a PDU
- It occurs when data moves up the OSI stack i.e. 1>2>3 and so on

- Each layer removes its own header/trailer
- Data is then passed up to the layer above
- Process repeats until the application is reached

PDU_Name	Encapsulation
Segment	TCP | WWW
Packet	IP | TCP | WWW
Frame	ETH | IP | TCP | WWW
Bit Streams	10010111100010101010001111110101

WHERE IS OSI HELPFUL IN REAL LIFE?

When troubleshooting a network problem we often go up the OSI model:

Physical - Is the network cable plugged in?

Data Link - Do you have a link light?

Network - Are you getting an IP?

Transport - Can you ping your default gateway?

Session - Do you have DNS server information?

- Can you ping 8.8.8.8 but not www.google.com ?

Presentation & Application - Can you browse a website?