NETWORK FUNDAMENTALS

BY

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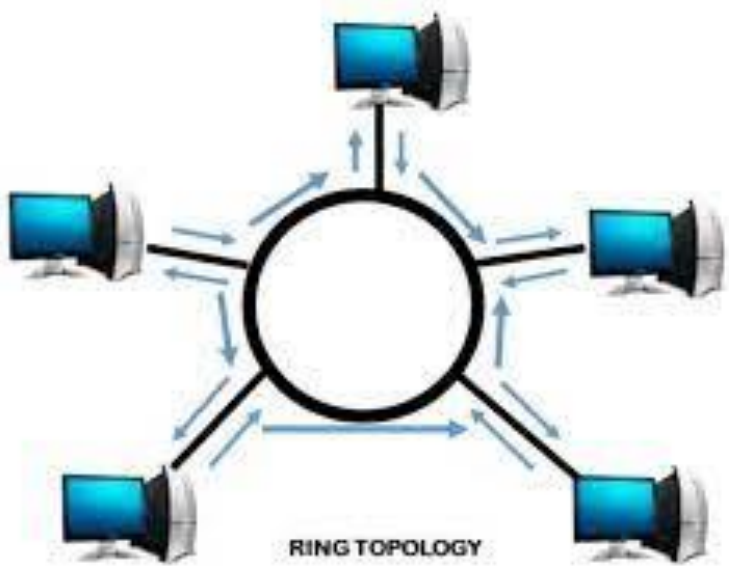
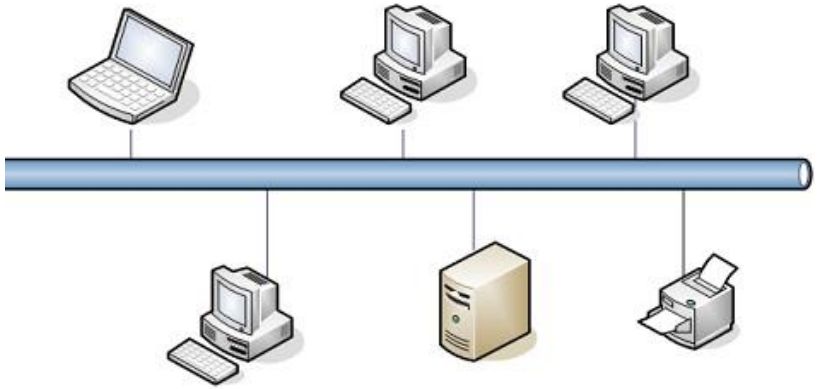
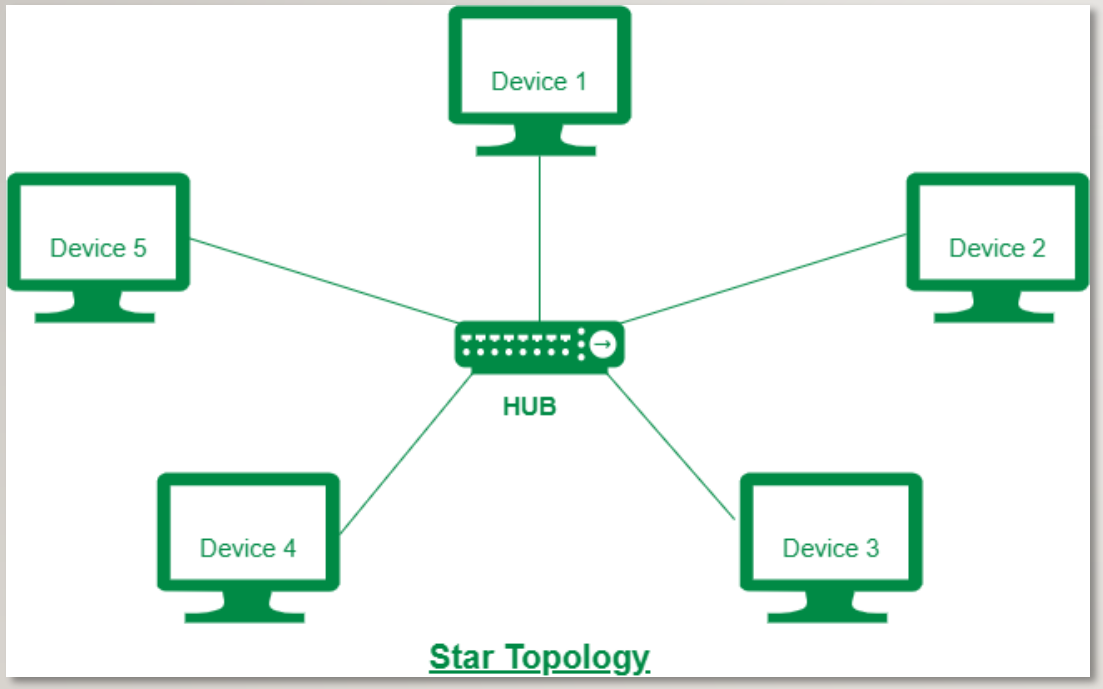
WHAT IS NETWORK?

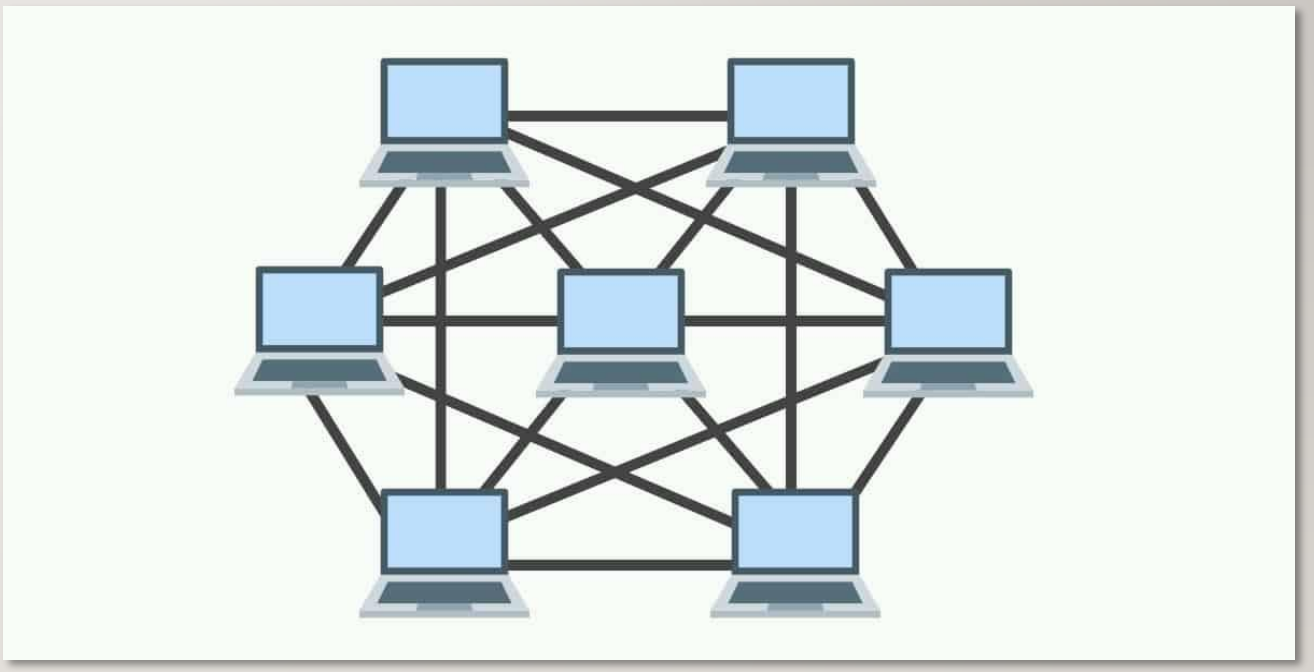
WHAT IS INTERNET ? WHO INVENTED IT? WHEN IT CAME?

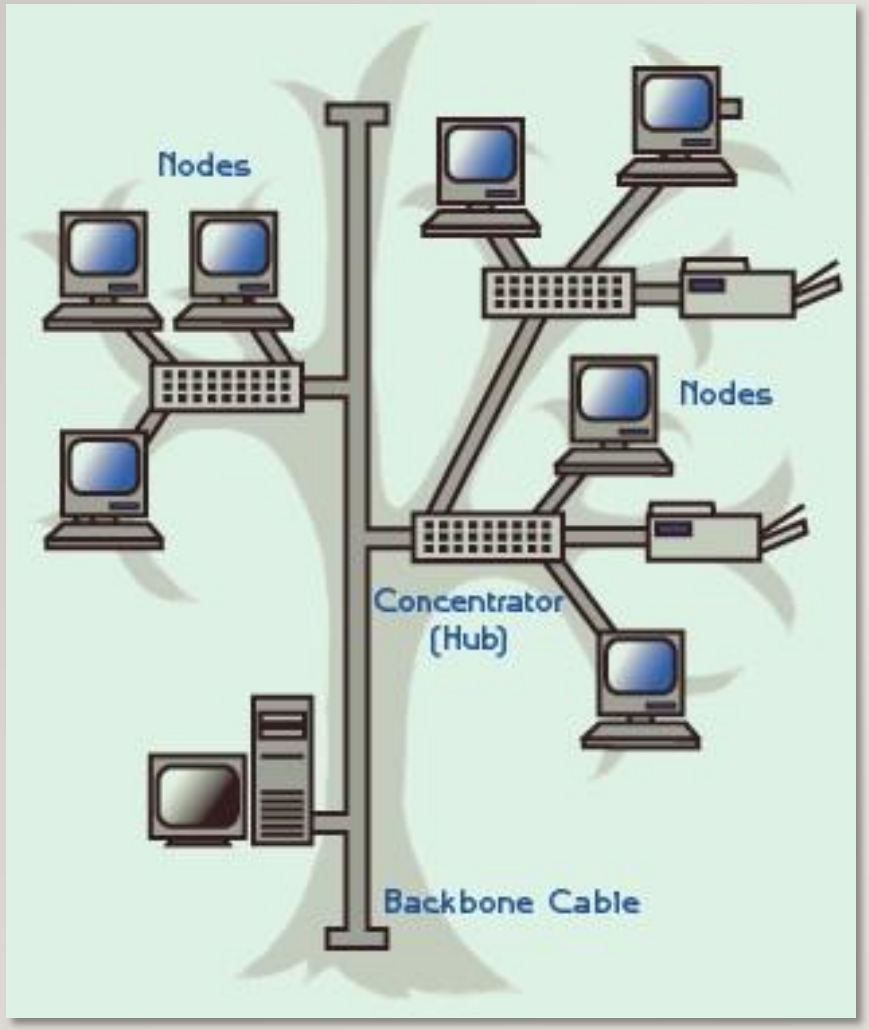
WHY WE USE IT ?

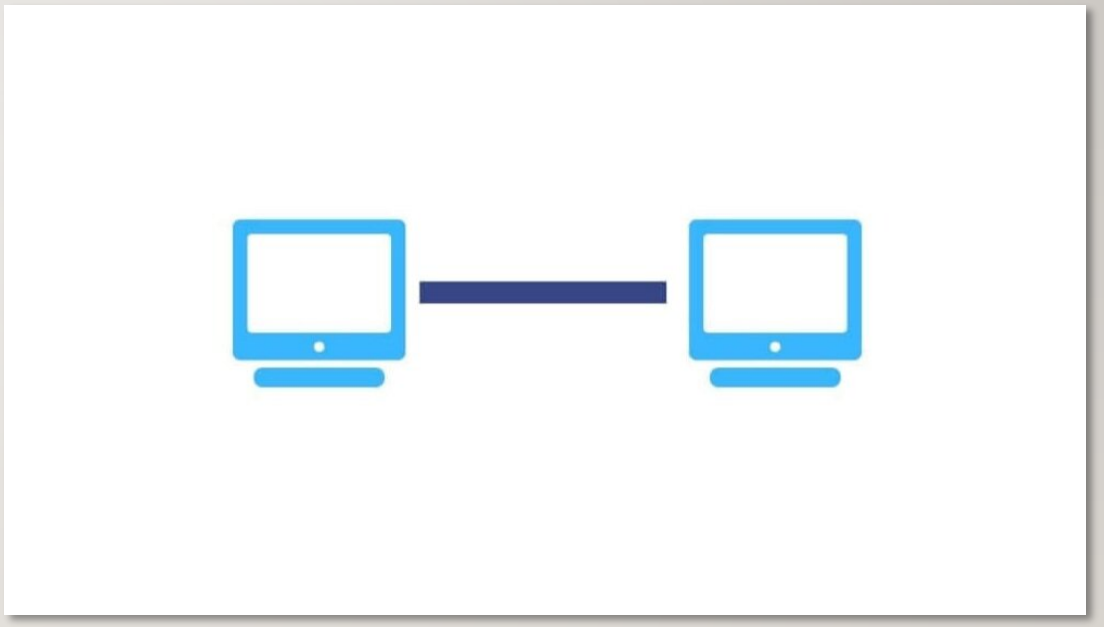

RING TOPOLOGY




Device 1
Device 5
Device 2
HUB
Device 4
Device 3
Star Topology




Nodes
Nodes
Concentrator
(Hub)
Backbone Cable



1. TRANSMISSION MEDIA

2. GEOGRAPHICAL AREA

3. ADMINISTRATION TYPE

COMPUTER NETWORK CATEGORIES

TRANSMISSIN MEDIA

- SIMPLEX ----------> ONE DIRECTIONAL
- HALF – DUPLEX ----> DEPENDS ON DIRECTION OF DATA
- FULL DUPLEX -------> BIDIRECTIONAL,DATA MAY BE IN SOURCE OR DESTINATION.

TRANSMISSION MEDIA

CHARACTERISTICS	CO AXIAL CABLE	TWISTED PAIR CABLE	OPTICAL FIBRE CABLE
USAGE	Shorter distance communication	Medium distance communication	Longer distance communication
TYPES	Thicknet - telecommunication, Thinnet - network	UTP - unshielded twisted pair cable, STP - shielded twisted pair cable - high cost, extra covering.	SM - Single Mode(longer), MM - Multi Mode(Shorter)
CONNECTORS	BNC Connector - BNCF, BNCT	4 pair cable (8 cables) - n/w, 2 pair cable (4 cables) - telecommunication RJ45, RJ11	SC -Subscriber Channel ST - Subscriber Terminal MTRJ - Mechanical Transfer Registered Jack
STANDARD	Radio guide (RG) RG48 Cable RG8 Cable	Category (CAT) CAT1,CAT2, CAT3, 4,5,5e,6 CAT6 cable is used now	
LOSS	EMI -Electro Magnetic Interference RFI - Radio Frequency Interference DIsturbance generated by external source.	EMI & RFI (but less than Co Axial Cable)	NO EMI & RFI Reflection / Refraction.

GEOGRAPHICAL AREA

- LAN --- WHICH WE USE FOR SMALLE DISTANCE – HIGH SPEED—ETHERNET UNDER USE ADMIN CONTROL
- MAN -- METROPOLITAN AREA NETWORK –IUB NETWORK-
- WAN --- WIDE AREA NETWORK—ISP-LOW SPEED--ATM
- PAN --- PERSONAL AREA NETWORK – PERSONAL DEVICES

ADMINISTRATION TYPE

- PEER –PEER:
- PROVIDE AND CONSUME NETWORK SERVICES
- EACH HOST HAS SAME ADMIN PRIVELLEDGES
- CLIENT-SERVER NETWORK:
- CONNECTED TO SERVER
- SERVER IS MAIN
- CLIENT SENDS MULTIPLE REQUESTS

NIC---->NETWORK INTERFACE CONTROLLER/NETWORK ADAPTER

- INTERFACE BETWEEN PC AND NETWORK CABLES
- RESIDES ON MOTHERBOARD OF PC
- COMMUNICATE THROUGH DEVICE DRIVERS
- CONTAINS TRANSMITTER/RECEIVER
- WIRED – WIRED /WIRELESS --ANTENNA/ADAPTER

- DEFAULT GATEWAY
- THIS TERMS REFERS YOUR ROUTER
- GATEWAY IP - ACTUAL ROUTER'S IP
-

To check the ip of your computer type ipconfig in the command prompt.

FIREWALL

- IT IS BOTH HARDWARE AND SOFTWARE
- FUNCTION - ANALYSING INCOMING & OUTGOING TRAFFIC
-

RULES

- INBOUND RULES - INCOMING
- OUTBOUND RULES - OUTGOING
-

VPN

VIRTUAL PRIVATE NETWORK

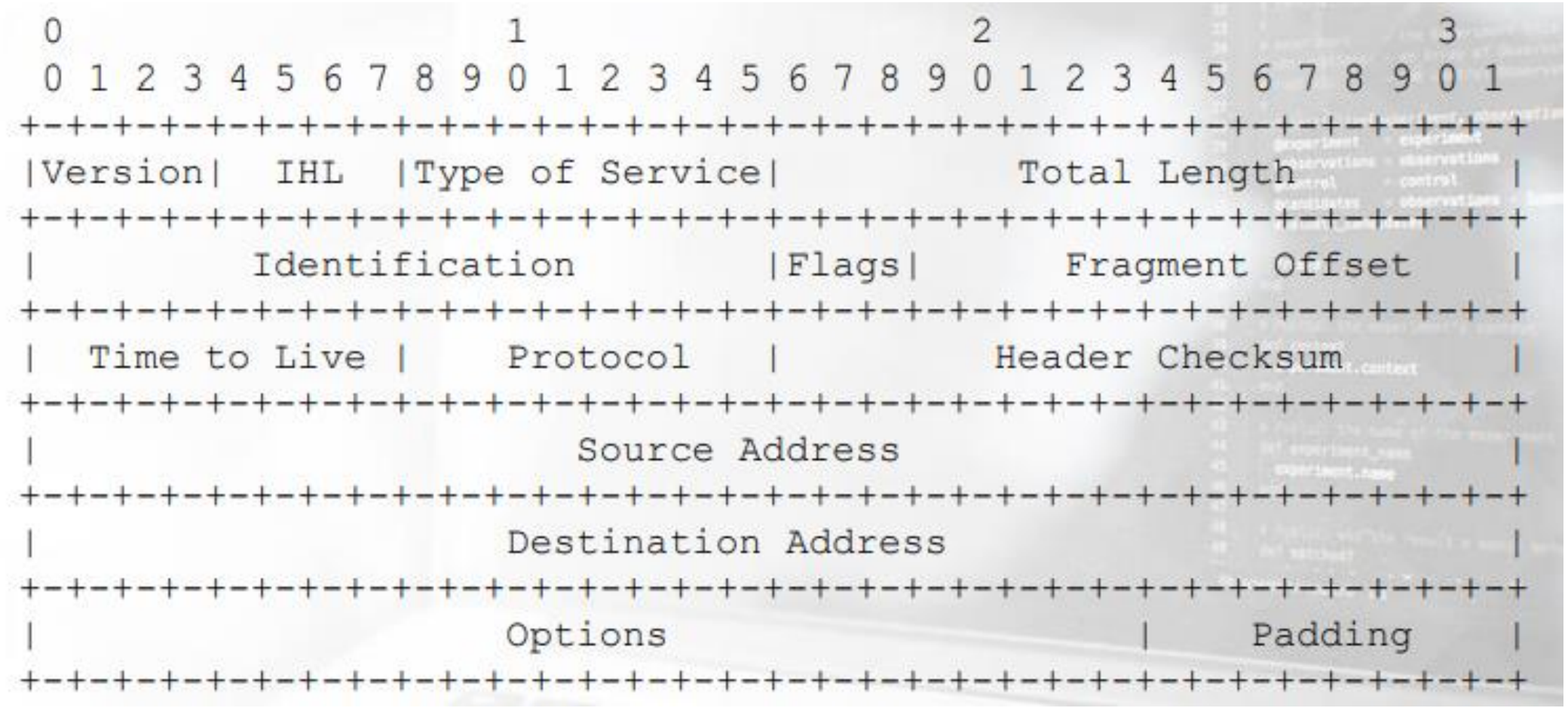
- TO SECURE YOUR TRAFFIC
- USING TECHNOLOGY CALLED IPSEC - IPSECURITY

PROTOCOLS

- Why protocols ?
- Protocols are used in every computer network communication • You need to know how things work to exploit them.
- In a computer network, machines talk to each other by means of protocols. These protocols ensure that different computers, using different hardware and software, can communicate.
- There is a large variety of networking protocols on the Internet, each one with its own purpose

PACKETS

- The primary goal of networking is to exchange information between networked computers; this information is carried by packets.
- Packets are nothing but streams of bits running as electric signals on physical media used for data transmission. Such media can be a wire in a LAN or the air in a WiFi network.
- These electrical signals are then interpreted as bits (zeros and ones) that make up the information.


0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
Version
IHL
Type of Service
Total Length
Identification
Flags
Fragment Offset
Time to Live
Protocol
Header Checksum
Source Address
Destination Address
Options
Padding

PROTOCOL LAYERS

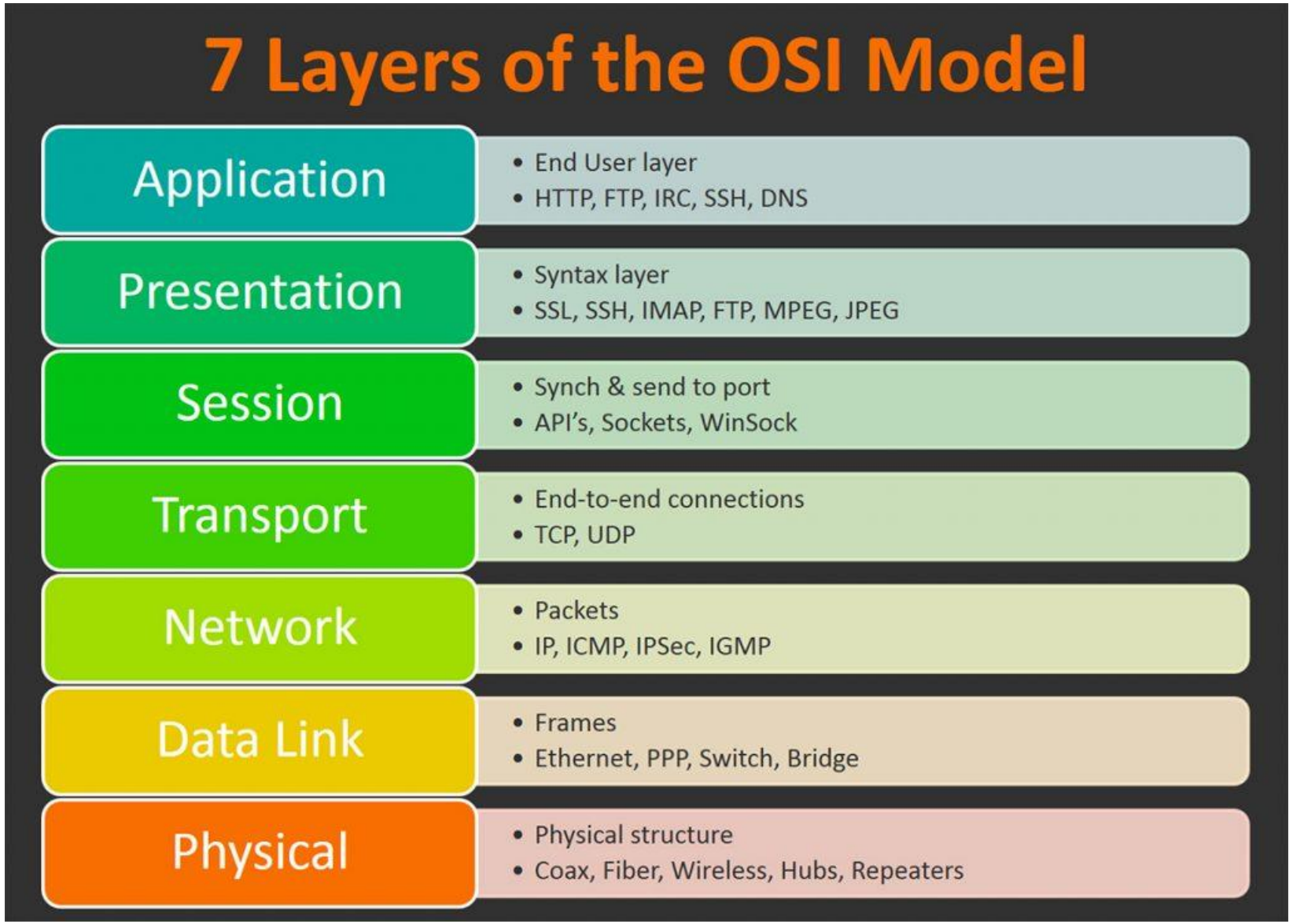
- • Make an application (email client, FTP, browser, …) work
- • Transport data between processes (the server and the client programs)
- • Identify hosts
- • Use the physical media to send packets

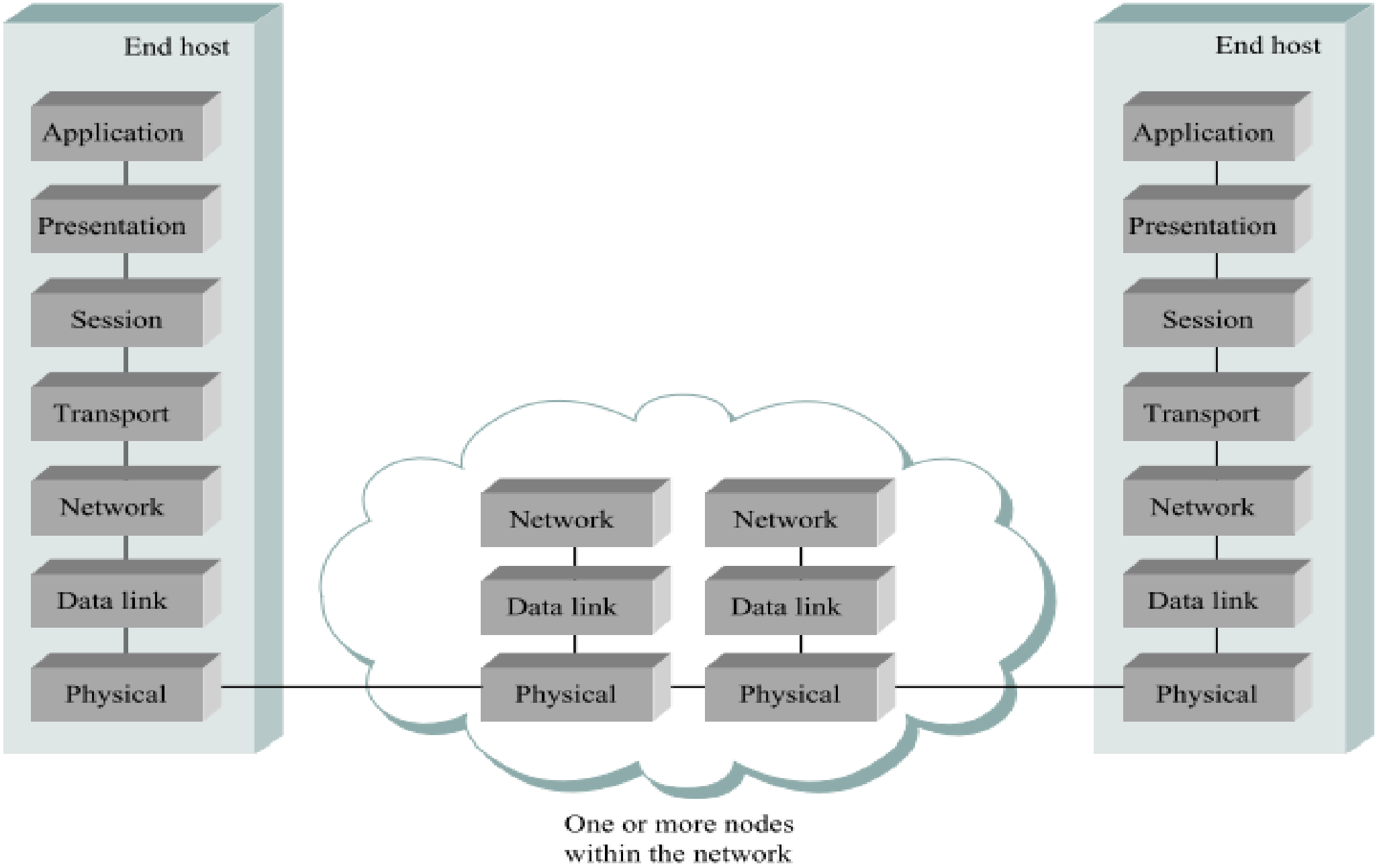
ISO / OSI MODEL

INTERNATIONAL STANDARDIZATION ORGANIZATION / OPEN SYSTEM INTERCONNECTION

ISO/OSI

- In 1984, the International Organization for Standardization (ISO) published a theoretical model for network systems communication: the Open System Interconnection (OSI) model.
- The ISO/OSI model was never implemented, but it is widely used in literature or when talking about IT networks.
- ISO/OSI consists of seven layers and is used as a reference for the implementation of actual protocols.


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


End host
Application
Presentation
Session
Transport
Network
Data link
Physical
Network
Data link
Physical
Network
Data link
Physical
End host
Application
Presentation
Session
Transport
Network
Data link
Physical
One or more nodes
within the network

LAYERS	DEVICES	ENCAPSULATION DATA	FUNCTIONS
APPLICATION	COMPUTER	DATA	In built system app or 3rd party apps
PRESENTATION	COMPUTER	DATA	Encryption/Decryption & Data Integrity
SESSION	COMPUTER	DATA	Authentication, Authorisation
TRANSPORT	CABLES	SEGMENTS	Segmentation, Flow Control, Error Control
NETWORK	ROUTER	PACKETS	IP Addressing, Path Determination
DATALINK	SWITCH	FRAMES	Mac Addressing, Multiplexing
PHYSICAL	NIC, HUB	BITS	Converting to 0's and 1's