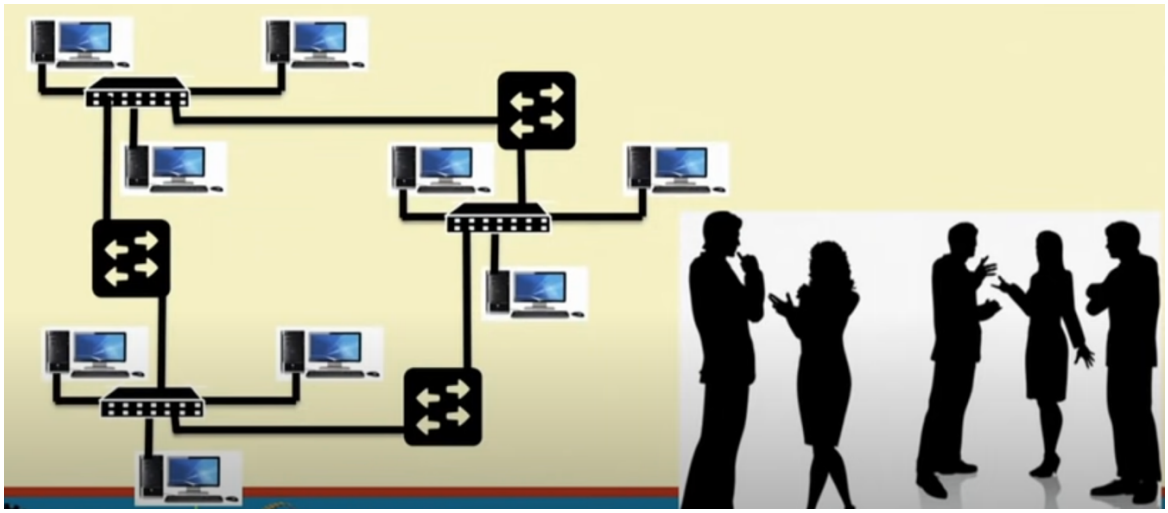
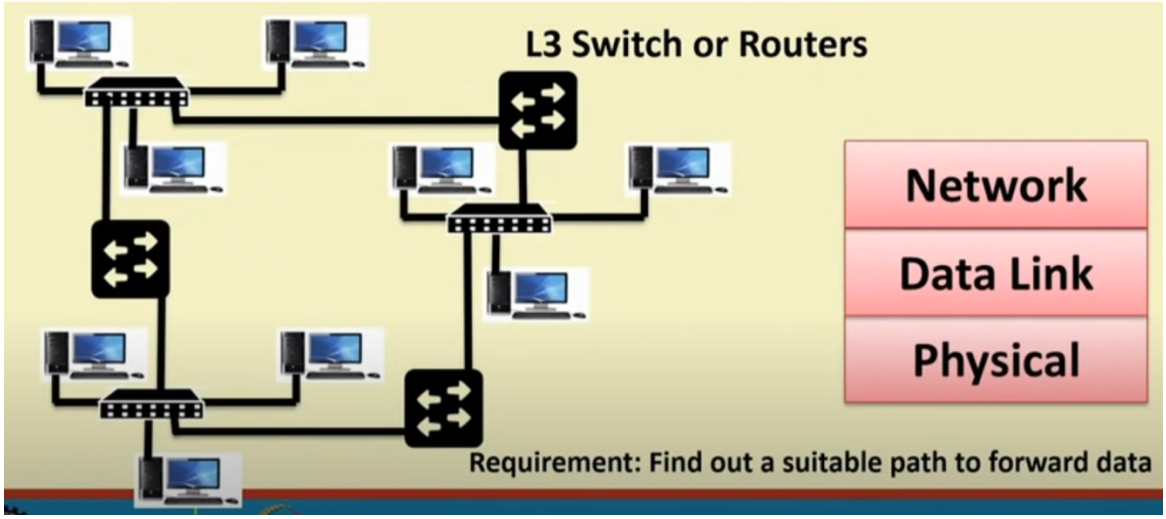
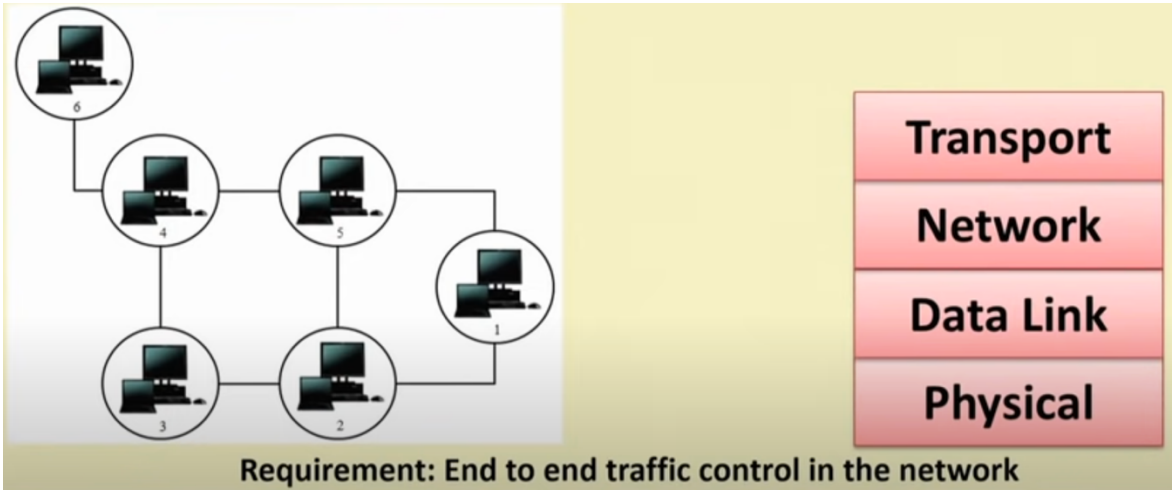
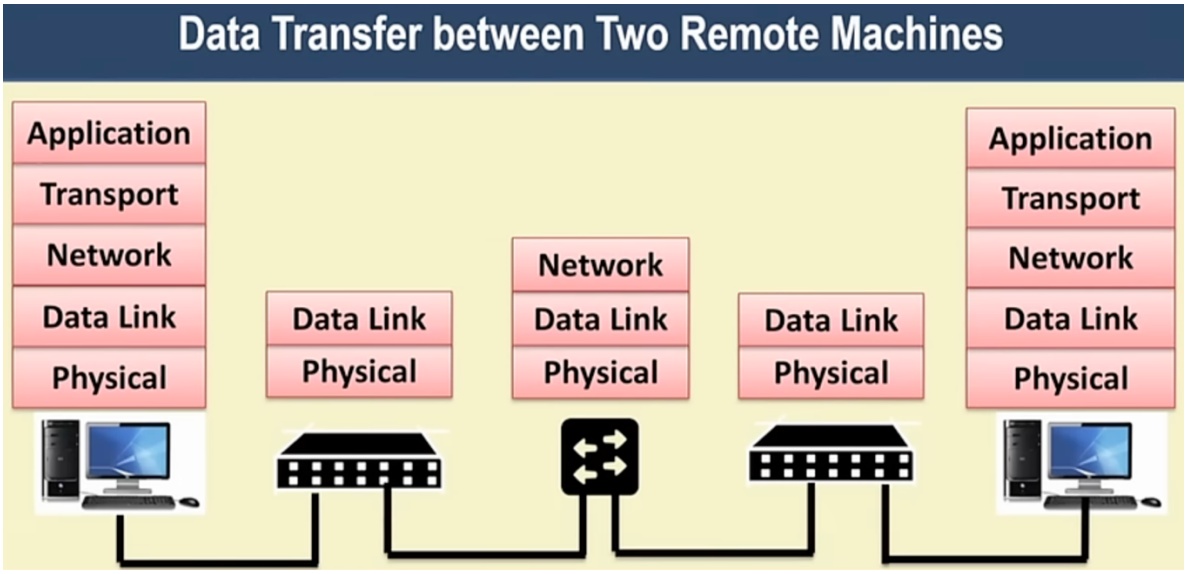
Requirement: Convert digital data to analog signal and vice versa

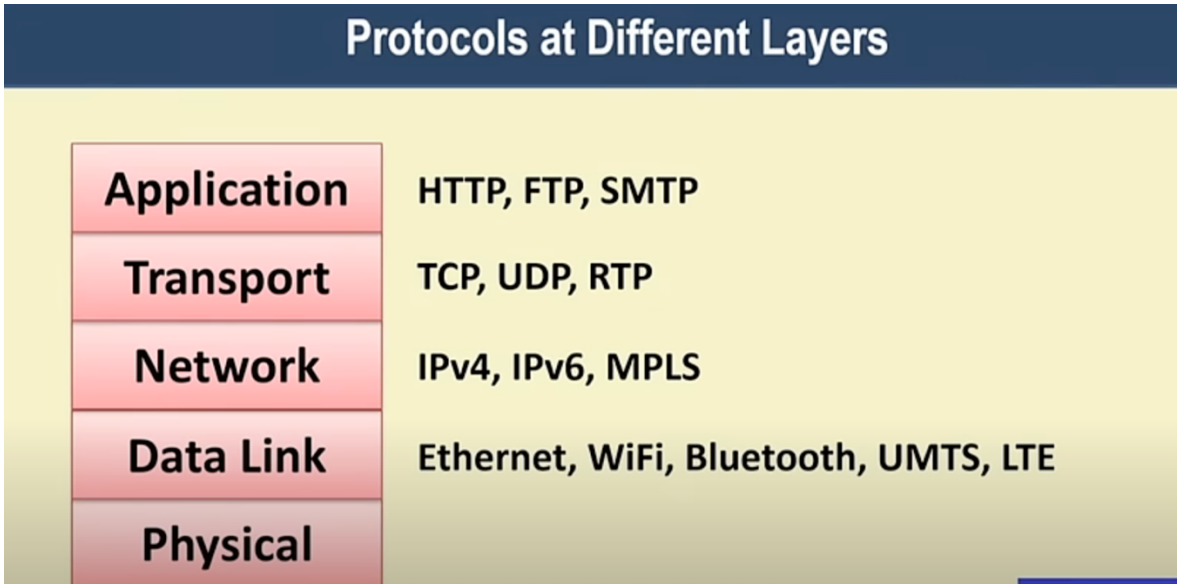
Physical

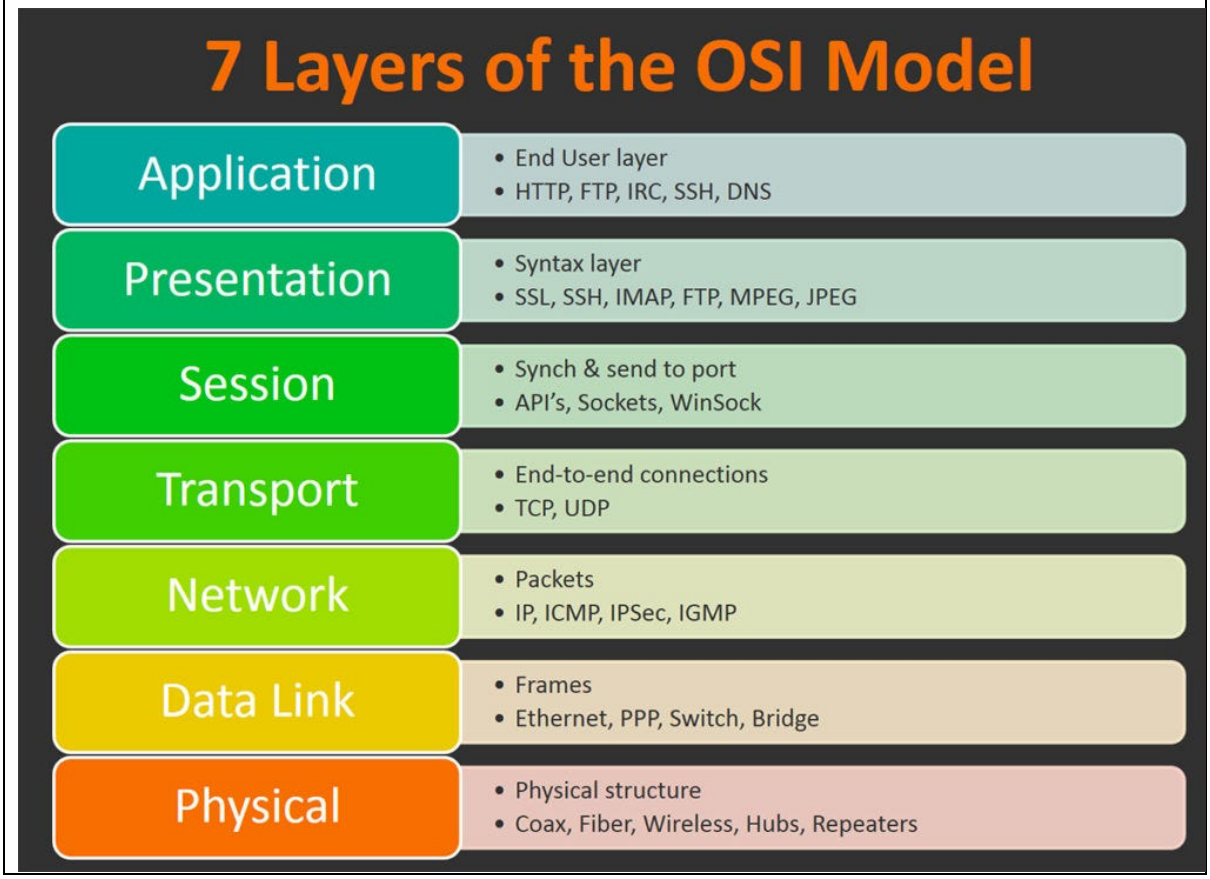


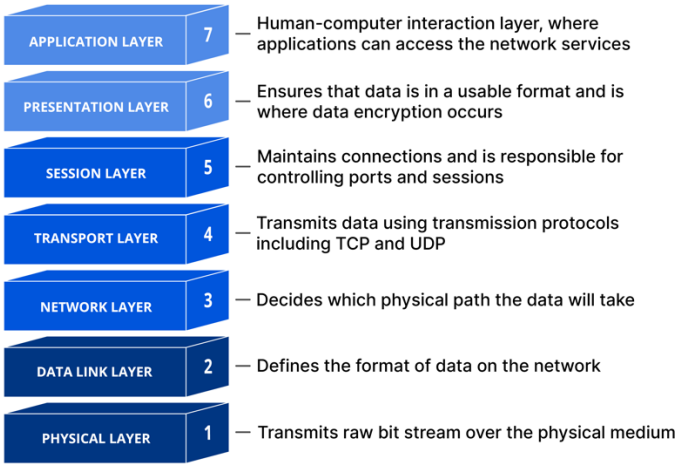

L3 Switch or Routers
Network
Data Link
Physical
Requirement: Find out a suitable path to forward data

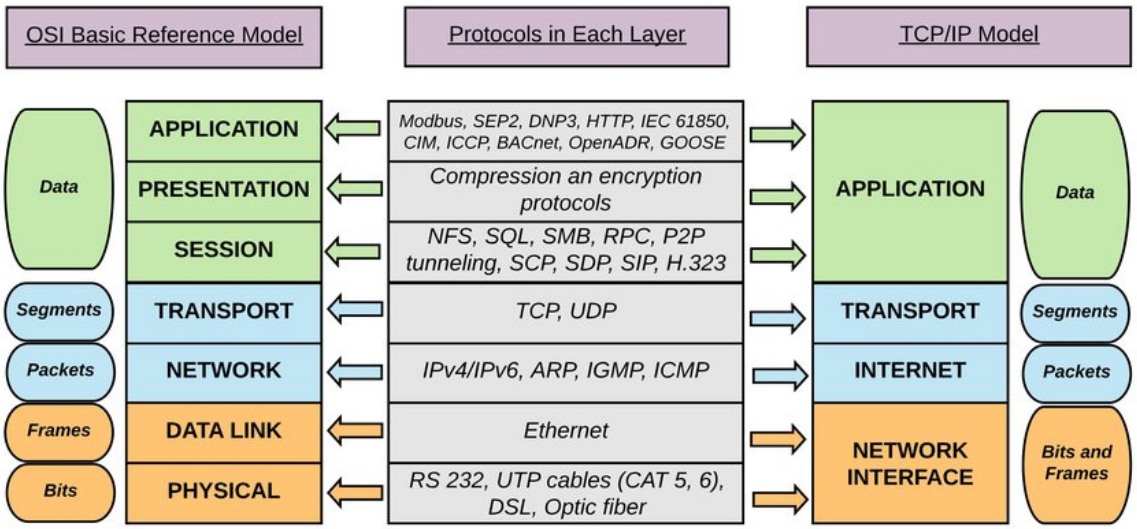

6
4
5
1
3
2
Transport
Network
Data Link
Physical
Requirement: End to end traffic control in the network


Data Transfer between Two Remote Machines
Application
Transport
Network
Data Link
Physical
Data Link
Physical
Network
Data Link
Physical
Data Link
Physical
Application
Transport
Network
Data Link
Physical


Protocols at Different Layers
Application
Transport
Network
Data Link
Physical
HTTP, FTP, SMTP
TCP, UDP, RTP
IPv4, IPv6, MPLS
Ethernet, WiFi, Bluetooth, UMTS, LTE


7 Layers of the OSI Model
Application
• End User layer
• HTTP, FTP, IRC, SSH, DNS
Presentation
• Syntax layer
• SSL, SSH, IMAP, FTP, MPEG, JPEG
Session
• Synch & send to port
• API's, Sockets, WinSock
Transport
• End-to-end connections
• TCP, UDP
Network
• Packets
• IP, ICMP, IPSec, IGMP
Data Link
• Frames
• Ethernet, PPP, Switch, Bridge
Physical
• Physical structure
• Coax, Fiber, Wireless, Hubs, Repeaters


APPLICATION LAYER
7
Human-computer interaction layer, where applications can access the network services
PRESENTATION LAYER
6
Ensures that data is in a usable format and is where data encryption occurs
SESSION LAYER
5
Maintains connections and is responsible for controlling ports and sessions
TRANSPORT LAYER
4
Transmits data using transmission protocols including TCP and UDP
NETWORK LAYER
3
Decides which physical path the data will take
DATA LINK LAYER
2
Defines the format of data on the network
PHYSICAL LAYER
1
Transmits raw bit stream over the physical medium



Circuit Switching, Packet-Switching: Datagram and virtual-circuit switching

Data, segments, packets, frames, bits

Hub vs Repeater

Ethernet, optical-fibre, copper wire, wi-fi

Topology : Mesh, Star, Bus, Ring, Hybrid

Unit	Full Name	Power of 10	Example
bps	bits per second	10^0	Morse code transmission speed, low-power IoT devices
kbps	kilobits per second	10^3	Dial-up modems (56 kbps), basic VoIP calls (64 kbps)
Mbps	megabits per second	10^6	Standard-definition video streaming (3-5 Mbps), 50 Mbps broadband
Gbps	gigabits per second	10^9	High-speed internet connections, 4K video streaming (25 Mbps)
Tbps	terabits per second	10^{12}	Ultra-high-speed backbone internet infrastructure

What is bandwidth ?

Transmission delay and Propagation delay

Switches vs Router

In the following pairs of OSI protocol layer/sub-layer and its functionality, the INCORRECT pair is

A. Network layer and Routing

B. Data Link Layer and Bit synchronization

C. Transport layer and End-to-end process communication

D. Medium Access Control sub-layer and Channel sharing

Match the following:

```
 (P) SMTP     (1) Application layer
(Q) BGP      (2) Transport layer
(R) TCP      (3) Data link layer
(S) PPP      (4) Network layer
             (5) Physical layer
```

A. P - 2 Q - 1 R - 3 S - 5

B. P - 1 Q - 4 R - 2 S - 3

C. P - 1 Q - 4 R - 2 S - 5

D. P - 2 Q - 4 R - 1 S - 3

Choose the best matching between Group 1 and Group 2

Group-1	Group-2
P. Data link layer	1. Ensures reliable transport of data over a physical point-to-point link
Q. Network layer	2. Encodes/decodes data for physical transmission
R. Transport layer	3. Allows end-to-end communication between two processes
	4. Routes data from one network node to the next

A. P - 1, Q - 4, R - 3

B. P- 2, Q - 4, R - 1

C. P - 2, Q - 3, R - 1

D. P-1, Q - 3, R - 2

If there are n devices (nodes) in a network, what is the number of cable links required for a fully connected mesh and a star topology respectively

A n(n-1)/2 , n-1

B n, n-1

C n-1, n

D n-1, n(n-1)/2

Physical topology of FDDI is?

A Bus

B Ring

C Star

D None of the above