

FULL COURSE ON

Computer Networking

Beginner – Expert

हिन्दी में

JOB BASED COURSE

Faculty – Shesh Sir

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NO NEED TO LEARN ANYWHERE

This training program is clear your networking concept from beginner to expert level – Hindi Tutorial

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01 Full Networking Course

Dear all Learner in this tutorial I will provide you the complete course with 100% Lab.

02 Job based Course content

Dear All Learner in this Tutorial we will research the market need and then design the content. It is very much helpful for you to grab the job in top IT industries.

03 Online Assessment – Free

Dear All Learner - after finished you can access online assessment to check your knowledge and improve your skill.

04 Online Chat Session

Deal All Learner after all as a student when we start to learn something, lots of doubts are coming in mind – now no need to worry we will organize the online chat option which help you to resolve your doubts.

Course Content

- Chapter 1 - Why We Should Learn Network & Networking?
- Chapter 2- Introduction to computer network
- Chapter 3- Networking terminology
- Chapter 4- Identifying & Working of networking devices
- Chapter 5- Network topology
- Chapter 6- OSI model
- Chapter 7- TCP/IP Model
- Chapter 8- Transmission Mode and Transmission Media
- Chapter 9- How to prepare cable
- Chapter 10- Internet
- Chapter 11- Types of Internet connection
- Chapter 12- Internet Vs Intranet vs Arpanet with Milnet
- Chapter 13- Wireless Technology
- Chapter 14- Mobile Network Technology
- Chapter 15- Networking Protocols
- Chapter 16- How to setup Local Area Network
- Chapter 17- IP Address
- Chapter 18- IoT
- Chapter 19- Network vulnerability % Securing Network and Networking
- Chapter 20- WAN Connection?
- Chapter 21- Creating Awesome Project on Networking
- Chapter 22- Job & Industry Requirements
- Chapter 23- Quiz (Check Your Knowledge)

Chapter 1 - Why We Should Learn Network & Networking?

- A network Administrator can manage
 - Education services (state, local, and private)
 - Finance and insurance
 - Administrative and support services
 - Information
 - Computer systems design and related areas
 - Entertainment
 - Medical
-

Chapter 2- Introduction to computer network

- What is Network?
- Networking?
- Internetworking?
- Advantages of network & Networking?
- What is Point-to-Point and Server-Client Model?
- What Is Computer Network? Types of Computer Network?
- LAN, MAN, WAN, CAN, PAN
- Advantages & Disadvantages of LAN, MAN, WAN, PAN, CAN



Chapter 3- Networking terminology

- Node
- Hope
- Terminal
- Command
- Shell
- Virus
- Attack
- Hacker
- Attacker
- Phishing
- Vulnerability
- OS
- Firmware
- BIOS
- Speed
- Bandwidth
- MBps
- Mbps
- RF vs Analog Signal



Chapter 4- Identifying & Working of networking devices

- o Hub (Advantages & Disadvantages)
- o Switch
- o L2 & L3 Switch
- o Switching
- o Types of Switching
- o CAM Table
- o Router
- o Modem
- o Cisco Router Vs Normal Router?
- o Access Point?
- o Firewall & Its Types (NGFW, Palo Alto)
- o NIC Card (Wired & Wireless)
- o Sever
- o Desktop or Laptop
- o Network Printer?
- o Bridge
- o Repeater
- o Rack

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Chapter 5- Network topology

- o What is Topology? ↗
- o Types of topology? ↘
- o BUS
- o STAR
- o TREE
- o Mesh
- o RING
- o DUAL RING
- o HYBRID
- o Difference Between BUS and Start topology?
- o How to Create Topology Over a Local Area Network (Cover in Project)



Chapter 6- OSI model

- o Introduction to OSI Model?
- o Layers of OSI Models?
- o Application Layer
- o Presentation Layer
- o Session Layer
- o Transport Layer
- o Network Layer
- o Data-Link Layer
- o Physical Layer
- o How to Check Transmission (USE CPT for Love Demonstration)?

Chapter 7- TCP/IP Model

- o Introduction to TCP/IP Model?
- o Layers of TCP/IP Models?
- o Process/Application Layer
- o Host-to-Host/Transport Layer
- o Internet Layer
- o Network Access/Link Layer
- o Difference Between OSI model and TCP/IP Model



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Chapter 8- Transmission Mode and Transmission Media

- o What is Transmission?
- o Transmission Mode and Its Types
- o Transmission Media and its types
- o Twisted Pair Cable (STP & UTP)
- o FOC- Fiber Optic Cable and Types of FOC
- o Coaxial Cable and Types of Coaxial Cable?

Chapter 9- How to prepare cable

- o Color Code?
- o Cross Cable
- o Straight Cable / Patch Cable

Chapter 10- Internet

- o What is internet?
- o How does internet work?
- o Owner of internet?
- o IANA, ARIN, ICANN, IEEE, IETF



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Chapter 11- Types of Internet connection

- o Broadband
- o Leased Line
- o Cellular network

Chapter 12- Internet Vs Intranet vs Arpanet with Milnet

- o Internet
- o Intranet
- o Arpanet
- o Milnet

Chapter 13- Wireless Technology

- o Introduction to wireless network
- o How does wireless network work?
- o Types of wireless standard? With explanation
- o How to setup wireless network and Wi-Fi router configuration?
- o Advantages and disadvantages of wireless network

Chapter 14- Mobile Network Technology

- o What is cellular network?
- o Generation of mobile networking?
- o Telecom (Mobile Operator)?



Chapter 15- Networking Protocols

- o What is protocol?
- o IP
- o TCP
- o UDP
- o ARP
- o RARP
- o POP
- o IMAP
- o SMTP
- o SNMP
- o FTP
- o HTTP
- o HTTPS
- o NTP
- o DNS
- o DHCP
- o

Chapter 16- How to setup Local Area Network

- o Creating and managing LAN suing CPT



Chapter 17- IP Address

- o What is IP?
- o Types of IP?
- o IPv4
- o IPv6
- o Classes of ipv4
- o Host id & Network Id
- o Subnet mask
- o VLSM
- o Subnetting
- o Gateway
- o How to configure IP address subnet mask and gateway?

Chapter 18- IoT

- o Introduction to IoT
- o What is Network Automation?



Chapter 19- Network vulnerability % Securing Network and Networking

- What is vulnerability?
- How to check network vulnerability?
- How to secure our network?

Chapter 20- WAN Connection?

- What is WAN networking?
- WAN Networking Protocols?
- How to setup WAN network?

Chapter 21- Creating Awesome Project on Networking

- Network Projects using CPT or GNS3

Chapter 22- Job & Industry Requirements

- How to get Ready for job?
- How to apply job in Networking Field?
- Salary and growth in Networking Field?

Chapter 23- Quiz (Check Your Knowledge)

- Organize monthly quiz on Website or blog



Chapter 1 - Why We Should Learn Network & Networking?

- A network Administrator can manage
Network Admin or Engineer can manage (Internet Connection, Networking Devices, Troubleshooting of Network and networking devices, and also configure and manage Ip address and many more.)
- Education services (state, local, and private)
Network Engineer can manage services in educational area (like- college network or projects network)
- Finance and insurance
- Administrative and support services
- Information
- Computer systems design and related areas
- Entertainment
- Medical



Chapter 2- Introduction to computer network



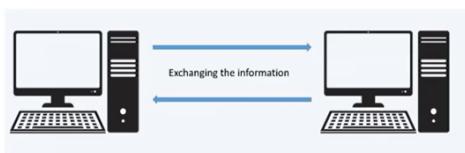
- o **What is Network?**

Network is a connection of multiple network devices via any medium is called network.



- o **Networking?**

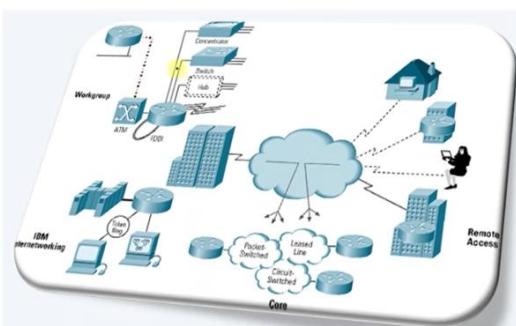
Networking is a process of communication/Transmission of data between devices is called networking.



→

- o **Internetworking?**

Connect more than two network is known as Internetworking.



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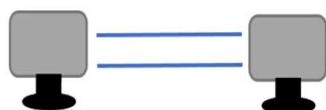
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→

- **Advantages of network & Networking?**
Network admin can share resources over a LAN or WAN
Share Printer
Share file folder or data

- **What is Point-to-Point and Server-Client Model?**

P2P Model – in this model only two devices are connected to each other is known as P2P Model



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Client-Server Model - The client-server model is the relationship between two computers in which one, the client, makes a service request from another, the server.



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- What Is Computer Network? Types of Computer Network?

A computer network is a group of computers that use a set of common communication protocols over digital interconnections for the purpose of sharing resources located on or provided by the network nodes.

- LAN, MAN, WAN, CAN, PAN

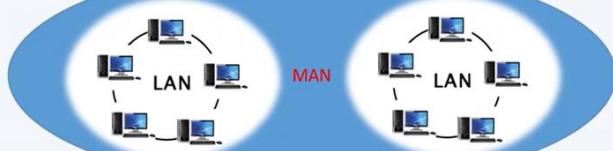
- LAN- Stand for Local Area Network. It established over a local area network like home, small offices etc.



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- MAN – it stand for metropolitan area network it established over two LAN or more than two.



- WAN – It stand for wide area network it established geographical communication.



- Advantages & Disadvantages of LAN, MAN, WAN, PAN, CAN

We can connect and share network resources and data or info over a local area or wide area network.





Chapter 3- Networking terminology

- o **Node**

Any system or device connected to a network is also called a node. For example, if a network connects a file **server**, five computers, and two printers, there are eight nodes on the network. Each device on the network has a network address, such as a MAC address, which uniquely identifies each device.

- o **Hope**

In wired computer networking, including the Internet, a hop occurs when a packet is passed from one network segment to the next. ... The hop count refers to the number of intermediate devices through which data must pass between source and destination.

- o **Terminal**

Terminal is an interface where we can input instruction (it is a command line interface)



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- o **Command**



Command is a set of instruction which is used for particular task. In computing, a command is a directive to a computer program to perform a specific task. It may be issued via a command-line interface, such as a shell, or as input to a network service as part of a network protocol, or as an event in a graphical user interface triggered by the user selecting an option in a menu.

- o **Shell**

A shell is a computer program that presents a command line interface which allows you to control your computer using commands entered with a keyboard instead of controlling graphical user interfaces (GUIs) with a mouse/keyboard combination.

- o **Virus**

A virus is also a program which is very harmful for our system and information. It is a bad program and virus deleted our file or data.

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- **Attack** ✓
It is an activity which is perform by hacker or attacker to hack the data or confidential information.
- **Hacker**
A person who have extra ordinary knowledge in Computer field and hacker is bad person because he hacks the information of victim or hack the confidential information.
- **Attacker**
Attacker is also a hacker in computer technology.
- **Phishing**
Phishing is a process to hack the information online by hacker. Phishing is a site cloner or it is a technique which is used by hacker or attacker to create fake website of any original site.
- **Vulnerability**
Vulnerability is technical term in this we can find the lack of any computer, program, services. Or user can analyze the security setting in any computer machine.
- **OS**
OS stand for Operating system and it is used to create user interface between user and hardware. Also we can say its enable or activate the hardware and provide interface.

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- **Firmware** ✓ ↗
It's also a program. Also known as firmware it is a small program which is used to boot or activate the hardware of machine. Firmware is a software program or set of instructions programmed on a hardware device. Firmware is typically stored in the flash ROM.
- **BIOS**
The BIOS software has a number of different roles, but its most important role is to load the operating system. When you turn on your computer
- **Bandwidth**
The maximum amount of data transmitted over an internet connection in a given amount of time. Calculated in Mbps Megabits per second
- **MBps**
Megabytes per Second
- **Mbps**
Megabits per second (1 MBps = 8 Mbps)
- **RF vs Analog Signal**
Rf stand for radio frequency. And analog is also a signal used to connect and share info from one point to another.

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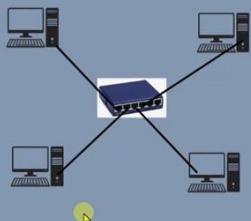
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Chapter 4- Identifying & Working of networking devices

○ Hub (Advantages & Disadvantages)

HUB is a networking device which is used to connect multiple network devices as a central point and also it is used to connect single network connection segment and distribute it in to multiple devices.



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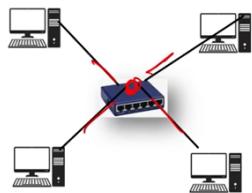
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Switch

- ✓ Switch is also connecting multiple devices in a LAN and connect single network segment and distribute it in to multiple network devices.
- ✓ Centralized management connection. But switch is better than HUB.



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Hub	Switch
They operate in the physical layer of the OSI model.	They operate in the data link layer of the OSI model.
It is a non-intelligent network device that sends message to all ports.	It is an intelligent network device that sends message to selected destination ports.
It primarily broadcasts messages.	It supports unicast, multicast and broadcast.
Transmission mode is half duplex.	Transmission mode is full duplex.
Collisions may occur during setup of transmission when more than one computers place data simultaneously in the corresponding ports.	Collisions do not occur since the communication is full duplex.
They are passive devices, they don't have any software associated with it.	They are active devices, equipped with network software.
They generally have fewer ports of 4 or 8 or 12 ports .	The number of ports is higher – 4,8,24,48

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L2 & L3 Switch

L2 mean unmanageable switch because it has no feature of routing
 And L3 is manageable switch and used to configure the routing protocols.
 L3 switch is costly from L2 switch
 L3 Switch is more secure and reliable for networking.



L2 SWITCH



L3 SWITCH

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Types of Data Transmission?

- 1 – unicast
- 2 – Multicast
- 3 - Broadcast



What is FCS?

FCS stand for frame check sequence. In this process we learn the frame checking process while transmitting the data.

o CAM Table

CAM stand for content address memory it is a switch technology and its store the Ip and MAC table details or switching table details in switch technology over a network.

Let's learn flow chart of CAM table.



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ROUTERS

Router is L3 networking device and it is used to route the packet over the network.

There is mainly two types of router?

Router is a networking and L3 Devices which is used to manage the WAN network as well as LAN also.



ADSL2+Router Router



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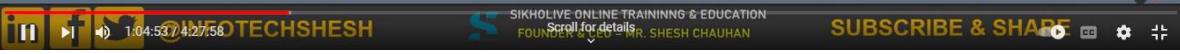
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CISCO ROUTER

1. To manage network
2. Connect different network id's
3. Provide best path
4. Avoid collision and manage broadcast
5. Traffic control and filter the packet
6. Provide data security using various types of encryption protocols.



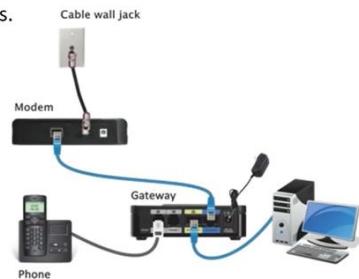
MODEM

Modem is short for "Modulator-Demodulator."

It is a hardware component that allows a computer or another device, such as a router or switch, to connect to the Internet.

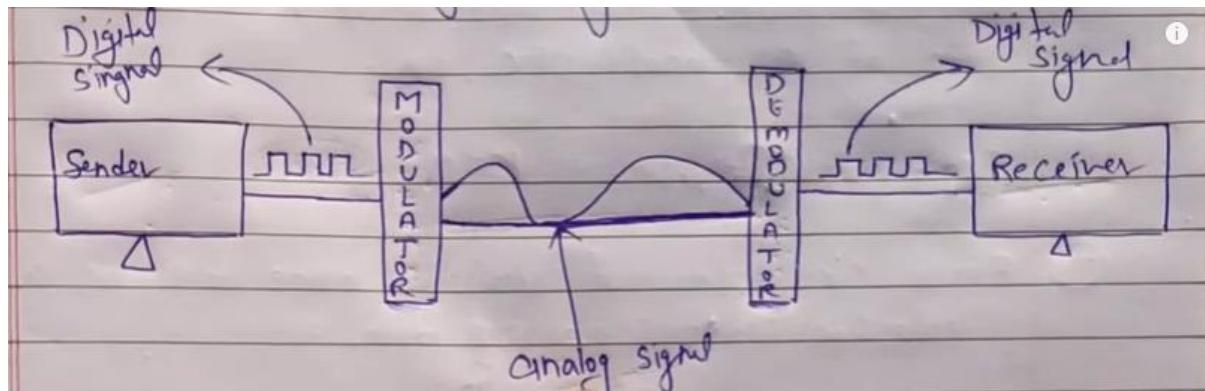
It converts or "modulates" an analog signal from a telephone or cable wire to digital data (1s and 0s) that a computer can recognize.

Similarly, it converts digital data from a computer or other device into an analog signal that can be sent over standard telephone lines.



Modem stands for **modulator** and **demodulator**, it is a network device that is placed between the **computer system and Telephone Line**

It has 2 parts modulator and demodulator. **Modulator Convert Digital Signal to Analog Signal. Demodulator Digital Signal to Analog Signal**



CISCO vs BASIC ROUTER



CISCO ROUTER



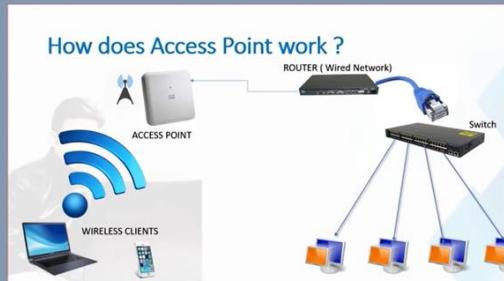
BASIC ROUTER

Access Point

Access Point is used to increase the network segment length over Wired or wireless.

An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building.

An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area.



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FIREWALL

o Firewall & Its Types (NGFW, Palo Alto)

Firewall is a security point which is used to filter the packet for incoming and outgoing connection and protect our network infrastructure.

There are Two types of firewall

1. Software based firewall
2. Hardware based firewall

1. Software based firewall- it's built in technology in all OS. And user can configure it using control panel.

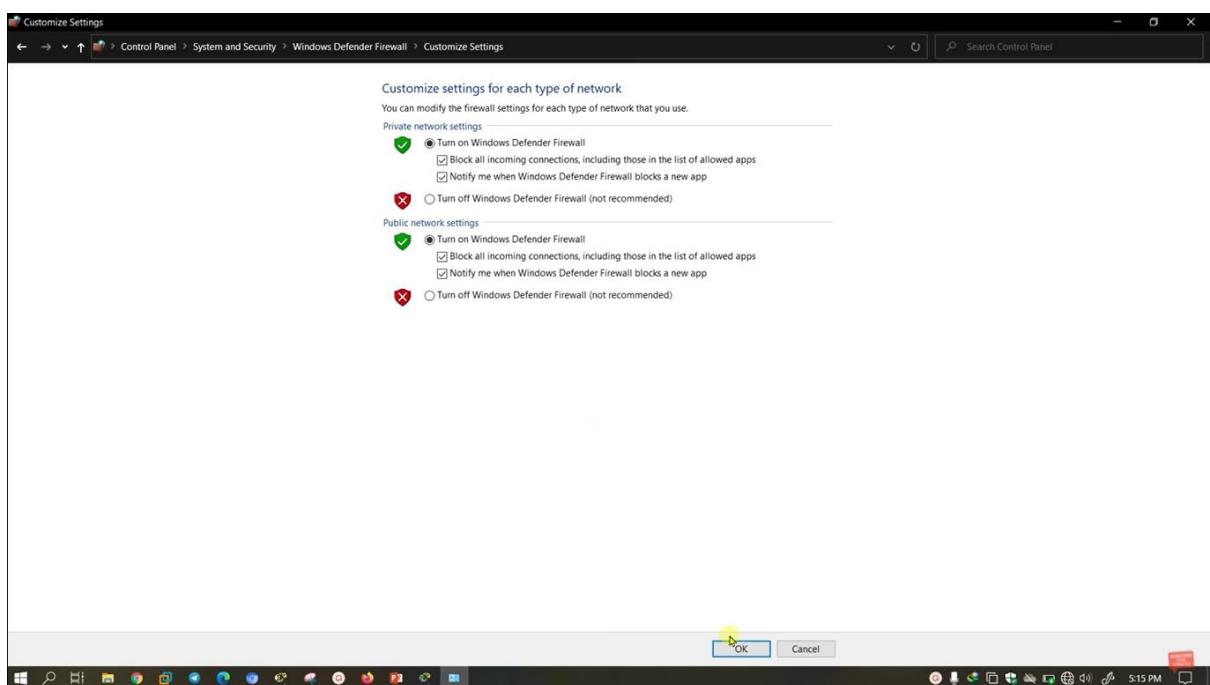
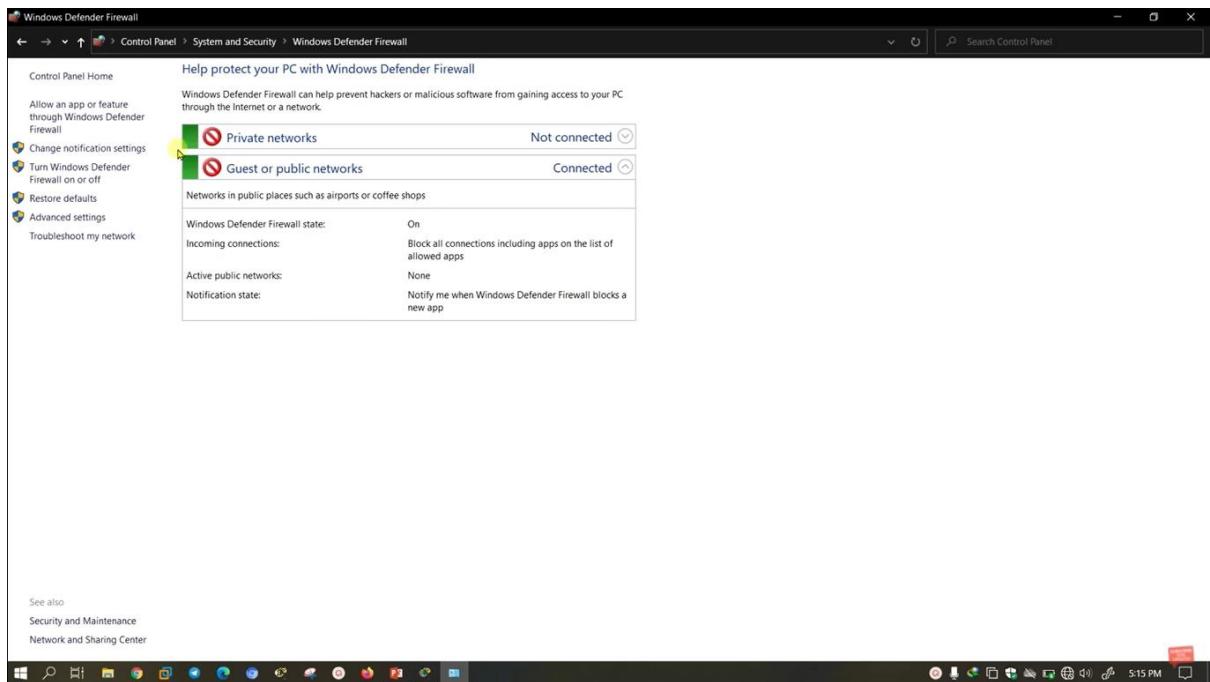


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2- Hardware based firewall- it is more secure and reliable for network security. But it is costlier.



- ✓ It has more feature like.
- ✓ User can monitor network devices and create port security.
- ✓ User can configure and control the port and access permission over a network.



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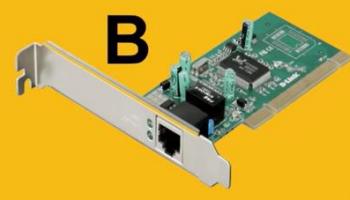
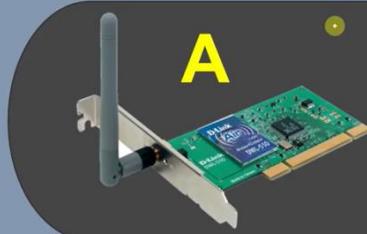
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NIC

NIC stand for network interface card it is used to connect internet to pc.

Types of NIC

1. Wired
2. Wireless



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SERVER

Server is a highly configure devices Computer system which is used to provide services over LAN or WAN



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LAPTOP/DESKTOP



NOTEBOOK/LAPTOP



DESKTOP



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PRINTER

Printer is a hardware device which is used to print the information.

Types of Printer

1. Basic Printer
2. Network Printer



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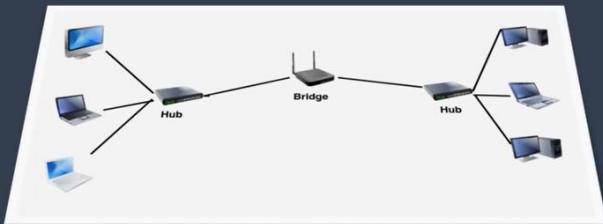


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BRIDGE

A network bridge is a computer networking device that creates a single aggregate network from multiple communication networks or network segments. This function is called network bridging. Bridging is distinct from routing



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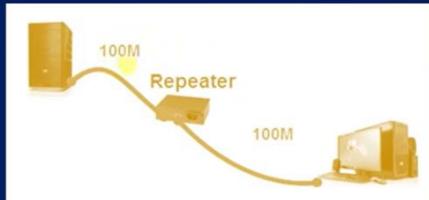
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REPEATER



In telecommunications, a repeater is an electronic device that receives a signal and retransmits it. Repeaters are used to extend transmissions so that the signal can cover longer distances or be received on the other side of an obstruction.



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RACK



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TOPOLOGY

What is Topology?

Topology is an architecture or arrangement of networking devices over a network is known as topology.

Types of topology?

- Physical topology
- Logical Topology

- BUS
- STAR
- TREE
- Mesh
- RING
- DUAL RING
- HYBRID



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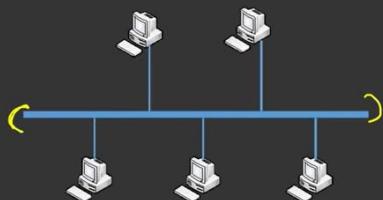
BUS-TOPOLOGY

All devices are connected to a single backbone cable.

One device fails, creates problem in entire network.

In bus topology, all devices are connected to this main cable through drop lines.

There is a device called tap that connects the drop line to the main cable. Since all the data is transmitted over the main cable, there is a limit of drop lines and the distance a main cable can have.



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BUS-TOPOLOGY

Advantages of bus topology

1. Easy installation, each cable needs to be connected with backbone cable.
2. Less cables required than Mesh and star topology

Disadvantages of bus topology

1. Difficultly in fault detection.
2. Not scalable as there is a limit of how many nodes you can connect with backbone cable.



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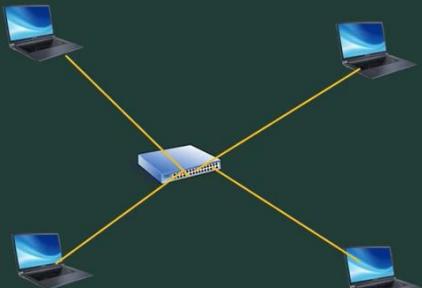
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STAR-TOPOLOGY

Star topology doesn't allow direct communication between devices, a device must have to communicate through hub.

If one device wants to send data to other device, it has to first send the data to hub and then the hub transmit that data to the designated device.

Best topology ever for networking of multiple devices over a network.



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F Advantages of Star topology

Less expensive because each device only need one I/O port and needs to be connected with hub with one link.

Easier to install

Less amount of cables required because each device needs to be connected with the hub only.

Robust, if one link fails, other links will work just fine.

Easy fault detection because the link can be easily identified.

Disadvantages of Star topology

If hub goes down everything goes down, none of the devices can work without hub.

Hub requires more resources and regular maintenance because it is the central system of star topology.



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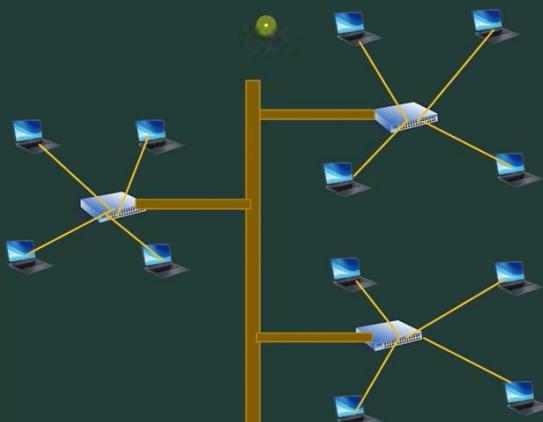


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TREE-TOPOLOGY

It is the combination of bus and start topology and also it has feature of both



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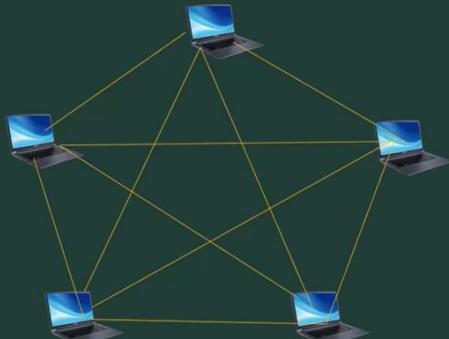
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MESH-TOPOLOGY

In mesh topology each device is connected to every other device on the network through a dedicated point-to-point link. When we say dedicated it means that the link only carries data for the two connected devices only.



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Advantages of Mesh topology

No data traffic issues as there is a dedicated link between two devices which means the link is only available for those two devices.

Mesh topology is reliable and robust as failure of one link doesn't affect other links and the communication between other devices on the network.

Mesh topology is secure because there is a point to point link thus unauthorized access is not possible.

Fault detection is easy.

Disadvantages of Mesh topology

Amount of wires required to connect each system is tedious and headache.

Since each device needs to be connected with other devices, number of I/O ports required must be huge.

Scalability issues because a device cannot be connected with large number of devices with a dedicated point to point link.



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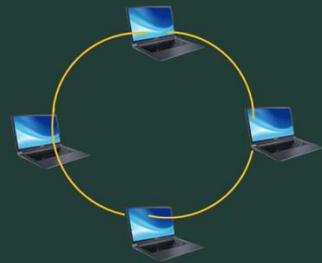
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RING-TOPOLOGY

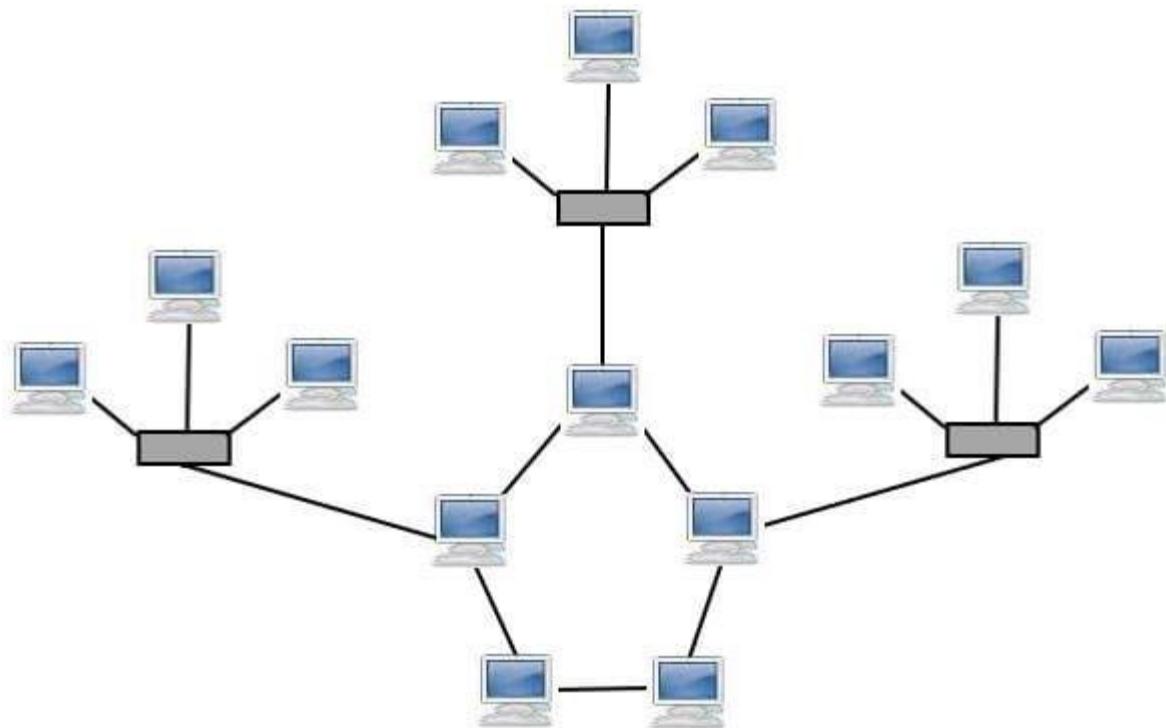
- ❑ In ring topology each device is connected with the two devices on either side of it.
- ❑ There are two dedicated point to point links a device has with the devices on the either side of it.
- ❑ This structure forms a ring thus it is known as ring topology.
- ❑ If a device wants to send data to another device then it sends the data in one direction, each device in ring topology has a repeater, if the received data is intended for other device then repeater forwards this data until the intended device receives it.

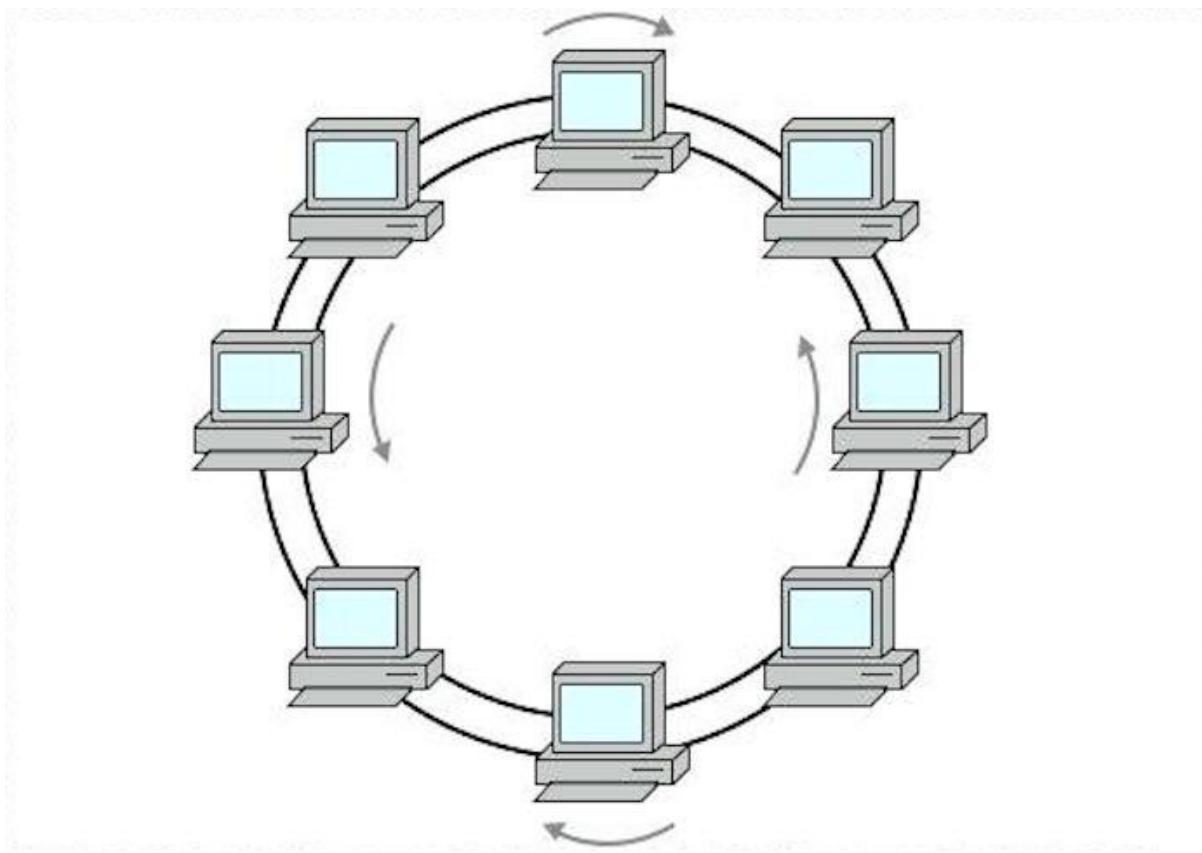


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Advantages of Ring Topology

- Easy to install.
- Managing is easier as to add or remove a device from the topology only two links are required to be changed.

Disadvantages of Ring Topology

- A link failure can fail the entire network as the signal will not travel forward due to failure.
- Data traffic issues, since all the data is circulating in a ring.

OSI MODEL

- Introduction to OSI Model?
- Layers of OSI Models?
- Application Layer
- Presentation Layer
- Session Layer
- Transport Layer
- Network Layer
- Data-Link Layer
- Physical Layer
- How to Check Transmission (USE CPT for Live Demonstration)?



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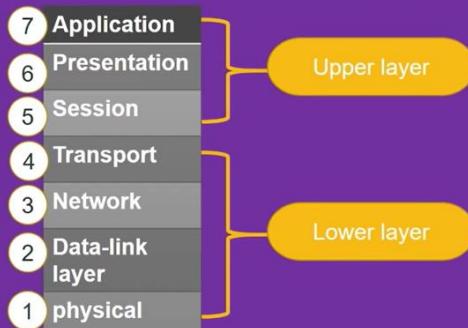
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Introduction to OSI Model?

OSI stand for open system interconnection and it is used to know the flow of data from a point to b point. And OSI model was developed by the International Organization for Standardization (ISO) in 1984, and it is now considered as an architectural model for the inter-computer communications.

Characteristics of the OSI model



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7- Application Layer

An **application layer** is an abstraction **layer** that specifies the shared communications protocols and interface methods used by hosts in a communications network. The **application layer** abstraction is used in both of the standard models of computer networking: the Internet Protocol Suite (TCP/IP) and the OSI model.



6- Presentation Layer

The presentation layer is responsible for the formatting and delivery of information to the application layer for further processing or display



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5- Session Layer

Session Layer protocol is used to check the session between end user.

The session layer provides the mechanism for opening, closing and managing a session between end-user application processes

In case of a connection loss this protocol may try to recover the connection. If a connection is not used for a long period, the session-layer protocol may close it and re-open it.



PING command is used to check session is active or not



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4- Transport Layer



Transport layer protocol is showing the transmission process and information.

Used two protocol to carry the info/packets

The best-known transport protocol of the Internet protocol suite is the Transmission Control Protocol (TCP).

It is used for connection-oriented transmissions, whereas the connectionless User Datagram Protocol (UDP) is used for simpler messaging transmissions.

TCP is the more complex protocol, due to its stateful design incorporating reliable transmission and data stream services. Together, TCP and UDP comprise essentially all traffic on the internet and are the only protocols implemented in every major operating system.



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What Services Can the Transport Layer Provide?

- ❑ **Connection-Oriented Communication:-** The weakness of this method is that for each delivered message, there is a requirement for an acknowledgment, adding considerable network load compared to self-error-correcting packets.
- ❑ The repeated requests cause significant slowdown of network speed when defective byte streams or datagrams are sent.
- ❑ **Same Order Delivery:-** Ensures that packets are always delivered in strict sequence by assigning them a number.
- ❑ **Data Integrity:-** Using checksums, the data integrity across all the delivery layers can be ensured.
- ❑ These checksums guarantee that the data transmitted is the same as the data received and that is not corrupt. Missing or corrupted data can be resent by requesting retransmission from other layers.
- ❑ **Flow control:-**
- ❑ Flow control ensures that the data is sent at a rate that is acceptable for both sides by managing data flow.
- ❑ **Traffic Control:-**
- ❑ Digital communications networks are subject to bandwidth and processing speed restrictions, which can mean a huge amount of potential for data congestion on the network.
- ❑ **Multiplexing:-**
- ❑ This multiplexing allows the use of simultaneous applications over a network such as when different internet browsers are opened on the same computer.



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Best Path

3- Network Layer

Network layer manages options pertaining to host and network addressing, managing sub-networks, and internetworking

Functions:-

- Addressing devices and networks.
- Populating routing tables or static routes.
- Queuing incoming and outgoing data and then forwarding them according to quality of service constraints set for those packets.
- Internetworking between two different subnets.
- Delivering packets to destination with best efforts.
- Provides connection oriented and connection less mechanism.

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2- Data-Link Layer

Data Link Layer is responsible for MAC addressing and LLC control checking.

Data link layer is responsible for converting data stream to signals bit by bit and to send that over the underlying hardware.

At the receiving end, Data link layer picks up data from hardware which are in the form of electrical signals, assembles them in a recognizable frame format, and hands over to upper layer.

Data link layer has two sub-layers:

1. **Logical Link Control:** flow-control, and error control
2. **Media Access Control:** Physical Address or Permanent address for media control

Functionality of Data-link Layer

1. Framing
2. Addressing
3. Flow control
4. Error control
5. Multi-access
6. Synchronization

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Physical Layer

L3 Annex

- Maintain the physical connectivity between networking devices.
- This layer defines the hardware equipment, cabling, wiring, frequencies, pulses used to represent binary signals etc.

Signals of physical layer protocols

- 1- Analog
- 2- Digital Signal

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Chapter 7- TCP/IP Model

- Introduction to TCP/IP Model?
- Layers of TCP/IP Models?
- Process/Application Layer
- Host-to-Host/Transport Layer
- Internet Layer
- Network Access/Link Layer
- Difference Between OSI model and TCP/IP Model



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Advantages of TCP/IP

- It helps you to establish/set up a connection between different types of computers.
- It operates independently of the operating system.
- It supports many routing-protocols.
- It enables the internetworking between the organizations.
- TCP/IP model has a highly scalable client-server architecture.
- It can be operated independently.
- Supports several routing protocols.
- It can be used to establish a connection between two computers.



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OSI Model	TCP/IP Model
It is developed by ISO (International Standard Organization)	It is developed by ARPANET (Advanced Research Project Agency Network).
OSI model provides a clear distinction between interfaces, services, and protocols.	TCP/IP doesn't have any clear distinguishing points between services, interfaces, and protocols.
OSI refers to Open Systems Interconnection.	TCP refers to Transmission Control Protocol.
OSI uses the network layer to define routing standards and protocols.	TCP/IP uses only the Internet layer.
OSI follows a vertical approach.	TCP/IP follows a horizontal approach.
OSI layers have seven layers.	TCP/IP has four layers.
In the OSI model, the transport layer is only connection-oriented.	A layer of the TCP/IP model is both connection-oriented and connectionless.
In the OSI model, the data link layer and physical are separate layers.	In TCP, physical and data link are both combined as a single host-to-network layer.
Session and presentation layers are a part of the OSI model.	There is no session and presentation layer in the TCP model.
It is defined after the advent of the Internet.	It is defined before the advent of the internet.
The minimum size of the OSI header is 5 bytes.	The minimum header size is 20 bytes. (www.sikhlive.com)



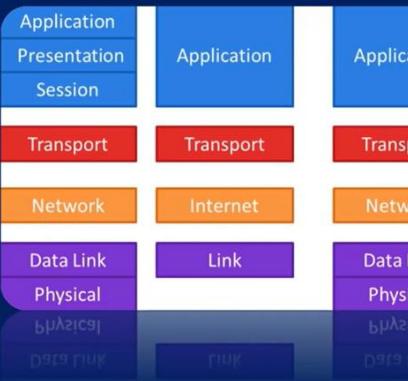
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F Introduction to TCP/IP model ?

These protocols **describe** the movement of data between the source and destination or the internet. They also offer simple naming and addressing schemes.



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Chapter 8- Transmission Mode and Transmission Media

- What is Transmission?
- Transmission Mode and Its Types
- Transmission Media and its types
- Twisted Pair Cable (STP & UTP)
- FOC- Fiber Optic Cable and Types of FOC
- Coaxial Cable and Types of Coaxial Cable?



Chapter 9- How to prepare cable

- Color Code?
- Cross Cable
- Straight Cable / Patch Cable

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What is Transmission?

- Transmission is a process in which user can send data or information using network devices is known as Transmission.
- In simple language we can say it is the process of sharing information between devices.

There are two types of Transmission Mode ?

1. Simplex mode
2. Duplex mode (HDX- Half Duplex Mode , FDX- Full Duplex Mode)

Simplex mode – it is one way communication and in this device can only send the data .
Exp - Keyboard , mouse, mic etc.

Duplex mode - in this mode devices can send and receive the data.

HDX – Half duplex mode supports one way communication at a time. User can't send and receive data simultaneously.

FDX- in this technology user / Device can send and receive the data simultaneously.



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Types of transmission media

1. Wired media (Note- wave, electromagnetic signal)
2. Wireless media (RF – Radio Frequency)



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Difference between STP and UTP

BASIS FOR COMPARISON	STP	UTP
Basic	STP (Shielded twisted pair) is a twisted pair cable enclosed in foil or mesh shield.	UTP (Unshielded twisted pair) is a cable with wires that are twisted together.
Noise and crosstalk generation	Less susceptible to noise and crosstalk.	High comparatively.
Grounding cable	Necessarily required	Not required
Ease of handling	Installation of cables is difficult comparatively.	Easily installed as cables are smaller, lighter, and flexible.
Cost	Moderately expensive.	Cheaper and does not require much maintenance.
Data Rates	Provides high data rates	Slow comparatively.
Max used	Less used	More used



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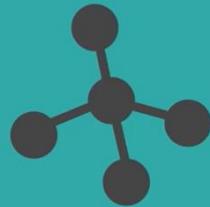
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Types of Fiber optic cable?

- There are two types of fiber optic cable.
 - 1. Single mode fiber optic cable ✓
 - 2. Multi-mode fiber optic cable ✓



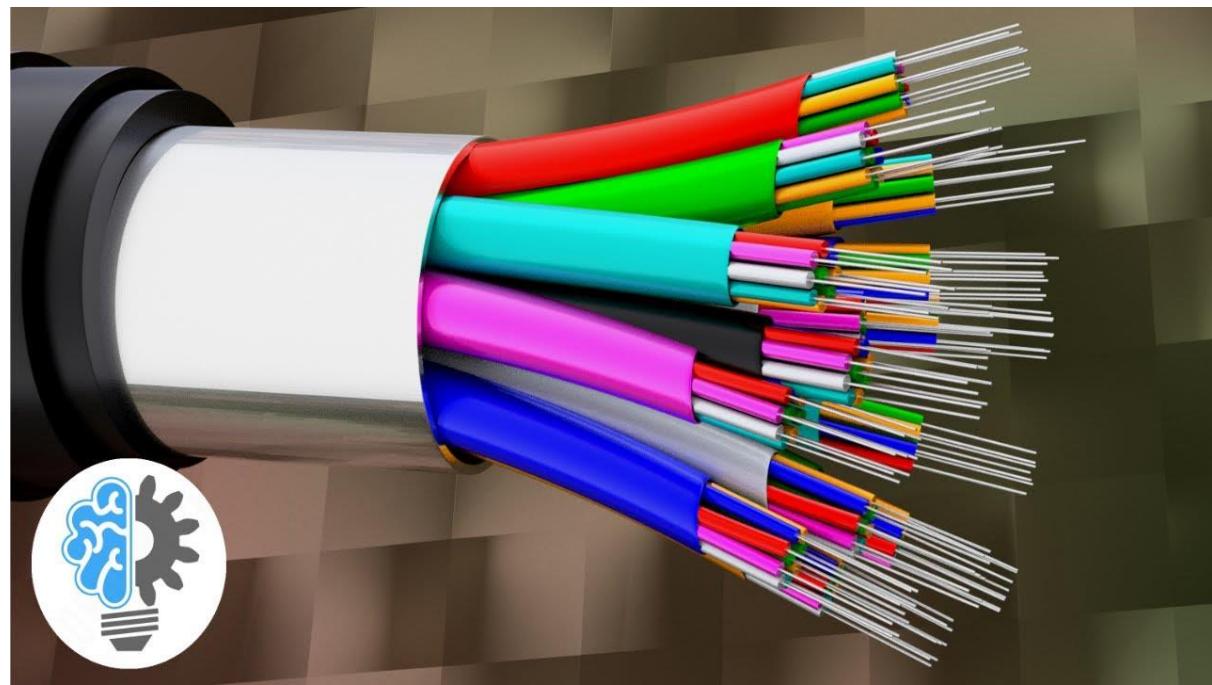
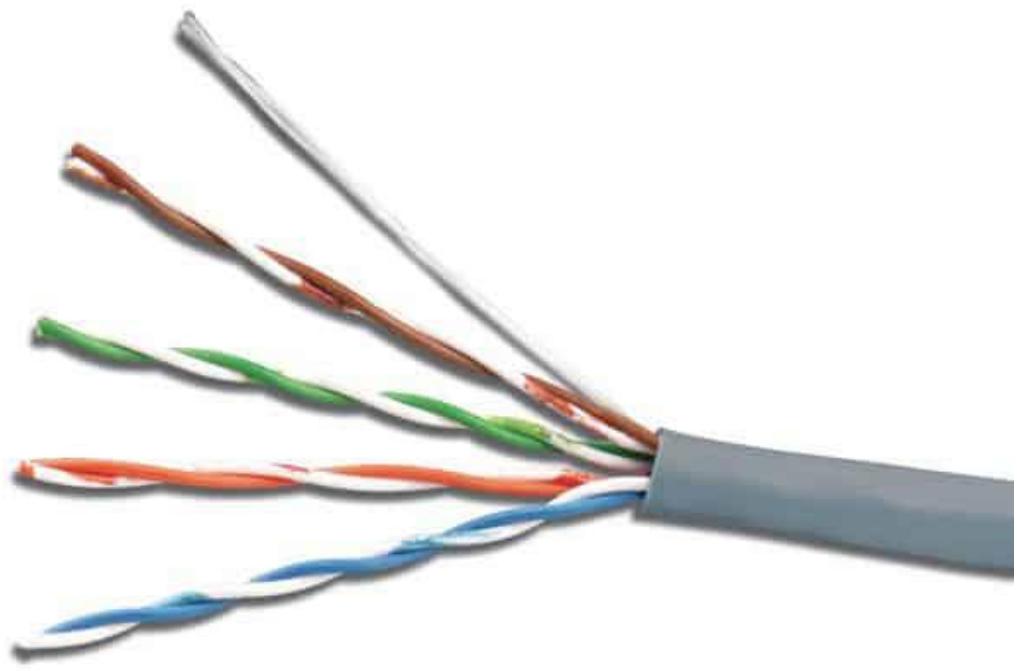
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Chapter 10- Internet

- What is internet?
- How does internet work?
- Owner of internet?
- IANA, ARIN, ICANN, IEEE, IETF



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What is internet ?

The Internet is a global wide area network that connects computer systems across the world.



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How does internet work?



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The Internet Assigned Numbers Authority is a standards organization that oversees global IP address allocation, autonomous system number allocation, root zone management in the Domain Name System, media types, and other Internet Protocol-related symbols and Internet numbers.



The American Registry for Internet Numbers is the regional Internet registry for Canada, the United States, and many Caribbean and North Atlantic islands. ARIN manages the distribution of Internet number resources, including IPv4 and IPv6 address space and AS numbers.



The Internet Corporation for Assigned Names and Numbers is an American multistakeholder group and nonprofit organization responsible for coordinating the maintenance and procedures of several databases related to the namespaces and numerical spaces of the Internet, ensuring the network's stable and secure operation.



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The Institute of Electrical and Electronics Engineers is a professional association for electronic engineering and electrical engineering with its corporate office in New York City and its operations center in Piscataway, New Jersey.



The Internet Engineering Task Force is an open standards organization, which develops and promotes voluntary Internet standards, in particular the standards that comprise the Internet protocol suite. It has no formal membership roster or membership requirements.



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Chapter 11- Types of Internet connection



- Broadband
- Leased Line
- Cellular network

Cellular network

A cellular network or mobile network is a communication network where the last link is wireless. The network is distributed over land areas called "cells", each served by at least one fixed-location transceiver, but more normally, three cell sites or base transceiver stations.

these base stations provide the cell with the network coverage which can be used for transmission of voice, data, and other types of content. A cell typically uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed service quality within each cell



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Broadband

•Broadband is not a dedicated connection between your premises and the local exchange. It is variable bandwidth, asymmetric, meaning faster for downloads than for uploads, and subject to contention with other users.

•A leased line is a dedicated connection between your premises and the local exchange. It is fixed bandwidth and offers identical upload and download speeds and is not subject to contention with other users.

Leased Line

A leased line is a private telecommunications circuit between two or more locations provided according to a commercial contract. It is sometimes also known as a private circuit, and as a data line in the UK. Typically, leased lines are used by businesses to connect geographically distant offices.



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Chapter 12- Internet Vs Intranet vs Arpanet with Milnet

- Internet
- Intranet
- Arpanet
- Milnet

Intranet

An intranet is a computer network for sharing information, collaboration tools, operational systems, and other computing services within an organization, usually to the exclusion of access by outsiders



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ARPANET

The ARPANET (an acronym for Advanced Research Projects Agency Network) was the first wide-area packet-switching network with distributed control and one of the first networks to implement the TCP/IP protocol suite. Both technologies became the technical foundation of the Internet.

Funding: From 1966, Advanced Research Project

Operator: From 1975, Defense Communications

Protocols: 1822 protocol, NCP, TCP/IP

Closed: 1990

MILNET

In computer networking, MILNET was the name given to the part of the ARPANET internetwork designated for unclassified United States Department of Defense traffic. MILNET was physically separated from the ARPANET in 1983.



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Chapter 13- Wireless Technology

- Introduction to wireless network
- How does wireless network work?
- Types of wireless standard? With explanation
- How to setup wireless network and Wi-Fi router configuration?
- Advantages and disadvantages of wireless network

Introduction to wireless network:- Wireless Network technology connect networking devices using Radio Frequency. So we can connect all networking devices wirelessly. But it covers small area in compare of wired technology.

We can use this technology over a small area like home, small office, schools
For wireless communication.



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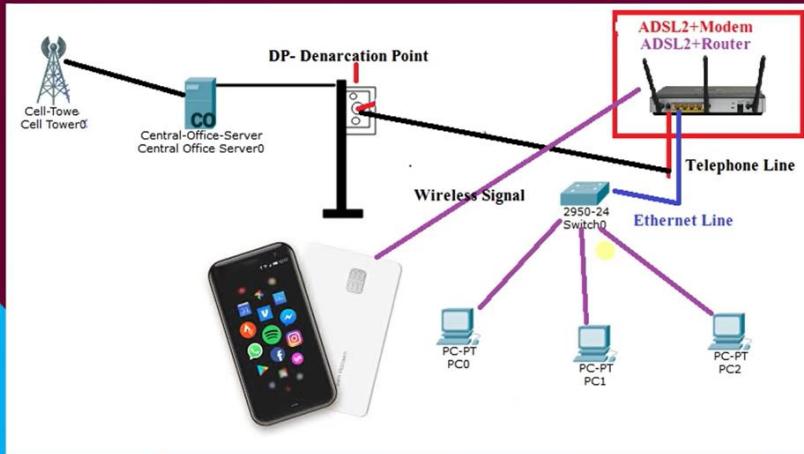


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How does wireless network work ?



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Wireless Security

Open (risky): Open Wi-Fi networks have no passphrase. You shouldn't set up an open Wi-Fi network—seriously, you could have your door busted down by police.

WEP 64 (risky): The old WEP protocol standard is vulnerable and you really shouldn't use it.

WEP 128 (risky): This is WEP, but with a larger encryption key size. It isn't really any less vulnerable than WEP 64.

WPA2-PSK (TKIP): This uses the modern WPA2 standard with older TKIP encryption. This isn't secure, and is only a good idea if you have older devices that can't connect to a WPA2-PSK (AES) network.

WPA2-PSK (AES): This is the most secure option. It uses WPA2, the latest Wi-Fi encryption standard, and the latest AES encryption protocol. **You should be using this option.** On some devices, you'll just see the option "WPA2" or "WPA2-PSK." If you do, it will probably just use AES, as that's a common-sense choice.

WPA/WPA2-PSK (TKIP/AES): Some devices offer—and even recommend—this mixed-mode option. This option enables both WPA and WPA2, with both TKIP and AES. This provides maximum compatibility with any ancient devices you might have, but also allows an attacker to breach your network by cracking the more vulnerable WPA and TKIP protocols.



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Wireless standard

STANDARD	FREQUENCY	SPEED
802.11a	5GHz	54Mbps
802.11b	2.4GHz	11Mbps
802.11g	2.4GHz	54Mbps
802.11n	2.4GHz/5GHz	600Mbps
802.11ac	Up to 5GHz	More than 1Gbps



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Advantages and disadvantages of wireless network

- Convenience
- Expandability
- Deployment
- Productivity
- Mobility
- Cost
- Security



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Chapter 14- Mobile Network Technology

- What is cellular network?
- Generation of mobile networking?
- Telecom (Mobile Operator)?

A cellular network or mobile network is a communication network where the last link is wireless. The network is distributed over land areas called "cells", each served by at least one fixed-location transceiver, but more normally, three cell sites or base transceiver stations.



Generation of mobile network

Features	1G	2G	3G	4G	5G
Start/Development	1970/1984	1980/1999	1990/2002	2000/2010	2010/2015
Technology	AMPS, NMT, TACS	GSM	WCDMA	LTE, WiMax	MIMO, mm Waves
Frequency	30 KHz	1.8 Ghz	1.6 - 2 GHz	2 - 8 GHz	3 - 30 Ghz
Bandwidth	2 kbps	14.4 - 64 kbps	2 Mbps	2000 Mbps to 1 Gbps	1 Gbps and higher
Access System	FDMA	TDMA/CDMA	CDMA	CDMA	OFDM/BDMA
Core Network	PSTN	PSTN	Packet Network	Internet	Internet

Chapter- 15 Protocols

- What is protocol?
- IP
- TCP
- UDP
- ARP
- RARP
- POP
- IMAP
- SMTP
- SNMP
- FTP
- HTTP
- HTTPS
- NTP
- DNS
- DHCP



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Protocols:- it is a set of rule for particular object. Networking Technology using various types of protocols to manage the network and share the information from one network device to other network device.

IP:- IP stand for internet protocols and it is used to connect one pc to others.

TCP:- TCP stand for transmission control protocol and this protocol allow pc to share data with reliability, security, slow, and also manage the packets. And TCP provide acknowledgement.

UDP :- User Datagram Protocol – this protocol allow pc to carry the data with fast, unreliable, insecure, and UDP does not provide any types of acknowledgement and it is used for video streaming also.

ARP- Address Resolution Protocol- it is used to find Mac address from IP address. ARP work on switch devices.

RARP- Reverse address resolution protocol- it is used to find IP address from mac address and work oppo.. Of ARP.

DNS- Stand for Domain name system- it is used to find the ip to name like xyz.com=10.0.0.10

DHCP- Stand for Dynamic Host configuration protocol and it is used to manage IP over a network. Its provide Dynamic IP or auto ip over a network.



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- POP:- Post Office protocols this protocol is used to receive the email.
- IMAP- Stand for internet message access protocol and **Internet Message Access Protocol (IMAP)** means that all of your email is saved on your Internet Service Provider's servers. If you are using IMAP, you can run an email program at home and an email program at work and both programs will access the same set up messages and folders.
- SMTP: - Simple mail transfer protocol – used to send email messages.
- FTP- File Transfer Protocol used to upload and download.
- HTTP- Hyper Text Transfer Protocol – use to access Web data.
- HTTPS:-
- NTP- Network Time Protocol- Is used to manage network router and server time to sync the time.



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TCP	UDP
TCP is a connection-oriented protocol. Connection-orientation means that the communicating devices should establish a connection before transmitting data and should close the connection after transmitting the data.	UDP is the Datagram oriented protocol. This is because there is no overhead for opening a connection, maintaining a connection, and terminating a connection. UDP is efficient for broadcast and multicast type of network transmission.
TCP is reliable as it guarantees delivery of data to the destination router.	The delivery of data to the destination cannot be guaranteed in UDP.
TCP provides extensive error checking mechanisms. It is because it provides flow control and acknowledgment of data.	UDP has only the basic error checking mechanism using checksums.
Sequencing of data is a feature of Transmission Control Protocol (TCP). this means that packets arrive in-order at the receiver.	There is no sequencing of data in UDP. If ordering is required, it has to be managed by the application layer.
TCP is comparatively slower than UDP.	UDP is faster, simpler and more efficient than TCP.
Retransmission of lost packets is possible in TCP, but not in UDP.	There is no retransmission of lost packets in User Datagram Protocol (UDP).
TCP doesn't supports Broadcasting.	UDP supports Broadcasting.



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Chapter 16- How to setup Local Area Network

- Creating and managing LAN suing CPT



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Chapter 17- IP Address

- What is IP?
- Types of IP?
- IPv4
- IPv6
- Classes of ipv4
- Host id & Network Id
- Subnet mask
- VLSM
- Subnetting
- Gateway
- How to configure IP address subnet mask and gateway?



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IP – Internet protocol and assign on computer for computer identity

It is unique address it may be decimal or hexadecimal An Internet Protocol address is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication.

An IP address serves two main functions: host or network interface identification and location addressing

Categorized in two part

1- Network id

2- Host id

IPv4 address is 202.56.215.200 or 10.0.0.0 or 10.0.0.100, 172.168.0.25

IPv6 Address is 2001:0db8:85a3:0000:0000:8a2e:0370:7334



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Ipv4	ipv6
32 bit address	128 bit address
Classful address	Classless address
5 class	No class
4 block	8 block
8bit/block	16bit/block
Small Network	Geographical Network



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● Subnet Mask:- is used to identify network id and host id

● How to identify Class of IP address

Class	Range
A	1-126
B	128-191
C	192-223
D	224-239
E	240-255



Class	Subnet mask
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0



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Explain

Private IP: - ✓

Public IP:-

Loopback IP:-



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Chapter 18- IoT

- Introduction to IoT
- What is Network Automation?

The Internet of things describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet.



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Chapter 19- Network vulnerability % Securing Network and Networking

- What is vulnerability?
- How to check network vulnerability?
- How to secure our network?

Vulnerability Existence of a weakness, design or implementation error that can lead to an unexpected event compromising the security of the system.



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- How to check network vulnerability?
- How to secure our network?



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Chapter 20- WAN Connection?

- What is WAN networking?
- WAN Networking Protocols?
- How to setup WAN network?

The key WAN protocols that are in use are Asynchronous Transfer Mode (ATM), Broadband Access, Frame Relay, Point-to-Point Protocol (PPP), Synchronous Optical Network (SONET), Synchronous Digital Hierarchy (SDH), X. 25, and a few other WAN protocols.



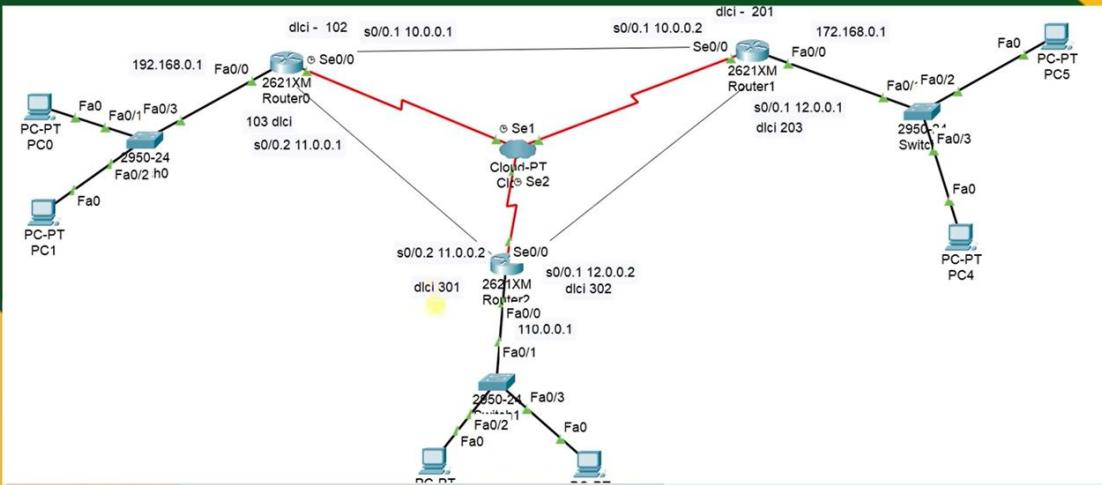
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How to setup WAN network?

P2P and Frame-Relay Configuration



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