CA-C14L: COMPUTER NETWORKS LAB

1.Execute the following commands:

arp, ipconfig, hostname, netdag, netstat, nslookup, pathping, ping route, tracert

2.Study of different types of network cables.

3. Practically implement the cross-wired cable and straight wired cable using crimping tool.

4.Study of network IP address configuration (Classification of address, static and dynamic address)

5.Study of network IP address configuration: (IPv4 and IPv6, Subnet, Supernet)

6. Study of network devices: (Switch, Router, Bridge)

7. Configure and Connect the computer in LAN.

8.Block the website using "Windows Defender Firewall" in windows 10.

9. Share the folder in a system, and access the files of that folder from other system using IP address.

10.Share the printer in Network, and take print from other PC.

11. Configuration of wifi hotspot, and connect other devices (mobile/laptop).

12.Configuration of switches.

13.Configuration of I/O box fixing.

14.Making your own patch cord.

15.Configuration of VLAN using Packet Tracer/ GNS3.

16.Configuration of VPN using Packet Tracer/ GNS3.

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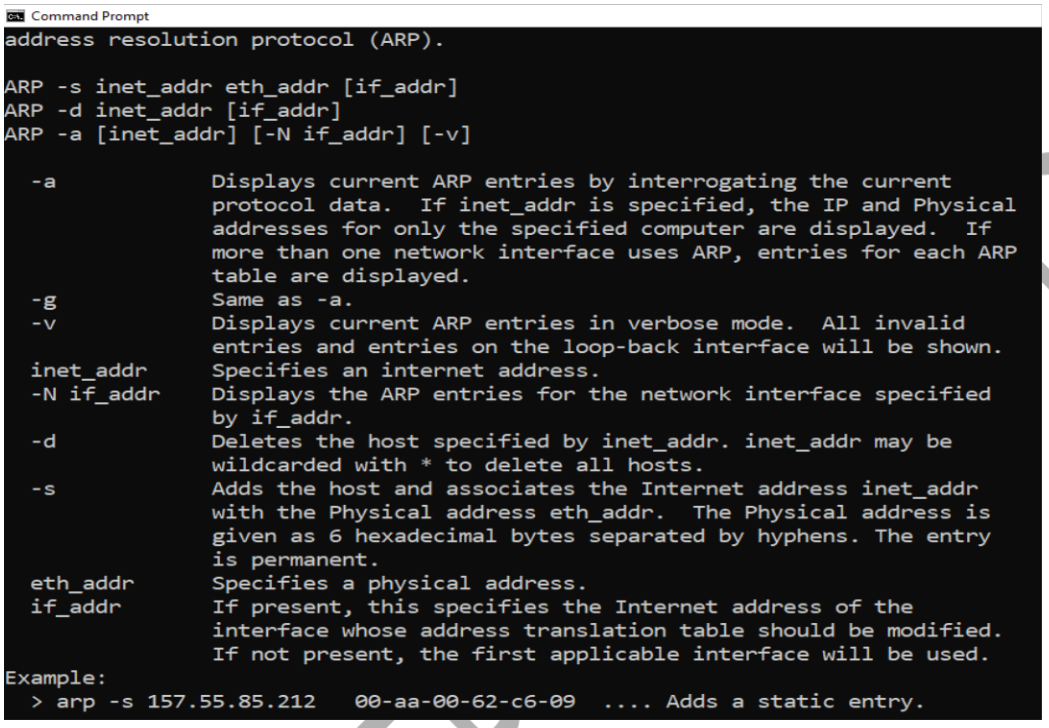
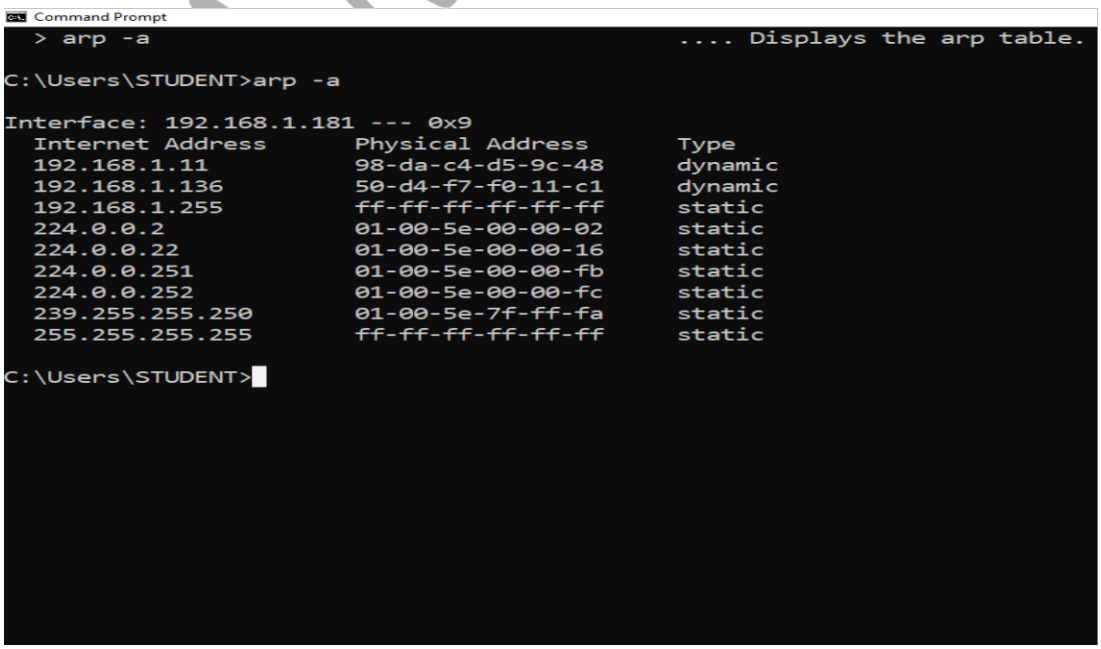
LAB PROGRAM 1: Execute the the following commands Arp, ipconfig, ipgonfig/All, host name, netstat, nslookup, pathping, tracert.

SOLUTION:

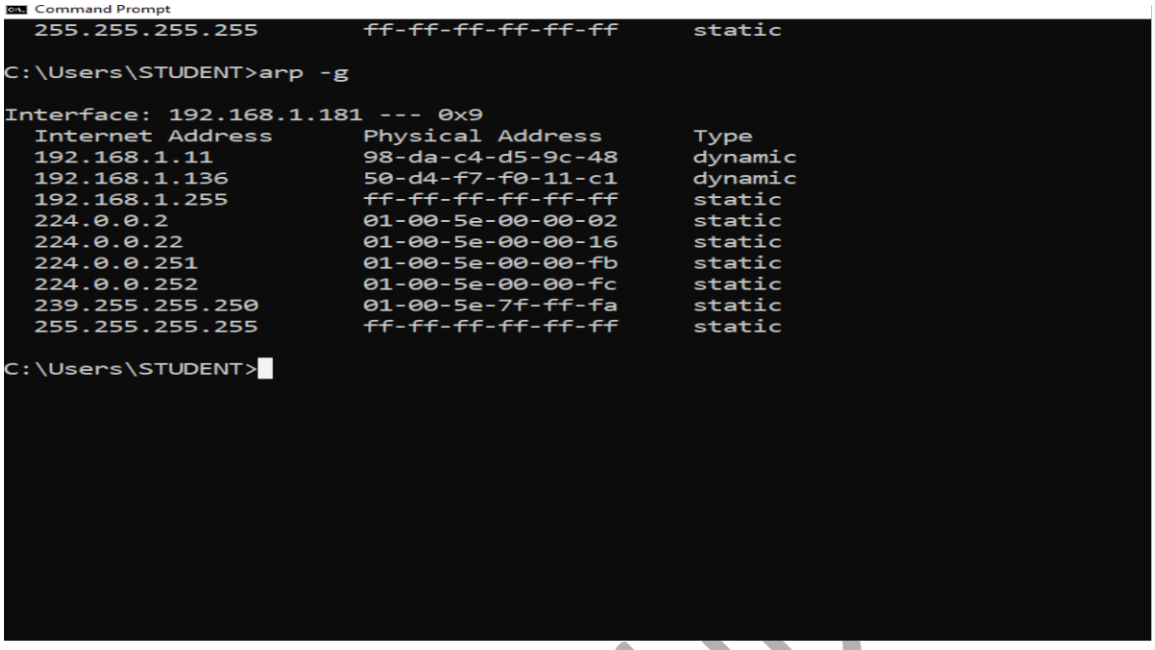
1) **arp**：This command is used to display the arp table for a particular IP address.



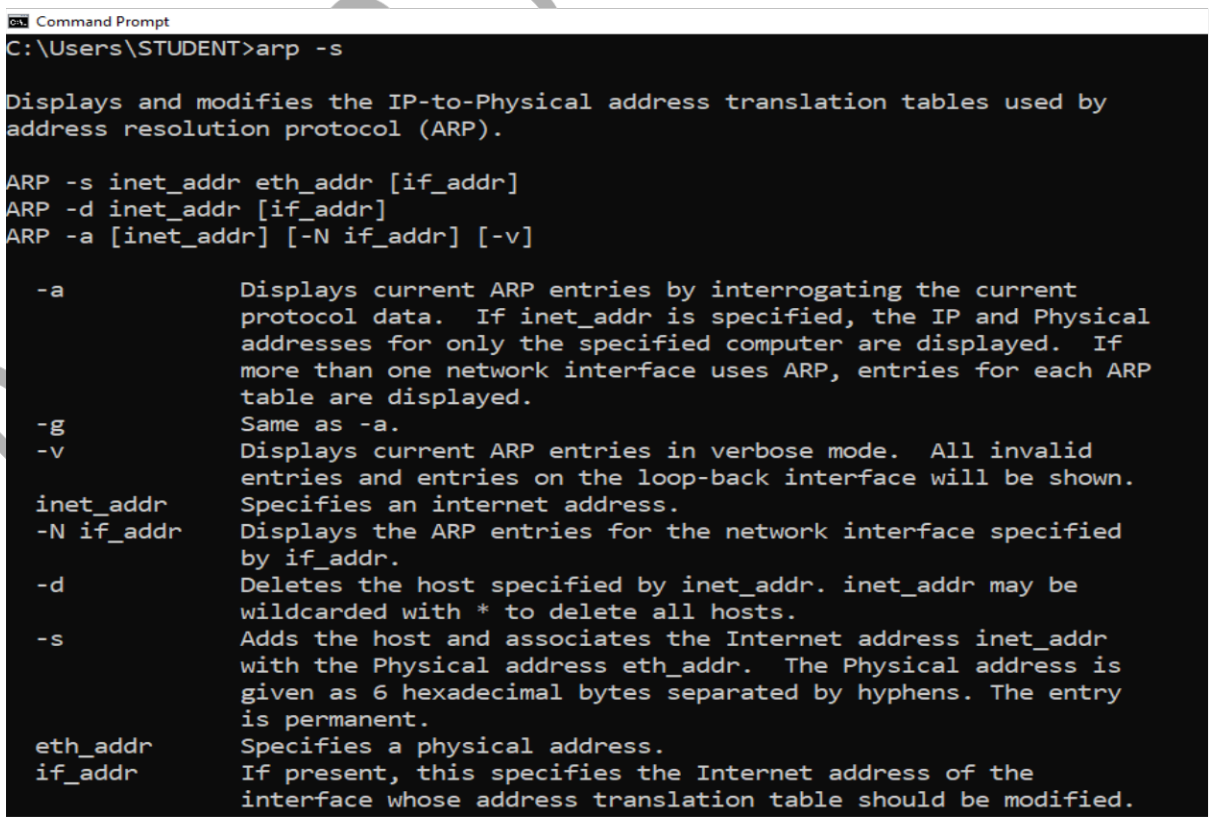
arp -a : This command is used to display the current arp entreies.



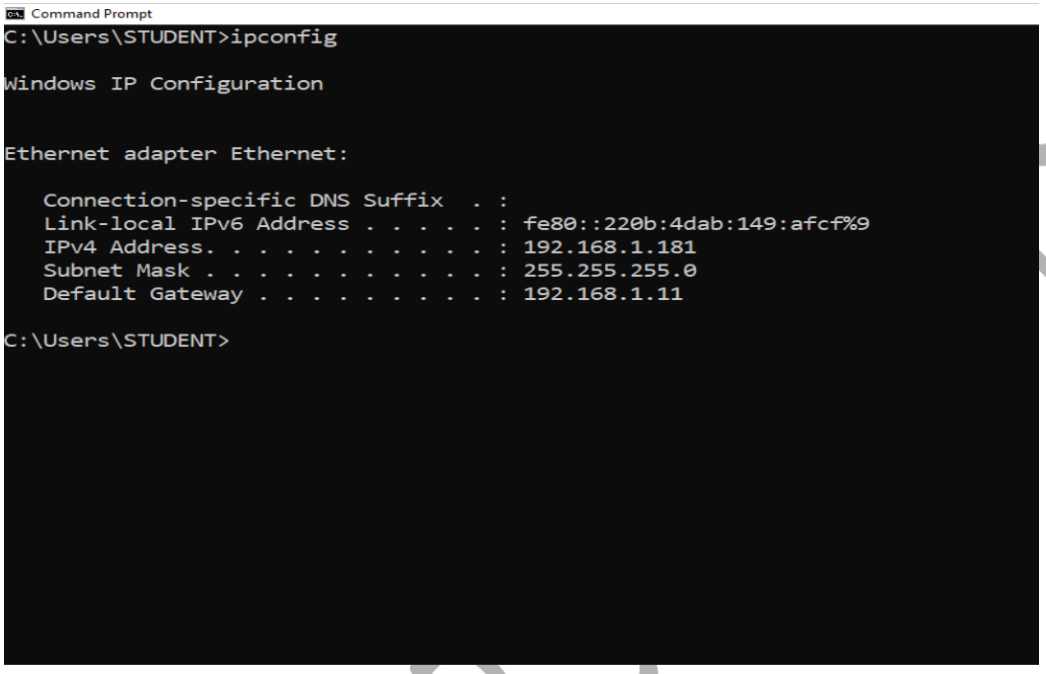
arp -g : This command works the same the **arp -a** command.



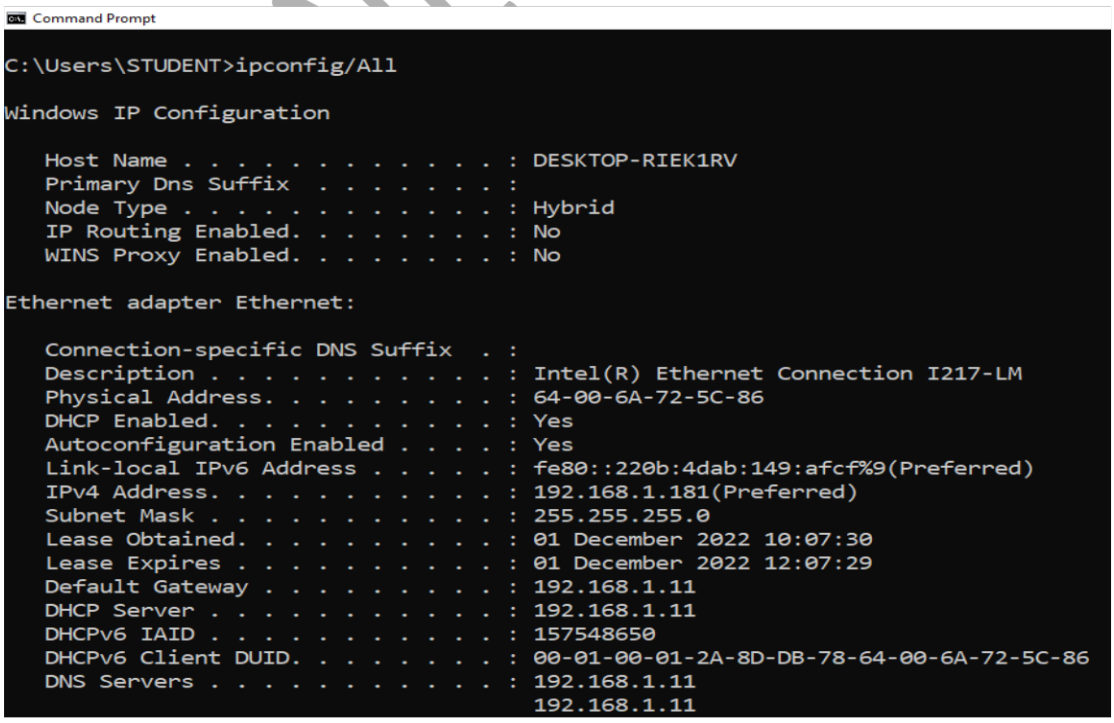
arp -s : This command is used to add the static entry in the arp table, which resolves the IP Address to the phsyical address.



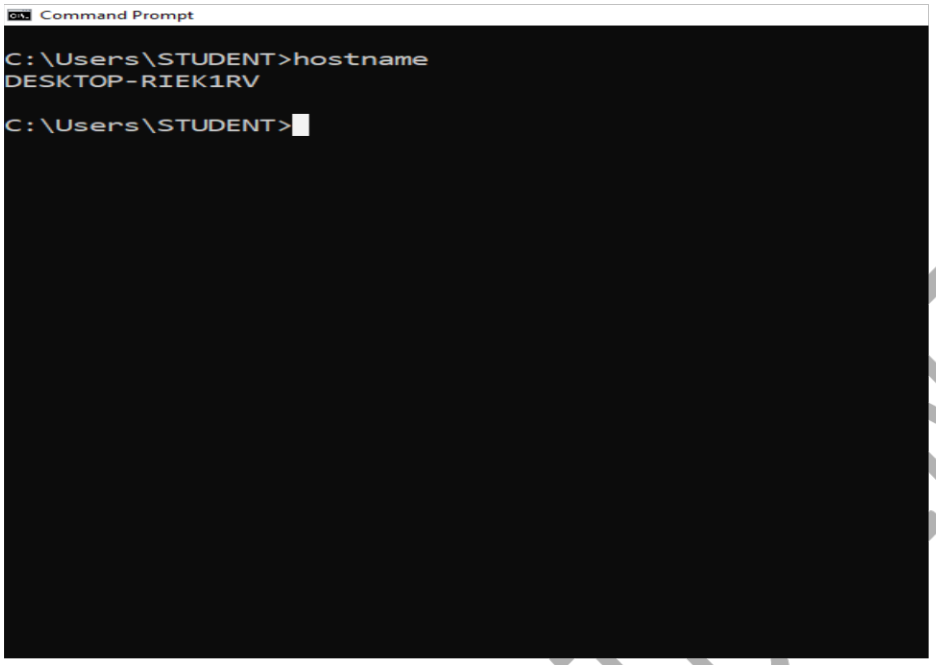
2) **ipconfig:** Displays all current IP network configuration values.



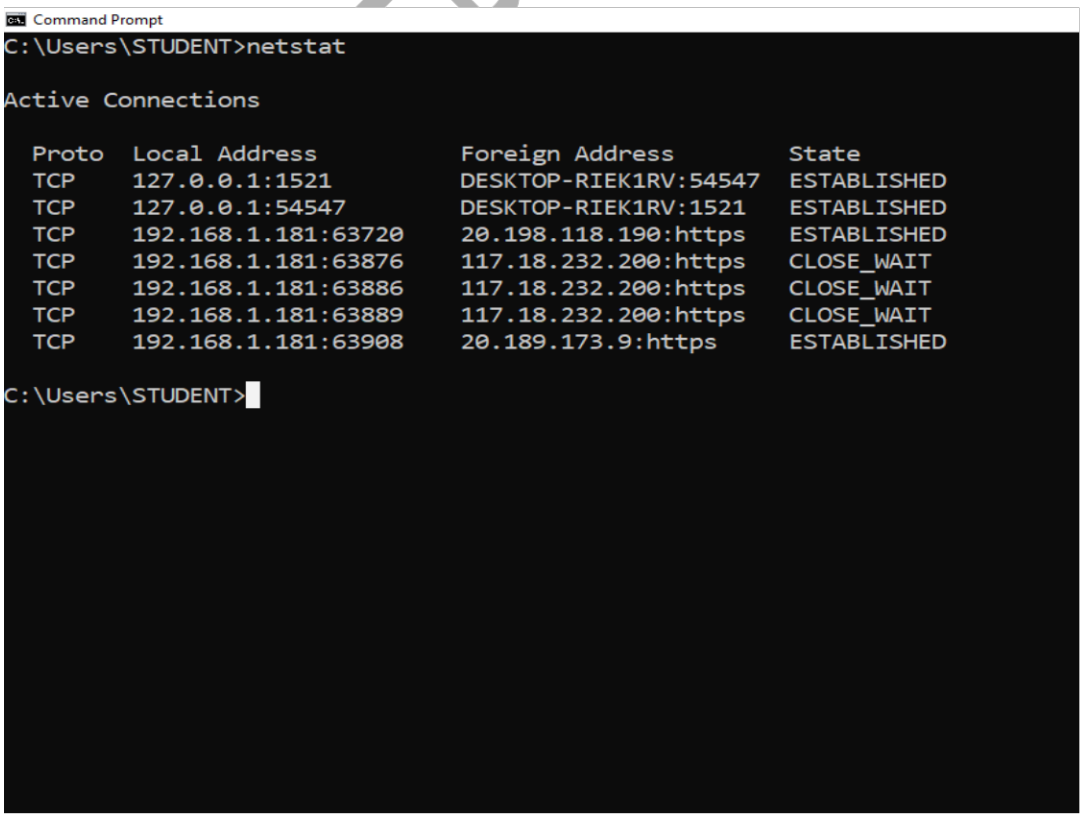
3) **ipconfig/All:** Displays all configuration information for each adapter bound to TCP/IP.



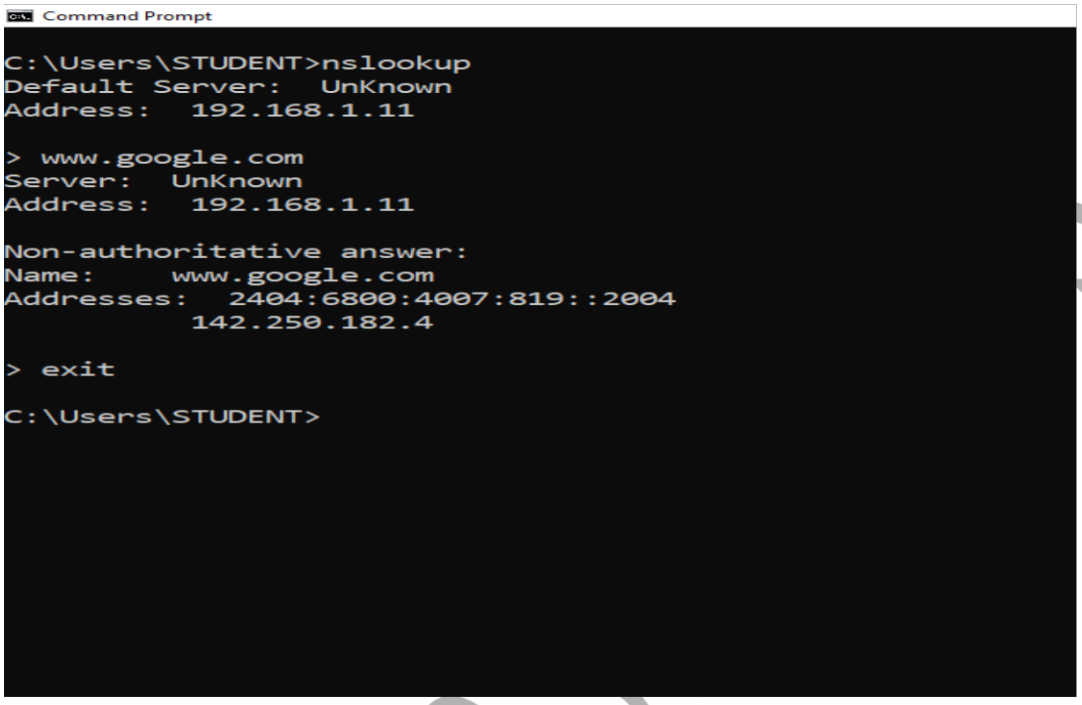
4) **host name :** Displays the name of the current host system.



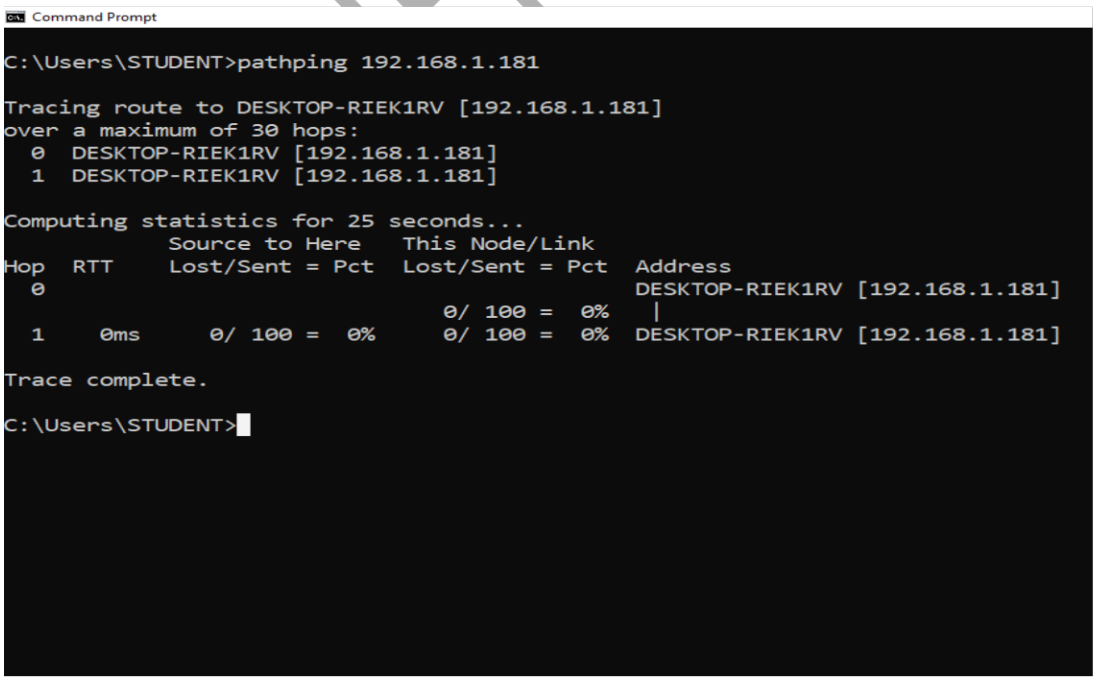
5) **netstat :** it is a networking tool used for troubleshooting and configuration ,that can also serve as a monitoring tool for connections over the network.



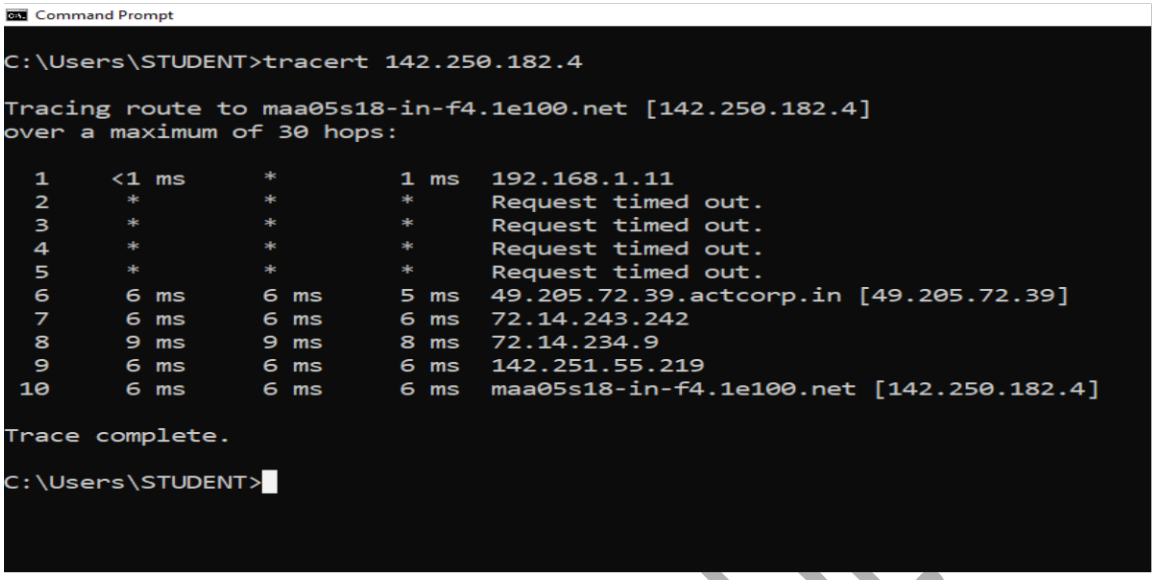
6) **nslookup :** This command Queries internet domain name servers in two modes.We use exit to come out of the command.
   - Interactive mode
   - Noninteractive mode



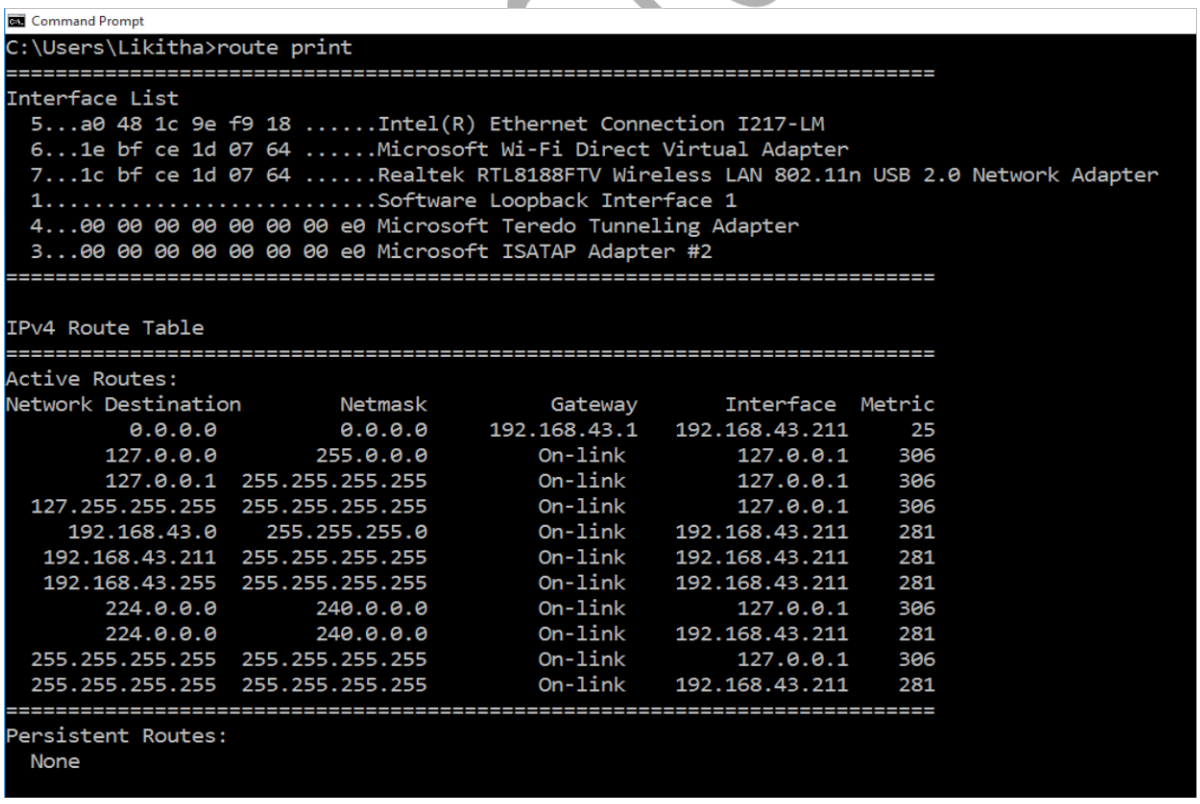
7) **pathping**: it shows the details of packet travelling.

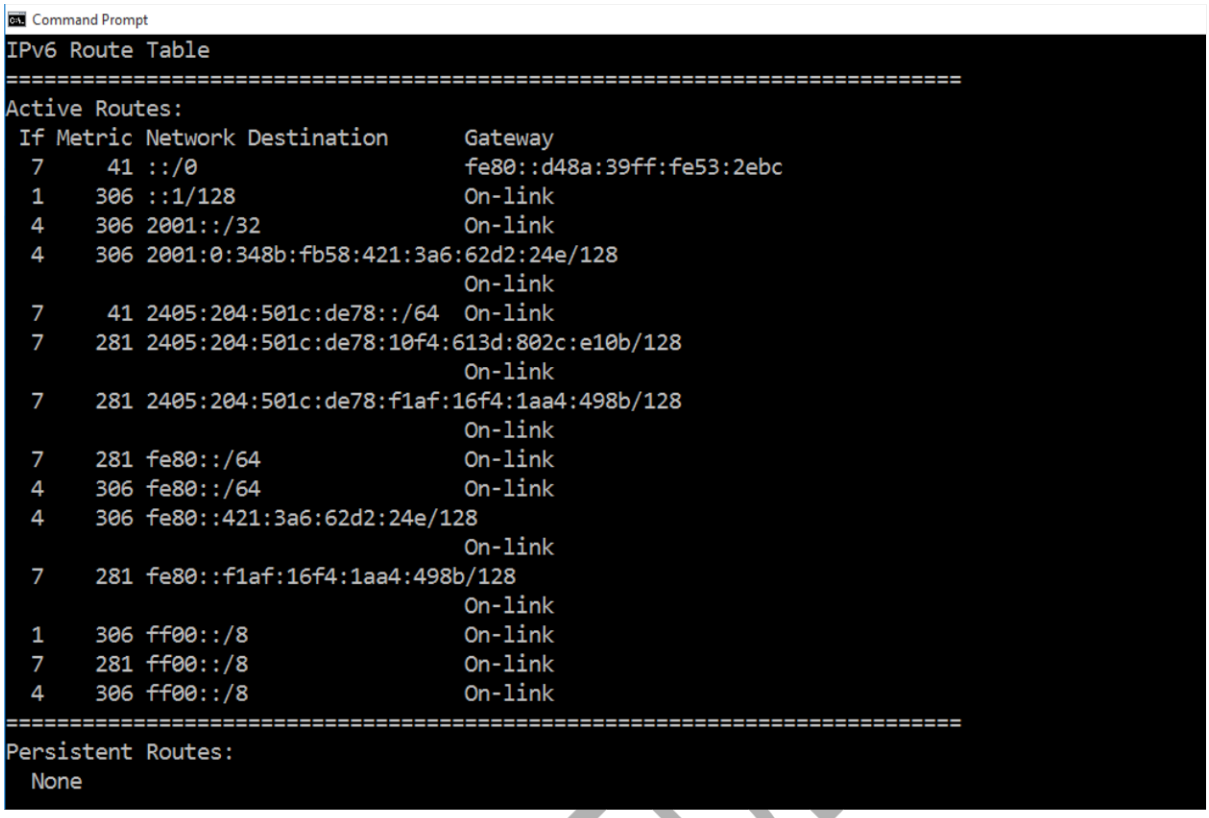


8) **tracert :** Determines the route of packets that reaches destination.



9) **path route :** A route defines a path for sending packets through the Internet network to an address on another network.





```
Command Prompt
IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  7     41 ::/0                     fe80::d48a:39ff:fe53:2ebc
  1    306 ::1/128                  On-link
  4    306 2001::/32                On-link
  4    306 2001:0:348b:fb58:421:3a6:62d2:24e/128
                                    On-link
  7     41 2405:204:501c:de78::/64  On-link
  7    281 2405:204:501c:de78:10f4:613d:802c:e10b/128
                                    On-link
  7    281 2405:204:501c:de78:f1af:16f4:1aa4:498b/128
                                    On-link
  7    281 fe80::/64                On-link
  4    306 fe80::/64                On-link
  4    306 fe80::421:3a6:62d2:24e/128
                                    On-link
  7    281 fe80::f1af:16f4:1aa4:498b/128
                                    On-link
  1    306 ff00::/8                 On-link
  7    281 ff00::/8                 On-link
  4    306 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

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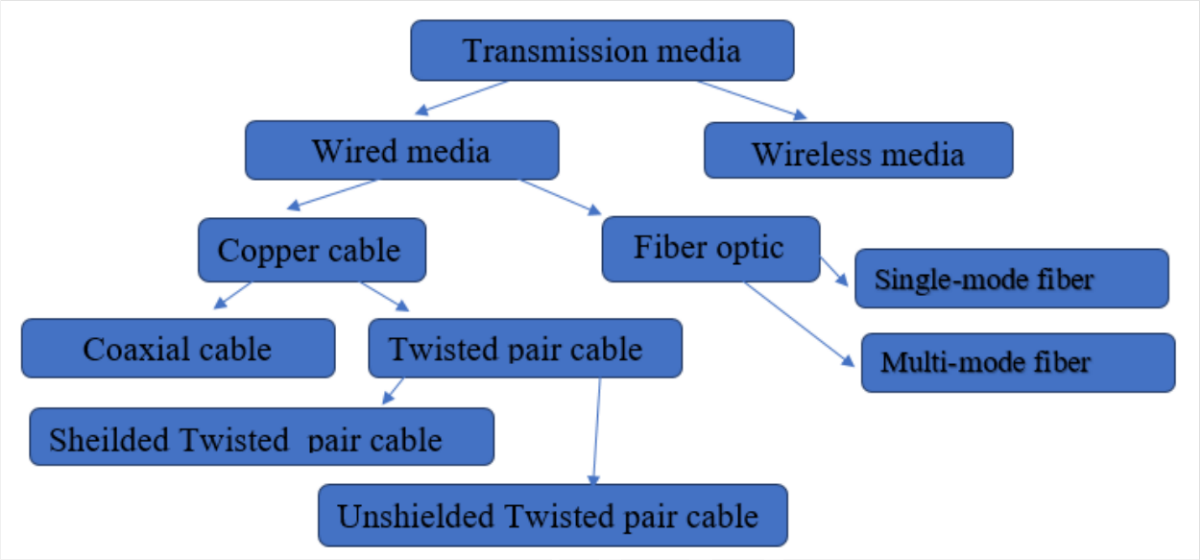
LAB PROGRAM 2: Study of different types of network cables.

Transmission Media

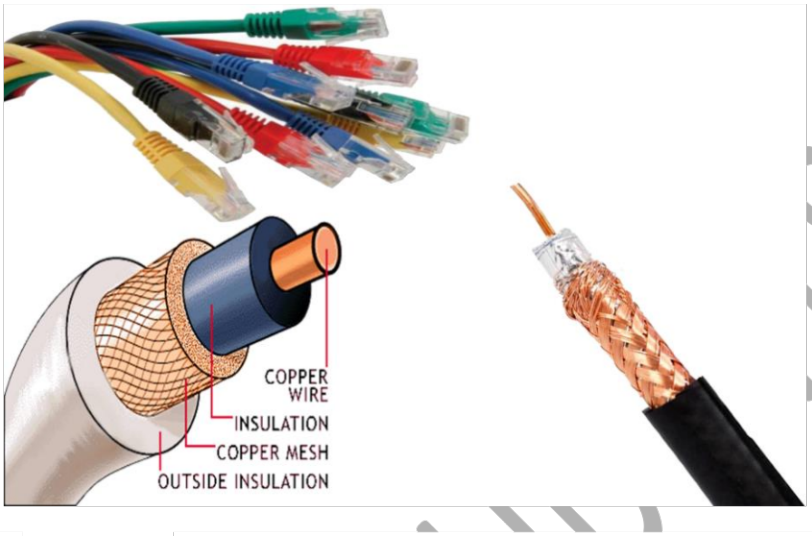
In data communication terminology, a transmission medium is a physical path between the transmitter and the receiver i.e. it is the channel through which data is sent from one place to another. Transmission Media is broadly classified into the following types:



1. **Wired:**
   It is also referred to as Wired or Bounded transmission media. Signals being transmitted are directed and confined in a narrow pathway by using physical links.
   Features:
   - High Speed
   - Secure
   - Used for comparatively shorter distances
2. **Wireless:**
   It is also referred to as Wireless or Unbounded transmission media. No physical medium is required for the transmission of electromagnetic signals.
   Features:
   - The signal is broadcasted through air
   - Less Secure
   - Used for larger distances

Copper cable and types

A copper cable is a group of two or more copper wires bundled together in a single sheath or jacket. Copper wire and cable is used in power generation, power transmission, power distribution, telecommunications, electronics circuitry, and countless types of electrical equipment.



Copper wire: A copper wire is simply a conductor which transfers energy from one end to the other, it does not generate a spark on its own.

Insulation: Dielectric plastic insulation around the copper conductor. It is used to maintain the spacing between the center conductor and shield.

Copper mesh: A copper mesh helps to shield from electromagnetic interference. The shield provides a barrier against EMI moving into and out of the coaxial cable.

Outside insulation: An external polymer layer, which has a plastic coating. It is used to protect internal layers from damages.

Types of copper

1.Coaxial cable

2.Twisted pair cable

1.Coaxial cable

A coaxial cable is an electrical cable with a copper conductor and an insulator shielding around it and a braided metal mesh that prevents signal interference and cross talk. Coaxial cable is also known as coax.

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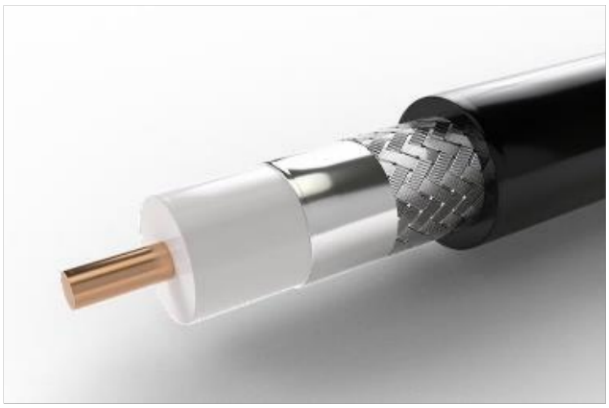
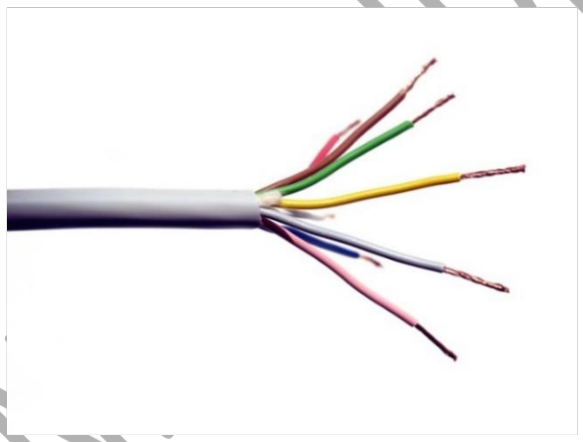


2. Twisted–Pair Cables

One of the earliest guided transmission media is twisted pair cables. A twisted pair cable comprises of two separate insulated copper wires, which are twisted together and run in parallel. The copper wires are typically 1mm in diameter. One of the wires is used to transmit data and the other is the ground reference.



Types of Twisted–Pair Cables

There are two types of twisted pair cables −

->Unshielded Twisted Pair (UTP)

->Shielded Twisted Pair (STP)

->Unshielded Twisted Pair

A twisted pair includes two insulated conductors twisted together in the spiral form, as shown in the figure. It can be shielded with a plastic cover. The UTP cables are very low-cost and simple to install.

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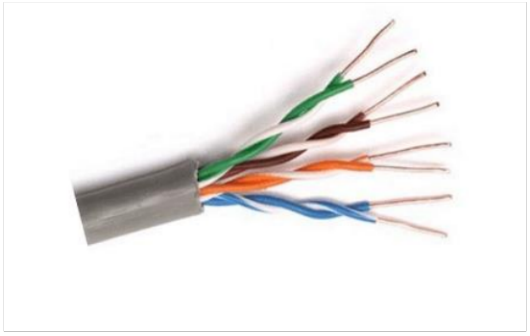
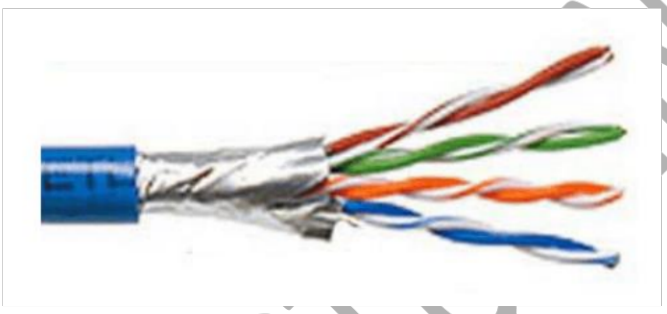


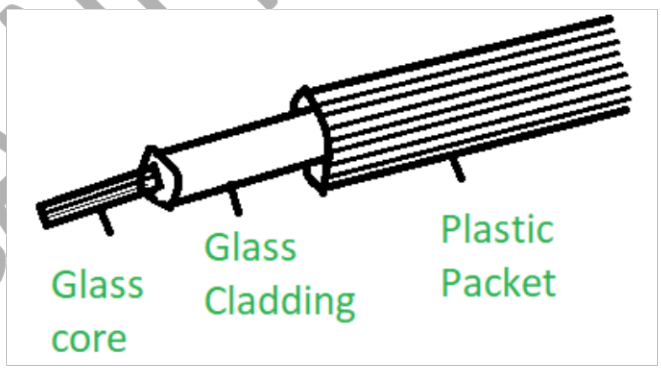
->Shielded Twisted Pair

In this, each insulated twisted pair are shielded by a metal foil or braided mesh. This mesh is also known as a metal shield. It decreases the interference of the disturbance caused by the surrounding. This property makes the cable bulky and expensive.



Fiber Optics Cable

An **Optical Fiber** is a cylindrical fiber of glass which is hair thin size or any transparent dielectric medium. The fiber which is used for optical communication is waveguides made of transparent dielectrics.



Main element of Fiber Optics:

Core:

It is the central tube of very thin size made of optically transparent dielectric medium and carries the light transmitter to receiver and the core diameter may vary from about 5um to 100 um.

Cladding:

It is outer optical material surrounding the core having reflecting index lower than core and

cladding helps to keep the light within the core throughout the phenomena of total internal reflection.

Buffer Coating:
It is a plastic coating that protects the fiber made of silicon rubber. The typical diameter of the fiber after the coating is 250-300 um.

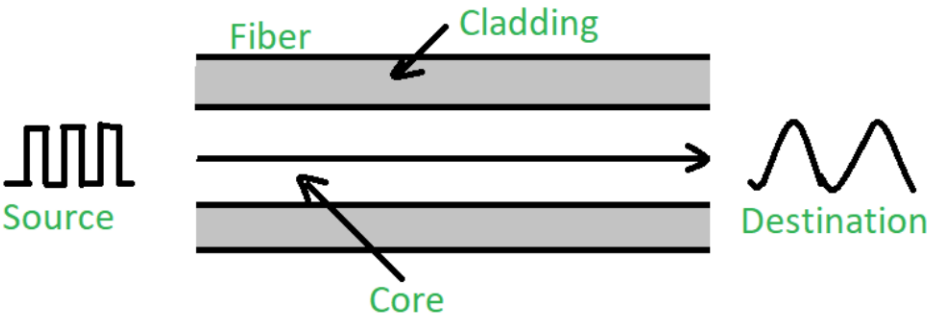
Types of Fiber optics:

Generally optical fiber is classified into two categories based on: the number of modes, and the refractive index. These are explained as following below.

On the basis of the Number of Modes:
It is classified into 2 types:
(a)Single-mode
(b)Multi-mode

(a)Single-mode

In single-mode fiber, only one type of ray of light can propagate through the fiber. This type of fiber has a small core diameter (5um) and high cladding diameter (70um) and the difference between the refractive index of core and cladding is very small. There is no dispersion i.e. no degradation of the signal during traveling through the fiber. The light is passed through it through a laser diode.



(b)Multi-mode

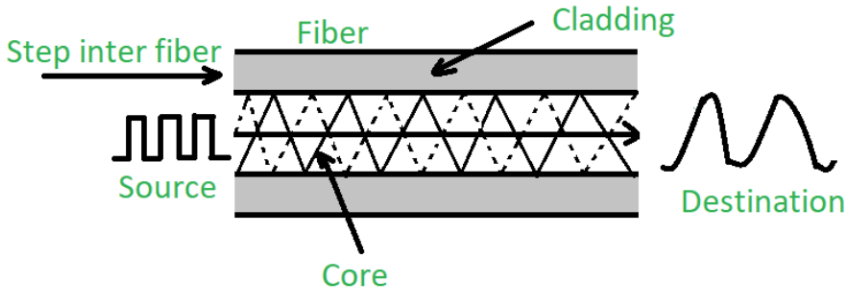
Multimode fiber allows a large number of modes for the light ray traveling through it. The core diameter is generally (40um) and that of cladding is (70um). The relative refractive index difference is also greater than single mode fiber. There is signal degradation due to multimode dispersion. It is not suitable for long-distance communication due to large dispersion and attenuation of the signal. There are two categories on the basis of Multi-mode fiber i.e. **Step Index Fiber** and **Graded Index Fiber**. Basically these are categories under the types of optical fiber on the basis of Refractive Index

On the basis of Refractive Index:

It is also classified into 2 types:

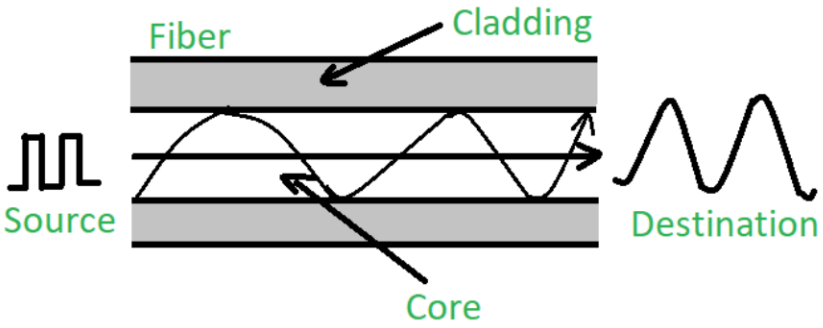
(a) Step optical fiber index:

The refractive index of core is constant. The refractive index of the cladding is also constant. The rays of light propagate through it in the form of meridional rays which cross the fiber axis during every reflection at the core-cladding boundary.



(b) Graded index optical fiber:

In this type of fiber, the core has a non-uniform refractive index that gradually decreases from the center towards the core-cladding interface. The cladding has a uniform refractive index. The light rays propagate through it in the form of skew rays or helical rays. it is not cross the fiber axis at any time.



LAB PROGRAM 4: Study of network IP address configuration (classification of address, static and dynamic address).

IP Address: An Internet Protocol Address/IP Address is a unique identifier assigned to every device on TCP/IP network. The Internet Protocol is the set of rules that outlines how data should be transported across the Internet or local networks. IP Addresses help to identify devices and allow them to communicate with each other.

CLASSIFICATION OF IP ADDRESS:

- **Static**
- **Dynamic**

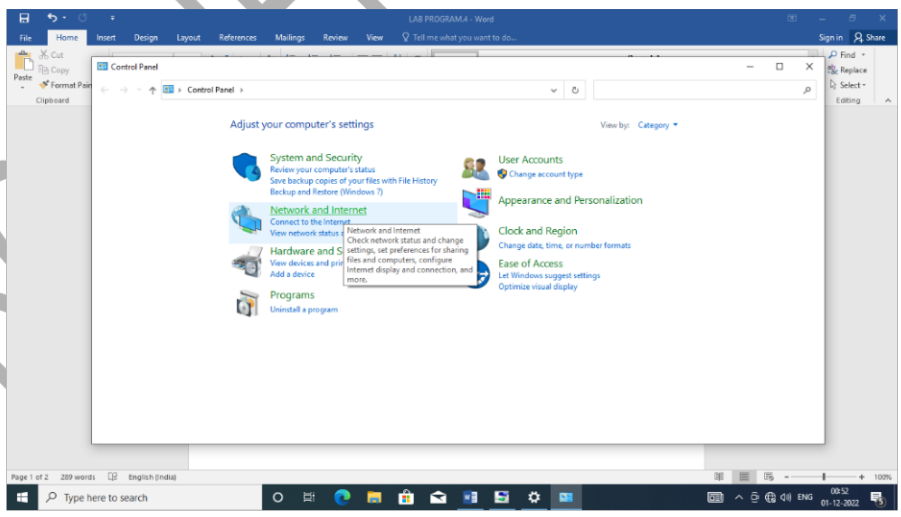
Static IP Address: Static IP Address is the one that you configure yourself by editing your computer's network settings. In simple words it is an Address that does not change once your device is assigned to a static IP address, that number typically stays the same until the device is decommissioned or your network architecture changes.

Dynamic IP Address: It is a temporary address for devices connected to a network that continually change over a time. They're assigned by the dynamic host configuration(DHCP), a service running on the network. Dynamic IP address are issued using leasing system, meaning that the IP address is only active for limited time. If the lease expires, the computer will automatically request a new lease.

How to generate dynamic IP Address? (manual IP address)

Step 1: Start option

Step 2: Open Control panel



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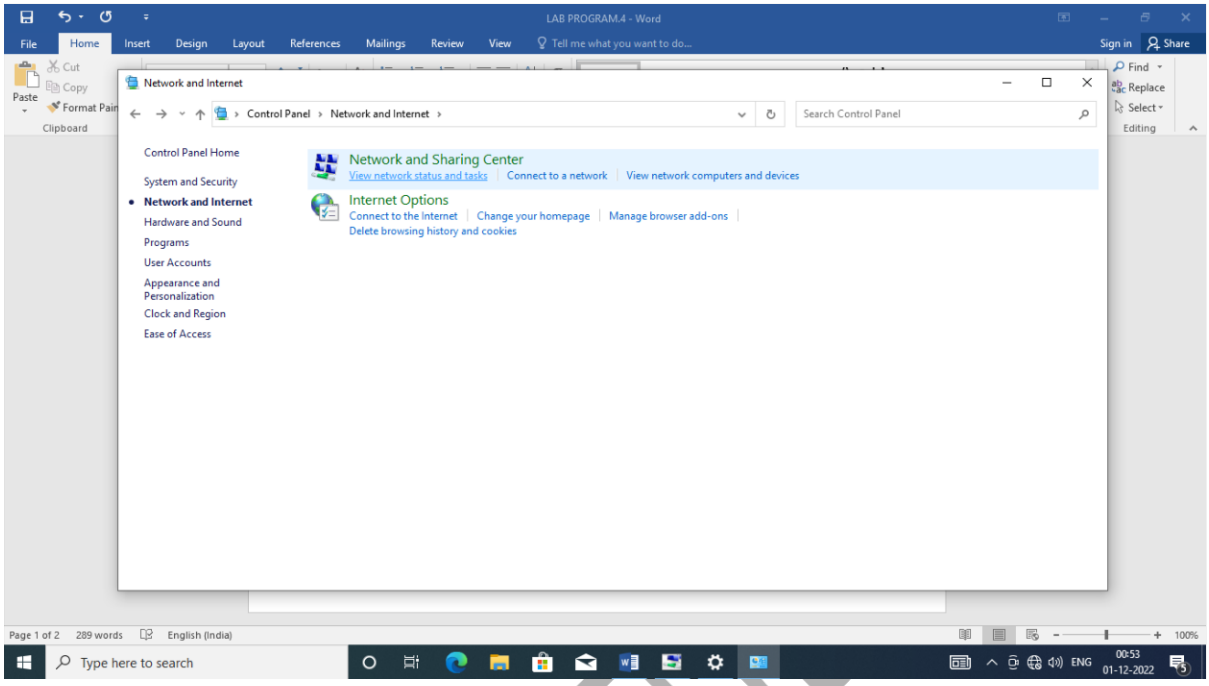
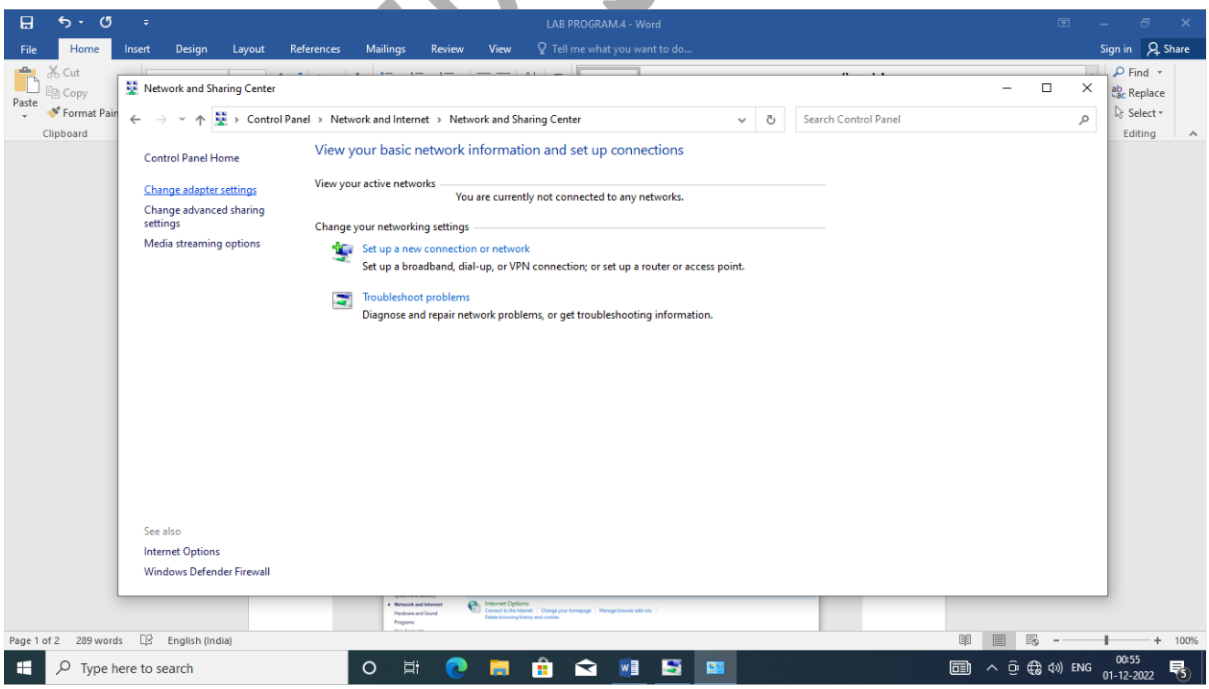
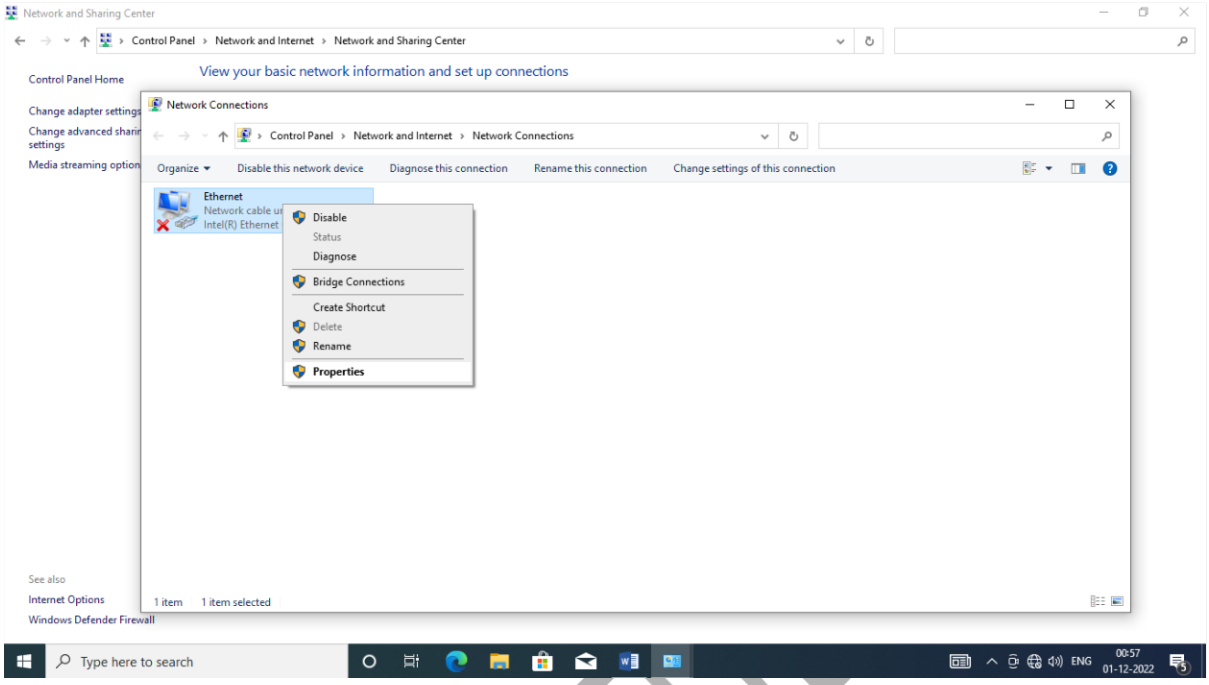
Step 3: Click on Network and Internet, connect to network.



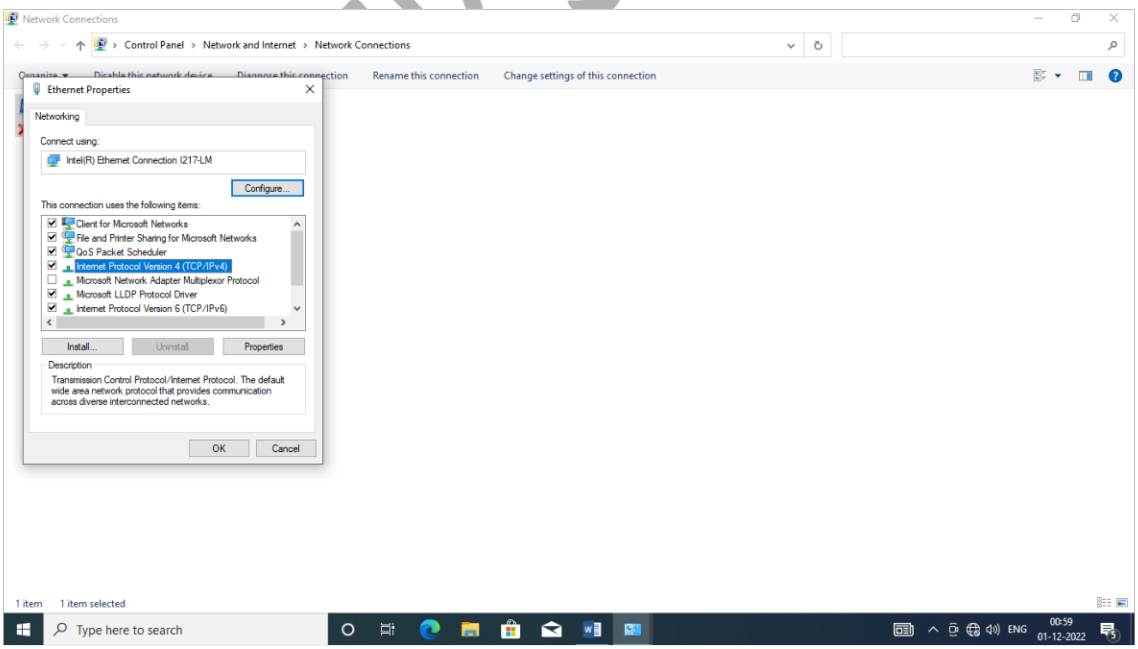
Step 4: On the left pane, click the change adapter settings link.



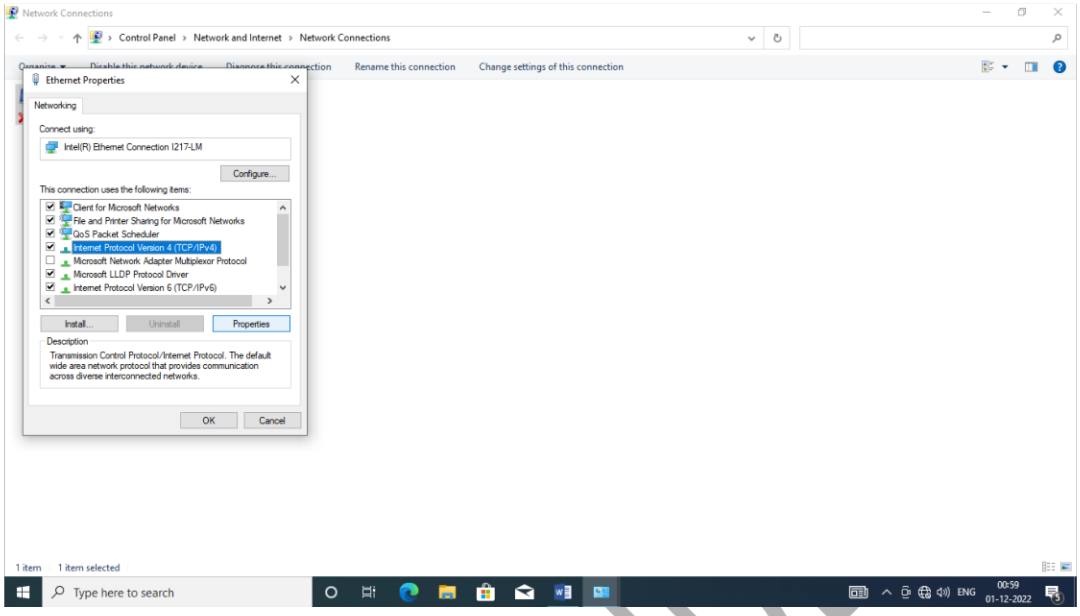
Step 5: Right-click the network adapter and select the Properties option.



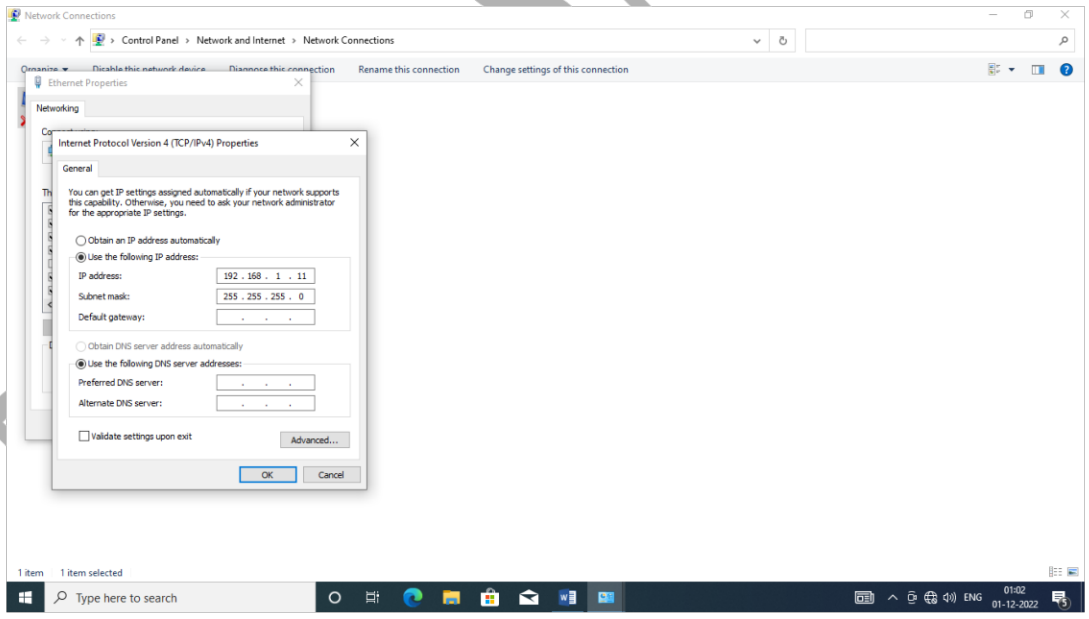
Step 6: Select the Internet Protocol version 4 (TCP/IPv4) option.



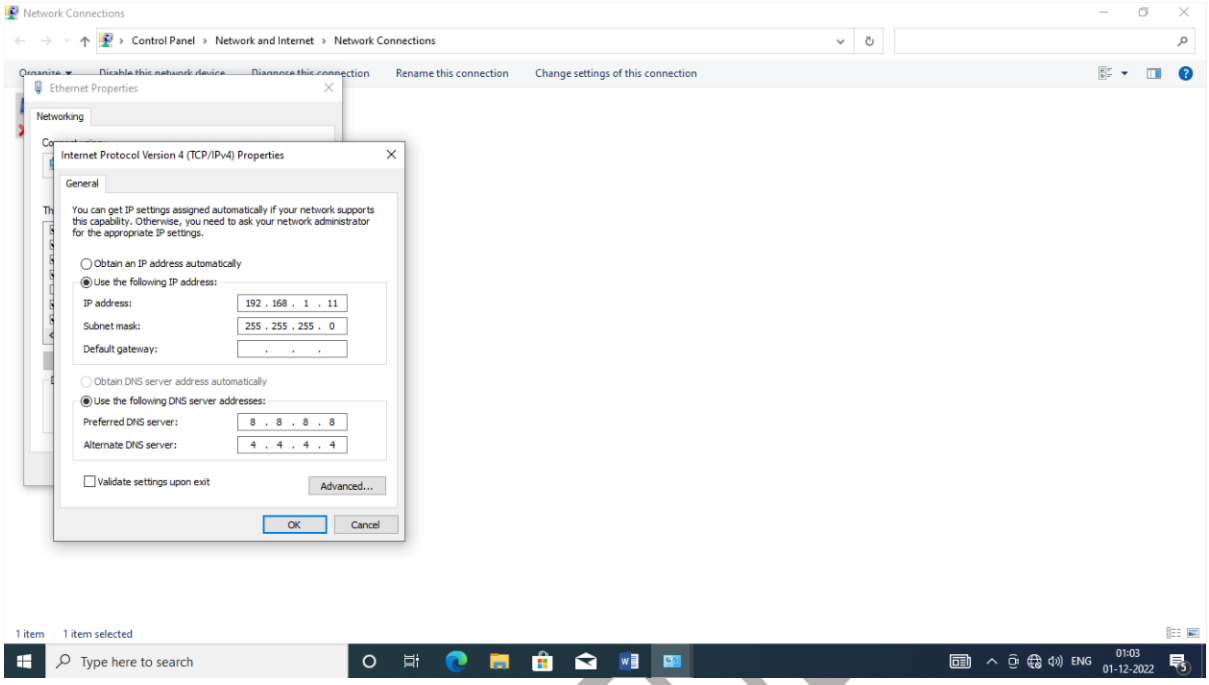
Step 7: Click the properties button



Step 8: Select the obtain an IP Address automatically option.



Step 9: Select the obtain the following DNS server address automatically option.



Step 10: Click the Ok button.

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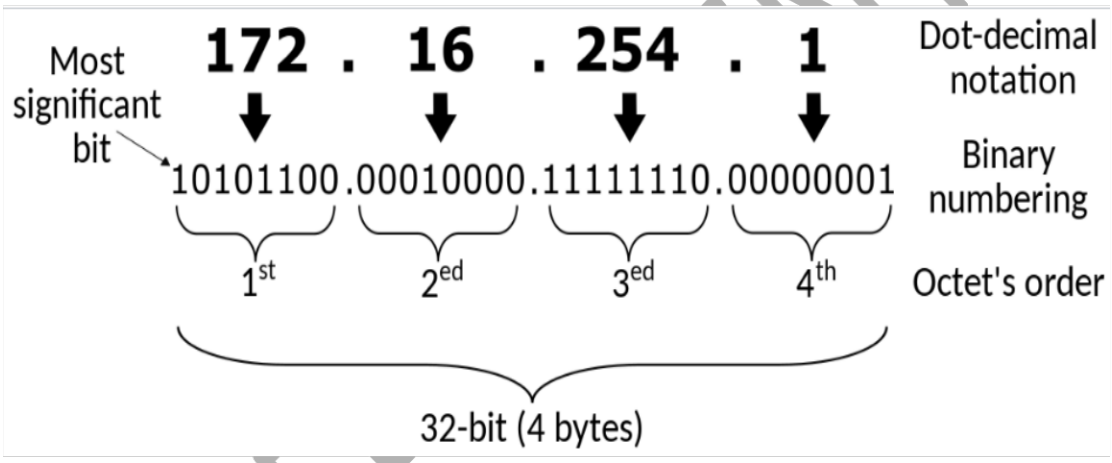
LAB PROGRAM 5: Study Of Network IP Address Configuration (IPv4 And IPv6, Subnet , Supernet).

Solution:

IPv4:

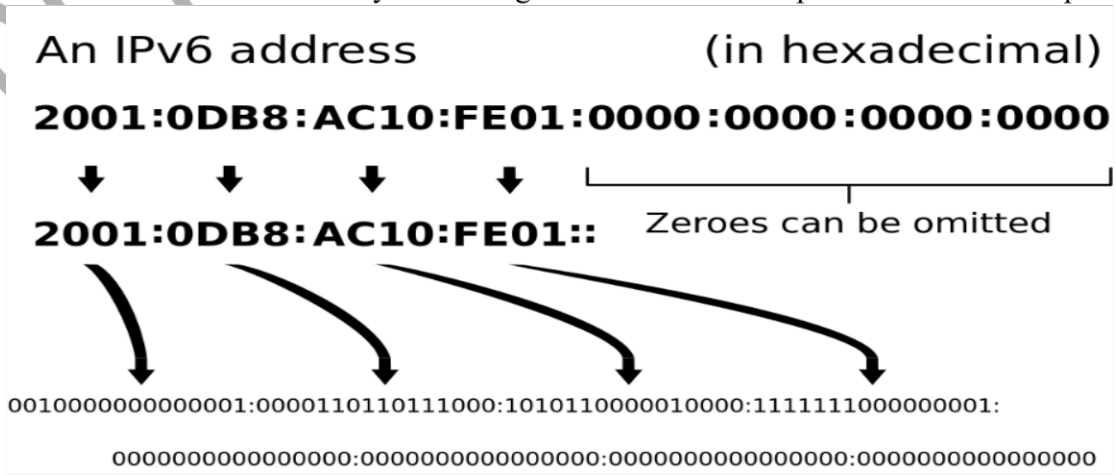
Internet protocol version 4(IPv4) is a connectionless protocol, and operates on a best-effort delivery model. IPv4 address is a 32-bit number that uniquely identifies a network interface on a machine. An IPv4 address is typically written in decimal digits, formatted as four 8-bit fields that are separated by periods. Each 8-bit field represents a byte of the IPv4 address. This form of representing the bytes of an IPv4 address is often referred to as the dotted-decimal format. The bytes of the IPv4 address are further classified into two parts: the network part and the host part.

Example:192.0.2.126



IPv6:

An IPv6 address is a 128-bit alphanumeric value that identifies an endpoint device in an Internet Protocol Version 6 (IPv6) network. IPv6 is the successor to a previous addressing infrastructure, IPv4, which had limitations IPv6 was designed to overcome. IPv6 has a vastly enlarged address space. Example:



Subnet:

A subnetwork or subnet is a logical subdivision of an IP network.The practice of dividing a network into two or more networks is called subnetting.

Example: 198.51.100.0/24 would have the subnet mask

255.255.255.0.

Supernet:

A supernet network, or supernet, is an Internet Protocol (IP) network that is formed by aggregation of multiple networks (or subnets) into a larger network. The new routing prefix for the aggregate network represents the constituent networks in a single routing table entry. The process of forming a supernet is called supernetting, prefix aggregation, route aggregation, or route summarization.

Example:192.168.1.248

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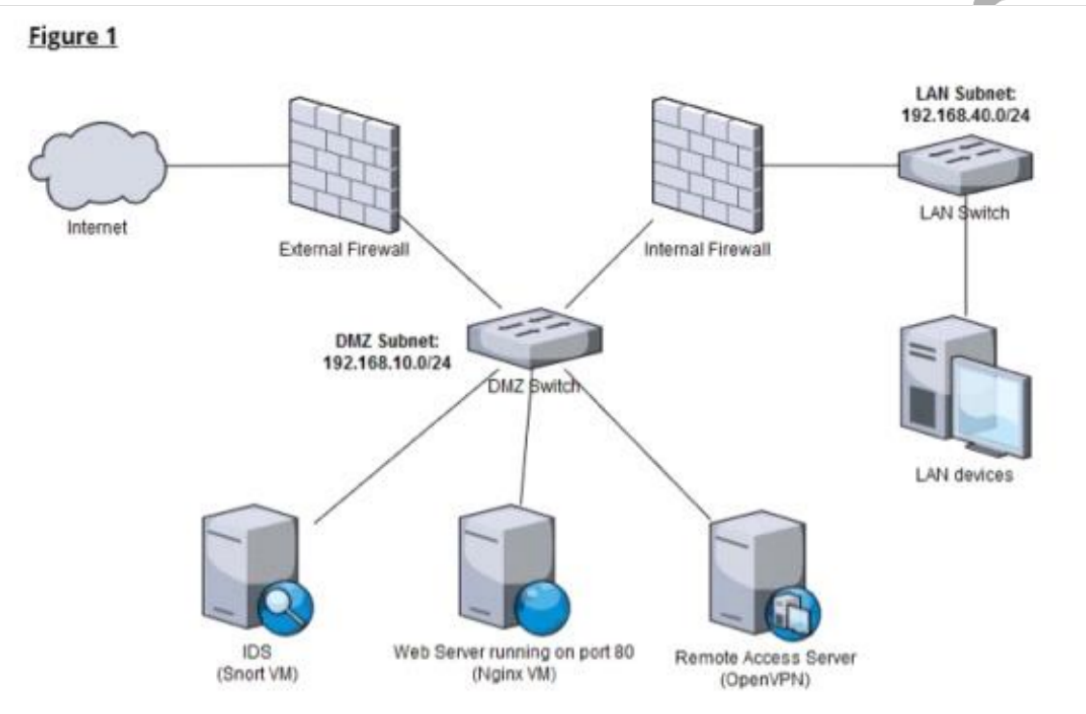
LAB PROGRAM 6: Study Of Network Devices (Switch, Router, Bridge).

Solution:

1)Switch :

- A switch a data link layer networking device which connects devices in a network and userspacket switching to send and receive data over the network.
- Like a hub, a switch also has many ports, to which computers are plugged in.
- However, when a data frame arrives at any port of a network switch, it examines the destination address and sends the frame to the corresponding devices.



- We can have a two-layer switch or a three-layer switch.
- A three-layer switch is used at the network layer; it is a kind of router.
- The two-layer switch performs at the physical and data link layer.
- A two-layer switch is a bridge, a bridge with many ports and a design that allows better performance.

Types Of Switches

1.Unmanaged Switch:

These are inexpensive switches commonly used in home networks and small businesses. They can be set up by simply plugging in to the network, after which they instantly start operating.

2.Managed Switch:

These are costly switches that are used in organizations with large and complex networks. Since they can be customized to argument the functionalities of a standard switch.

3.LAN Switch:

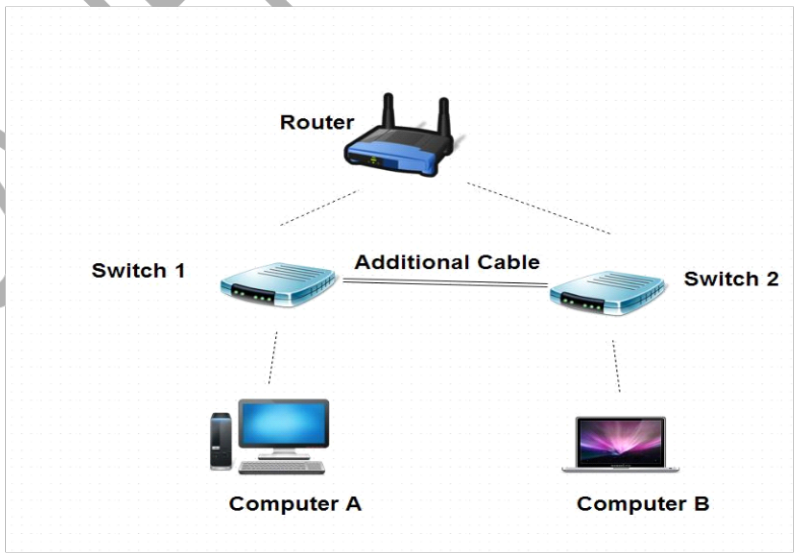
Local Area Network(LAN) switches connect devices in the internal LAN of an organization. They are also referred to as Ethernet switches or data switches.

4.POE Switch:

Power Over Ethernet(POE) switches are used in POE Gigabit Ethernet. POE technology combines data and power transmission over the same cable so, that devices connected to it can receive both electricity as well as data over the same line.

2)Router:

- Routers are networking devices operating at layer 3 or a network layer OSI model.
- They are responsible for receiving, analyzing, and forwarding data packets among the connected computer networks.
- **Entities:**
- IP address and subnet mask of the nodes in the network.
- IP addresses of the routers in the network.
- Interface information among the network devices and channels.



BCA DEP STUDENTS

Types Of Router

1.Wireless Routers:

They provide wifi connections wifi devices like laptops,smartphones etc.They can also provide standard ethernet routing for indoor connections,the range is 150 feet while its 300 feet for outdoor connections

2.Broadband Routers:

They are used to connect to the internet through telephone and to use voice over internet protocol(VOIP)technology for providing high-speed internet access.

3.Core Routers:

They can route data packets within a given network,but cannot route the packets between the netwroks.They help to link all the device within a network thus forming the backbone of the network.

4.Edge Routers:

They are low-quality routers placed at the periphery of the networks.They connect the internal network to the external netwroks,and are suitable for transferring data packets across the networks.

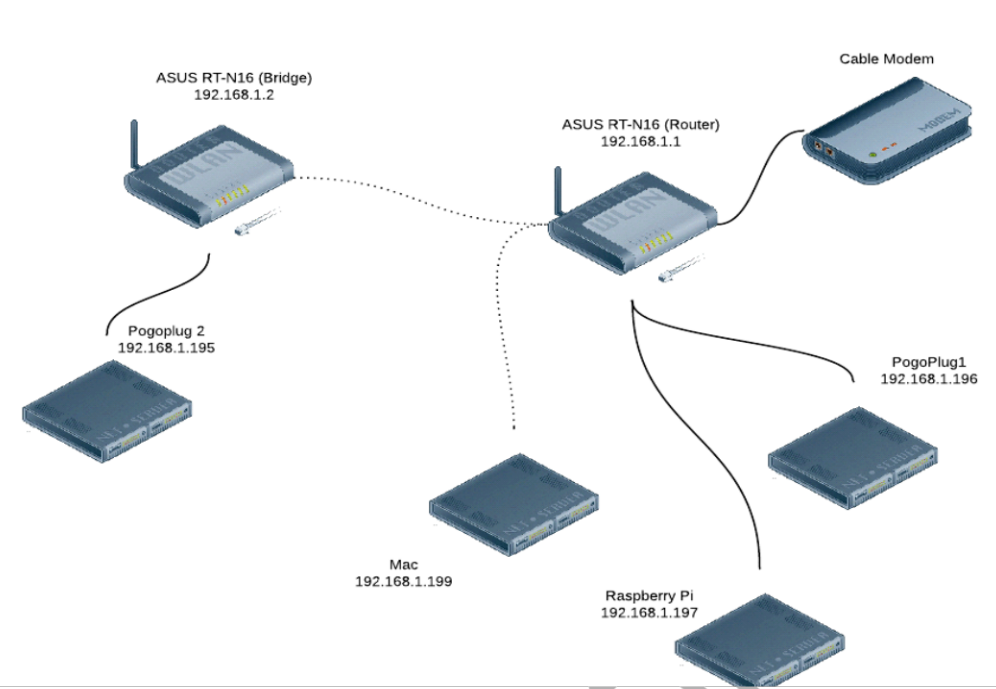
5.BRouters:

BRouters are specialized routers that can provide the functionalities of bridges as well.Like a bridge,brouters help to transfer between networks.

3)Bridges:

- A bridge operates in the physical layer as well as in the data link layer.
- It can regenerate the signals that it receives and as a data link layer device, it can check the physical address of source and destination contained in the frame.
- The major difference between the bridge and the repeater is that the bridge and the repeater is that the bridge as a filtering capacity.

BCA NEP STUDENTS



Types Of Bridges

1.Transparent Bridges:

These are the bridges in which the stations are completely unaware of the bridges existence i.e. whether or not a bridge is added or deleted from the network, reconfiguration of the station are unnecessary.

2.Source Routing Bridges:

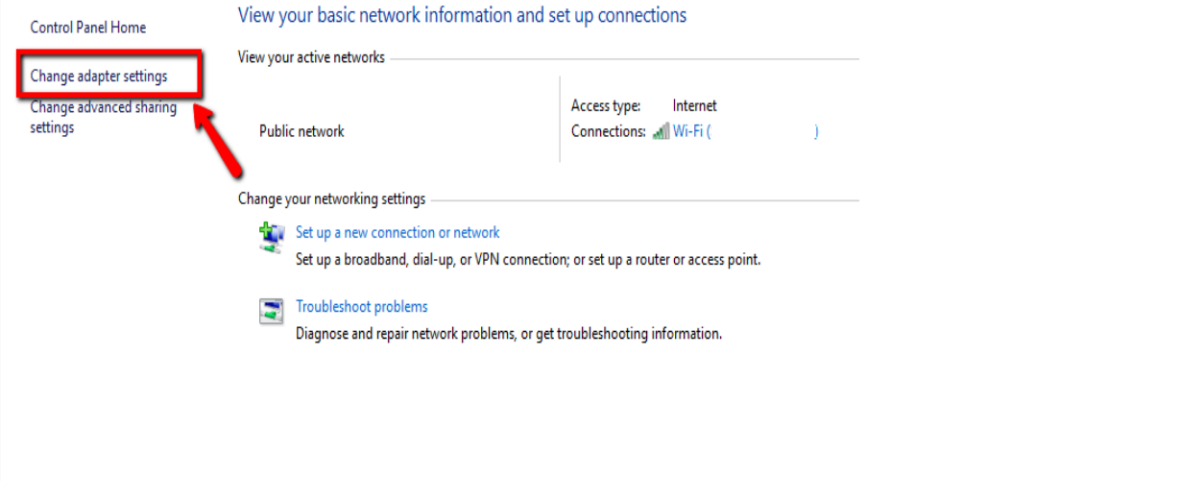
In these bridges, routing operation is performed by source station and the frame specifies which route to follow. The host can discover frames by sending a special frame called discovery frame, which spreads to the entire network using all possible paths to destination.

BCA NEP STUDE

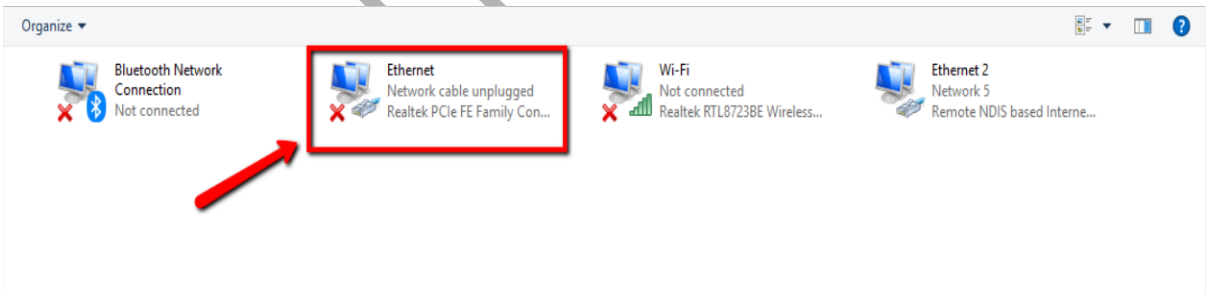
LAB PROGRAM 7: Configure and Connect the computer in LAN.

Solution:

Step.1: Go to "Control Panel →Network and Internet →Network and Sharing Center →Change Adapter Settings."

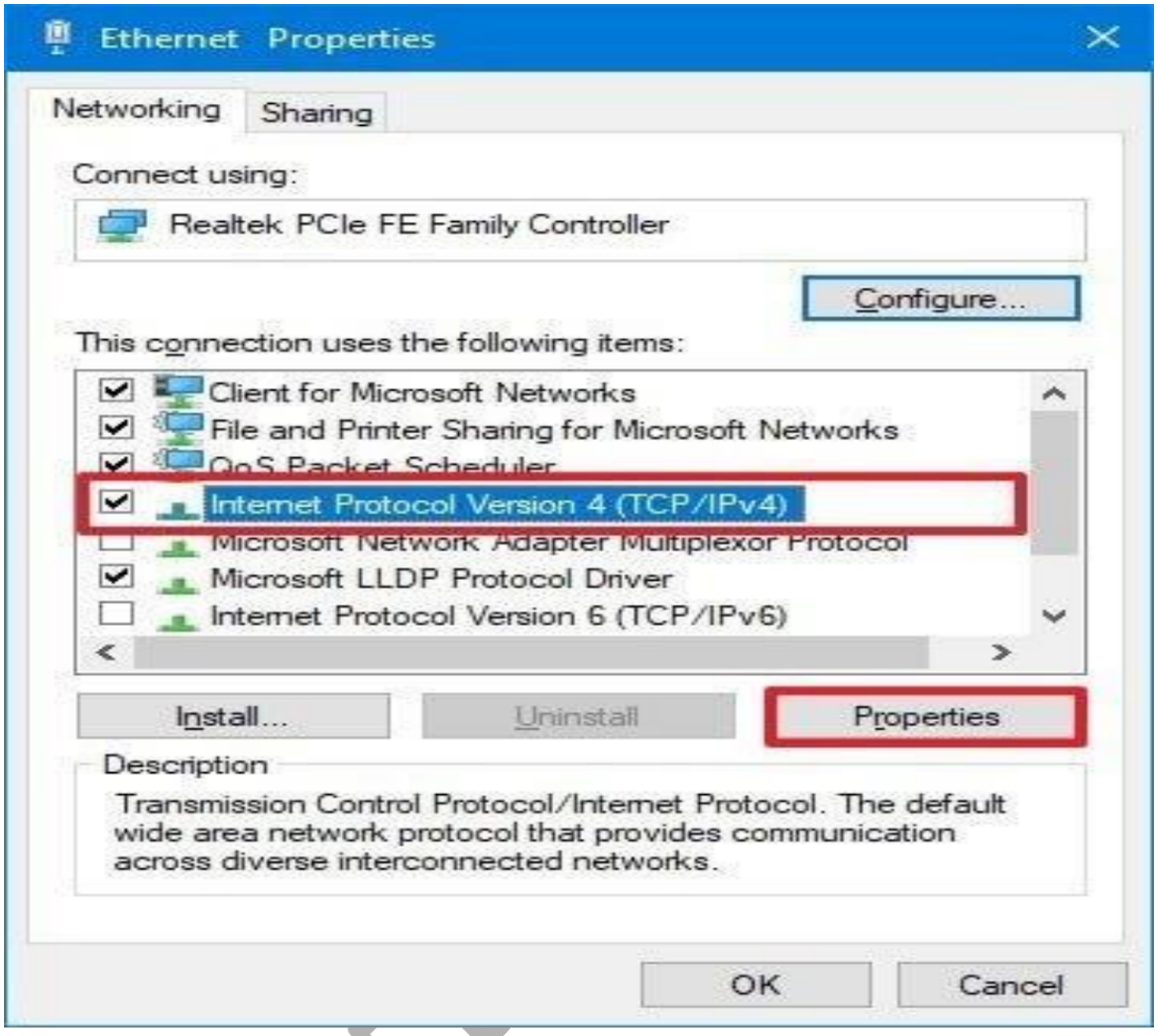


Step.2: Click on "Change Adapter Settings." This will reveal different connections. Select the appropriate connection for your LAN. Usually, but not necessarily, the connection will be called Ethernet.



Step.3: Right-click on the connection and select "Properties ." The local area's connection properties window will appear.

Step.4: Under the network tab, select "Internet protocol version 4 (TCP/IPv4)," then click on "Properties."



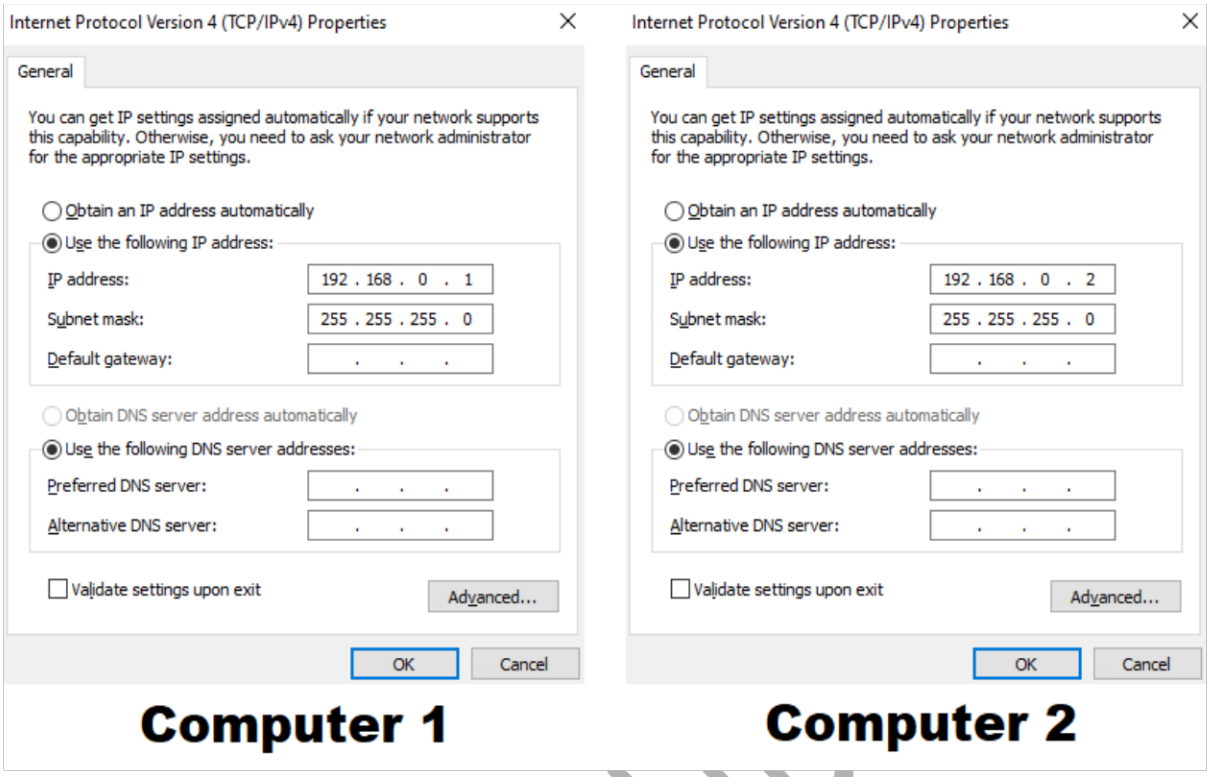
In the Properties menu, set the IP address and subnet masks of the first computer to:

- IP – 192.168.0.2
- Subnet Mask – 225.225.225.0

Repeat all the above steps for the second computer and set the IP address and subnet Mask as follows:

- IP – 192.168.0.2
- Subnet Mask – 225.225.225.0

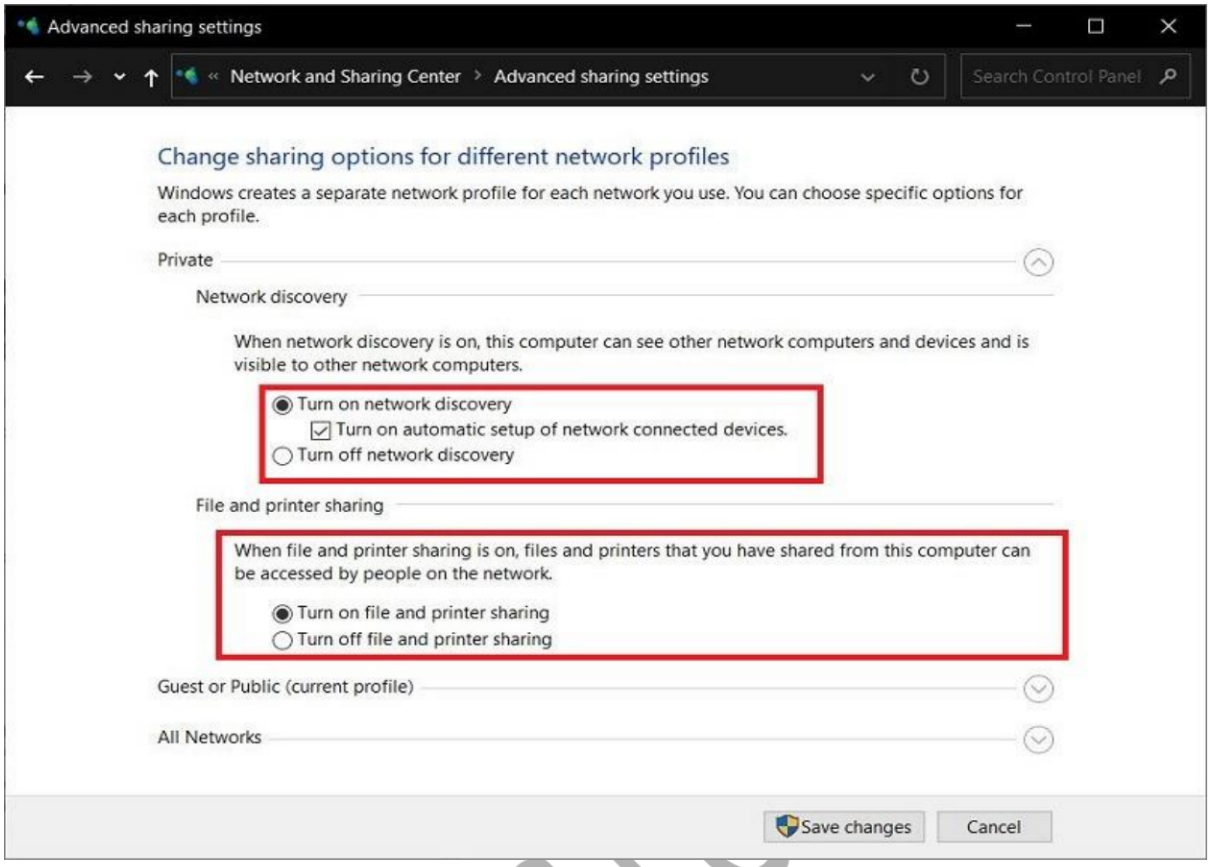
BCA NET



Step.5: After assigning the IP addresses, you need to head back to Network and Sharing Center and click on the "Change advanced sharing settings" option.

Step.6: In the advanced sharing settings menu, you need to enable the " Turn on network discovery" and "Turn on automatic setup of network-connected devices" options.

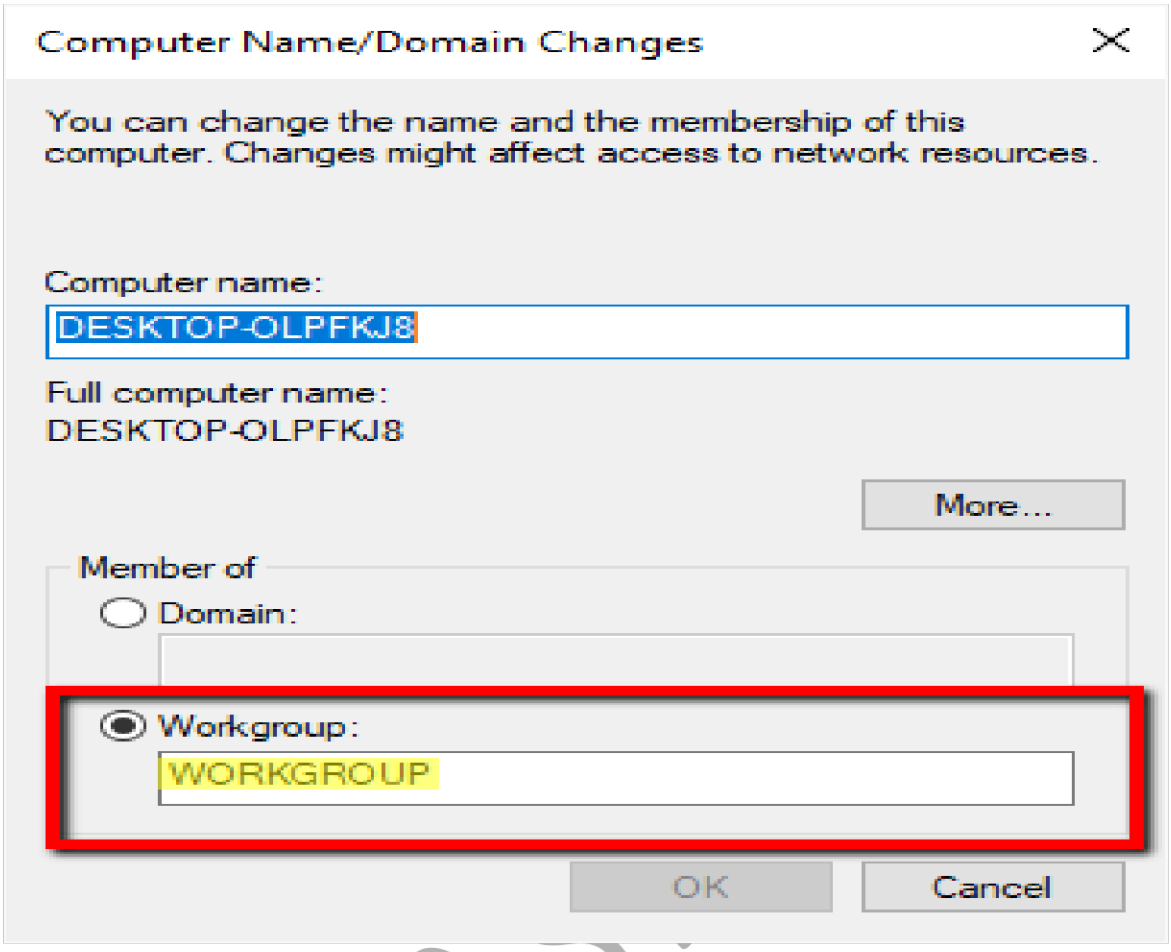
BCA NEP STUDY



You can also tick the File and printer sharing option. This would allow the other Windows 10 PC to access the files and printers shared on the network.

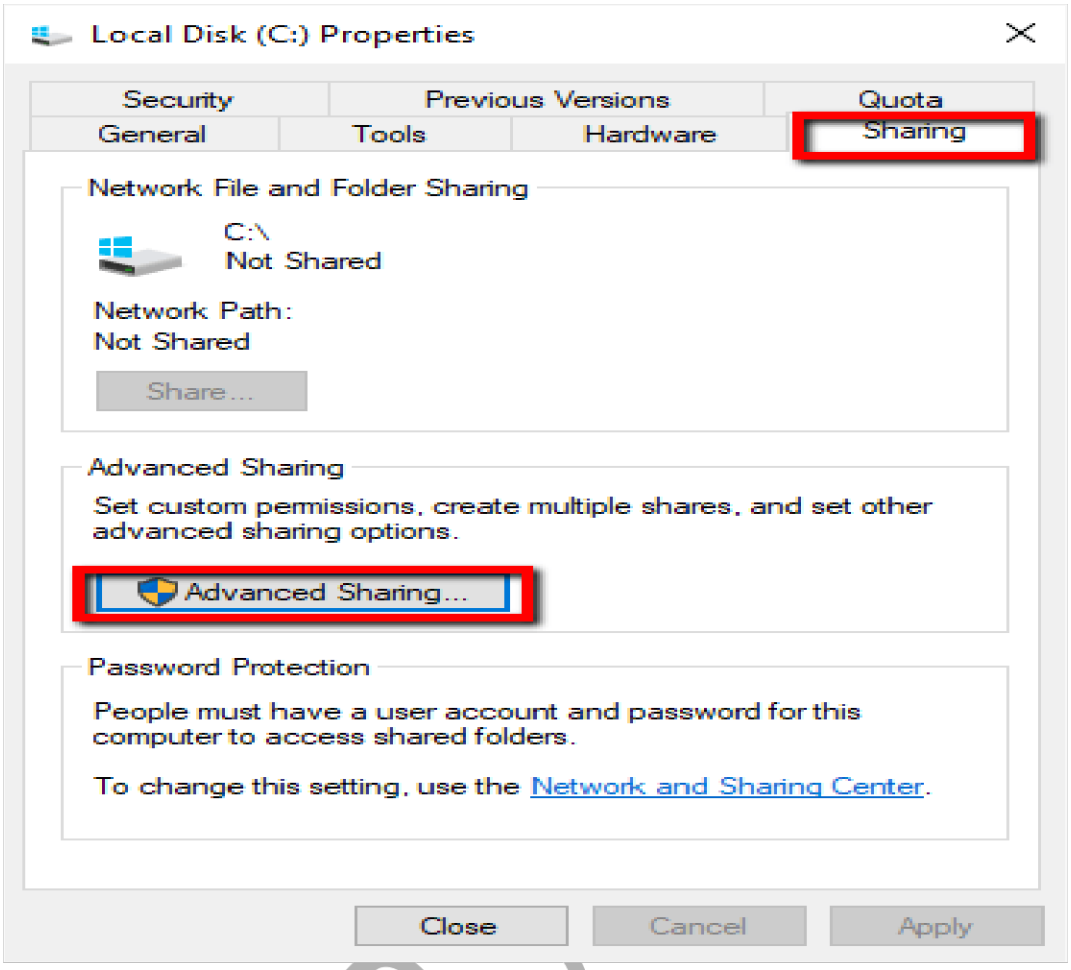
Step.7: Right-click on "This PC" and choose "Properties." Click on "Change settings →Change." This reveals a window with the name of the workgroup. The value for the workgroup name should be the same for both PC's. By default, but you can change it to any name you like.

BCA NEP SY



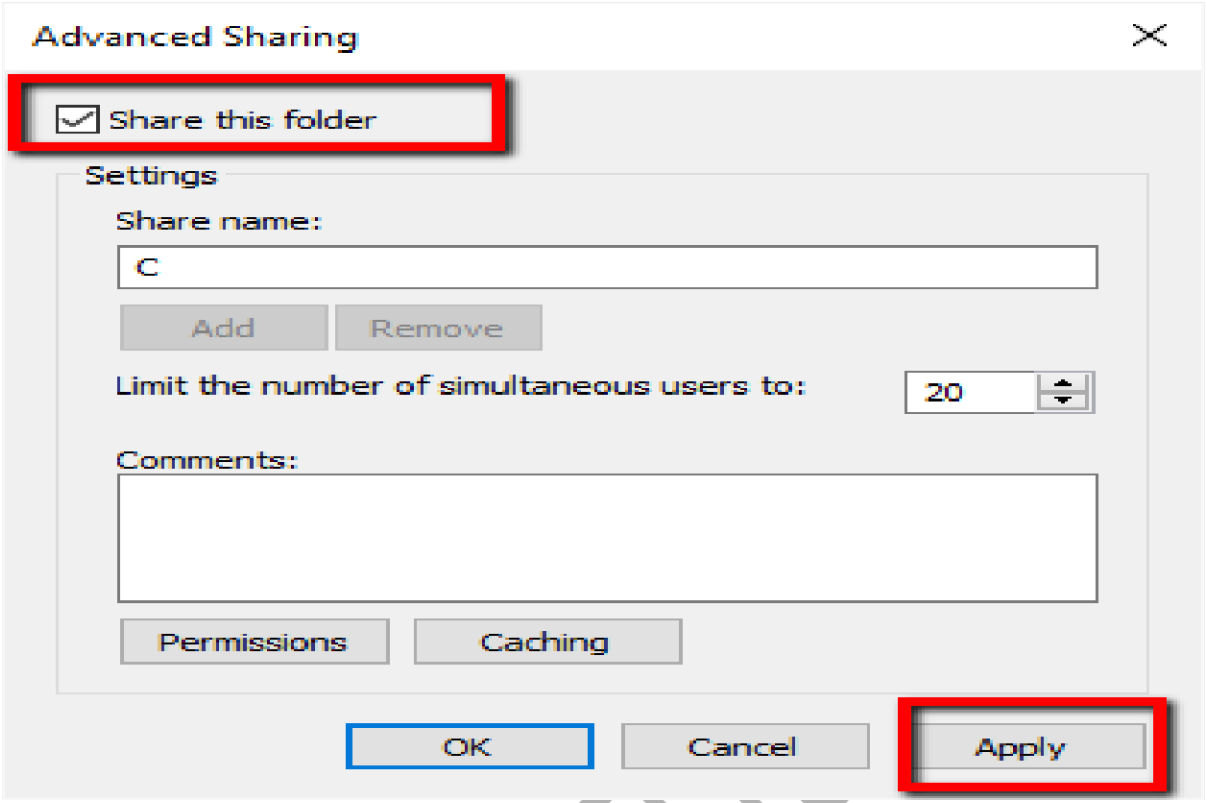
Step.8: Right -click on the drive you want to share. Scroll to the "Give access to" option and click "Advanced Sharing." Under the sharing tab, click the "Advanced Sharing" button.

BCA NEP



This reveals the advanced sharing window. Check the "Share this folder" checkbox and click "Apply →OK."

BCA NEP 3

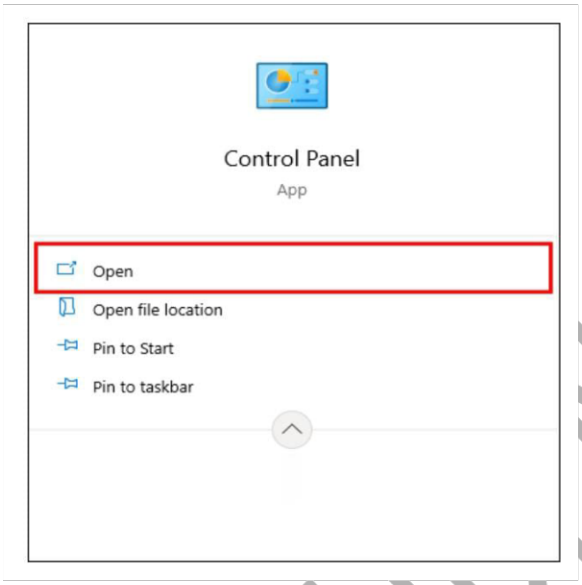


At this stage, you will have successfully connected the two Windows 10 PC's to share your drives between them.

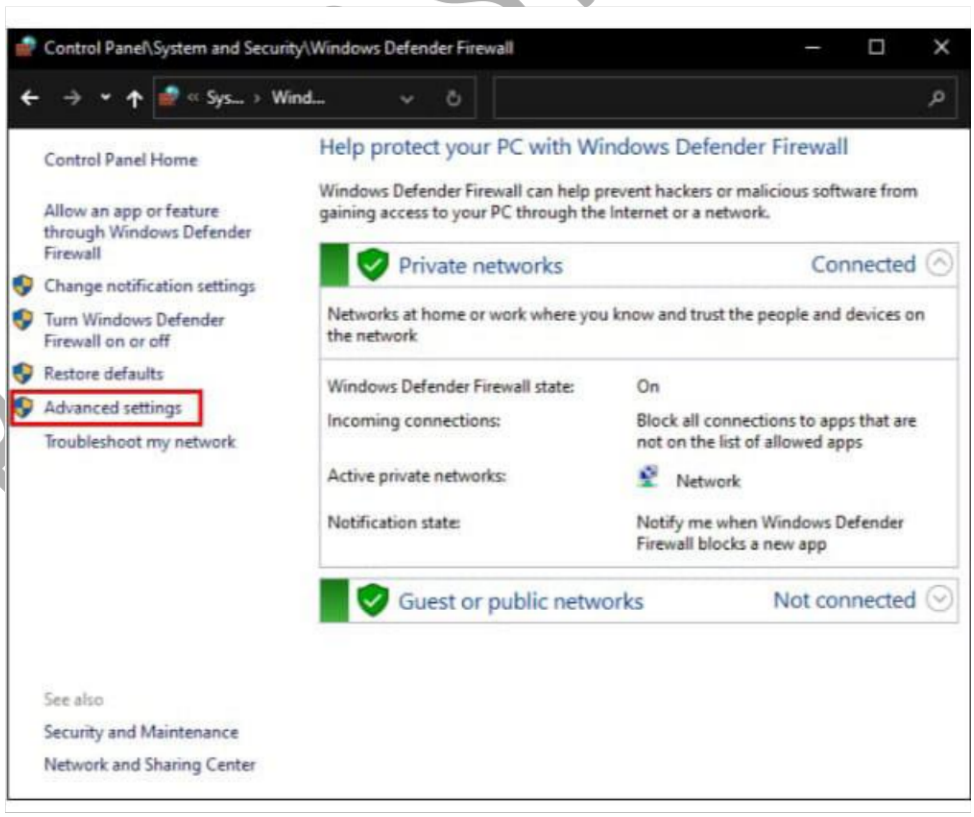
BCA NEP STU

LAB PROGRAM 8: Block the website using "windows defender firewall" in windows 10.

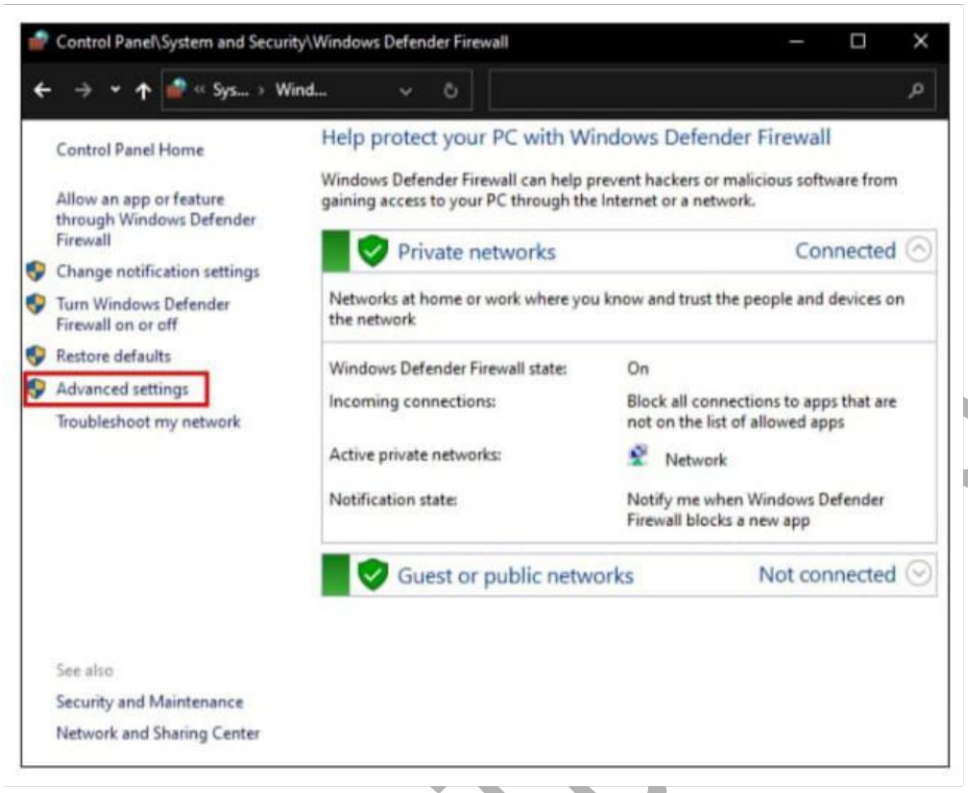
Step 1: Launch the Control Panel on your computer.



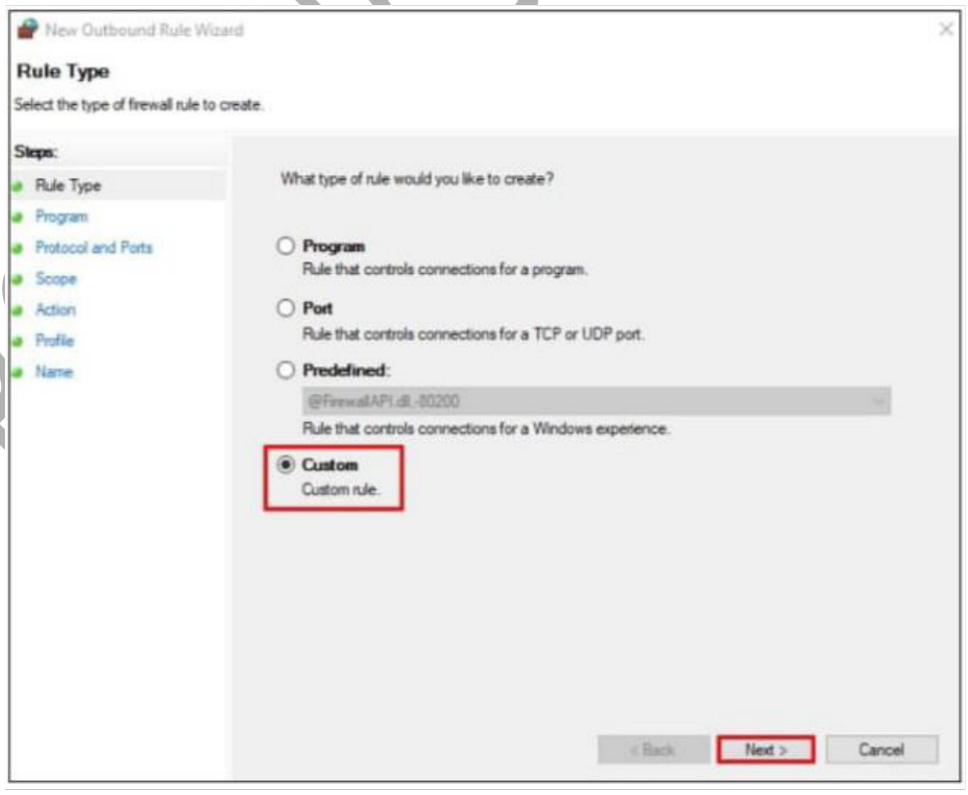
Step 2: Select "Windows Defender Firewall" followed by "Advanced Settings" on the left side-pane.



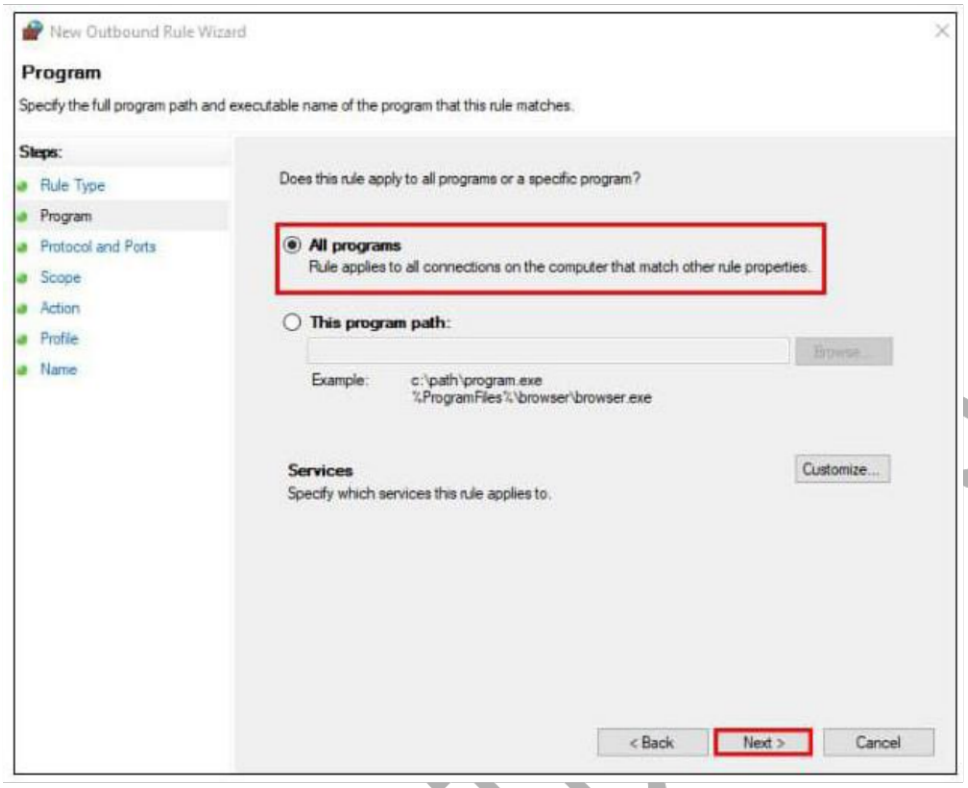
Step 3: Right-click on “Outbound Rules” from the menu on the left and select “New Rule”.



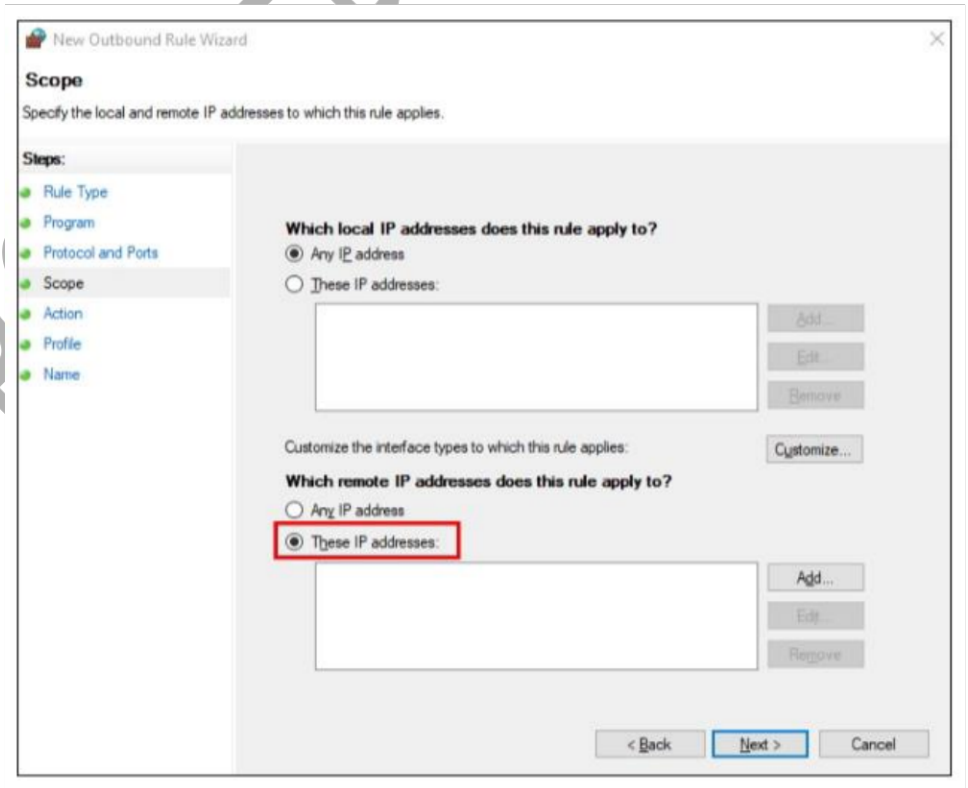
Step 4: When a new window pops up, select the “Custom” option followed by “Next”.



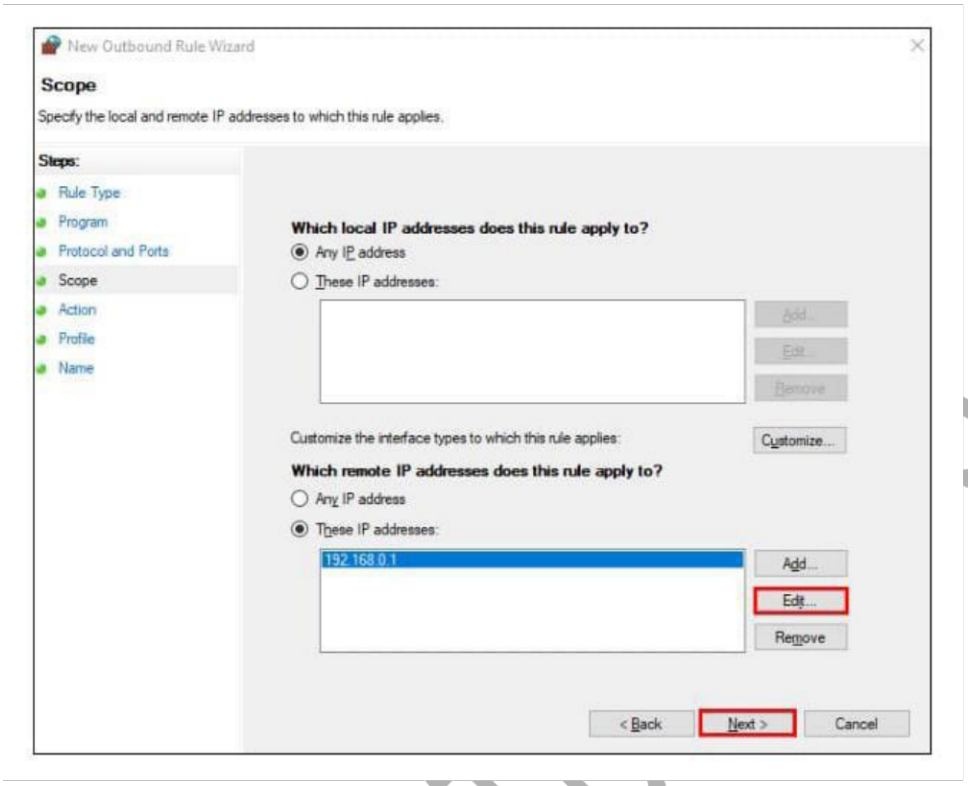
Step 5: On the next window, select "All Programs" and again select "Next".



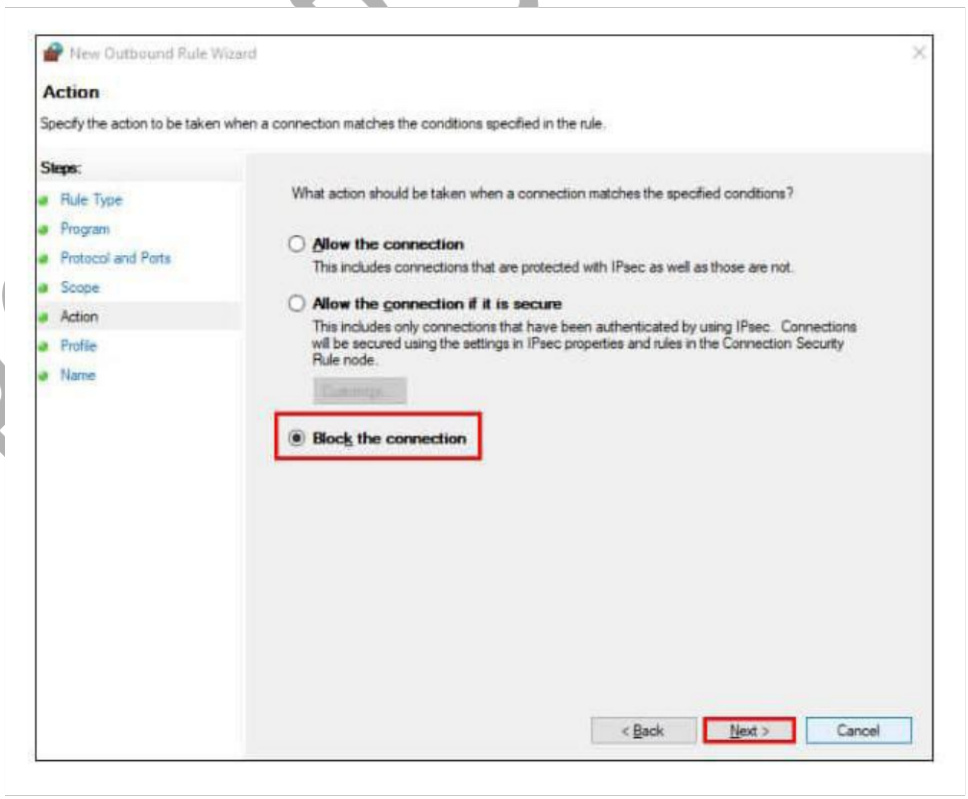
Step 6: Select the "These IP addresses" option under "which remote IP addresses does this rule apply to?".



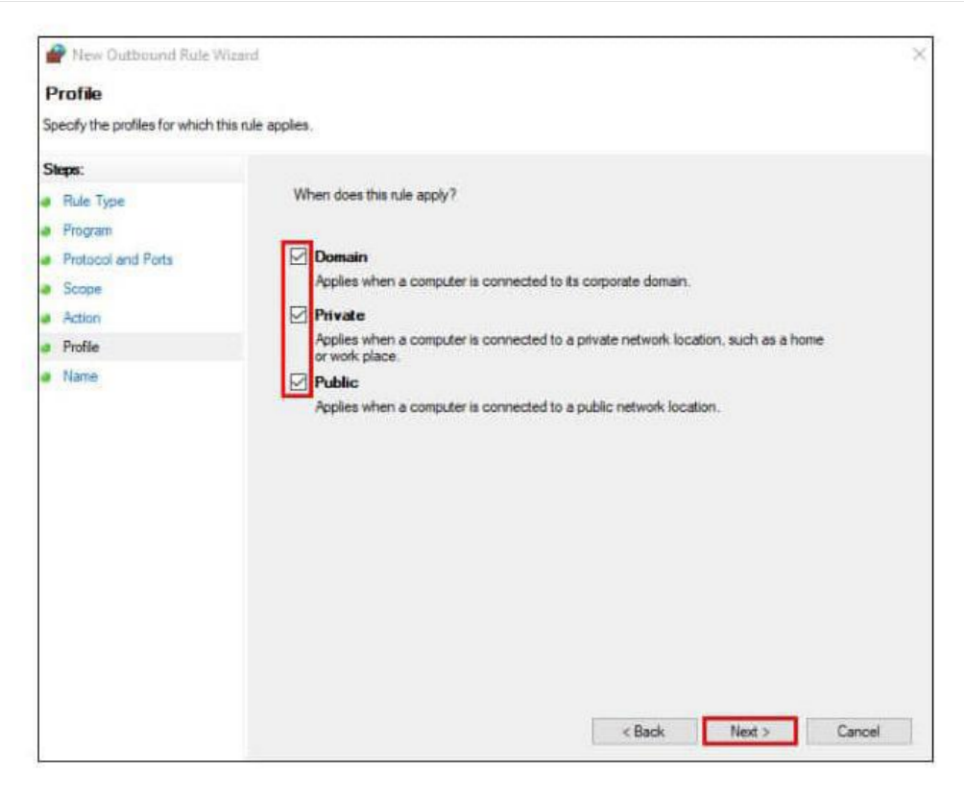
Step 7: Click on “Add” and enter the IP addresses you want to block. Then select “Next”.



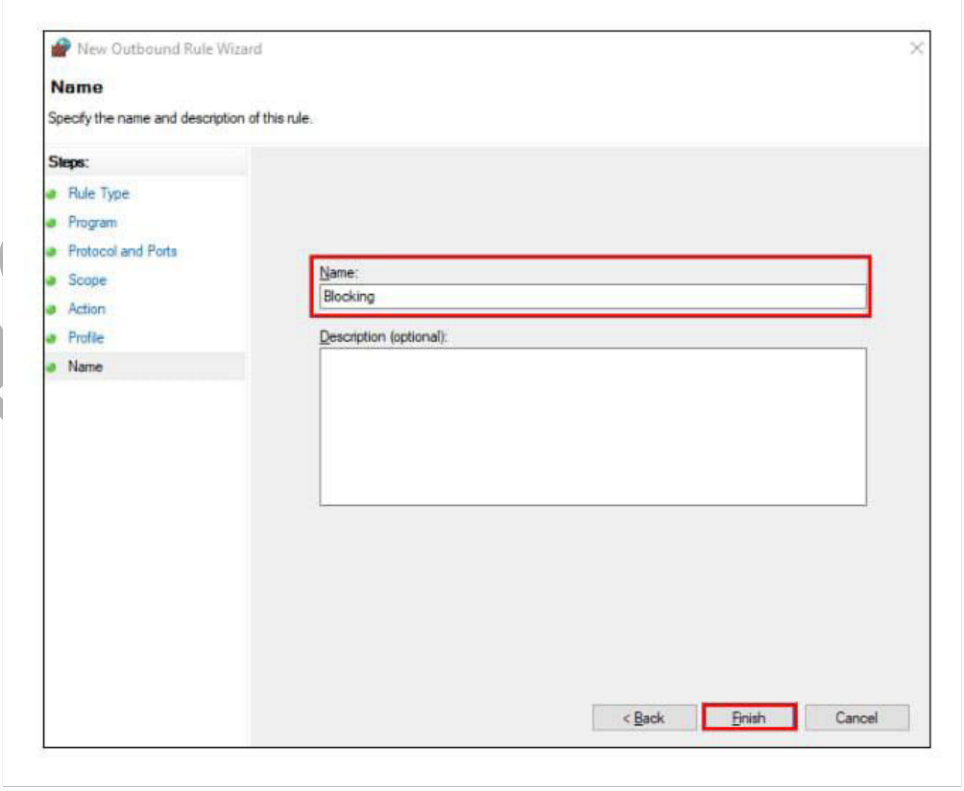
Step 8: Make sure to choose the “Block the connection” option and click on “Next”.



Step 9: Choose whether the rule applies to domain, private or public. You can also select all three.



Step 10: Select "Next", add a name or description to this rule, and select "Finish" to complete the action.



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