Experiment 1:

Study of Network media, cables, and devices and Cable Construction.

Aim: To study network media, cables, and devices and Cable Constructions.

Description:

Network Media: It describes the channel used for data transmission and is usually of two types: guided and unguided media.

Guided media:

It is a bounded/wired method of transmission of data. These media provide a controlled environment for transfer of data and help in maintaining signal integrity and reducing signal loss/interference. Guided media consists of twisted pair cable, coaxial cable and optical fibres.

Twisted pair cable:

It uses one conductor for data transfer and other for ground reference, wires are twisted to reduce the magnetic interference. It is used in connecting of

- Computers, switches, routers, printers, IP cameras in a LAN.
- Computers to a local area network using fast ethernet or gigabit ethernet.
- Internet connections that use standard telephone lines for voice signals.
- Telephone lines to communicate using telephones.

Twisted pair cables are divided into shielded and unshielded based on extra layer that may be used to cover the pair of wires.

Advantages of shielded wires:

1. STP cables have a metallic shield that provides excellent protection against electromagnetic interference (EMI) and radio frequency interference (RFI). This makes them ideal for environments with high levels of electrical noise, such as factories and industrial settings.
2. The shielding in STP cables helps maintain signal integrity over longer distances, reducing signal degradation and the chances of data loss or corruption.
3. STP cables can support higher data transfer rates and bandwidths compared to UTP cables. This makes them suitable for applications requiring high-speed data transmission, such as Gigabit Ethernet and beyond.

Disadvantages of shielded wires:

1. Cables are generally more expensive than their UTP counterparts due to the additional shielding material and manufacturing complexity.

2. The shielding in STP cables makes them thicker and less flexible than UTP cables, which can be a drawback in certain installations where space is limited or cable management is challenging.
3. Proper grounding is essential for STP cables to effectively dissipate interference. Failing to provide adequate grounding can negate their advantages.

Advantages of unshielded wires:

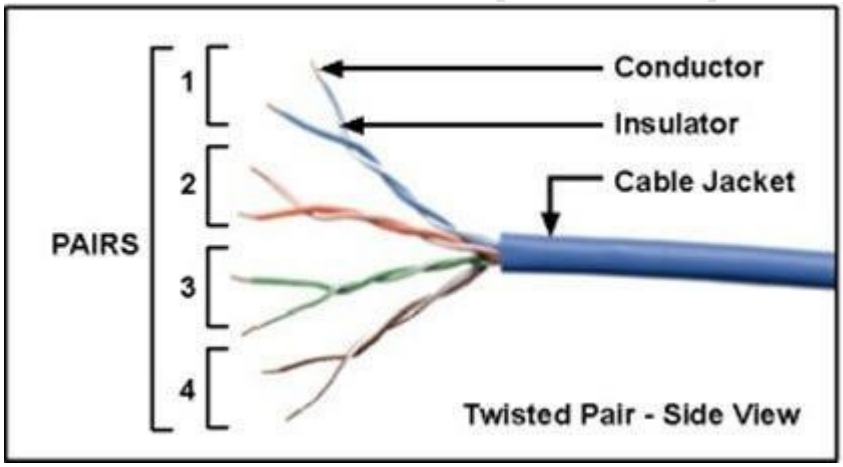
1. UTP cables are more affordable than STP cables, making them a cost-effective choice for many networking applications.
2. UTP cables are thinner and more flexible, making them easier to install in tight spaces and suitable for various cable management scenarios.
3. UTP cables do not require the additional grounding that STP cables do, which simplifies installation and reduces potential points of failure.

Disadvantages of unshielded wires:

1. UTP cables are more susceptible to electromagnetic and radio frequency interference compared to STP cables. This can result in signal degradation and potential data transmission issues in noisy environments.
2. UTP cables are generally limited in the distance they can transmit data without signal degradation, especially at higher data transfer rates. This limitation can require the use of additional networking equipment, such as repeaters or switches, for longer cable runs.
3. UTP cables are more prone to crosstalk, which can affect network performance in situations where cables are tightly bundled or poorly installed.

Bandwidth: 100MHz to 600MfHz (depends on category)

Data Rate: 1Gbps to 10 Gbps



Coaxial cables:Consists of two concentric conductors, a central conductor surrounded by insulation which in turn is within a metallic shield and an outer insulating layer. It is used in

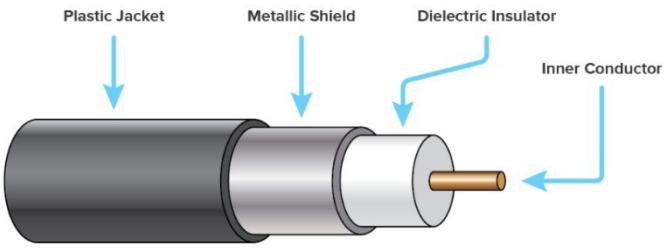
- Transmitting TV signal from antenna to TV and set top boxes
- High speed internet transmission through cable modem system
- CCTV systems to transmit video signals from camera to equipment.
- Transmitting audio signals in professional audio setup
- Connecting probes and sensors of medical devices like ultrasound

machines. Advantages of coaxial cables:

1. Coaxial cables can carry a wide range of frequencies, making them suitable for transmitting both analogue and digital signals. This makes them versatile for various applications, including cable TV, broadband internet, and data networking.
2. Coaxial cables have a metallic shield that provides excellent protection against electromagnetic interference (EMI) and radio frequency interference (RFI). This shielding helps maintain signal integrity and reduces the chances of data loss or signal degradation.
3. Coaxial cables can transmit signals over longer distances without significant signal loss compared to some other cable types, such as twisted pair cables. This makes them suitable for connecting devices that are farther apart.
4. Coaxial cables are robust and durable, making them suitable for outdoor and industrial applications. They are often used in harsh environments where other cable types may not hold up as well.

Disadvantages of coaxial cables:

1. Coaxial cables tend to be thicker and less flexible compared to some other cable types, such as twisted pair cables. This can make them less convenient for installation in tight spaces or when cable management is challenging.
2. Coaxial cables can be more expensive than some other cable types, such as twisted pair cables. The cost can vary depending on factors like the cable's quality and the type of connectors used.
3. Coaxial cables are typically used for specific applications like television or cable internet. They may not be as versatile as some other cable types that can be used for various data and communication purposes.
4. While coaxial cables can transmit signals over longer distances, signal degradation can still occur, especially at higher frequencies. This may require the use of signal boosters or amplifiers in some cases.



Bandwidth: 0.9GHz to 3GHz (depends on category RG-6, RG-11, RG-58, RG-59)

Data rate: 1Gbps to 10 Gbps

Fibre optics:

Uses electromagnetic signals for transmission. It has a glass/plastic core covered by a cladding which in turn is covered by a jacket. It is used in,

- Long distance communication across continents, high speed internet and mobile networks.
- Tv signal broadcasts for live and HD channels as well as video streaming channels.
- Medical endoscopes laser-based surgeries.
- Military, aviation, and space applications for better communication
- Industrial automation systems, oil/gas drilling environments and submarine cables.

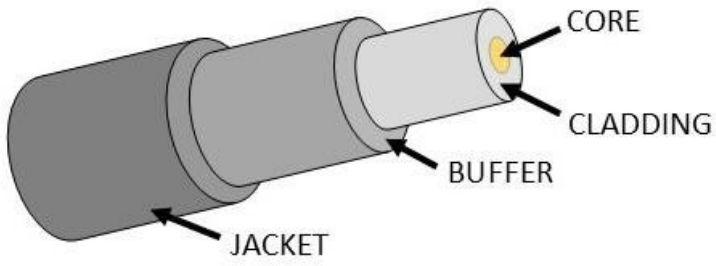
Advantages of fibre optics:

1. Fibre optics can carry a tremendous amount of data at very high speeds. This makes it ideal for applications that require high bandwidth, such as internet access, video streaming, and data center networking.
2. Fibre optic cables can transmit data over long distances without significant signal loss. This is particularly important for long-haul telecommunications and undersea cable connections.
3. Fibre optics are immune to EMI, making them highly reliable in environments with electrical interference, such as industrial settings or areas with heavy radio-frequency interference.
4. Fibre optic cables are difficult to tap into or intercept because they do not emit electromagnetic signals that can be easily intercepted. This makes them a secure option for data transmission.

5. Fibre optic cables are thin and lightweight compared to traditional copper cables, which makes them easier to handle and install.

Disadvantages of fibre optics:

1. Fibre optic cables, components, and installation can be more expensive than traditional copper cabling. The cost can be a significant barrier to adoption, especially for smaller organizations.
2. Fibre optic cables are more delicate than copper cables and can be easily damaged if mishandled. They are also sensitive to bending beyond their minimum bend radius.
3. Fibre optic networks require specialized equipment for installation, maintenance, and repair. Technicians need to be trained to work with fibre optics.
4. Fibre optic infrastructure may not be as widely available in certain areas, especially in rural or remote locations, compared to traditional copper networks.
5. In some cases, existing equipment may not be compatible with fibre optic connections, necessitating costly upgrades or replacements.



Bandwidth: greater than 2000MHz

Data rate: 100 Mbps (plastic based), 100 Gbps normally

Unguided media:

Here the electromagnetic waves are transmitted without any physical medium and this is generally known as “wireless transmission” where the medium of transmission is air. Unguided media usually consists of radio waves, micro waves and infrared waves.

Radio waves:

Electromagnetic waves which are transmitted in all directions of free space. Waves are omnidirectional. The sending and receiving antennas are not aligned, waves sent by sender antenna can be used by any receiving antenna. They are used in,

- Radio broadcasting and cellular communication.
- Wireless local area network (Wifi) uses 2.4GHz and 5GHz radio bands to provide wireless internet.

- Radio frequency identification (RFID) for identification, tracking of objects.

Advantages of radio waves:

1. Radio waves enable wireless communication, allowing devices to transmit and receive data without the need for physical connections. This is particularly useful for mobile devices like smartphones, Wi-Fi, and Bluetooth.
2. Radio waves can travel over long distances, making them suitable for broadcasting, cellular communication, and long-distance wireless networking.
3. Radio waves have the ability to penetrate some obstacles, such as walls and buildings, making them suitable for indoor and outdoor wireless communication.
4. Radio waves are used in a wide range of applications, including radio broadcasting, television broadcasting, satellite communication, radar systems, and more.

Disadvantages of radio waves:

1. The available radio frequency spectrum is limited, and it can become congested as more devices and applications rely on radio waves for communication. This can lead to interference and reduced signal quality.
2. Radio waves are susceptible to interference from other electronic devices, atmospheric conditions, and physical obstacles, which can affect the quality and reliability of communication.
3. While radio waves can transmit data wirelessly, their data transfer rates may be slower compared to wired connections, especially for long-distance communication.
4. Radio waves are susceptible to eavesdropping and unauthorized access, making wireless communication vulnerable to security breaches if not properly encrypted and secured.

Bandwidth: medium to high frequency

Data rate: few Kbps to Gbps

Micro waves:

It is an electromagnetic wave which has a shorter wavelength than radio waves but has longer wavelengths than infrared radiation. It is used in ,

- Cooking devices like microwave owens.
- Satellite communications, radio links, radar(radio detection and ranging)
- Remote sensing and wireless communication systems.
- Radio telescopes

Advantages of micro waves:

1. Microwaves are used in point-to-point communication systems, such as microwave links and satellite communication, because they can transmit data at high speeds, making them suitable for broadband internet and long-distance data transmission.
2. Microwaves travel in straight lines and require a clear line of sight between the transmitter and receiver. This characteristic is advantageous for point-to-point communication and microwave links where precise targeting is needed.
3. Microwaves are less absorbed by the Earth's atmosphere compared to other electromagnetic waves, such as radio waves or millimeter waves. This enables them to travel longer distances without significant signal loss.
4. The relatively short wavelength of microwaves allows for the construction of compact and directional antennas, making them suitable for applications where space constraints are a concern.

Disadvantages of micro waves:

1. Microwaves require a clear line of sight between the transmitter and receiver. Obstacles like buildings, trees, and terrain can obstruct the signal, limiting their use in some scenarios.
2. The microwave frequency bands are limited, and they can become congested, especially in densely populated areas and for certain applications. This can lead to interference and reduced performance.
3. Microwaves do not penetrate solid materials as well as lower-frequency radio waves, making them less suitable for applications that require signal transmission through walls or underground.
4. Heavy rain, fog, and other atmospheric conditions can attenuate or scatter microwave signals, leading to signal degradation in certain weather conditions.

Bandwidth: 300 MHz to 300 GHZ

Data rate: 300 Mbps to 1Gbps

Infrared waves:

It is a form of wireless technology used for data communication over short distances. It supports higher bandwidth and cannot penetrate walls but provides better communication with lesser interference. It is used in,

- Infrared cameras, sensors to see temperature distribution.

- Night vision goggles and thermal scopes
- Remote controls of tv, dvd players
- Analysis of materials in chemistry

Advantages of infrared waves:

1. Infrared radiation is non-ionizing, which means it doesn't have enough energy to ionize atoms or molecules, making it generally safe for human exposure and use in various applications.
2. Infrared radiation is commonly used in thermal imaging and thermography. It allows for the detection of heat patterns, temperature variations, and anomalies in objects and living organisms. This has applications in fields like medicine, firefighting, and building inspection.
3. Infrared waves are widely used in remote control devices for consumer electronics, including TVs, DVD players, and air conditioners. Infrared remote controls are easy to use and cost-effective.
4. Infrared communication systems, such as IrDA (Infrared Data Association), are used for short-range wireless data transfer between devices like laptops, smartphones, and printers.

Disadvantages of infrared waves:

1. Infrared communication and transmission have limited range, typically only a few meters. This makes them less suitable for long-distance communication compared to other wireless technologies like radio waves or microwaves.
2. Infrared signals require a clear line of sight between the transmitter and receiver. Obstacles like walls or objects can block or reflect the signals, limiting their usability.
3. Infrared devices can be susceptible to interference from other sources of infrared radiation, such as sunlight or other nearby devices using infrared communication.
4. Infrared radiation can be affected by environmental factors like temperature, humidity, and atmospheric conditions, which can impact the accuracy of measurements and sensor readings.

Bandwidth: 300 GHz to 400 THz

Data rate: 100 Kbps to 16 Mbps

Experiment 2:

Demonstration of basic network commands/utilities

Aim: To demonstrate the basic network commands/utilities on computer

Procedure:

- Switch on the computer and open command prompt on it
- On the command prompt, type the network commands and observe the output generated.

Description:

- Ping:

Verifies IP-level connectivity to another TCP/IP computer by sending Internet Control Message Protocol (ICMP) Echo Request messages. The receipt of corresponding Echo Reply messages are displayed, along with round-trip times. Ping is the primary TCP/IP command used to troubleshoot connectivity, reachability, and name resolution. It is one of the most basic yet useful network commands to utilize in the command prompt application. It tells whether the computer can reach some destination IP address or domain name, and if it can, how long it takes data to travel there and back again.

```
student@CSELab3-01:~$ ping 172.20.8.201
PING 172.20.8.201 (172.20.8.201) 56(84) bytes of data.
64 bytes from 172.20.8.201: icmp_seq=1 ttl=64 time=0.460 ms
64 bytes from 172.20.8.201: icmp_seq=2 ttl=64 time=0.365 ms
```

- Arp:

ARP (Address Resolution Protocol): ARP is a protocol used to map an IP address to its corresponding hardware (MAC) address on a local network. It helps devices find each other on the same network.

```
student@CSELab3-17:~$ arp
Address                  HWtype  HWaddress           Flags Mask            Iface
172.20.10.126            ether   8c:ec:4b:85:c3:d4   C                     enp2s0
172.20.11.108            ether   8c:ec:4b:86:ab:8d   C                     enp2s0
_gateway                 ether   e4:8d:8c:17:b8:6a   C                     enp2s0
student@CSELab3-17:~$
```

- Dig:

dig is a command-line tool for querying DNS (Domain Name System) servers to retrieve information about domain names, IP addresses, and DNS records. It is often used for network troubleshooting and DNS analysis.

```
student@CSELab3-17:~$ dig

; <<>> DiG 9.16.1-Ubuntu <<>>
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 32775
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;.                              IN      NS

;; ANSWER SECTION:
.                       371724  IN      NS      k.root-servers.net.
.                       371724  IN      NS      j.root-servers.net.
.                       371724  IN      NS      h.root-servers.net.
.                       371724  IN      NS      c.root-servers.net.
.                       371724  IN      NS      e.root-servers.net.
.                       371724  IN      NS      m.root-servers.net.
.                       371724  IN      NS      f.root-servers.net.
.                       371724  IN      NS      d.root-servers.net.
.                       371724  IN      NS      g.root-servers.net.
.                       371724  IN      NS      l.root-servers.net.
.                       371724  IN      NS      i.root-servers.net.
.                       371724  IN      NS      a.root-servers.net.
.                       371724  IN      NS      b.root-servers.net.

;; Query time: 48 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Wed Sep 20 13:32:35 IST 2023
;; MSG SIZE  rcvd: 239
```

- Host:

The host command is used to perform DNS lookups and resolve hostnames to IP addresses or vice versa. It can be used for domain name resolution and reverse DNS queries.

```
student@CSELab3-17:~$ host cbit.ac.in
cbit.ac.in has address 3.111.165.12
cbit.ac.in mail is handled by 10 apmx.l.google.com.
cbit.ac.in mail is handled by 10 aspmx.l.google.com.
cbit.ac.in mail is handled by 5 alt1.aspmx.l.google.com.
cbit.ac.in mail is handled by 10 aspmx3.googlemail.com.
cbit.ac.in mail is handled by 5 alt2.aspmx.l.google.com.
cbit.ac.in mail is handled by 10 aspmx2.googlemail.com.
student@CSELab3-17:~$
```

- Ifconfig:

ifconfig (short for "interface configuration") is a command-line utility used to configure, display, and manage network interfaces on Unix-like operating systems. It provides information about network interfaces, including IP addresses and network settings.

```
student@CSELab3-17:~$ ifconfig
enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.20.10.166  netmask 255.255.252.0  broadcast 172.20.11.255
        inet6 fe80::95d7:321f:a86e:faf4  prefixlen 64  scopeid 0x20<link>
        ether 34:64:a9:2b:68:cd  txqueuelen 1000  (Ethernet)
        RX packets 117041  bytes 62872690 (62.8 MB)
        RX errors 0  dropped 378  overruns 0  frame 0
        TX packets 30947  bytes 3577684 (3.5 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 2663  bytes 284692 (284.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 2663  bytes 284692 (284.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

- Ifplugstatus:

ifplugstatus is a command that checks the status of Ethernet interfaces, specifically whether a cable is plugged in or unplugged. It is useful for determining the physical link status of network connections.

```
student@CSELab3-17:~$ ifplugstatus
lo: link beat detected
enp2s0: link beat detected
student@CSELab3-17:~$
```

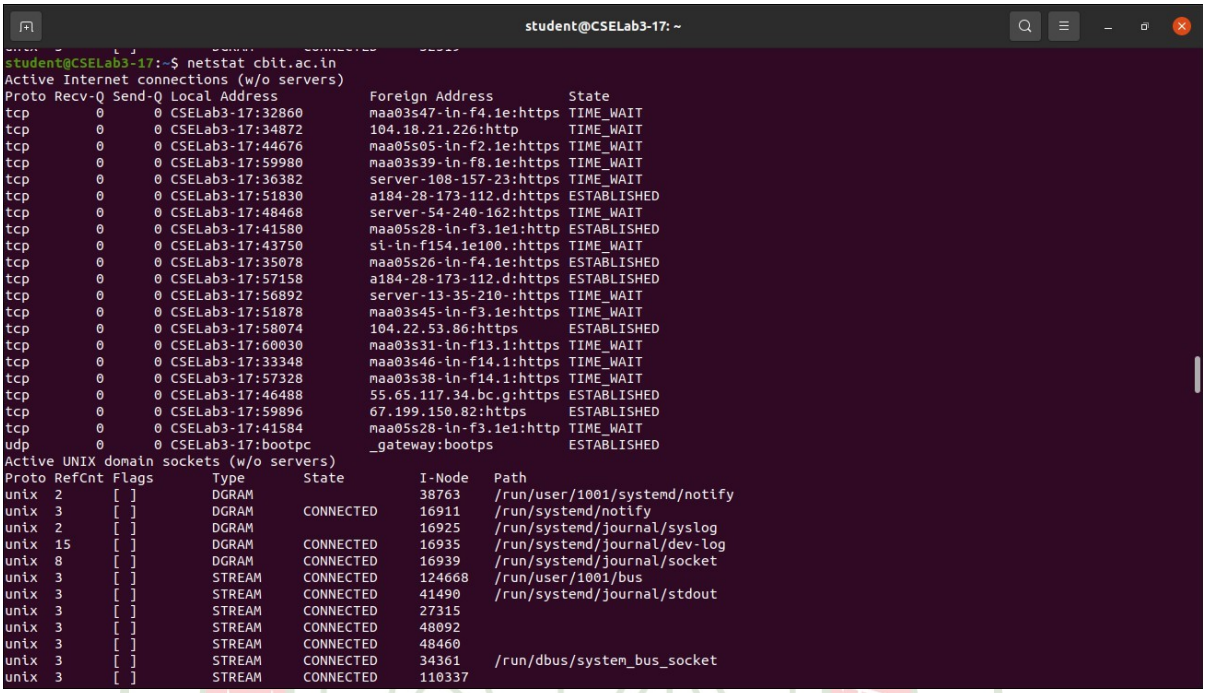
- Ip:

The ip command is a versatile networking tool in Linux and Unix-like systems. It allows you to configure network interfaces, display routing information, manage IP addresses, and more.

```
student@CSELab3-01:~$ ip
Usage: ip [ OPTIONS ] OBJECT { COMMAND | help }
       ip [ -force ] -batch filename
where  OBJECT := { link | address | addrlabel | route | rule | neigh | ntable |
                   tunnel | tuntap | maddress | mroute | mrule | monitor | xfrm |
                   netns | l2tp | fou | macsec | tcp_metrics | token | netconf | ila |
                   vrf | sr | nexthop }
       OPTIONS := { -V[ersion] | -s[tatistics] | -d[etails] | -r[esolve] |
                    -h[uman-readable] | -iec | -j[son] | -p[retty] |
                    -f[amily] { inet | inet6 | mpls | bridge | link } |
                    -4 | -6 | -I | -D | -M | -B | -0 |
                    -l[oops] { maximum-addr-flush-attempts } | -br[ief] |
                    -o[neline] | -t[imestamp] | -ts[hort] | -b[atch] [filename] |
                    -rc[vbuf] [size] | -n[etns] name | -N[umeric] | -a[ll] |
                    -c[olor]}
```

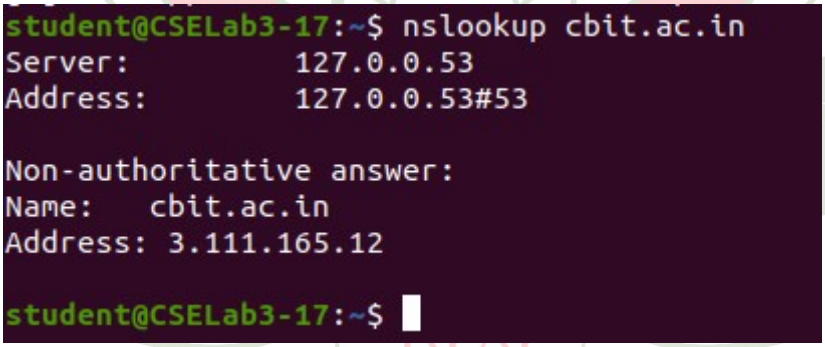
- Netstat:

netstat is a command-line utility that provides information about network connections, routing tables, network interfaces, and network statistics on Unix-like operating systems. It is used for network monitoring and troubleshooting.



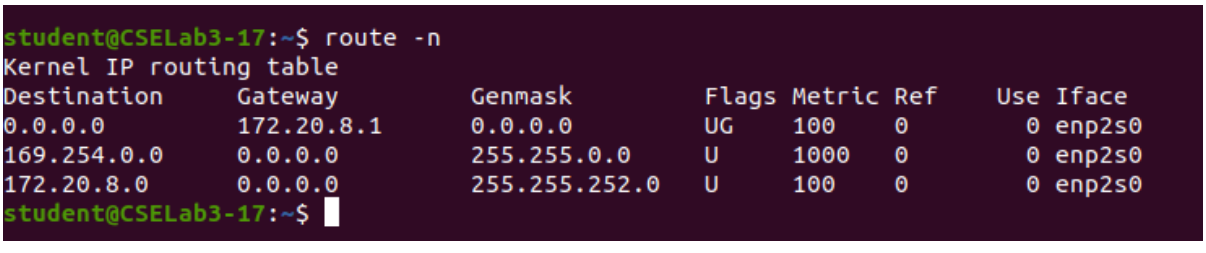
- Nslookup:

nslookup is a command-line tool for querying DNS servers to perform DNS lookups. It is used to retrieve information about domain names, IP addresses, and DNS records.



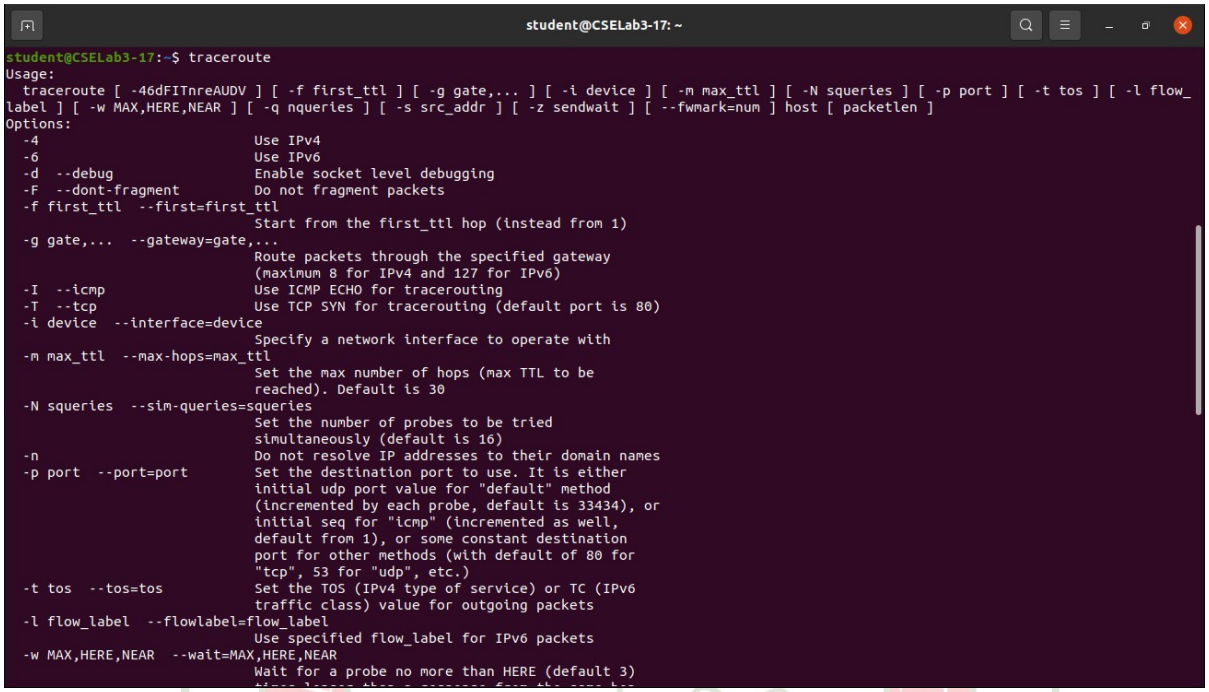
- Route-n:

The route command is used for managing the IP routing table on Unix-like systems. The "-n" option is often used to display routing table entries without resolving hostnames.



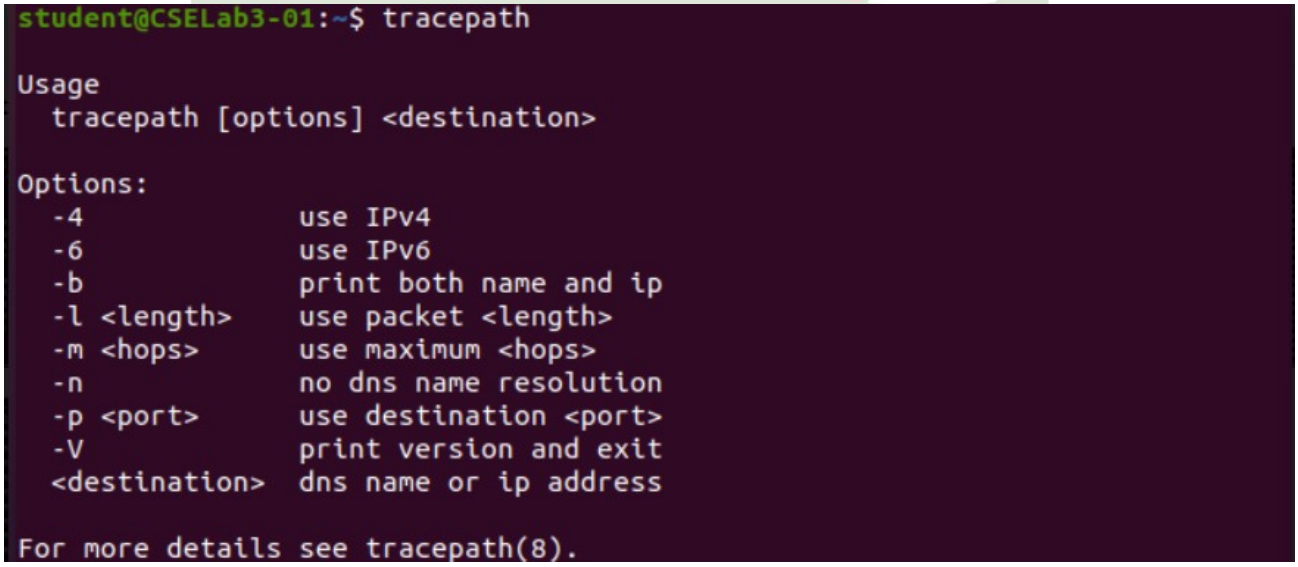
- Traceroute:

Traceroute is a network diagnostic tool that traces the route packets take from your computer to a destination IP address. It shows the intermediate routers or hops along the path and their response times.



- Tracepath:

Tracepath is similar to traceroute but provides a more detailed view of the network path by analyzing the MTU (Maximum Transmission Unit) values along the route. It is used for network troubleshooting and path analysis.



- Whois:

Whois is a command-line tool and a protocol used to query domain name registration information from domain registrars' databases. It provides details about domain ownership, contact information, and registration dates.

```
student@CSELab3-17:~$ whois cbit.ac.in
Domain Name: cbit.ac.in
Registry Domain ID: D14106-IN
Registrar WHOIS Server:
Registrar URL: http://www.ernet.in
Updated Date: 2022-04-19T04:23:19Z
Creation Date: 2003-04-30T04:00:00Z
Registry Expiry Date: 2024-04-30T04:00:00Z
Registrar: ERNET India
Registrar IANA ID: 800068
Registrar Abuse Contact Email:
Registrar Abuse Contact Phone:
Domain Status: ok http://www.icann.org/epp#OK
Registry Registrant ID: REDACTED FOR PRIVACY
Registrant Name: REDACTED FOR PRIVACY
Registrant Organization: Chaitanya Bharathi Institute of Technology
Registrant Street: REDACTED FOR PRIVACY
Registrant Street: REDACTED FOR PRIVACY
Registrant Street: REDACTED FOR PRIVACY
Registrant City: REDACTED FOR PRIVACY
Registrant State/Province:
Registrant Postal Code: REDACTED FOR PRIVACY
Registrant Country: IN
Registrant Phone: REDACTED FOR PRIVACY
Registrant Phone Ext: REDACTED FOR PRIVACY
Registrant Fax: REDACTED FOR PRIVACY
Registrant Fax Ext: REDACTED FOR PRIVACY
Registrant Email: Please contact the Registrar listed above
Registry Admin ID: REDACTED FOR PRIVACY
Admin Name: REDACTED FOR PRIVACY
Admin Organization: REDACTED FOR PRIVACY
Admin Street: REDACTED FOR PRIVACY
Admin Street: REDACTED FOR PRIVACY
Admin Street: REDACTED FOR PRIVACY
Admin City: REDACTED FOR PRIVACY
Admin State/Province: REDACTED FOR PRIVACY
Admin Postal Code: REDACTED FOR PRIVACY
```

Results:

Ipconfig, ping, tracert, nslookup, netstat, arp, net, hostname and some other commands have been executed and the results have been displayed.

Experiment 3:

PC Network Configuration.

Aim: To demonstrate PC Network Configuration.

Procedure:

- Connect to the internet
- Gather TCP/IP configuration information
- Record IP address, Subnet Mask and Default gateway for the computer
- Compare TCP/IP information with othercomputers
- Check additional TCP/IPinformation

Description:

IP address:

An internet protocol address is a unique numerical label which is assigned to every device connected to a network for communication purposes. It is generally used for device identification and routing. An IP address serves two main functions: host or network interface identification and location addressing. IPv4 is the fourth version of the Internet Protocol and has been widely used since the early days of the Internet. It uses 32-bit addresses, allowing for approximately 4.3 billion unique IP addresses. The IPv4 address format consists of four decimal numbers (0-255) separated by periods. IP addresses are categorized and managed using classful and classless classification.

Classful classification:

IPv4 addresses originally use fixed length prefix but 3 prefixes for n=8,16,24 were added to support small and big networks. This led to address space being divided into 5 classes: A,B,C,D,E. Based on size of network range of IP addresses are allocated to each class.

Class A:

The first bit of the first octet is always set to 0 (zero). Thus the first octet ranges from 1 – 127. Class A addresses only include IP starting from 1.x.x.x to 126.x.x.x only. The IP range 127.x.x.x is reserved for loopback IP addresses. The default subnet mask for Class A IP address is 255.0.0.0 which implies that Class A addressing can have 126 networks (2^7 -2) and 16777214 hosts (2^24 -2)

Class B:

An IP address which belongs to class B has the first two bits in the first octet set to 10. Class B IP Addresses range from 128.0.x.x to 191.255.x.x. The default subnet mask for Class B is 20 255.255.x.x. Class B has 16384 (2^14) Network addresses and 65534 (2^16 -2) Host addresses.

Class C:

The first octet of Class C IP address has its first 3 bits set to 110. Class C IP addresses range from 192.0.0.x to 223.255.255.x. The default subnet mask for Class C is 255.255.255.x. Class C gives 2097152 (221) Network addresses and 254 (2^8 -2) Host addresses

Class D:

Very first four bits of the first octet in Class D IP addresses are set to 1110. Class D has IP address range from 224.0.0.0 to 239.255.255.255. Class D is reserved for Multicasting. In multicasting data is not destined for a particular host, that is why there is no need to extract host address from the IP address, and Class D does not have any subnet mask.

Class E:

This IP Class is reserved for experimental purposes only for R&D or Study. IP addresses in this class ranges from 240.0.0.0 to 255.255.255.254. Like Class D, this class too is not equipped with any subnet mask.

Subnet mask:

A subnet mask, in brief, is a 32-bit number used in Internet Protocol (IP) networking to divide an IP address into a network portion and a host portion. It is used to identify which part of an IP address corresponds to the network and which part identifies individual hosts on that network.

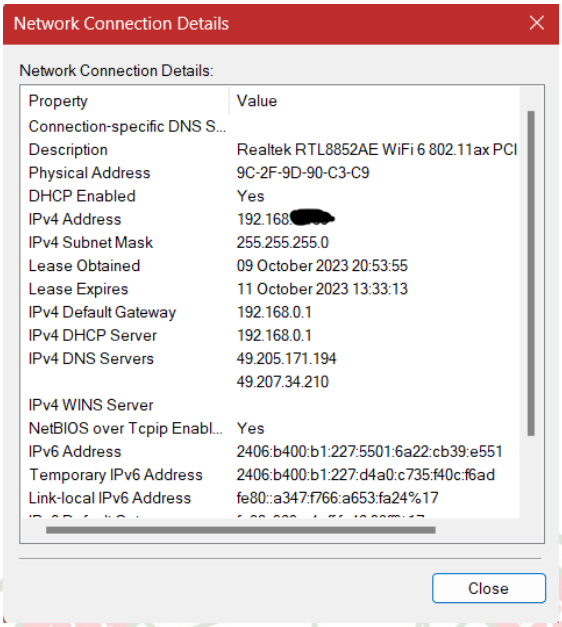
Classless classification/addressing:

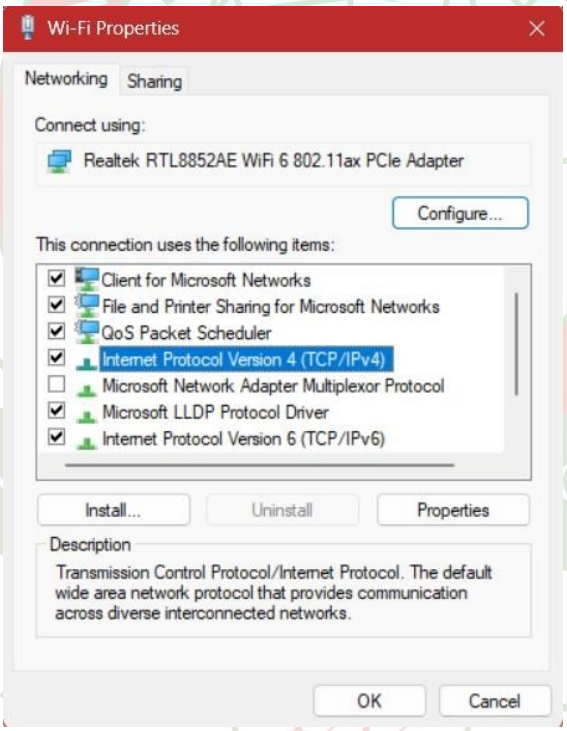
Classless Inter-Domain Routing (CIDR) is a method of IP address allocation and route aggregation that allows for more flexible and efficient use of IP addresses compared to the traditional classful addressing scheme (Classes A, B, and C) used in IPv4. CIDR is designed to address the limitations of classful addressing, which allocated fixed-sized blocks of IP addresses to organizations, often resulting in inefficient address allocation and routing.

Procedure:

- Switch on the computer and open control panel on it
- Open network and sharing centre and go to connection section
- Click on the details button of the pop up window to observe the IP address, Subnet mask and default gateways.
- Click on the wireless properties button to observe the wireless network status.
- Go to adapter settings and click on properties of wifi adapter to observe the wifi properties.

Observation:





Results:

IP classes are studied and PC network configuration info is noted.

Experiment-4:

Building a switch based network or configuration of CISCO switch 2960

Aim:

- 1.To demonstrate building a switch – based network / Configuration Cisco Catalyst Switch2960.
- 2.Star topology Hub and end systems
- 3.Access point configuration

Procedure:

- Open packettracer and check for the specified network and end devices.
- Setup the different topology using the identified devices.
- Configure chosen devices and verify connectivity between devices.
- Display device connectivity information.

Resources:

- 4-PC s
- 2-Router s
- 2-Switches

Description:

Switching: Process of transferring data packets from one device to another in a network or from one network to another network using specific devices called switches.

Star Topology: A star topology is a topology for a Local Area Network (LAN) in which all nodes are individually connected to a central connection point, like a hub or a switch.

Access Point Configuration: An access point is connected directly to a wired LAN, providing a connection point for wireless users.

Execution:

Switching:

- 1.Consider 4 PCs (PC-PT) and connect 2 of the PCs to the 2 different switches as shown below.
- 2.Join the 2 switches using the routers (Router 2811)

- 3.Change the IPv4 address of all the PCs by going into config of each PCs.

Star Topology:

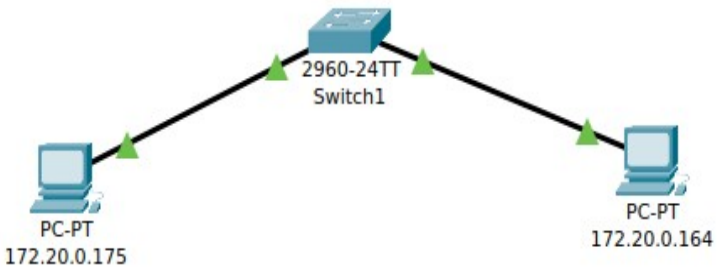
- 1.Take one hub and place it in the middle.
- 2.Take any number of end systems (like 2-any) .
- 3.Connect all the end systems to the hub.
- 4.Then the star topology is ready.

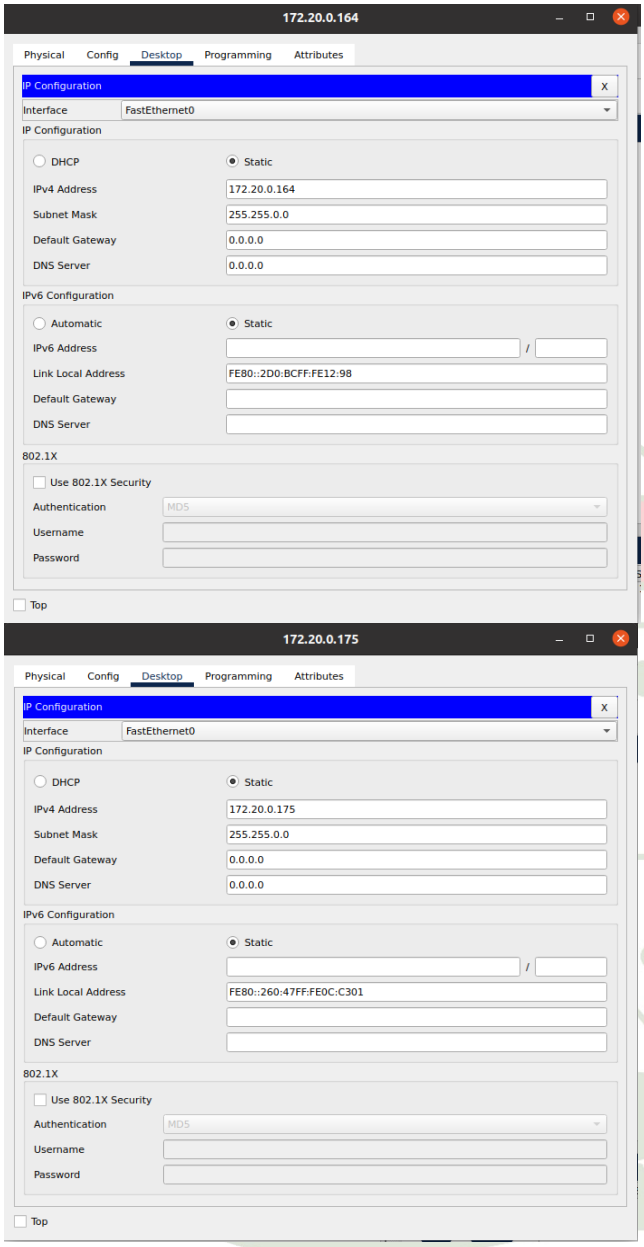
Access Point configuration:

- 1.Take one end device and connect it to a switch.
- 2.And connect the switch to the access point.
- 3.The Access point configuration is ready.

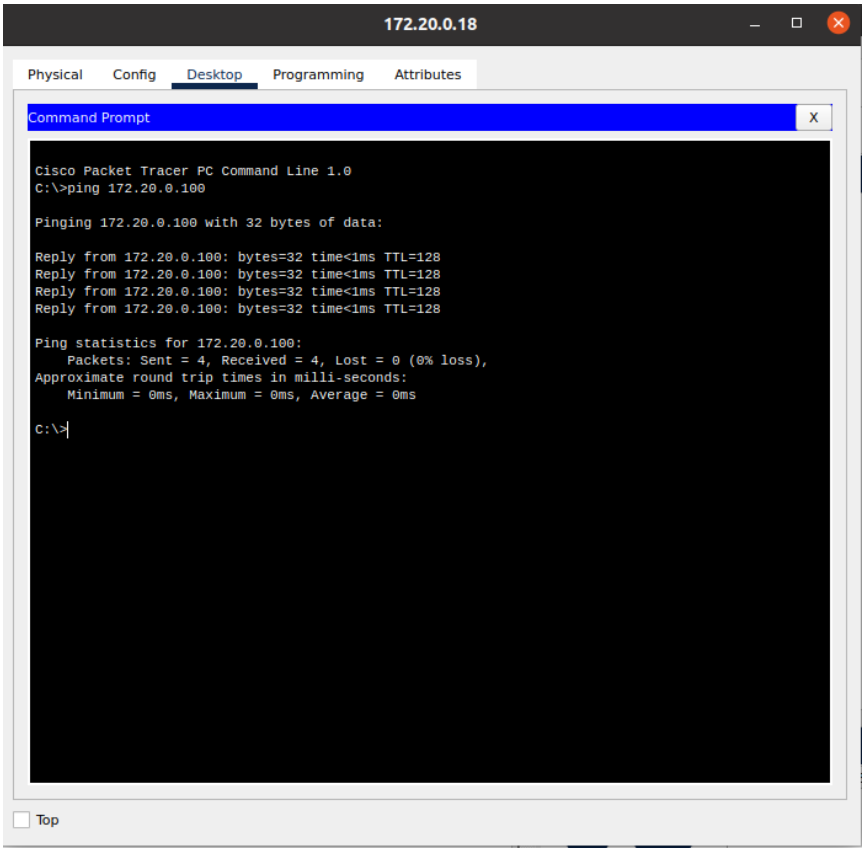
Output:

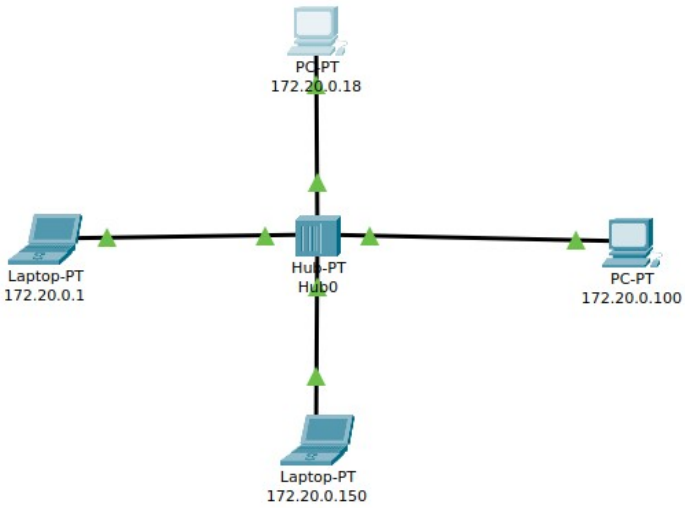
Access Point Configuration



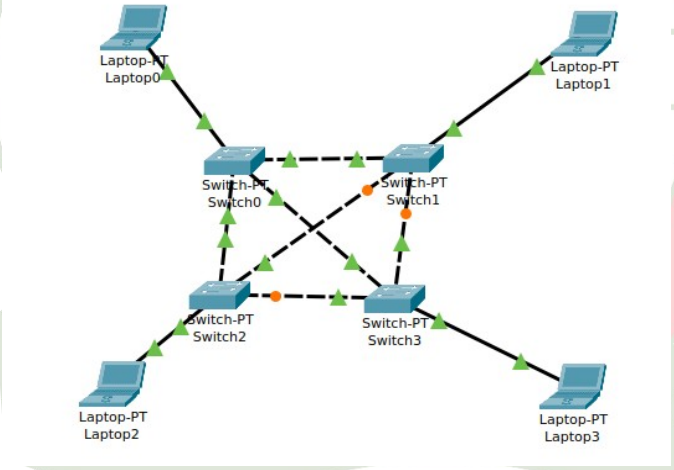


Star Topology(Hub and end systems)

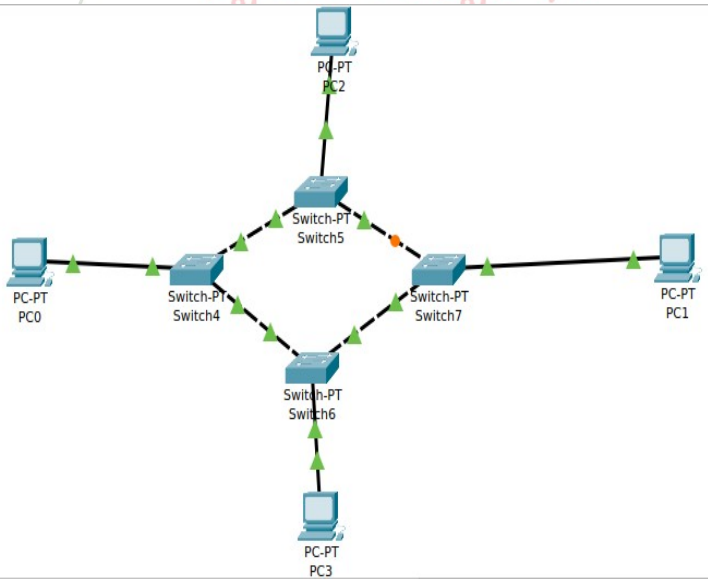

172.20.0.18
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.20.0.100
Pinging 172.20.0.100 with 32 bytes of data:
Reply from 172.20.0.100: bytes=32 time<1ms TTL=128
Reply from 172.20.0.100: bytes=32 time<1ms TTL=128
Reply from 172.20.0.100: bytes=32 time<1ms TTL=128
Reply from 172.20.0.100: bytes=32 time<1ms TTL=128
Ping statistics for 172.20.0.100:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>
Top



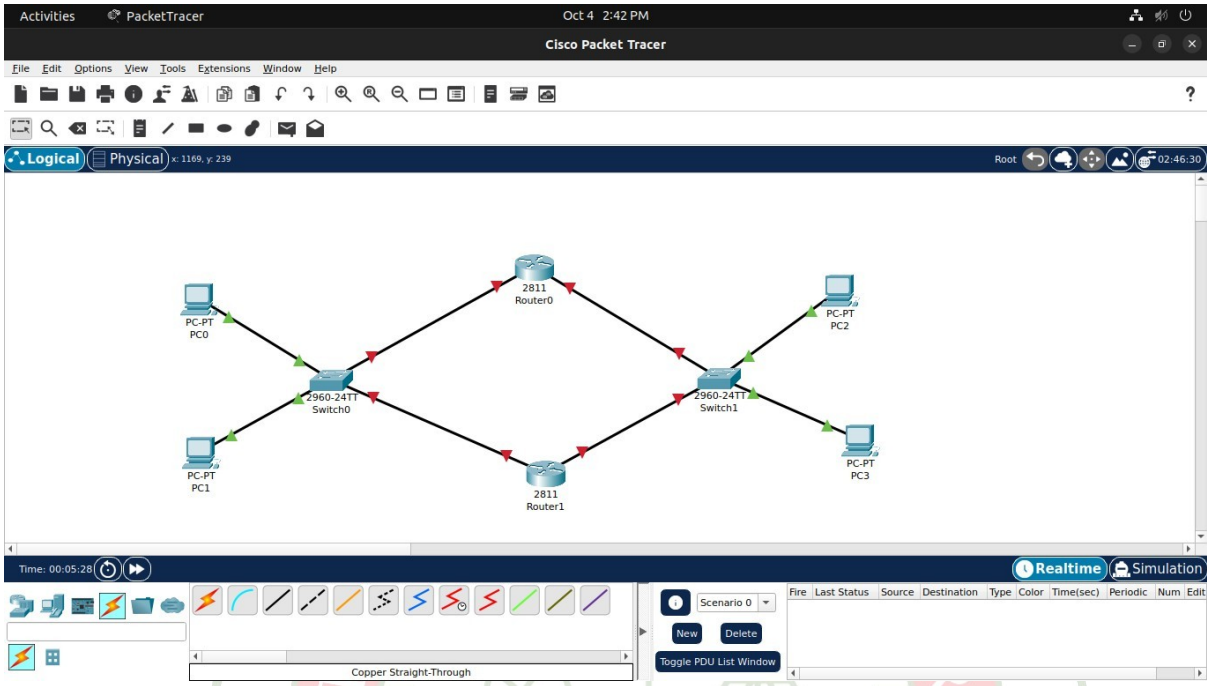
Mesh Topology:



Ring Topology:



Switching:



Switching Commands:

From Switch to the Command Line Interface:

```
Switch>enable
Switch#config t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname vaibhav
vaibhav(config)#banner motd $
Enter TEXT message. End with the character 's'.
Gladiators Champs$
Do
vaibhav(config)#exit
vaibhav#
%SYS-5-CONFIG_I: Configured from console by console
vaibhav#exit
```

Creating Password for Switch:

```
Gladiators Champs
vaibhav>enable
vaibhav#config t
Enter configuration commands, one per line. End with CNTL/Z.
vaibhav(config)#line con e
vaibhav(config-line)#password GDResports
vaibhav(config-line)#login
vaibhav(config-line)#exit
vaibhav(config)#exit
vaibhav#
%SYS-5-CONFIG_I: Configured from console by console
vaibhav#exit
```

Setting Password to the config:

```
Gladiators Champs
User Access Verification
Password:
vaibhav>enable
vaibhav#config t
Enter configuration commands, one per line. End with CNTL/Z.
vaibhav(config)#enable secret soulesp
vaibhav(config)#exit
%SYS-5-CONFIG_I: Configured from console by console
vaibhav#
vaibhav#exit
```

To configure IP to Switch:

```
Gladiators Champs
User Access Verification
Password:
vaibhav>enable
Password:
vaibhav#config t
Enter configuration commands, one per line. End with CNTL/Z.
vaibhav(config)# line vty @ 15
vaibhav(config-line)#password soulesp
vaibhav(config-line)#login
vaibhav(config-line)#interface vlan 1
vaibhav(config-if)#ip address 172.20.0.2
% Incomplete command.
vaibhav(config-if)#ip address 172.20.0.2 255.255.0.0
vaibhavconfig-if)#no shut
vaibhav(config-if)#
%LINK-5-CHANGED: Interface vlani, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface vlani, changed state to up
vaibhav(config-if)#exit
vaibhav(config)#exit
vaibhav#
%SYS-5-CONFIG_I: Configured from console by console
vaibhav#exit
```