

RAJALAKSHMI ENGINEERING COLLEGE

An Autonomous Institution

**Affiliated to Anna University, Chennai,
Rajalakshmi Nagar, Thandalam – 602 105**



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ENGINEERING COLLEGE**

An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CS19541 - COMPUTER NETWORKS

Laboratory Record Note Book

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Submitted for the Practical Examination held on.....20.11.2024.....

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Date: 19.07.24	

Study Of Various Networking Commands Used in Linux and Windows

Basic Networking Commands:

- 1) **arp -a:** ARP is short form of address resolution protocol, It will show the IP address of your computer along with the IP address and MAC address of your router.

Output:

```
[student@fedora ~]$ arp -a
_gateway (172.16.52.1) at 7c:5a:1c:cf:be:3e [ether] on enp2s0
```

- 2) **hostname:** This is the simplest of all TCP/IP commands. It simply displays the name of your computer.

Output:

```
[student@fedora ~]$ hostname
fedora
```

- 3) **ipconfig/all:** This command displays detailed configuration information about your TCP/IP connection including Router, Gateway, DNS, DHCP, and type of Ethernet adapter in your System.

Output:

```
[student@fedora ~]$ ifconfig
enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.16.52.83  netmask 255.255.254.0 broadcast 172.16.53.255
              inet6 fe80::d193:bbe:929b:17d1  prefixlen 64  scopeid 0x20<link>
        ether 88:ae:dd:15:ec:fb  txqueuelen 1000  (Ethernet)
          RX packets 199637  bytes 100276261 (95.6 MiB)
          RX errors 0  dropped 8587  overruns 0  frame 0
          TX packets 84435  bytes 25372084 (24.1 MiB)
          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 292  bytes 42675 (41.6 KiB)
          RX errors 0  dropped 0  overruns 0  frame 0
          TX packets 292  bytes 42675 (41.6 KiB)
          TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
```

- 4) **nbstat -a:** This command helps solve problems with NetBIOS name resolution. (Nb stands for NetBIOS over TCP/IP)

Output:

```
[student@fedora ~]$ netstats -r
bash: netstats: command not found...
Similar command is: 'netstat'
[student@fedora ~]$ netstat -r
Kernel IP routing table
Destination     Gateway         Genmask       Flags   MSS Window irtt Iface
default         _gateway       0.0.0.0      UG        0 0          0 enp2s0
172.16.52.0    0.0.0.0       255.255.254.0 U          0 0          0 enp2s0
```

- 5) **netstat:** (network statistics) netstat displays a variety of statistics about a computers active TCP/IP connections. It is a command line tool for monitoring network connections both incoming and outgoing as well as viewing routing tables, interface statistics etc.

e.g.: netstat -r

Output:

```
[student@fedora ~]$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address             State
tcp      0      0 fedora:57916               maa05s25-in-f10.1:https ESTABLISHED
tcp      0      0 fedora:50068               maa05s19-in-f3.1e:https ESTABLISHED
tcp      0      0 fedora:50080               maa05s19-in-f3.1e:https ESTABLISHED
tcp      0      0 fedora:48494               93.243.107.34.bc.:https ESTABLISHED
tcp      0      0 fedora:37772               maa05s26-in-f14.1:https ESTABLISHED
tcp      0      0 fedora:51330               maa03s45-in-f14.1:https ESTABLISHED
tcp      0      0 fedora:47066               maa05s20-in-f5.1e:https ESTABLISHED
tcp      0      0 fedora:44674               se-in-f84.1e100.n:https ESTABLISHED
tcp      0      0 fedora:48284               maa05s20-in-f5.1e:https TIME_WAIT
tcp      0      0 fedora:57904               maa05s25-in-f10.1:https ESTABLISHED
tcp      0      0 fedora:44036               maa03s26-in-f14.1:https ESTABLISHED
udp      0      0 fedora:bootpc             _gateway:bootps            ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State      I-Node      Path
unix    3      [ ]      STREAM    CONNECTED  34078
unix    3      [ ]      STREAM    CONNECTED  28171
unix    3      [ ]      STREAM    CONNECTED  23299      /run/dbus/system_bus_socket
unix    2      [ ]      DGRAM     CONNECTED  30896
unix    3      [ ]      STREAM    CONNECTED  25354      /run/user/1000/bus
```

- 6) **nslookup:** (name server lookup) is a tool used to perform DNS lookups in Linux. It is used to display DNS details, such as the IP address of a particular computer, the MX records for a domain or the NS servers of a domain. nslookup can operate in two modes: interactive and Non-interactive.

e.g.: nslookup www.google.com

Output:

```
[student@fedora ~]$ nslookup www.google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   www.google.com
Address: 142.250.182.4
Name:   www.google.com
Address: 2404:6800:4007:819::2004
```

- 7) **ping:** (Packet INternet Groper) command is the best way to test connectivity between two nodes. Ping uses ICMP (Internet Control Message Protocol) to communicate to other devices.

1. #ping hostname(ping localhost)
2. #ping ip address (ping 4.2.2.2)
3. #ping fully qualified domain name(ping www.facebook.com)

Output:

```
[student@fedora ~]$ ping fedora
PING fedora(fe80::e5d3:4ba6:f3f4:5526%enp2s0) 56 data bytes
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=1 ttl=64 time=0.082 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=2 ttl=64 time=0.068 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=3 ttl=64 time=0.063 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=4 ttl=64 time=0.068 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=5 ttl=64 time=0.063 ms
```

- 8) **Route:** route command is used to show/manipulate the IP routing table. It is primarily used to set up static routes to specific hosts or networks via an interface.

Output:

```
[student@fedora ~]$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         _gateway       0.0.0.0        UG    100    0        0 enp2s0
```

Some important Linux networking commands:

1) ip:

The ip command is one of the basic commands every administrator will need in daily work, from setting up new systems and assigning IPs to troubleshooting existing systems. The ip command can show address information, manipulate routing, plus display network various devices, interfaces, and tunnels.

ip <OPTIONS> <OBJECT> <COMMAND>

Here are some common use cases for the ip command.

- To show the IP addresses assigned to an interface on your server: [root@server ~]# ip address show

Output:

```
[student@fedora ~]$ ip address show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 88:ae:dd:15:eb:e8 brd ff:ff:ff:ff:ff:ff
    inet 172.16.53.236/23 brd 172.16.53.255 scope global dynamic noprefixroute enp2s0
        valid_lft 84786sec preferred_lft 84786sec
    inet6 fe80::6802:2582:1fb9:bfb3/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

- To assign an IP to an interface, for example, enps03:

```
[root@server ~]# ip address add 192.168.1.254/24 dev enps03
```

Output:

```
[root@fedora ~]# ip address add 192.168.1.254/24 dev enp2s0
[root@fedora ~]# ip address show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 88:ae:dd:15:eb:9f brd ff:ff:ff:ff:ff:ff
    inet 172.16.53.134/23 brd 172.16.53.255 scope global noprefixroute enp2s0
        valid_lft forever preferred_lft forever
    inet 192.168.1.254/24 scope global enp2s0
        valid_lft forever preferred_lft forever
    inet6 fe80::4ce1:20d3:25c2:b9ad/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

- To delete an IP on an interface:

```
[root@server ~]# ip address del 192.168.1.254/24 dev enps03
```

Output:

```
[root@fedora ~]# ip address del 192.168.1.254/24 dev enp2s0
[root@fedora ~]# ip address show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 88:ae:dd:15:eb:9f brd ff:ff:ff:ff:ff:ff
    inet 172.16.53.134/23 brd 172.16.53.255 scope global noprefixroute enp2s0
        valid_lft forever preferred_lft forever
    inet6 fe80::4ce1:20d3:25c2:b9ad/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

d. Display the route taken for IP 10.10.1.4:

```
[root@server ~]# ip route get  
10.10.1.4
```

Output:

```
[student@fedora ~]$ ip route get 10.10.1.4  
10.10.1.4 via 172.16.52.1 dev enp2s0 src 172.16.53.236 uid 1000  
cache
```

2) ifconfig:

The ifconfig command was/is a staple in many sysadmin's tool belt for configuring and troubleshooting networks. It has since been replaced by the ip command discussed above.

Output:

```
[student@fedora ~]$ ifconfig  
enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
      inet 172.16.53.126 netmask 255.255.254.0 broadcast 172.16.53.255  
        inet6 fe80::e5d3:4ba6:f3f4:5526 prefixlen 64 scopeid 0x20<link>  
          ether 88:ae:dd:15:ee:fe txqueuelen 1000 (Ethernet)  
            RX packets 112679 bytes 64994994 (61.9 MiB)  
            RX errors 0 dropped 1263 overruns 0 frame 0  
            TX packets 26201 bytes 12868430 (12.2 MiB)  
            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 283 bytes 146669 (143.2 KiB)  
            RX errors 0 dropped 0 overruns 0 frame 0  
            TX packets 283 bytes 146669 (143.2 KiB)  
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

3) mtr:

MTR (Matt's traceroute) is a program with a command-line interface that serves as a network diagnostic and troubleshooting tool. This command combines the functionality of the ping and traceroute commands. Just like a traceroute, the mtr command will show the route from a computer to a specified host. mtr provides a lot of statistics about each hop, such as response time and percentage. With the mtr command, you will get more information about the route and be able to see problematic devices along the way. If you see a sudden increase in response time or packet loss, then obviously, there is a bad link somewhere.

The syntax of the command is as follows:

mtr <options> hostname/IP

Let's look at some common use cases.

a. The basic mtr command shows you the statistics, including each hop (hostnames) with time and loss%:

```
[root@server ~]# mtr google.com
```

Output:

My traceroute [v0.95]							2024-08-03T08:29:16+0530		
							Packets		
							Loss%	Snt	Last
Host	1. _gateway						0.0%	6	0.4
	2. static-41.229.249.49-tataidc.co.in						0.0%	6	9.0
	3. 142.250.171.162						0.0%	6	10.4
	4. 142.251.227.217						0.0%	5	4.8
	5. 209.85.253.85						0.0%	5	4.9
	6. maa05s23-in-f14.1e100.net						0.0%	5	6.5
									12.2
									2.9
									25.6
									9.5

- b. Show the numeric IP addresses and hostnames,
too: [root@server ~]# mtr -b google.com

Output:

My traceroute [v0.95]							2024-08-03T08:32:18+0530		
							Packets		
							Loss%	Snt	Last
Host	1. _gateway (172.16.52.1)						0.0%	5	0.3
	2. static-41.229.249.49-tataidc.co.in (49.249.229.41)						0.0%	5	5.0
	3. 142.250.171.162 (142.250.171.162)						0.0%	5	4.2
	4. 142.251.227.217 (142.251.227.217)						0.0%	4	14.5
	5. 209.85.253.85 (209.85.253.85)						0.0%	4	12.3
	6. maa05s23-in-f14.1e100.net (142.250.183.238)						0.0%	4	18.5
									14.2
									3.1
									19.6
									7.6

- c. Set the number of pings that you want to
send: [root@server ~]# mtr -c 10
google.com

Output:

My traceroute [v0.95]							2024-08-03T08:32:49+0530		
							Packets		
							Loss%	Snt	Last
Host	1. _gateway						0.0%	4	0.4
	2. static-41.229.249.49-tataidc.co.in						0.0%	4	2.6
	3. 142.250.171.162						0.0%	4	7.9
	4. 142.251.227.217						0.0%	3	11.6
	5. 209.85.253.85						0.0%	3	31.6
	6. maa05s23-in-f14.1e100.net						0.0%	3	19.0
									16.2
									10.8
									19.0
									4.7

4) tcpdump:

The tcpdump command is designed for capturing and displaying packets.

- a. Before starting any capture, you need to know which interfaces tcpdump can use.
You will need to use sudo or have root access in this case.

[root@server ~]# tcpdump -D

Output:

```
[root@fedora ~]# tcpdump -D
1.enp2s0 [Up, Running, Connected]
2.any (Pseudo-device that captures on all interfaces) [Up, Running]
3.lo [Up, Running, Loopback]
4.bluetooth-monitor (Bluetooth Linux Monitor) [Wireless]
5.usbmon2 (Raw USB traffic, bus number 2)
6.usbmon1 (Raw USB traffic, bus number 1)
7.usbmon0 (Raw USB traffic, all USB buses) [none]
8.nflog (Linux netfilter log (NFLOG) interface) [none]
9.nfqueue (Linux netfilter queue (NFQUEUE) interface) [none]
```

5) ping:

Ping is a tool that 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.

Output:

```
[student@fedora ~]$ ping fedora
PING fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0) 56 data bytes
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=1 ttl=64 time=0.082 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=2 ttl=64 time=0.068 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=3 ttl=64 time=0.063 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=4 ttl=64 time=0.068 ms
64 bytes from fedora (fe80::e5d3:4ba6:f3f4:5526%enp2s0): icmp_seq=5 ttl=64 time=0.063 ms
```

Result:

Thus, the Basic Linux commands have been executed successfully.

Exp. No. 02	Study of different types of Network cables				
Date: 26.07.24					

Understand different types of network cable.

Different type of cables used in networking are:

1. Unshielded Twisted Pair (UTP) Cable
2. Shielded Twisted Pair (STP) Cable
3. Coaxial Cable
4. Fibre Optic Cable

Cable type	Category	Maximum Data Transmission	Advantages/ Disadvantages	Application/Use	Image
UTP	Category 3	10 bps	Advantages <ul style="list-style-type: none"> * Cheaper in cost * Easy to install as they have a smaller overall diameter. Disadvantages <ul style="list-style-type: none"> * More prone to (EMI) Electromagnetic interference and noise 	10Base-T Ethernet	
	Category 5	Up to 100 Mbps		Fast Ethernet, Gigabit Ethernet	
	Category 5	1Gbps		Fast Ethernet, Gigabit Ethernet	
STP	Category 6,6a	10Gbps	Advantages <ul style="list-style-type: none"> *Shielded. *Faster than UTP *Less susceptible to noise and interference Disadvantages <ul style="list-style-type: none"> *Expensive *Greater installation effort 	Gigabit Ethernet, 10G Ethernet (55m) Widely used in data centers	
	Category 7	10Gbps		Gigabit Ethernet, 10G Ethernet (100m)	
Coaxial cable	RG-6 RG-59 RG-11	10-100Mbps	Advantages <ul style="list-style-type: none"> *High bandwidth *Immune to interference *Low loss 	Speed of signal is 500m Television network High speed internet connections	

			<p>bandwidth * Versatile</p> <p>Disadvantages *Limited distance * Cost * Size is bulky</p>		
Fiber optics cable	Single mode Multi mode	100Gbps	<p>Advantages *High speed *High bandwidth *High security *Long distance</p> <p>Disadvantages *Expensive * Requires skilled installers</p>	Maximum distance of fiber optics cable is around 100 meters	

Result:

Thus the study of different types of networking cable has been completed successfully.

Exp. No. 03	
Date: 27.07.24	

Study of Socket Programming

What is Socket Programming?

Socket Programming is a way of connecting two nodes on a network to communicate with each other. One socket or node listens on a particular port at an IP, while other socket reaches out to the other to form a connection. The server forms the listener socket while the client reaches out to the server. They are the real backbones behind web browsing.

In simpler terms, there is a server and a client. Socket programming is started by importing the socket module or framework. This module consists of built-in methods that are required for creating sockets and help them associate with each other.

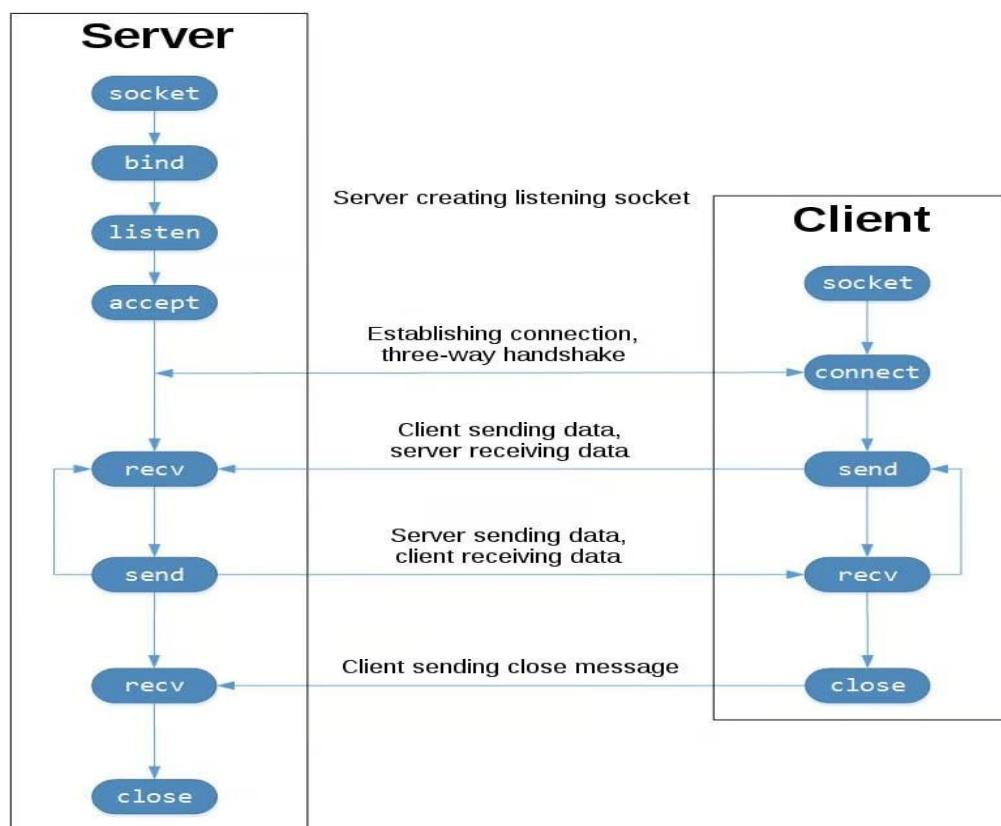
Types of Socket Programming:

- **TCP**

A connection-oriented protocol that's best for direct communication where reliability is important. TCP is used for web browsing, email, text messaging, and file transfers. TCP sockets establish a persistent connection between two processes, and data packets arrive in the correct order.

- **UDP**

A connectionless protocol that's best for real-time data transmission when speed is more important than reliability. UDP is used for online gaming, live streaming, and DNS protocols. UDP sockets prioritize time over reliability, and there is no session between the client and the server.



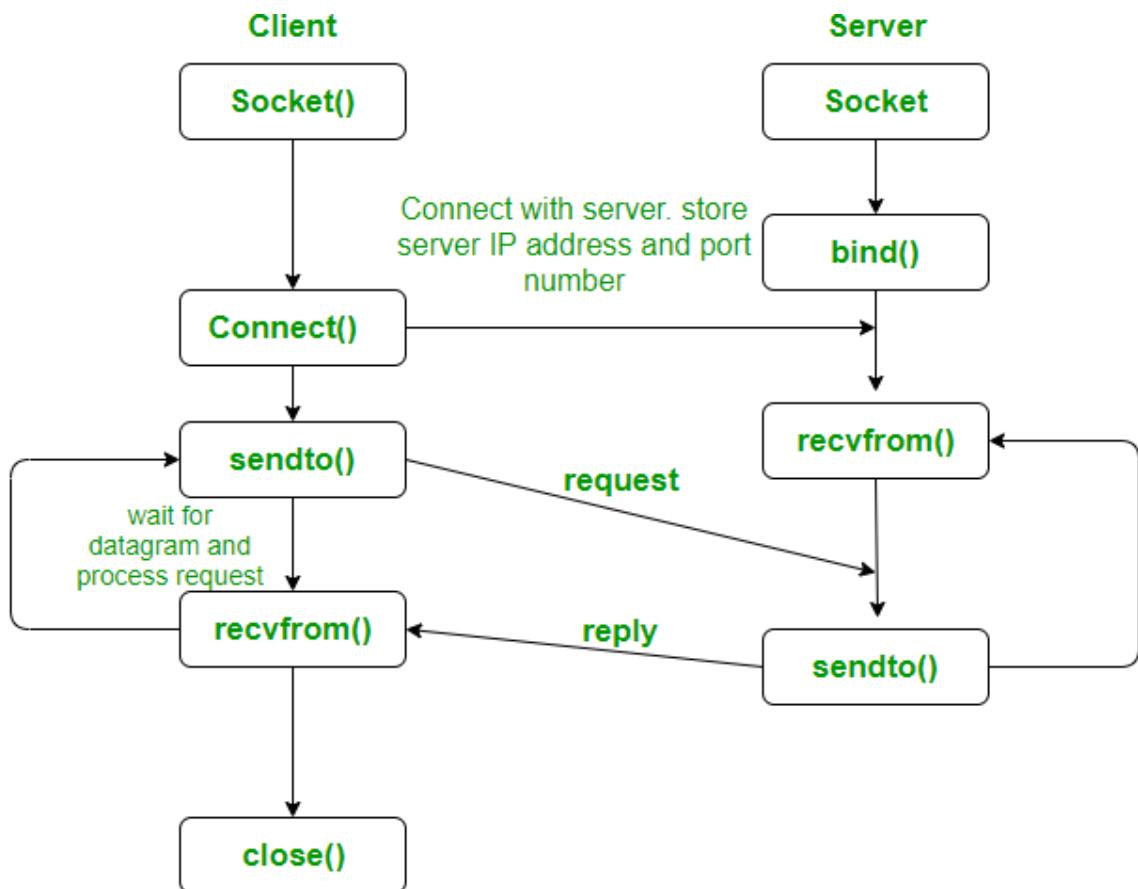
TCP Sockets:

Function Call	Description
Socket()	To create a socket
Bind()	It's a socket identification like a telephone number to contact
Listen()	Ready to receive a connection
Connect()	Ready to act as a sender
Accept()	Confirmation, it is like accepting to receive a call from a sender
Read()	To receive data
Close()	To close a connection
Write()	To send data

Steps for TCP Connection:

- **Create a socket:** The server creates a socket and listens for connections
- **Connect:** The client creates a socket and connects to the server's socket
- **Establish a connection:** The client and server use a three-way handshake to establish a connection
- **Transfer data:** Data is broken into segments and transmitted over the network
Acknowledge: The receiving end acknowledges the segments to ensure reliable delivery
- **Regulate flow:** TCP regulates the flow of data to prevent the sender from overwhelming the receiver
- **Terminate connection:** The connection is terminated using a four-way handshake Close sockets: The sockets are closed

UDP Sockets:



Function Call	Description
Socket.socket()	Creates a new UDP socket.
Socket.bind(address)	Binds the socket to a specified IP address and port.
Socket.sendto(data, address)	Sends data to a specified address.
Socket.recvfrom(buffsize)	Receives data from the socket, returning the data and the address of the sender.
Socket.close()	Closes the socket to free up resources.

STEPS FOR UDP CONNECTION :

UDP Server :

5. Create a UDP socket.
6. Bind the socket to the server address.
7. Wait until the datagram packet arrives from the client.
8. Process the datagram packet and send a reply to the client.
9. Go back to Step 3.

UDP Client :

1. Create a UDP socket.
2. Send a message to the server.
3. Wait until a response from the server is received.
4. Process the reply and go back to step 2, if necessary
5. Close socket descriptor and exit.

Result:

Thus the study of Socket Programming has been completed successfully.

Exp. No. 04	Implementation Of Echo Client/Server Application Using TCP
Date: 02.08.24	

Aim:

To develop Echo server and client program using TCP sockets

Program:

Server.py

```
from socket import *
s = socket(AF_INET,SOCK_STREAM)
s.bind(("",8000))
s.listen(5)
while True:
    c,a = s.accept()
    print("Received connection from",a)
    data=c.recv(100).decode()
    print(data)
    c.send(data.encode('utf-8'))
    c.close()
```

Client.py

```
from socket import *
s = socket(AF_INET,SOCK_STREAM)
s.connect(("127.0.0.1",8000))
op=" Hello "
s.send(op.encode('utf-8'))
data=s.recv(100).decode()
print(data)
s.close()
```

Output:

Server.py

```
*IDLE Shell 3.10.11*
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr 5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: E:\221001072\Server-TCP.py =====
Received connection from ('127.0.0.1', 55209)
Hello
```

Client.py

```
*IDLE Shell 3.10.11*
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr 5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: E:\221001072\Client-TCP.py =====
Hello
>>>
```

Result:

Thus the implementation of the echo server and client program using TCP has been executed successfully.

Exp. No. 05
Date: 03.08.24

Implementation Of Echo Client/Server Application Using UDP

Aim:

To develop Echo server and client program using UDP sockets

Program:

Server.py

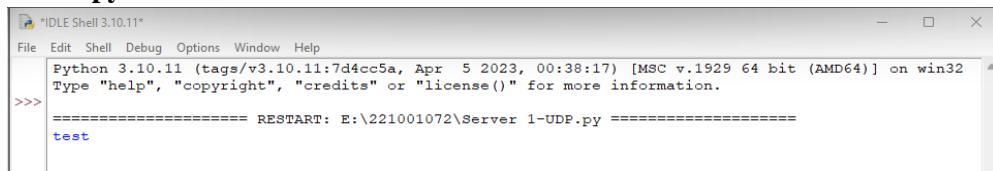
```
import socket
server_socket=socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
server_socket.bind(("127.0.0.1",12000))
while True:
    m,address=server_socket.recvfrom(1024)
    n=m.decode()
    print(n)
    server_socket.sendto(n.encode('utf-8'),address)
```

Client.py

```
import socket
client_socket=socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
Message = 'test'
addr=("127.0.0.1",12000)
client_socket.sendto(Message.encode('utf-8'),addr)
data,server=client_socket.recvfrom(1024)
m=data.decode()
print(m)
```

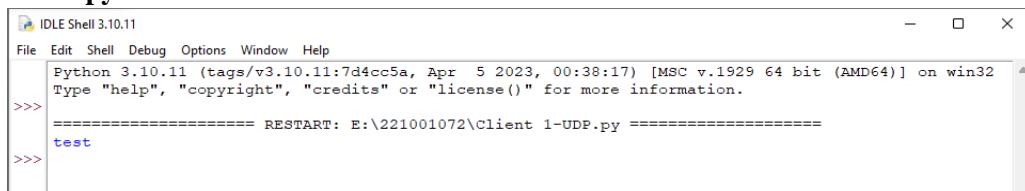
Output:

Server.py



```
*IDLE Shell 3.10.11*
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr  5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> ===== RESTART: E:\221001072\server 1-UDP.py =====
test
```

Client.py



```
*IDLE Shell 3.10.11*
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr  5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> ===== RESTART: E:\221001072\client 1-UDP.py =====
test
>>>
```

Result:

Thus the implementation of the echo server and client program using UDP has been executed successfully.

Exp. No. 06
Date: 09.08.24

Implementation Of Chat Application Using TCP

Aim:

To develop a Chat server and client program using sockets in pythons.

Program:

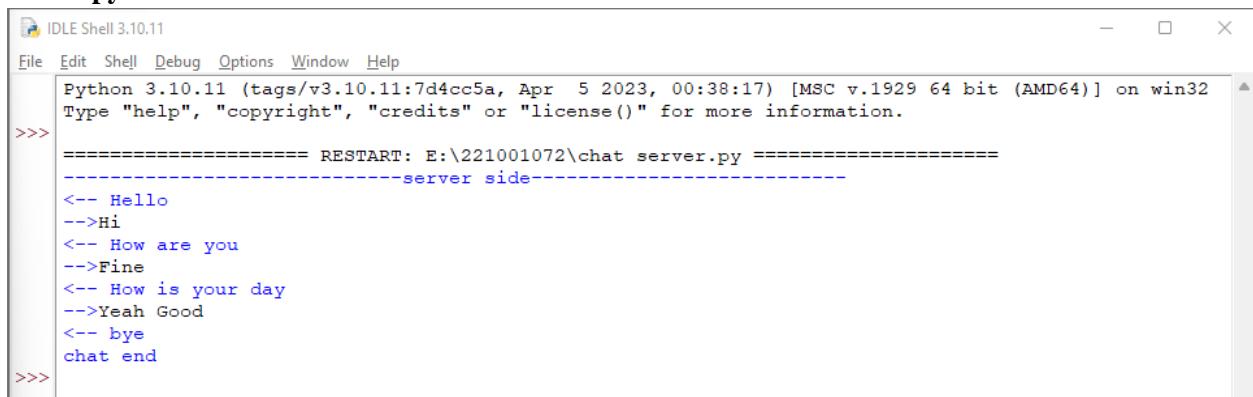
Server.py

```
from socket import *
s = socket(AF_INET,SOCK_STREAM)
s.bind(("",12000))
s.listen(5)
print("-----server side-----")
c,a = s.accept()
while True:
    data=c.recv(100).decode()
    print("<--",data)
    if(data=="bye" or data=="Bye" or data=="BYE"):
        p="bye"
        c.send(p.encode('utf-8'))
        print("chat end")
        break
    msg=input("-->,)
    c.send(msg.encode('utf-8'))
```

```
Client.py
from socket import *
s=socket(AF_INET,SOCK_STREAM)
s.connect(("127.0.0.1",12000))
print("-----client side-----")
while True:
    msg=input("-->,")
    s.send(msg.encode('utf-8'))
    data=s.recv(100).decode()
    print("<--",data)
    if(data=="bye" or data=="Bye" or data=="BYE"):
        print("chat end")
        break
```

Output:

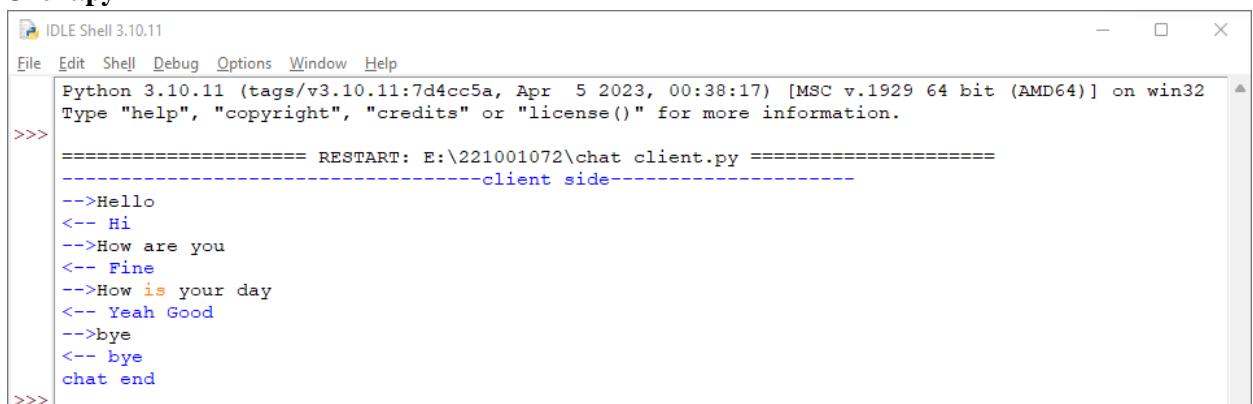
Server.py



```
IDLE Shell 3.10.11
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr 5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: E:\221001072\chat server.py =====
-----server side-----
<- Hello
-->Hi
<- How are you
-->Fine
<- How is your day
-->Yeah Good
<- bye
chat end
>>>
```

Client.py



```
IDLE Shell 3.10.11
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr 5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: E:\221001072\chat client.py =====
-----client side-----
-->Hello
<- Hi
-->How are you
<- Fine
-->How is your day
<- Yeah Good
-->bye
<- bye
chat end
>>>
```

Result:

Thus the implementation of a chat application using TCP has been executed successfully.

Exp. No. 07	Uppercase Converter Using UDP Socket
Date: 10.08.24	

To develop a program to do uppercase conversion using UDP in sockets.

Program:

Server.py

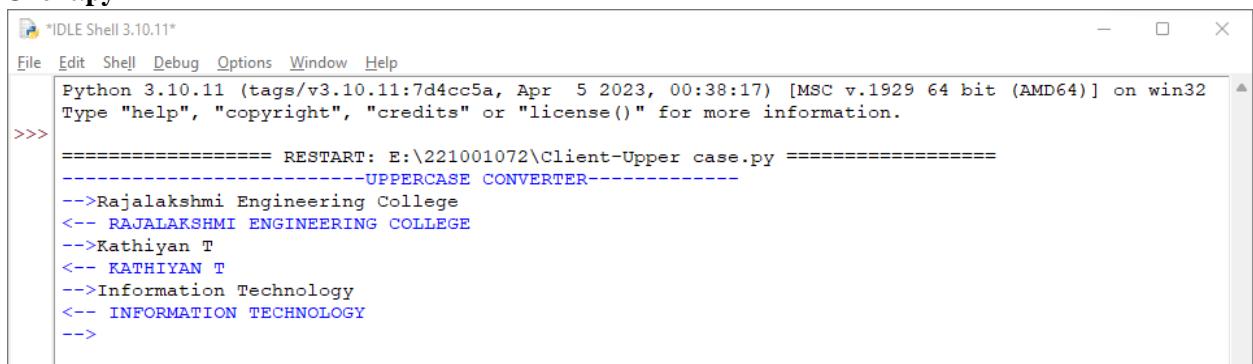
```
import socket
server_socket = socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
server_socket.bind(("127.0.0.1",12000))
print("-----UPPERCASE CONVERTER-----")
while True:
    message, address = server_socket.recvfrom(1024)
    f = message.upper()
    server_socket.sendto(f,address)
```

Client.py

```
import socket
client_socket = socket.socket(socket.AF_INET,socket.SOCK_DGRAM)
print("-----UPPERCASE CONVERTER-----")
while True:
    msg = input("-->")
    m = str.encode(msg)
    addr = ("127.0.0.1",12000)
    client_socket.sendto(m,addr)
    data,server = client_socket.recvfrom(1024)
    print("<--",data.decode())
```

Output:

Client.py



```
*IDLE Shell 3.10.11*
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr  5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=====
RESTART: E:\221001072\Client-Upper case.py =====
-----UPPERCASE CONVERTER-----
-->Rajalakshmi Engineering College
<-- RAJALAKSHMI ENGINEERING COLLEGE
-->Kathiyan T
<-- KATHIYAN T
-->Information Technology
<-- INFORMATION TECHNOLOGY
-->
```

Result:

Thus the Python program for Uppercase conversion using UDP has been executed successfully.

Exp. No. 08	Calculator Application Using TCP Socket
Date: 16.08.24	

Aim:

To develop a program to do Calculator Application using TCP in sockets.

Program:

Server.py

```
from socket import*
s=socket(AF_INET,SOCK_STREAM)
s.bind(("",8000))
s.listen(5)
print("=====CALCULATOR=====")
c,a=s.accept()
while True:
    data=c.recv(100).decode()
    if(data=='1'):
        f=("Enter 1st value")
        c.send(f.encode('utf-8'))
        d1=c.recv(100).decode()
        print(d1)
        d3=int(d1)
        g=("enter 2nd value")
        c.send(g.encode('utf-8'))
        d2=c.recv(100).decode()
        print(d2)
        d4=int(d2)
        ans=d3+d4
        ans1=str(ans)
        c.send(ans1.encode('utf-8'))
    if(data=='2'):
        f = ("Enter 1st value")
        c.send(f.encode('utf-8'))
        d1 = c.recv(100).decode()
        print(d1)
        d3=int(d1)
        g=("enter 2nd value")
        c.send(g.encode('utf-8'))
        d2=c.recv(100).decode()
        print(d2)
        d4=int(d2)
        ans=d3-d4
        ans1=str(ans)
        c.send(ans1.encode('utf-8'))
    if(data=='3'):
        f = ("Enter 1st value")
        c.send(f.encode('utf-8'))
        d1 = c.recv(100).decode()
        print(d1)
        d3=int(d1)
        g=("enter 2nd value")
        c.send(g.encode('utf-8'))
        d2=c.recv(100).decode()
        print(d2)
```

```

d4=int(d2)
ans=d3*d4
ans1=str(ans)
c.send(ans1.encode('utf-8'))
if(data=='4'):
    f = ("Enter 1st value")
    c.send(f.encode('utf-8'))
    d1 = c.recv(100).decode()
    print(d1)
    d3=int(d1)
    g=("enter 2nd value")
    c.send(g.encode('utf-8'))
    d2=c.recv(100).decode()
    print(d2)
    d4=int(d2)
    ans=d3/d4
    ans1=str(ans)
    c.send(ans1.encode('utf-8'))
if(data=='5'):
    ans1="end"
    c.send(ans1.encode('utf-8'))
    break

```

Client.py

```

from socket import *
s = socket(AF_INET,SOCK_STREAM)
s.connect(("127.0.0.1",8000))
print("-----client side-----")
while True:
    msg=input("-->,")

    s.send(msg.encode('utf-8'))
    data=s.recv(100).decode()
    print("<--",data)
    if(msg=="5"):
        print("chat end")
        break
    for i in range(1,3):
        msg1=input("-->,")

        s.send(msg1.encode('utf-8'))
        data=s.recv(100).decode()
        print("<--",data)

```

Output:

Server.py

```

IDLE Shell 3.10.11
File Edit Shell Debug Options Window Help
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr  5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: E:\221001072\Server-Calculator.py =====
=====CALCULATOR=====
7
9
20
2
5
5
14
7
1>>>

```

Client.py

```
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr  5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ====== RESTART: E:\221001072\Client-Calculator.py ======
-----client side-----
-->1
<-- Enter 1st value
-->7
<-- enter 2nd value
-->9
<-- 16
-->2
<-- Enter 1st value
-->20
<-- enter 2nd value
-->2
<-- 18
-->3
<-- Enter 1st value
-->5
<-- enter 2nd value
-->5
<-- 25
-->4
<-- Enter 1st value
-->14
<-- enter 2nd value
-->7
<-- 2.0
-->5
<-- end
chat end
>>>
```

Result:

Thus the Python program for Calculator Application using TCP has been executed successfully.

Exp. No. 09	Dictionary Application Using UDP Socket
Date: 17.08.24	

Aim:

To develop a program for Dictionary Application using UDP in sockets.

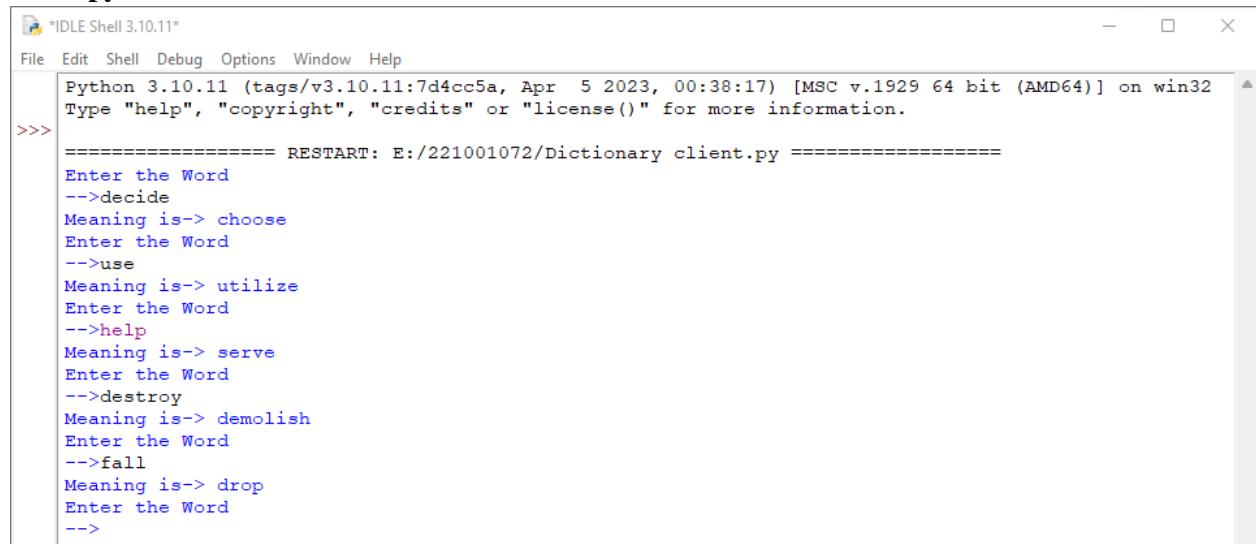
Program:

Server.py

```
from socket import *
s = socket(AF_INET,SOCK_STREAM)
s.bind(("",4000))
s.listen(5)
c,a = s.accept()
while True:
    data_received = c.recv(100).decode()
    a={'use':'utilize','destroy':'demolish','fall':'drop','decide':'choose','help':'serve'}
    data_tosend = a[data_received]
    c.send(data_tosend.encode('utf-8'))
```

Client.py

```
from socket import *
s = socket(AF_INET,SOCK_STREAM)
s.connect(("127.0.0.1",4000))
while True:
    print("Enter the Word")
    data_tosend=input("-->,")
    s.send(data_tosend.encode('utf'))
    data_received=s.recv(100).decode()
    print("Meaning is->",data_received)
```

Output:**Client.py**

The screenshot shows an IDLE Shell window with the title "*IDLE Shell 3.10.11*". The window contains Python code and its execution output. The Python version is 3.10.11, and it's running on Windows 10. The code is a client application for a dictionary service, specifically 'Dictionary client.py'. It prints several lines of text, each starting with 'Meaning is->'. These lines correspond to words and their meanings from the provided word-meaning pairs.

```
Python 3.10.11 (tags/v3.10.11:7d4cc5a, Apr  5 2023, 00:38:17) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>>
=====
RESTART: E:/221001072/Dictionary client.py =====
Enter the Word
-->decide
Meaning is-> choose
Enter the Word
-->use
Meaning is-> utilize
Enter the Word
-->help
Meaning is-> serve
Enter the Word
-->destroy
Meaning is-> demolish
Enter the Word
-->fall
Meaning is-> drop
Enter the Word
-->
```

Result:

Thus the Python program for Calculator Application using TCP has been executed successfully.

Exp. No. 10	Simple Ping Application Using UDP Socket
Date: 23.08.24	

Aim:

To develop a program for Simple Ping Application Using UDP in Sockets.

Program:

Server.py:

```
import socket
def start_server(host='127.0.0.1', port=12345):
    with socket.socket(socket.AF_INET, socket.SOCK_DGRAM) as s:
        s.bind((host, port))
        print(f"UDP Server running on {host}:{port}")
        while True:
            data, addr = s.recvfrom(1024)
            print(f"Received message from {addr}: {data.decode()}")
            s.sendto(b'Ping', addr)
if __name__ == "__main__":
    start_server()
```

Client.py:

```
import socket
import time
def ping_server(host='127.0.0.1', port=12345):
    with socket.socket(socket.AF_INET, socket.SOCK_DGRAM) as s:
        try:
            s.settimeout(2)
            start = time.time()
            s.sendto(b'Ping', (host, port))
            data, addr = s.recvfrom(1024)
            end = time.time()
            print(f"Received {data.decode()} from {addr} in {end - start:.2f} seconds")
        except socket.timeout:
            print("Request timed out")
if __name__ == "__main__":
    ping_server()
```

Output:**Server.py**

```
===== RESTART: D:/server.py =====
===
UDP Server running on 127.0.0.1:12345
Received message from ('127.0.0.1', 63929): Ping
Received message from ('127.0.0.1', 63922): Ping
Received message from ('127.0.0.1', 56820): Ping
```

Client.py

```
>>> ===== RESTART: D:/client.py =====
===
Received Ping from ('127.0.0.1', 12345) in 0.01 seconds
>>> ===== RESTART: D:/client.py =====
Received Ping from ('127.0.0.1', 12345) in 0.07 seconds
>>> ===== RESTART: D:/client.py =====
Received Ping from ('127.0.0.1', 12345) in 0.01 seconds
>>>
```

Result:

Thus the Python program for Simple Ping Application Using UDP in Sockets has been executed successfully.

Exp. No. 11	Implementation of Packet Sniffing Using Raw Socket
Date: 24.08.24	

Aim:

To develop a program for Implementation of Packet Sniffing Using Raw Sockets.

Algorithm:

Step 1: Import the necessary library.

Step 2: Capture Network Packet

Step 3: Parse Ethernet Header

Step 4: Parse IP Header

Step 5: Display Parsed Information

Program:

```
import socket
import struct
import binascii
s = socket.socket(socket.AF_INET, socket.SOCK_RAW, socket.IPPROTO_IP)
s.bind(("127.0.0.1", 0))
packet = s.recvfrom(65565)
print(packet)
ethernet_header = packet[0][0:14]
eth_header = struct.unpack("!6s6s2s", ethernet_header)
print("ETHERNET HEADER")
print("*****")
print("Destination Address")
print(binascii.hexlify(eth_header[0]))
print("Source Address")
print(binascii.hexlify(eth_header[1]))
print("Type")
print(binascii.hexlify(eth_header[2]))
print("IP HEADER")
print("*****")
ipheader = packet[0][14:34]
ip_header = struct.unpack("!12s4s4s", ipheader)
print("Destination Address")
print(socket.inet_ntoa(ip_header[1]))
print("Source Address")
print(socket.inet_ntoa(ip_header[2]))
```

Output:



```
idle shell 3.10.6
File Edit Shell Debug Options Window Help
Python 3.10.6 (tags/v3.10.6:9c7b4bd, Aug 1 2022, 21:53:49) [MSC v.1932 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: C:\Users\UGENIURA BABU\M3rpcpacketsniffing.py =====
(b'E\x00\x04\xb6\xc0\x00\x80\x06\x00\x00\x7f\x00\x00\x01\x7f\x00\x00\x00\x00\x00\x05\x40\x06\xbc\xab\x00\x00\x00\x80\x02\xff\xff\xea\x0e\x00\x02\x04\xff\xd7\x01\x03\x03\x08\x01\x01\x04\x02', ('127.0.0.1', 0))
ETHERNET HEADER
*****
Destination Address
b'45000034b6c0'
Source Address
b'400000060000'
Type
b'?FOO'
IP HEADER
*****
Destination Address
188.171.0.0
Source Address
0.0.128.2
>>>
```

Result:

Thus the Python program for Implementation of Packet Sniffing Using Raw Sockets has been executed successfully.

Exp. No. 12	Error Correction at Data Link Layer
Date: 30.08.24	

Aim:

To write a python program to implement error detection and correction using the Hamming Code concept.

Algorithm:

Encoding:

Step 1: Accept a 4-bit binary string as input data

Step 2: Check if the input data consists of exactly 4 bits and contains only 0's and 1's

Step 3: Convert the binary string into a list of integers

Step 4: Use a predefined generator matrix G for Hamming (7,4) encoding

Step 5: Multiply the data bits by the generator matrix G to calculate the 7-bit encoded data. Perform bitwise operations and store the result in a new list

Step 6: Return the 7-bit encoded data as a string

Decoding:

Step 1: Accept a 7-bit encoded binary string

Step 2: Check if the input encoded data consists of exactly 7 bits and contains only 0's and 1's

Step 3: Convert the binary string into a list of integers

Step 4: Use a predefined parity-check matrix H for Hamming (7,4)

Step 5: Multiply the received bits by the matrix **H** to calculate the syndrome, which helps detect errors

Step 6: Convert the syndrome to a decimal value to determine the error position, if any. If an error is found, correct the erroneous bit

Step 7: Extract the original 4 data bits from the corrected 7-bit sequence

Step 8: Return the decoded 4-bit data and the error position (if any)

Program:

```
def encode_hamming_7_4(data_bits):
    if len(data_bits) != 4 or any(bit not in '01' for bit in data_bits):
        raise ValueError("Data bits must be a 4-bit binary string.")
    d = list(map(int, data_bits))
    G = [
        [1, 1, 0, 1, 0, 0, 0],
        [1, 0, 1, 1, 0, 0, 0],
        [1, 0, 0, 1, 1, 0, 0],
        [0, 1, 1, 1, 0, 0, 0],
        [0, 1, 0, 1, 1, 0, 0],
        [0, 0, 1, 1, 1, 0, 0],
        [0, 0, 0, 1, 1, 1, 1]
    ]
    encoded_bits = [0] * 7
    for i in range(7):
        encoded_bits[i] = sum(G[i][j] * d[j] for j in range(4)) % 2
    return ''.join(map(str, encoded_bits))

def decode_hamming_7_4(encoded_bits):
    if len(encoded_bits) != 7 or any(bit not in '01' for bit in encoded_bits):
        raise ValueError("Encoded bits must be a 7-bit binary string.")
    r = list(map(int, encoded_bits))
```

```

H = [
    [1, 1, 1, 0, 0, 0, 0],
    [1, 1, 0, 1, 0, 0, 0],
    [1, 0, 1, 0, 1, 0, 0],
    [0, 1, 1, 0, 0, 1, 0],
    [0, 1, 0, 1, 0, 0, 1],
    [0, 0, 1, 1, 1, 0, 0],
    [0, 0, 0, 0, 1, 1, 1]
]
syndrome = [0] * 3
for i in range(3):
    syndrome[i] = sum(H[i][j] * r[j] for j in range(7)) % 2
error_pos = int("".join(map(str, syndrome[::1])), 2) - 1
if error_pos >= 0:
    r[error_pos] ^= 1
data_bits = [r[2], r[4], r[5], r[6]]
return "".join(map(str, data_bits)), error_pos
data_bits = '1010'
encoded = encode_hamming_7_4(data_bits)
print(f"Encoded bits: {encoded}")
encoded_with_error = encoded[:2] + ('1' if encoded[2] == '0' else '0') + encoded[3:]
print(f"Encoded bits with error: {encoded_with_error}")
decoded, error_position = decode_hamming_7_4(encoded_with_error)
print(f"Decoded bits: {decoded}")
print(f"Error position: {error_position}" if error_position >= 0 else "No error detected")

```

Output:

```

IDLE Shell 3.10.4
File Edit Shell Debug Options Window Help
Python 3.10.4 (tags/v3.10.4:9d38120, Mar 23 2022, 23:13:41) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> ===== RESTART: C:\Users\Lenovo\Desktop\hamming code.py =====
Encoded bits: 1011010
Encoded bits with error: 1001010
Decoded bits: 0110
Error position: 4
>>>

```

Result:

Thus the Python program to implement error detection and correction using Hamming Code has been executed successfully.

Exp. No. 13	Sliding Window Protocol
Date: 31.08.24	

Aim:

Write a program to implement flow control at the data link layer using SLIDING WINDOW PROTOCOL. Simulate the flow of frames from one node to another.

Algorithm:

- Step 1:** Initialize frames from 1 to total_frames, acknowledged array to False, and set sender_window_start to 0.
- Step 2:** While sender_window_start is less than total_frames, calculate window_end and display current window.
- Step 3:** For each unacknowledged frame in the window, simulate sending the frame with a random delay.
- Step 4:** Simulate ACK reception for each frame with an 80% chance of success.
- Step 5:** Mark frames as acknowledged if ACK is received; otherwise, leave them unacknowledged.
- Step 6:** Slide the window by moving sender_window_start to the first unacknowledged frame.
- Step 7:** Repeat steps 2-6 until all frames are sent and acknowledged.

Program:

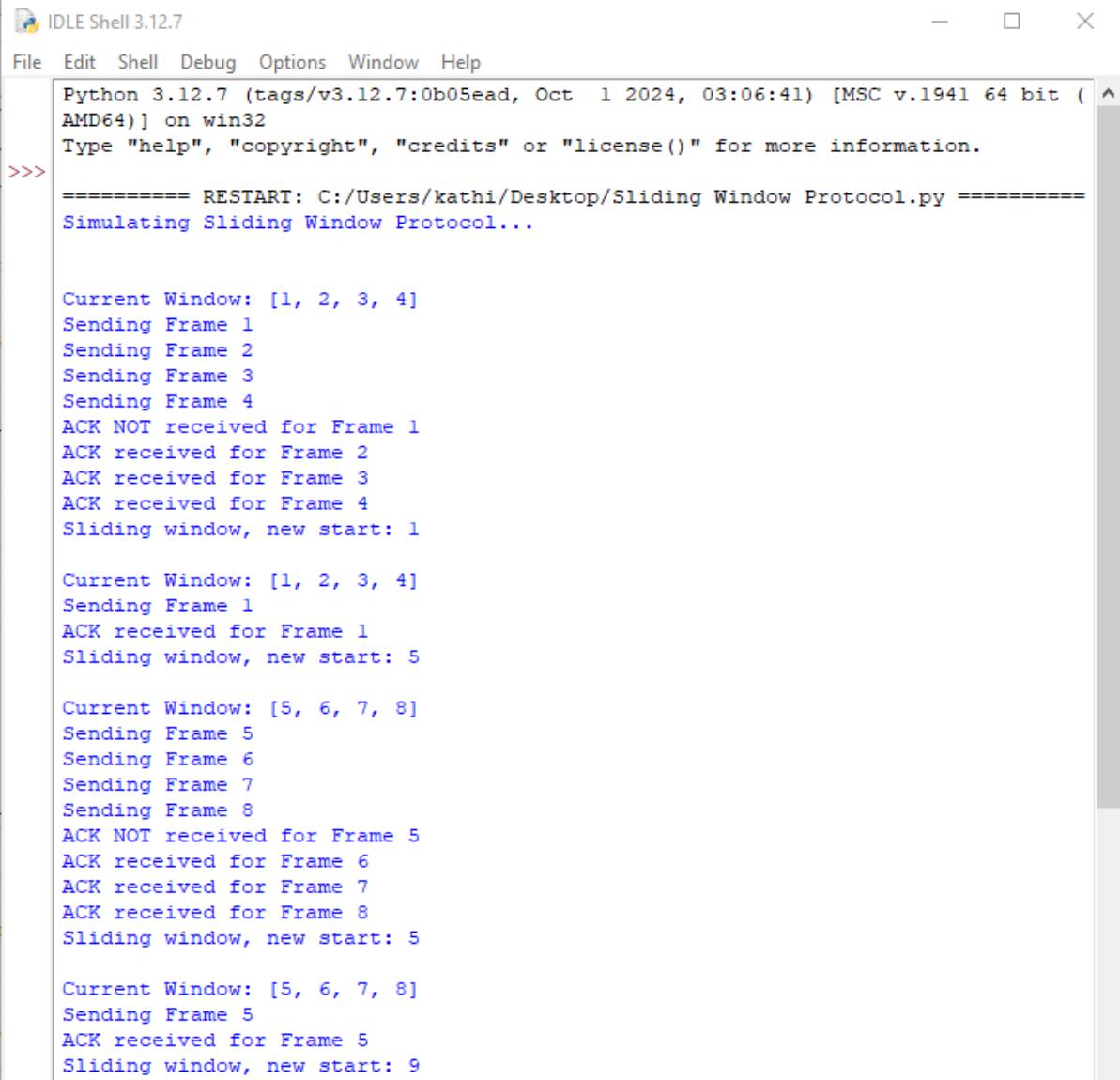
```
import time
import random
class SlidingWindowProtocol:
    def __init__(self, window_size, total_frames):
        self.window_size = window_size
        self.total_frames = total_frames
        self.frames = list(range(1, total_frames + 1))
        self.acknowledged = [False] * total_frames
        self.sender_window_start = 0
    def send_frame(self, frame_number):
        print(f"Sending Frame {frame_number}")
        time.sleep(random.uniform(0.1, 0.3))
    def receive_ack(self, frame_number):
        return random.random() < 0.8
    def send_frames(self):
        while self.sender_window_start < self.total_frames:
            window_end = min(self.sender_window_start + self.window_size, self.total_frames)
            print(f"\nCurrent Window: {self.frames[self.sender_window_start:window_end]}")
            for i in range(self.sender_window_start, window_end):
                if not self.acknowledged[i]:
                    self.send_frame(self.frames[i])
                    self.receive_acks()
    def receive_acks(self):
        window_end = min(self.sender_window_start + self.window_size, self.total_frames)
        for i in range(self.sender_window_start, window_end):
            if not self.acknowledged[i]:
                if self.receive_ack(self.frames[i]):
                    print(f"ACK received for Frame {self.frames[i]}")
                    self.acknowledged[i] = True
                else:
                    print(f"ACK NOT received for Frame {self.frames[i]}")
        self.slide_window()
```

```

def slide_window(self):
    while self.sender_window_start < self.total_frames and
self.acknowledged[self.sender_window_start]:
        self.sender_window_start += 1
        print(f"Sliding window, new start: {self.sender_window_start + 1}")
if __name__ == "__main__":
    window_size = 4
    total_frames = 10
    print("Simulating Sliding Window Protocol...\n")
    protocol = SlidingWindowProtocol(window_size, total_frames)
    protocol.send_frames()
    print("\nAll frames sent and acknowledged!")

```

Output:



```

IDLE Shell 3.12.7
File Edit Shell Debug Options Window Help
Python 3.12.7 (tags/v3.12.7:0b05ead, Oct  1 2024, 03:06:41) [MSC v.1941 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=====
RESTART: C:/Users/kathi/Desktop/Sliding Window Protocol.py =====
Simulating Sliding Window Protocol...

Current Window: [1, 2, 3, 4]
Sending Frame 1
Sending Frame 2
Sending Frame 3
Sending Frame 4
ACK NOT received for Frame 1
ACK received for Frame 2
ACK received for Frame 3
ACK received for Frame 4
Sliding window, new start: 1

Current Window: [1, 2, 3, 4]
Sending Frame 1
ACK received for Frame 1
Sliding window, new start: 5

Current Window: [5, 6, 7, 8]
Sending Frame 5
Sending Frame 6
Sending Frame 7
Sending Frame 8
ACK NOT received for Frame 5
ACK received for Frame 6
ACK received for Frame 7
ACK received for Frame 8
Sliding window, new start: 5

Current Window: [5, 6, 7, 8]
Sending Frame 5
ACK received for Frame 5
Sliding window, new start: 9

```

```
Current Window: [9, 10]
Sending Frame 9
Sending Frame 10
ACK NOT received for Frame 9
ACK NOT received for Frame 10
Sliding window, new start: 9

Current Window: [9, 10]
Sending Frame 9
Sending Frame 10
ACK received for Frame 9
ACK received for Frame 10
Sliding window, new start: 11

All frames sent and acknowledged!
>>>
```

Result:

Thus the Python program to implement Sliding Window Protocol has been executed successfully.

Exp. No. 14	Study of CISCO Tracker Installation Process
Date: 06.09.24	

Aim:

To study the Packet tracer tool Installation and User Interface Overview.

Introduction:

A simulator, as the name suggests, simulates network devices and its environment. Packet Tracer is an exciting network design, simulation and modelling tool.

1. It allows you to model complex systems without the need for dedicated equipment.
2. It helps you to practice your network configuration and troubleshooting skills via computer or an Android or iOS based mobile device.
3. It is available for both the Linux and Windows desktop environments.
4. Protocols in Packet Tracer are coded to work and behave in the same way as they would on real hardware.

Installing Packet Tracker:

Step 1: To download packet Tracer, go to <https://www.netacad.com> and log in with your credentials.

The screenshot shows the homepage of the Cisco Networking Academy. At the top, there is a navigation bar with the Cisco logo, 'Networking Academy', and links for 'Courses', 'Careers', 'Support', and 'More'. On the right side of the header are 'English' and 'Log In' dropdown menus. Below the header, a large blue banner features the text 'Learn the technology, land your dream job.' and 'Ready to begin, change, or propel your career? Cisco Networking Academy offers certification-aligned courses in topics like cybersecurity, networking, and Python.' Below the banner are four buttons: 'Learners', 'Educators', 'Employers', and 'Partners'. To the right of the banner is a graphic of a globe with the text '25 Years' and the Cisco Networking Academy logo. At the bottom of the page, there is a light blue footer bar with five pieces of information: '17.5 million', '29,300', '11,800', '190', and '95%'. The footer also includes social media icons for LinkedIn, YouTube, Facebook, and Twitter.

Step 2: By clicking on to link <https://www.netacad.com>, a page appears as below.

The screenshot shows the Cisco Networking Academy website. At the top, there's a navigation bar with links for Courses, Careers, Support, and More. A search bar and language selection (English) are also present. The main header reads "Empowering all people with career possibilities". Below it, a sub-header states: "Cisco Networking Academy transforms the lives of learners, educators and communities through the power of technology, education and career opportunities. Available to anyone, anywhere." A message indicates they are currently providing assistance for remote teaching and learning. A yellow button labeled "Explore remote tools and tips" is visible. To the right, there's a photograph of three young adults (two women and one man) looking at a tablet together. Below the photo, a quote reads: "An incredible opportunity is waiting for you. Technology is changing the world by connecting billions of devices and improving how we live, work, play and treat our planet. No industry is immune. Are you ready to change your life, and possibly make the world a better place?" Below the quote are eight circular icons representing different fields: Networking, OS & IT, Programming, Internet of Things, Infrastructure Automation, Cybersecurity, and Packet Tracer. Each icon has a small number next to it indicating the number of courses available.

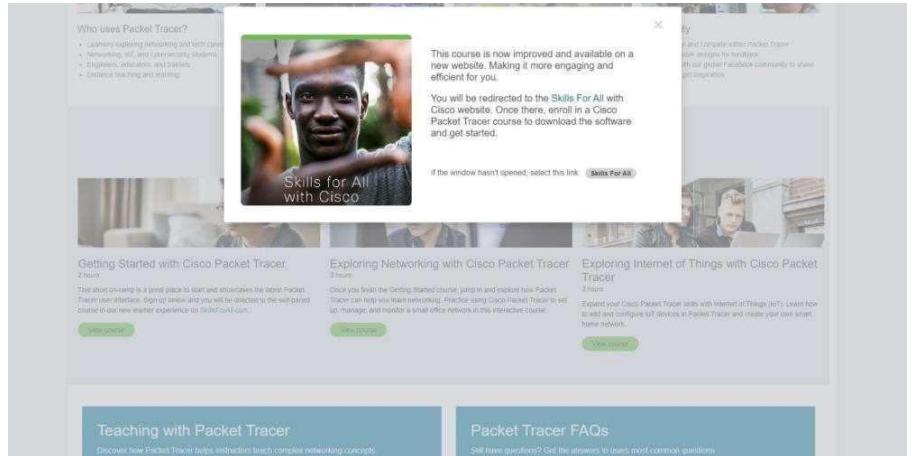
Step 3: As represented as in the below figure choose course -->Packet Tracer.

This screenshot is similar to the previous one but with a mouse cursor hovering over the "Packet Tracer" link in the sidebar menu. A dropdown menu appears, showing "All Courses" as the selected option. The rest of the page content is identical to the first screenshot, including the main header, sub-header, quote, and course icons.

Step 4: By choosing, “Packet Tracer”. The following screen appears as shown in the figure below.

This screenshot shows the Cisco Packet Tracer landing page. It features four main sections: "Who uses Packet Tracer?", "Use it to", "Download for Free", and "Community". Below these are three course cards: "Getting Started with Cisco Packet Tracer", "Exploring Networking with Cisco Packet Tracer", and "Exploring Internet of Things with Cisco Packet Tracer". Each card includes a thumbnail image, a title, a duration, a brief description, and a "View course" button. The "Who uses Packet Tracer?" section shows a person working on a computer. The "Use it to" section shows various networking components like switches and cables. The "Download for Free" section shows two people looking at a computer screen. The "Community" section shows two people talking.

Step 5: By choosing, “getting started with Cisco Packet Tracer”. The following screen appears as shown in the figure below.



Step 6: By clicking on “skill for all” a new page appears as represented below.

This is a detailed view of the "Getting Started with Cisco Packet Tracer" course page. It includes a large image of a person working on a laptop, course title, description, language options (English), and a "Get Started" button. To the right, there's a sidebar with course details: Free, 2 hours, Beginner level, and available in 4 languages (English, Español, Français, Português). There are also sections for achievements and a "Take a Tour" button.

Step 7: Press “get started”. A new screen appears as represented below

A screenshot of a web browser showing the login page for the Cisco Skills for All platform. The page features a blue header with the Cisco logo and a "Welcome!" message. It asks users to log in with their email and password, or to sign up if they don't have an account. There are also links for Google and Facebook login.

Step 8: Login with your Google account or by sign up e-mail and password. Its opens in new screen shown as below.

The screenshot shows a web browser window with the Cisco Networking Academy logo at the top. The main content area displays the 'Getting Started with Cisco Packet Tracer' course. A sidebar on the left lists course modules: 'Getting Started with Cisco Packet Tracer', 'Download and Use Cisco Packet Tracer', 'Cisco Packet Tracer Technical', and 'Course Completion Assessment & Survey'. The main content area has a title 'Module 1: Download and Use Cisco Packet Tracer' and a sub-section '1.0 Install Cisco Packet Tracer'. At the bottom right of the content area, there is a 'Networking Cisco Academy' logo.

Step 9: By clicking “click here to view”, a new page opens as it is shown below.

The screenshot shows a video player interface. The title bar reads 'Module 1: Download and Use Cisco Packet Tracer - Google Chrome'. The video frame shows a woman with dark hair and glasses, wearing a grey sweater, sitting at a desk and looking towards a computer screen. The video player has a progress bar at the bottom left and a 'Networking Cisco Academy' logo at the bottom right.

Step 10: By clicking on “1.0 Install Cisco Packet Tracer”, a new page occurs as shown in the figure below.

The screenshot shows a new page titled '1.0.3 Download Cisco Packet Tracer'. It features a large green circular icon with a white downward arrow in the center. Below the icon, text reads: 'To obtain and install your copy of Cisco Packet Tracer, please follow the instructions from the link below: https://skillsforall.com/resources/lab-downloads'.

Step 11: On clicking the link- <https://skillsforall.com/resources/lab-downloads> a new window opens showing the versions of Packet Tracer as required as shown in the below figure.

The screenshot shows the Cisco Networking Academy Learning Resources page. It features a large image of the Cisco Packet Tracer interface. Below the image, there is a brief description of what Cisco Packet Tracer is and its features. To the right, there is a section titled "To obtain and install your copy of Cisco Packet Tracer, please follow these simple steps:" followed by five numbered steps. Step 1 links to download pages for Mac OS, Ubuntu, and Windows 64-bit versions. Step 5 links to "Cisco Packet Tracer Download and Installation Instructions". A "System Requirements" section at the bottom specifies a computer with Windows 8.1, 10, or 11, Mac OS 10.14 or newer, or Ubuntu 20.04 LTS, an AMD64(x86-64) CPU, 4 GB of RAM, and 1.4 GB of free disk space. Below this, there is a screenshot of a terminal window showing a command being run, with a link to "CyberSecurity Essentials Virtual Machine".

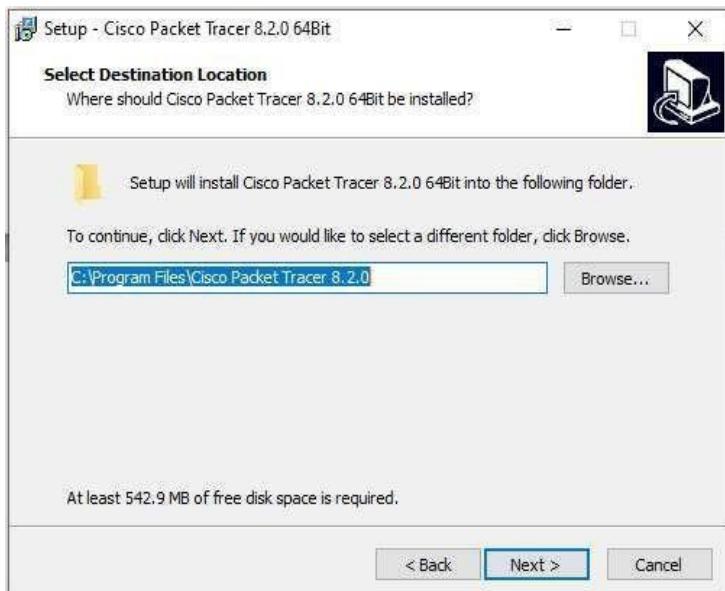
Step 12: Click on the “Packet Tracer 8.2.0 Windows 64bit” and the download will be started automatically.

This screenshot is identical to the one above, but the "Packet Tracer 8.2.0 Windows 64bit" link in Step 1 is highlighted in blue, indicating it has been clicked. The browser's address bar shows the URL for the download page.

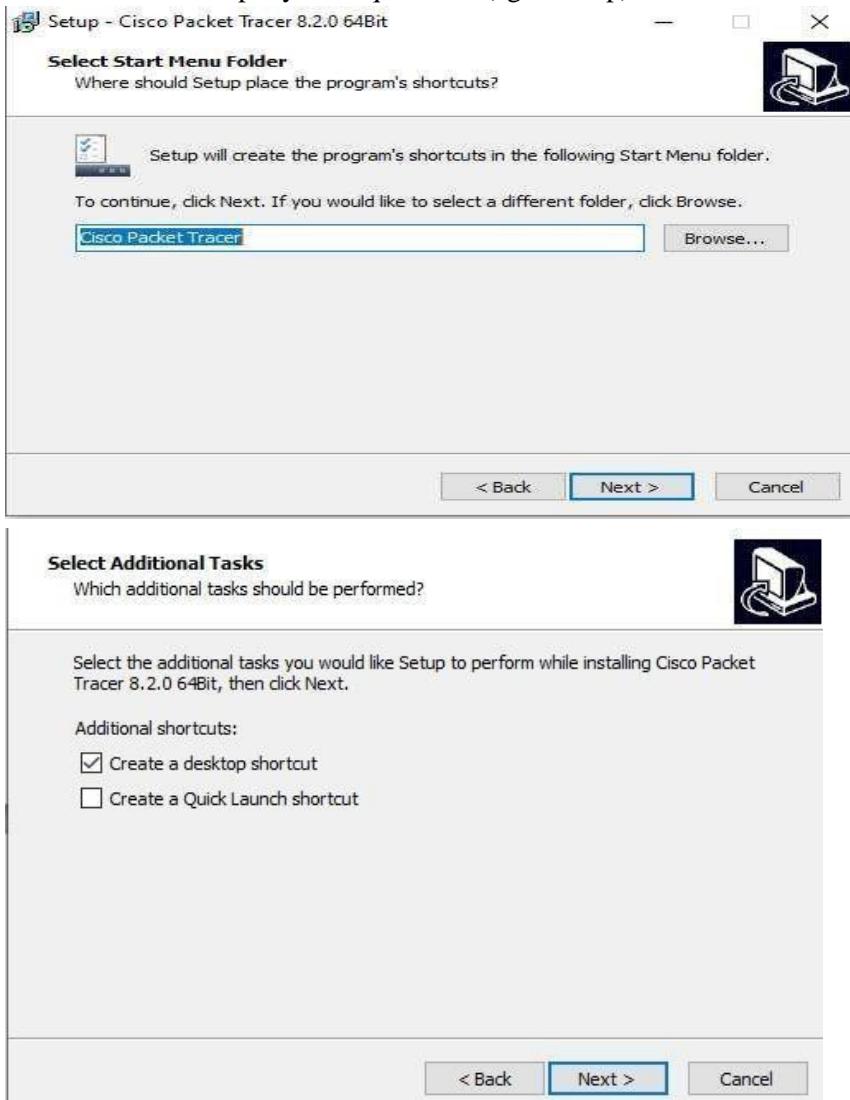
Step 13: After the download is completed, open the packet tracer setup file and agree the condition (License Agreement) and press next.

The screenshot shows the "Setup - Cisco Packet Tracer 8.2.0 64Bit" window. It displays a "License Agreement" page with the heading "License Agreement" and the instruction "Please read the following important information before continuing." There is a small icon of a computer monitor with a network cable. Below this, a text box contains the Cisco End User License Agreement (EULA). At the bottom, there are two radio buttons: "I accept the agreement" (selected) and "I do not accept the agreement". At the very bottom, there are "Next >" and "Cancel" buttons.

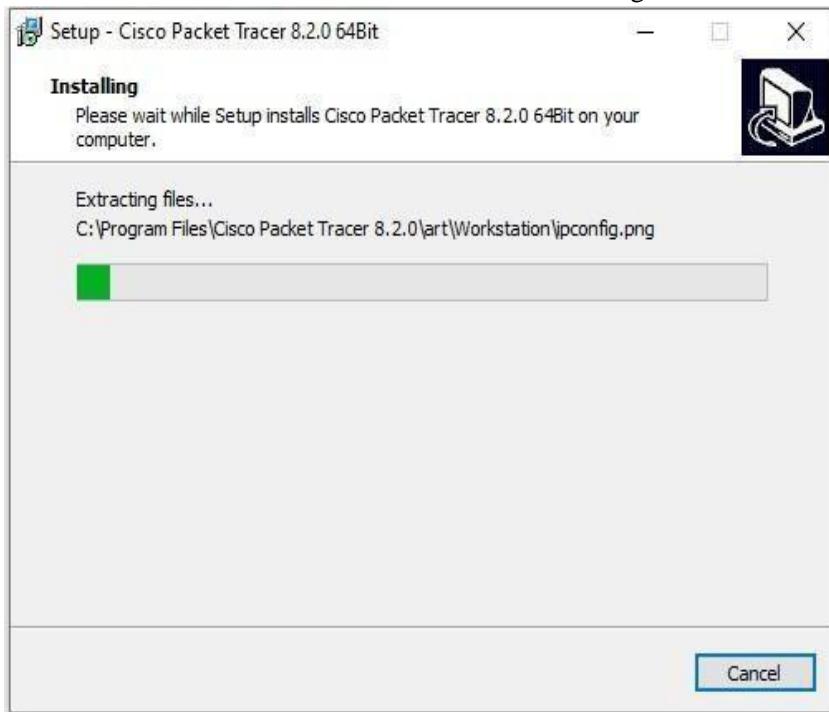
Step 14: Select the file path where the Cisco packet tracer is to be installed as represented below and enter next.



Step 15: Choose shortcut as per your requirement(eg.desktop) and enter next.

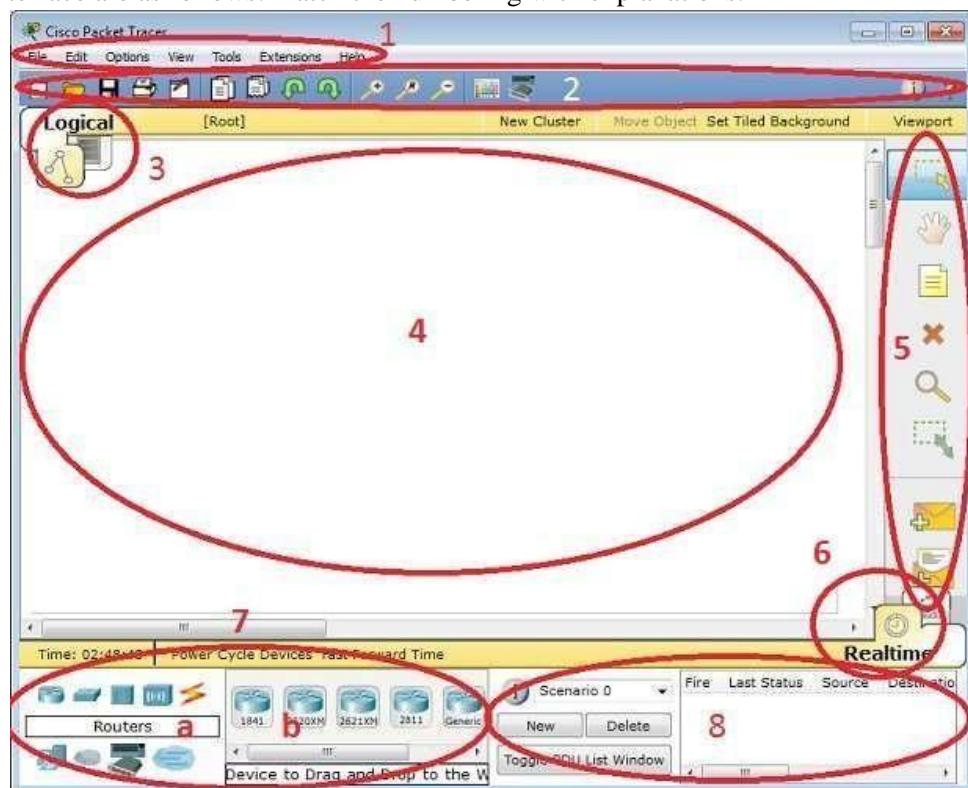


Step 16: Wait for a few minutes until the Cisco Packet Tracer gets installed.



User Interface Overview:

The layout of Packet Tracer is divided into several components. The components of the Packet Tracer interface are as follows: match the numbering with explanations.

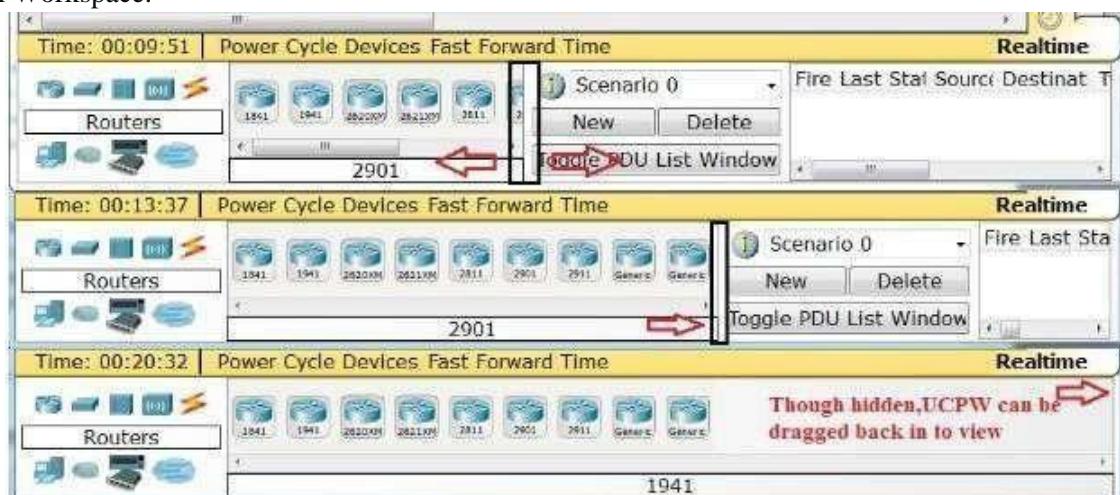


1. **Menu bar** – This is a common menu found in all software applications; it is used to open, save, print, change preferences, and so on.
2. **Main toolbar** – This bar provides shortcut icons to menu options that are commonly accessed, such as open, save, zoom, undo, and redo, and on the right-hand side is an icon for entering network information for the current network.
3. **Logical/Physical workspace tabs** – These tabs allow you to toggle between the Logical

- and Physical work areas.
4. **Workspace** – This is the area where topologies are created and simulations are displayed.
 5. **Common tools bar** – This toolbar provides controls for manipulating topologies, such as select, move layout, place note, delete, inspect, resize shape, and add simple/complex PDU.
 6. **Real-time/Simulation** tabs – These tabs are used to toggle between the real and simulation modes. Buttons are also provided to control the time, and to capture the packets.
 7. **Network component box** – This component contains all of the network and end devices available with Packet Tracer, and is further divided into two areas: Area 7a: Device-type selection box – This area contains device categories Area 7b: Device-specific selection box – When a device category is selected, this selection box displays the different device models within that category
 8. **User-created packet box** – Users can create highly-customized packets to test their topology from this area, and the results are displayed as a list.

Workspaces and Modes:

Packet Tracer has two workspaces (Logical and Physical) and two modes (Realtime and Simulation). Upon startup, you are in the Logical Workspace in Realtime Mode. You can build your network and see it run in real time in this configuration. You can switch to Simulation Mode to run controlled networking scenarios. You can also switch to the Physical Workspace to arrange the physical aspects (such as the location) of your devices. Note that you view a simulation while you are in the Physical Workspace. You should return to the Logical Workspace after you are done in the Physical Workspace.



Result:

Thus, the installation of cisco packet tracer is successfully implemented.

Exp. No. 15	
Date: 13.09.24	

Creating a Simple Network with Two End Devices (Simple PDU)

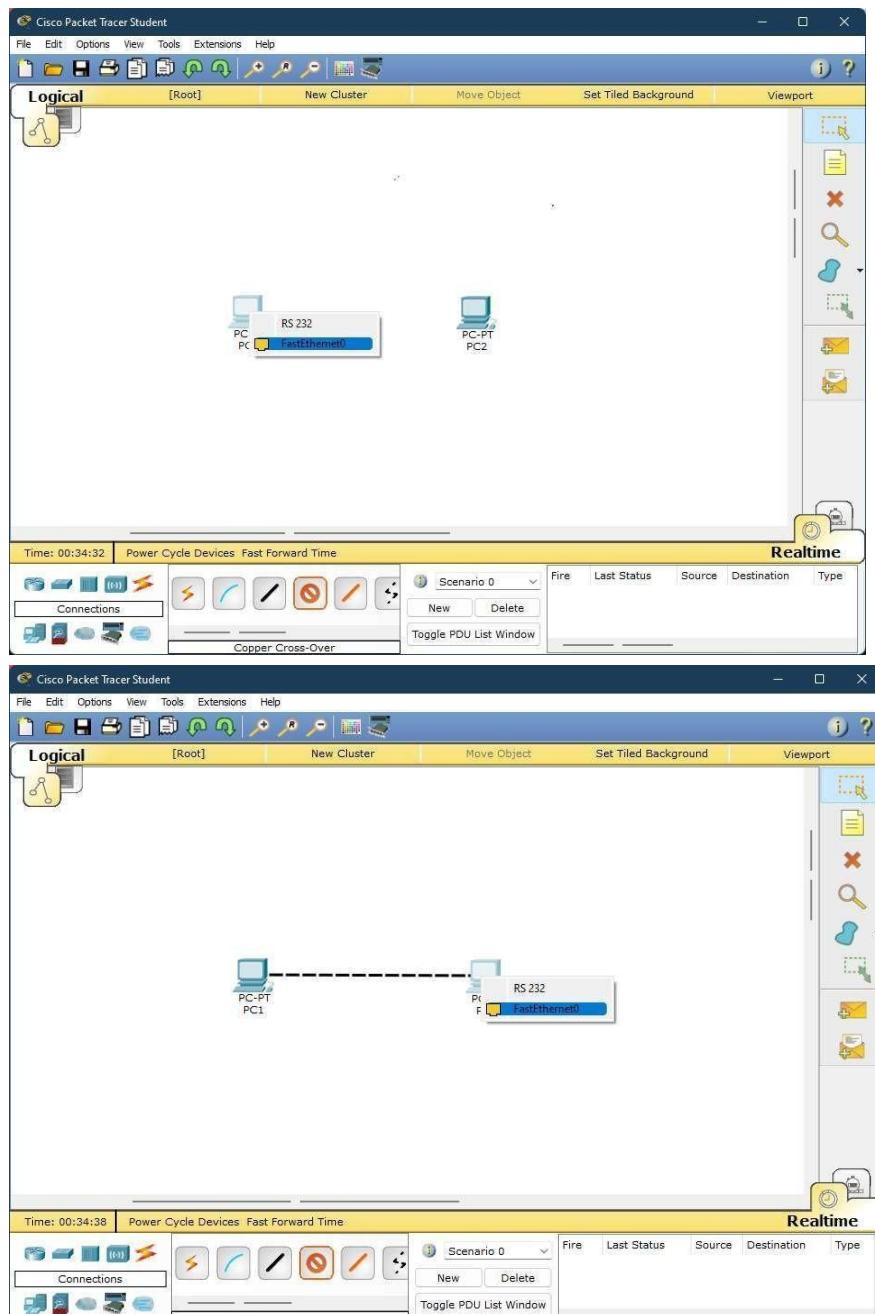
Aim:

To install and execute CISCO packet for simple PDU

Procedure:

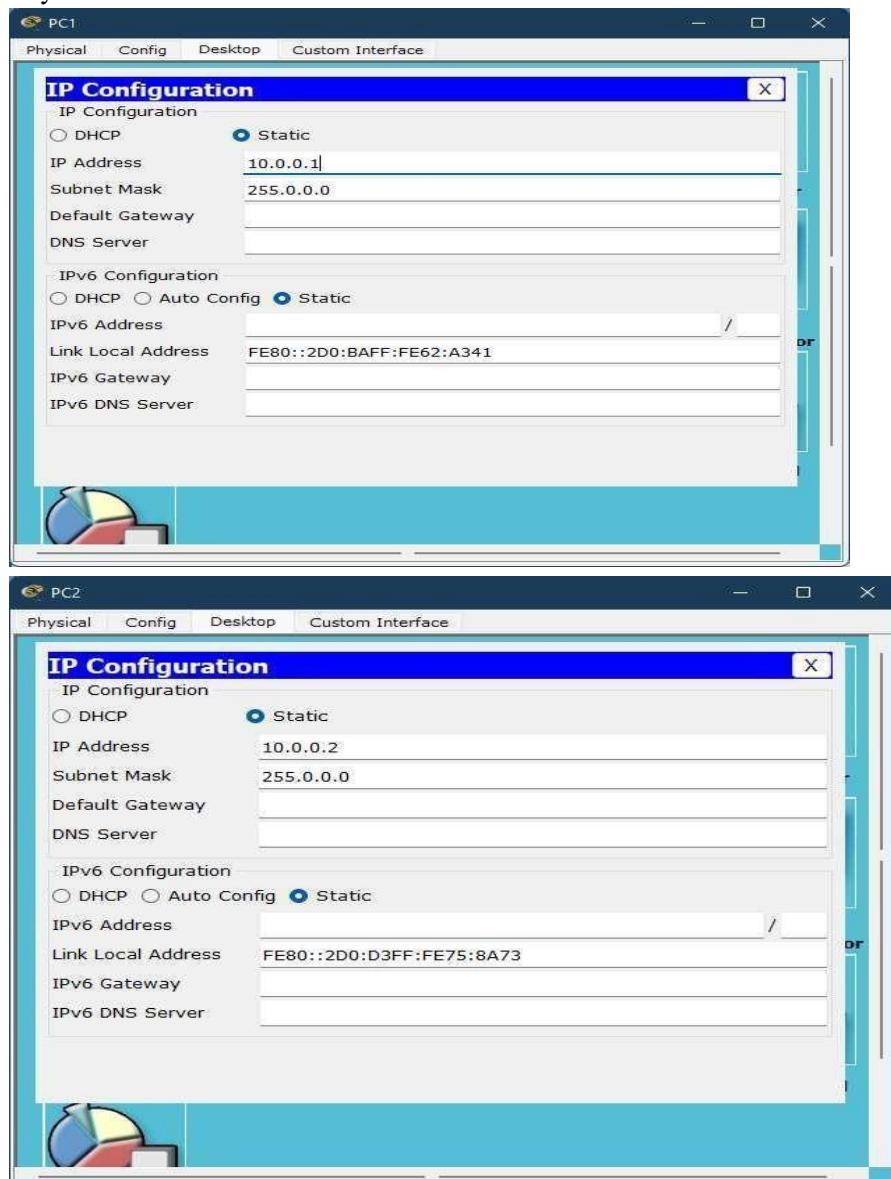
Creating and transmitting a simple PDU (Packet Data Unit) with Cisco Packet.

1. **Launch Cisco Packet Tracer:** Start by opening Cisco Packet on your computer.
2. **Create a Network Topology:** Build a simple network topology by dragging and dropping routers, switches and end devices (e.g. PCs) onto the workspace. Connect them using appropriate cables or connections.



3. **Power on Devices:** Ensure that all devices in your network topology are powered on. You can do this by clicking on each device and selecting the "Power" option.
4. **Configure Device Interfaces:** Configure the interfaces of routers and switches with

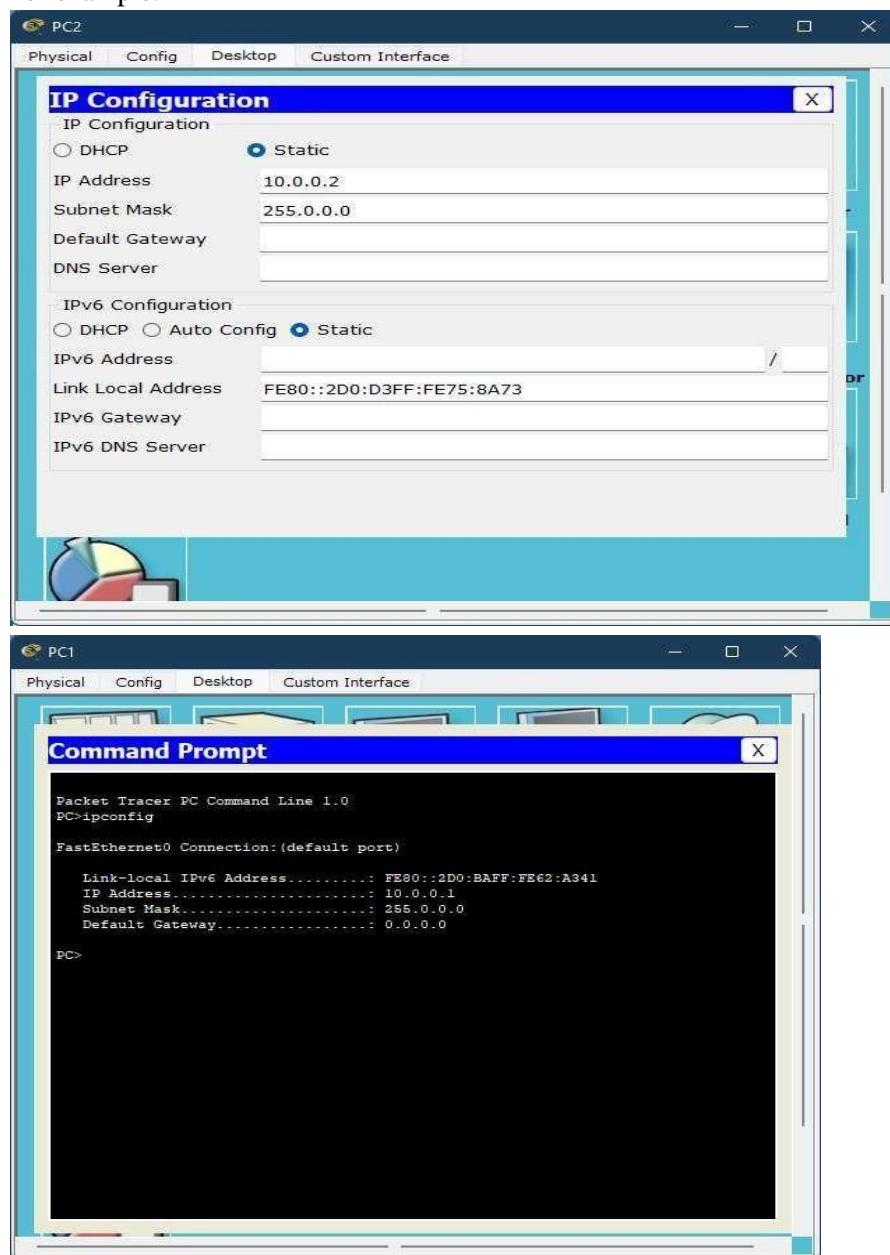
appropriate IP addresses, subnet masks, and routing protocols (if needed) to establish connectivity in the network.



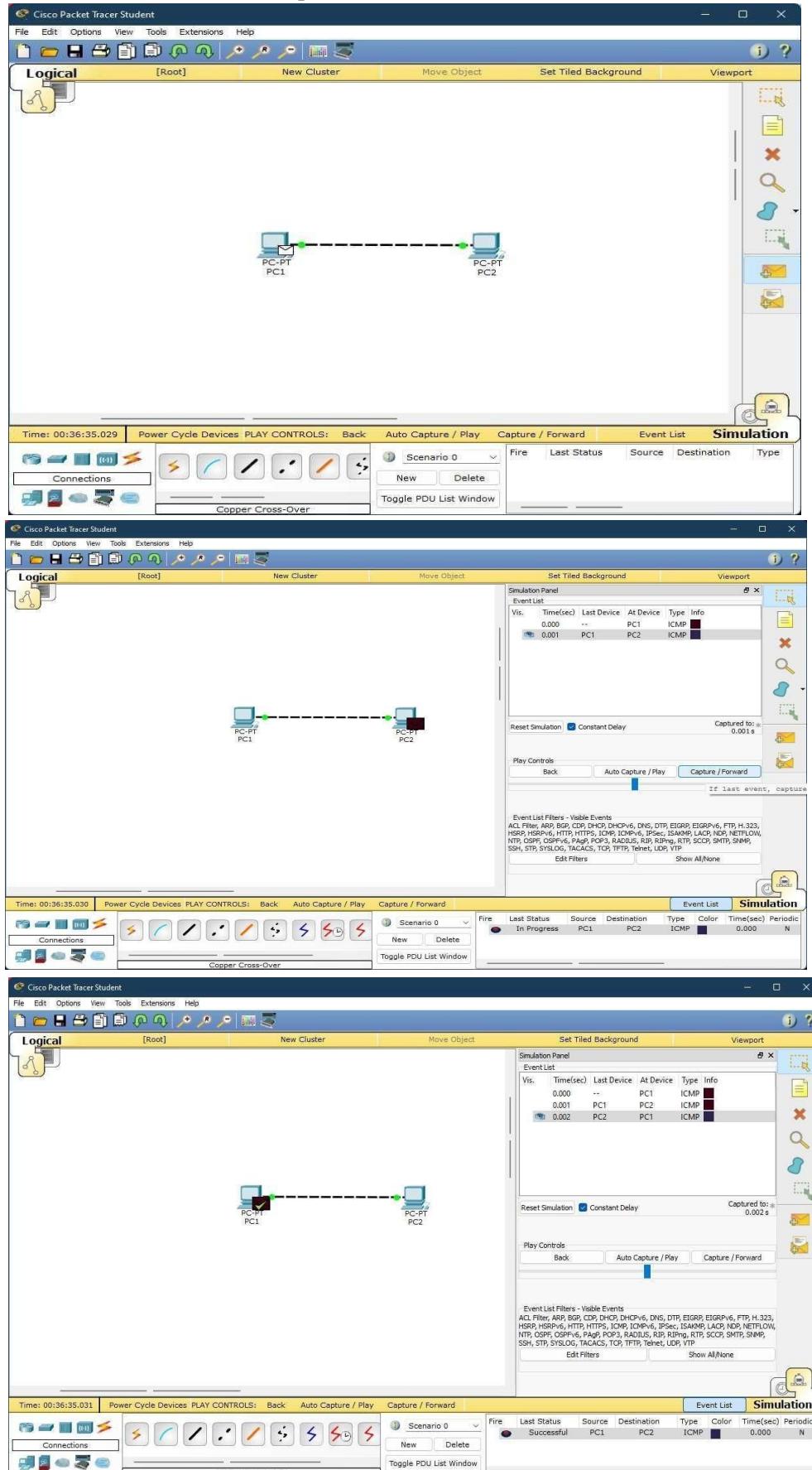
5. **Assign IP Addresses:** On the PCs in your network, assign IP addresses manually to ensure they can communicate with each other. This is crucial for generating a Simple PDU.
6. **Open Command Prompt or Terminal:** On one of the PCs, open the command prompt (Windows) or terminal (Linux). This will be your source device for sending the Simple PDU.

7. **Check Network Connectivity:** Before sending a Simple PDU, confirm that you can ping another device in your network. Use the `ping` command followed by the IP address of the destination device.

For example:



8. **Send:** Click to create and send the simple PDU



Result:

Thus the CISCO Packet for Simple PDU has been executed Successfully.

Exp. No. 16	
Date: 14.09.24	

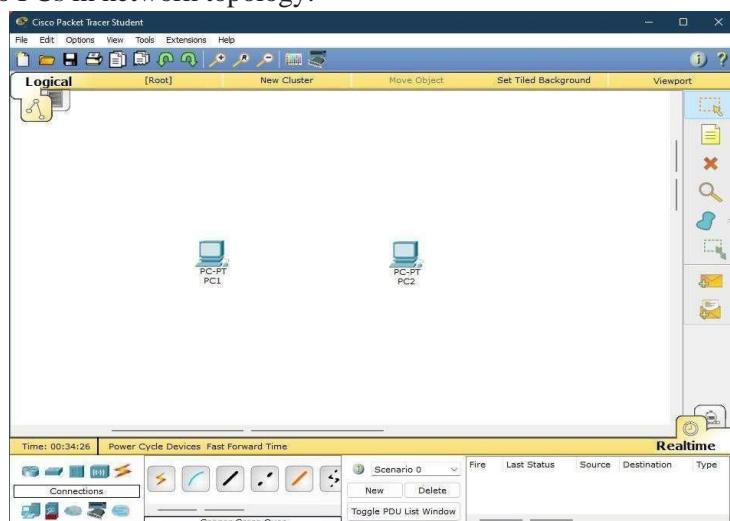
Creating a Simple Network with Two End Devices (CPDU)

Aim:

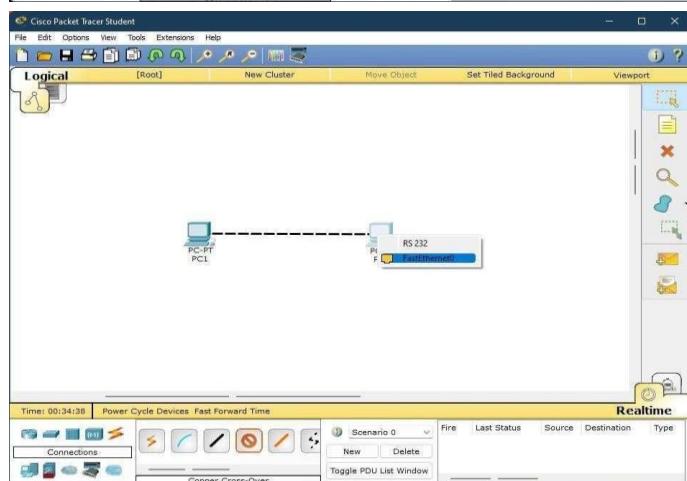
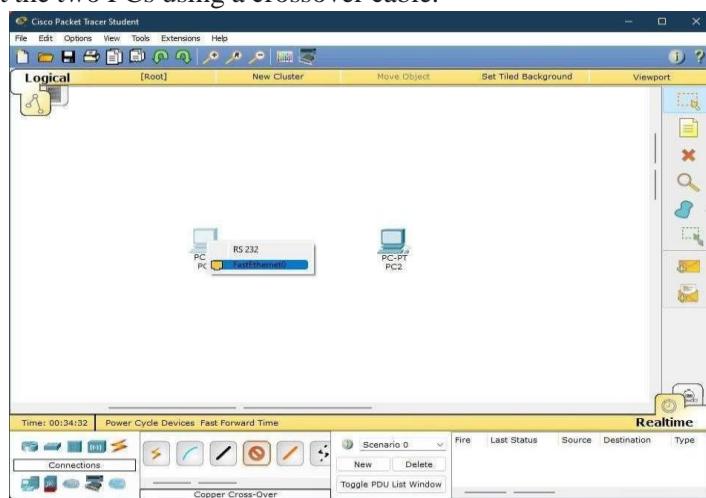
To create a simple network with two end devices with complex protocol data unit.

Procedure:

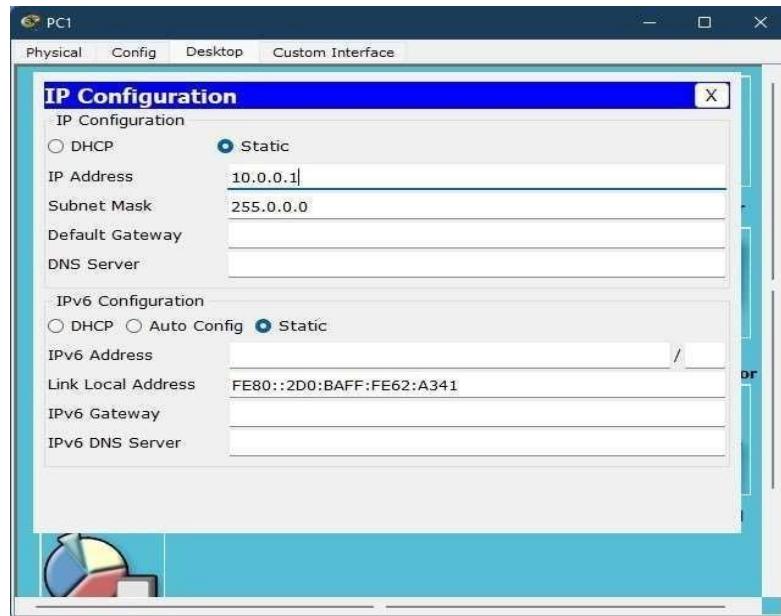
1. Open Cisco Packet Tracer and create a new network topology.
2. Add two PCs in network topology.



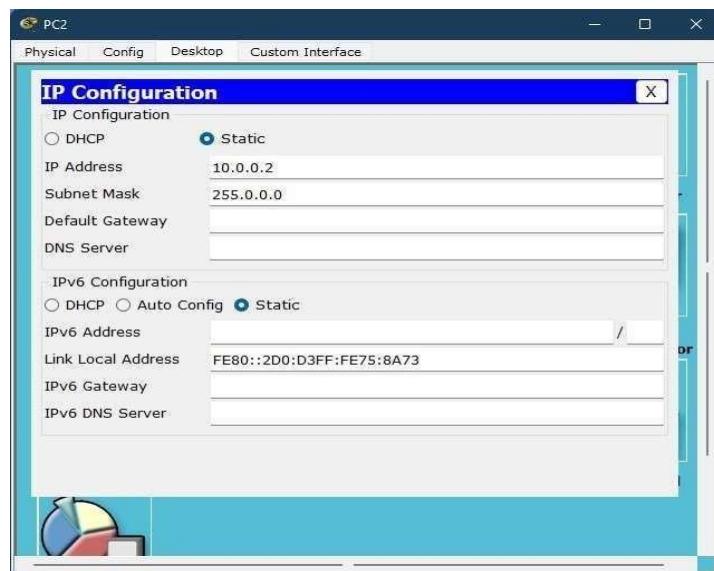
3. Connect the two PCs using a crossover cable.



4. Configure first PC as below:



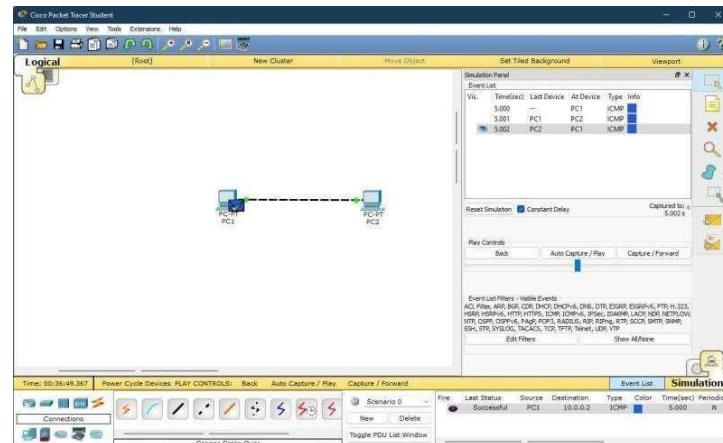
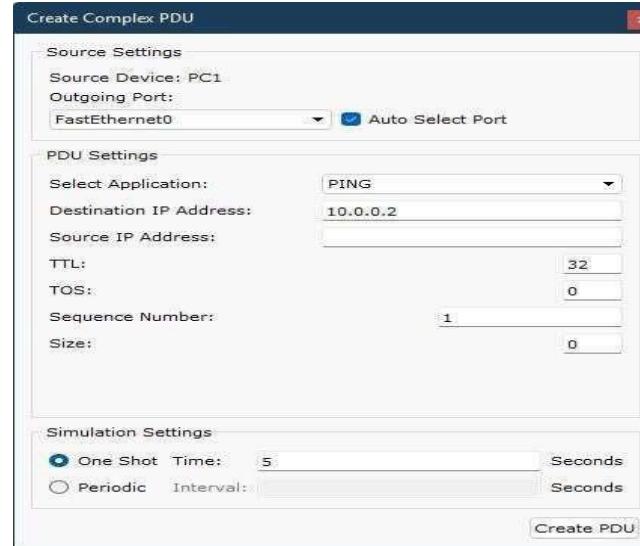
5. Configure second PC as below:



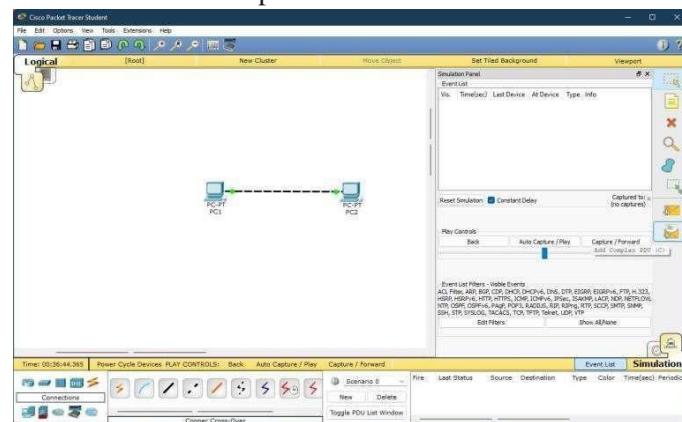
6. On one of the PCs, open the Add Complex PDU window.
7. Click the first PC so it will be the source device of the complex PDU, and then click the second PC.
8. The Create Complex PDU window will display.

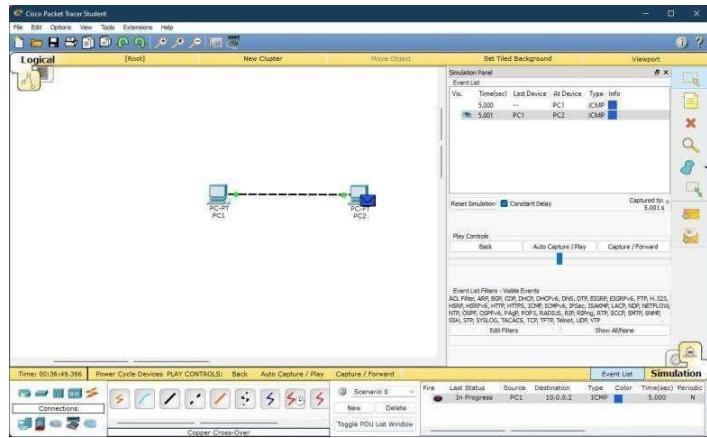
9. Configure the complex PDU settings as follows:

Protocol type: ICMP, Source IP address: 10.0.0.1, Destination IP address: 10.0.0.2.



10. Click Create to send the complex PDU.





Result:

Thus the CISCO Packets for simple network with two end devices with complex protocol data unit has been executed successfully.

Exp. No. 17
Date: 20.09.24

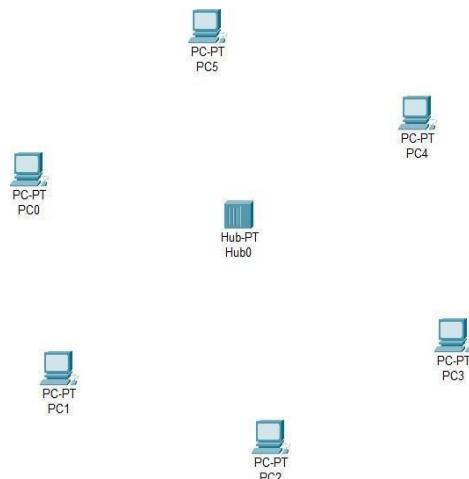
Network Topology using HUB

Aim:

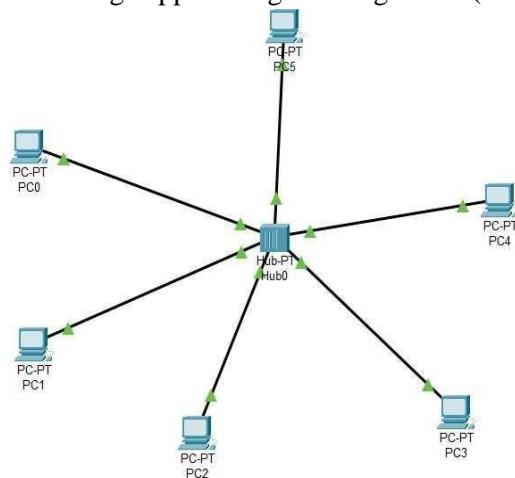
To create a simple network topology using HUB.

Procedure:

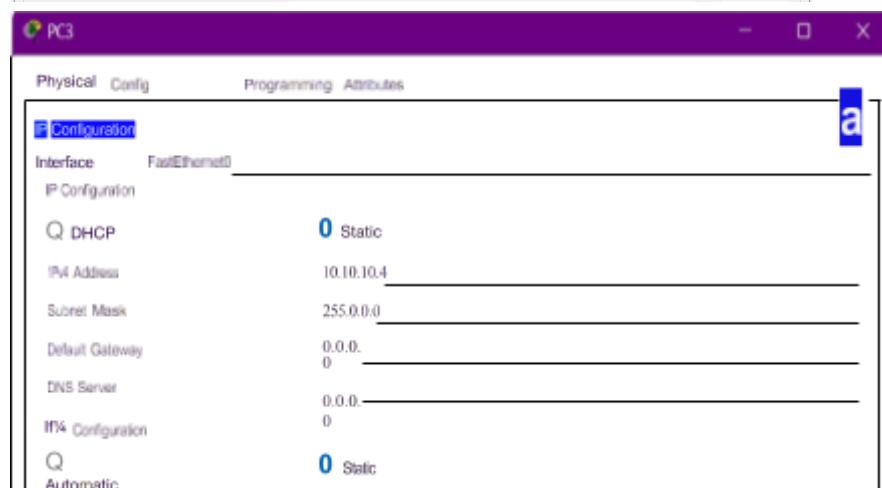
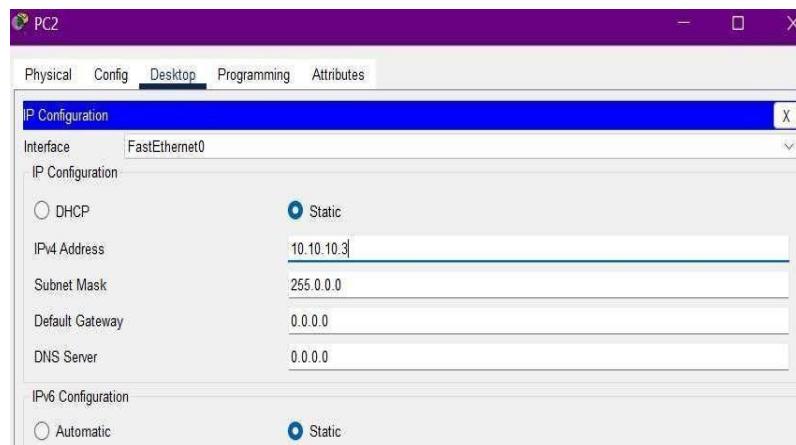
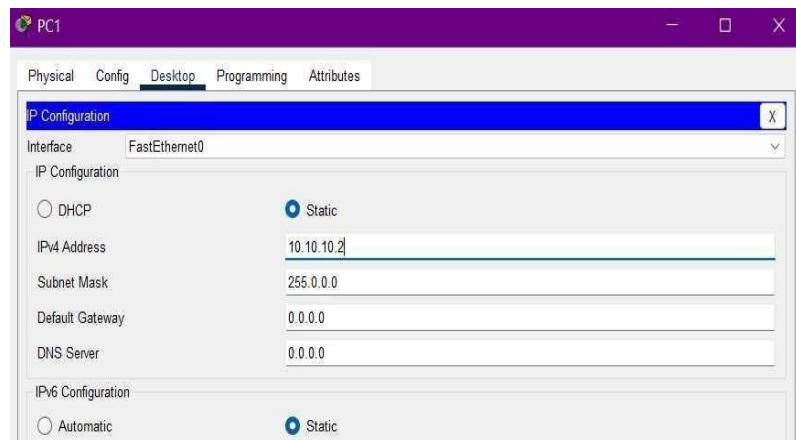
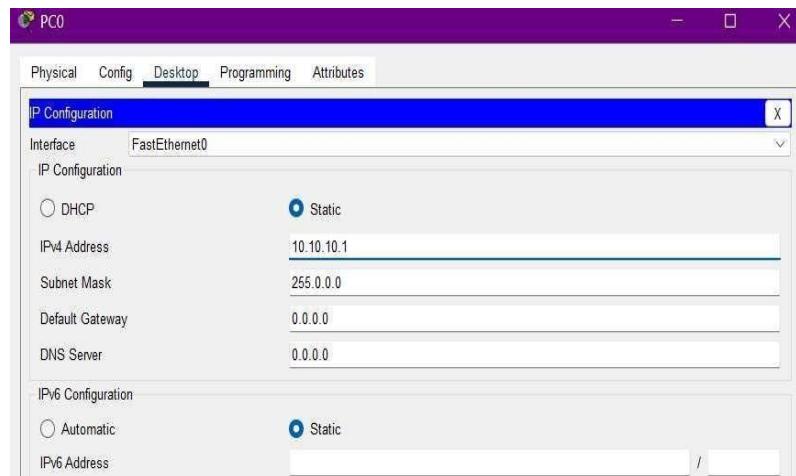
1. From the network component box, click on End Devices and drag and drop one Hub and six pcs onto the workspace.

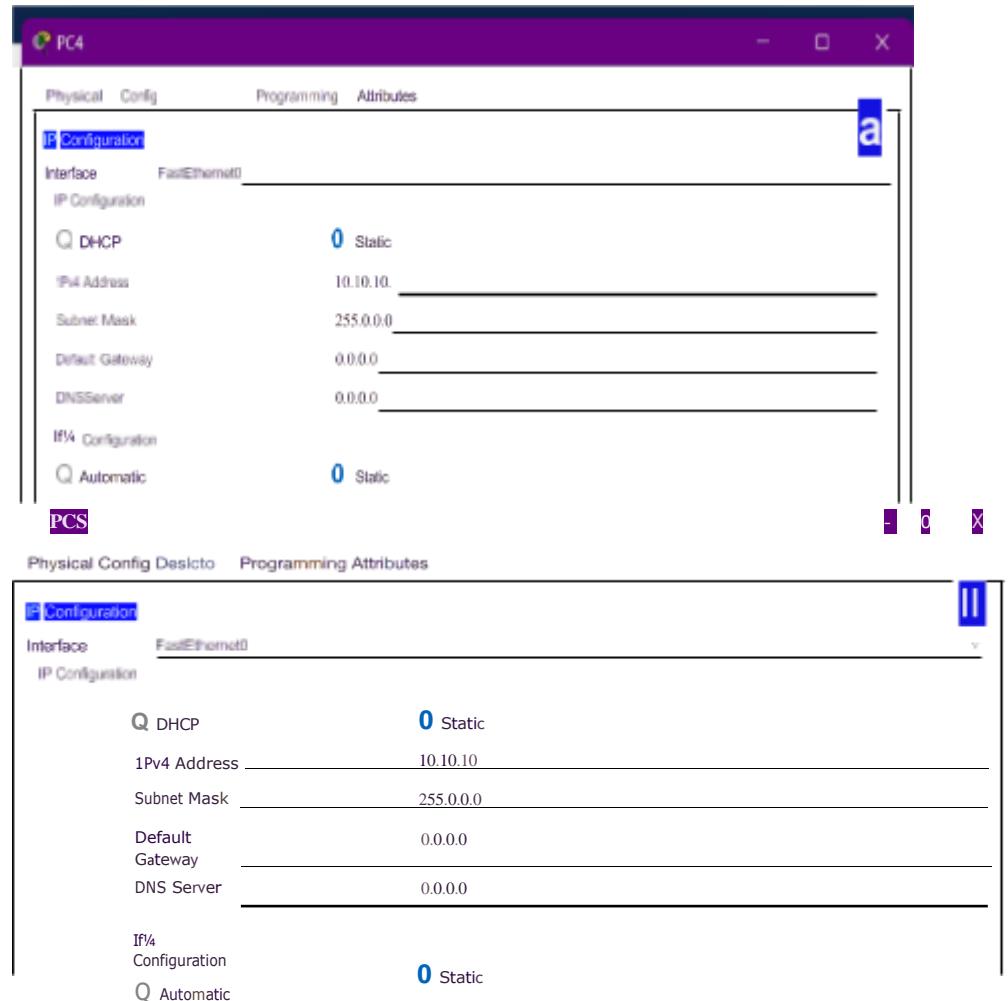


2. Connect each pc's to the hub using copper straight through cable(via fast ethernet port)

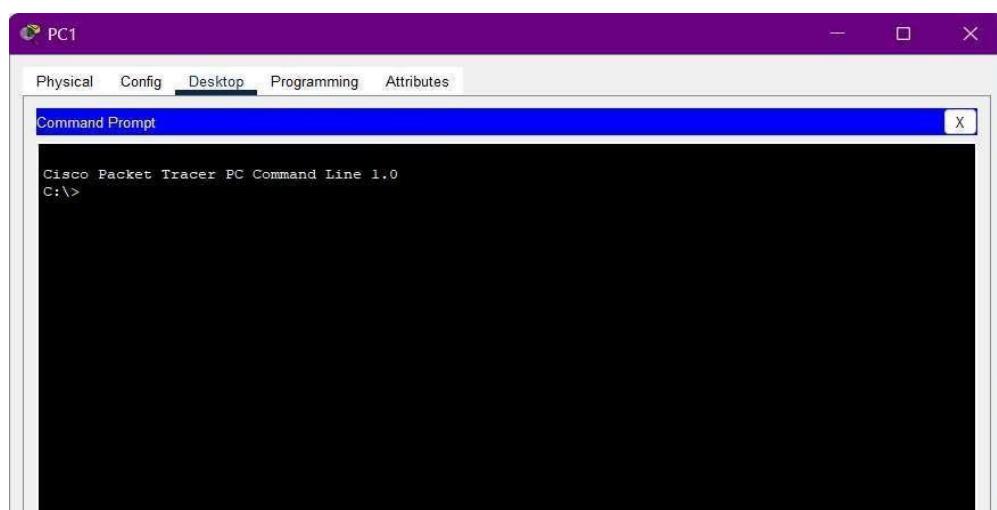


3. Assign IP address to each of the pc by right click the pc-> Desktop->ipconfig





- To check the connectivity between the pc's, close the ipconfig and open the command prompt from the desktop, for example we have taken the command prompt of pc1.



- Then ping the IP address of the destination pc, here we are going to check with pc5.

```

Cisco Packet Tracer PC Command Line 1.0
C:\ping 10.10.10.6

Pinging 10.10.10.6 with 32 bytes of data:

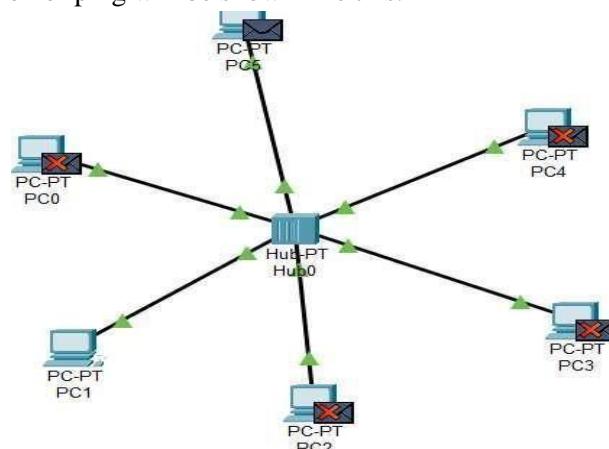
Reply from 10.10.10.6: bytes=32 time=25ms TTL=128
Reply from 10.10.10.6: bytes=32 time<1ms TTL=128
Reply from 10.10.10.6: bytes=32 time=<1ms TTL=128
Reply from 10.10.10.6: bytes=32 time=<1ms TTL=128

Ping statistics for 10.10.10.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 25ms, Average = 6ms

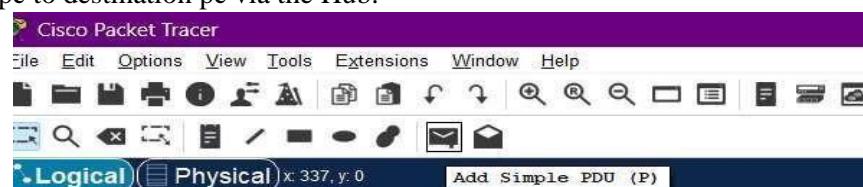
c:\>

```

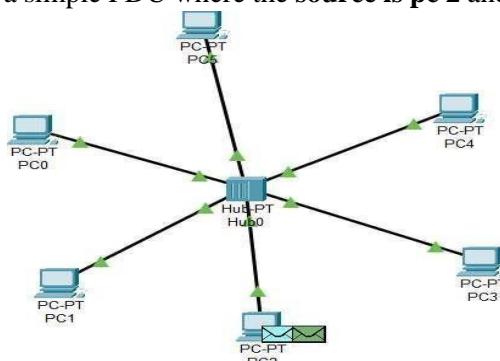
The simulation of ping will be shown like this:



- Add a simple PDU to one of the PC and check the simulation of the message from the source pc to destination pc via the Hub.



Here we have added a simple PDU where the **source is pc 2** and **destination is pc 4**.

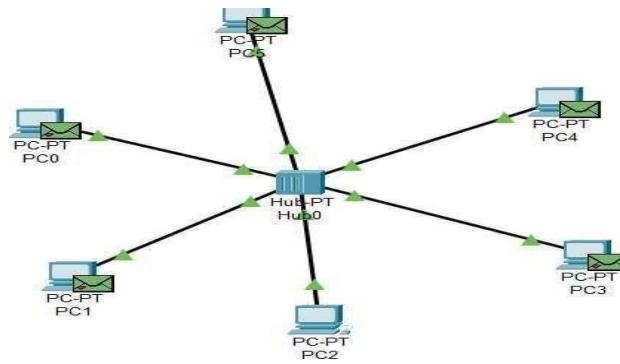


At the bottom of the cisco packet tracer, we can check the status of the PDU.

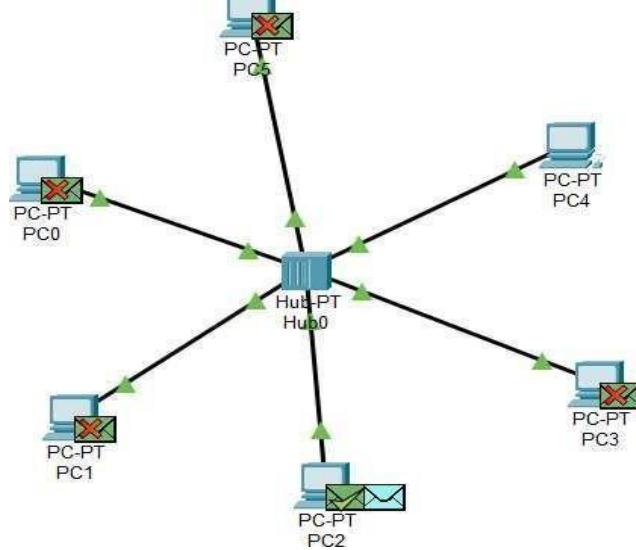
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	In Progress	PC2	PC4	ICMP	■ cyan	0.000	N	0	(edit)	(delete)

Here the status of the PDU is In Progress.

- The HUB broadcasts the message to all the pc's connected with it, but the only pc which is assigned as destination will receive it.



8. After the message reaches the destination, the destination pc again broadcasts the acknowledgement message, and it will be only received by the source pc.



After the acknowledgement, the status of the PDU will be Successful.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete	
	Successful	PC2	PC4	ICMP		0.000	N	0	(edit)	(delete)	

Result:

Thus a simple network topology using a hub is designed, configured, tested and PDU is transmitted successfully using packet tracer.

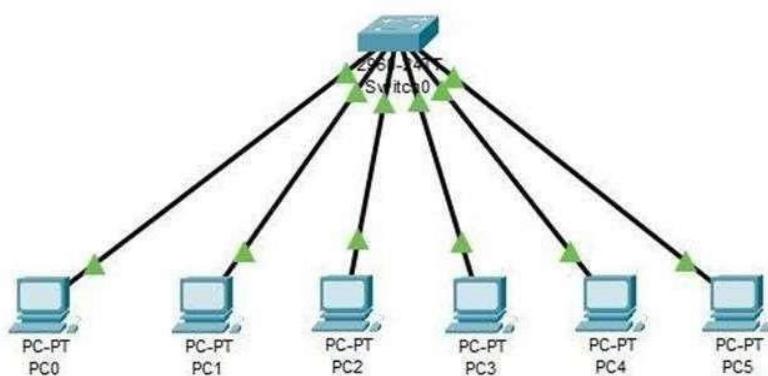
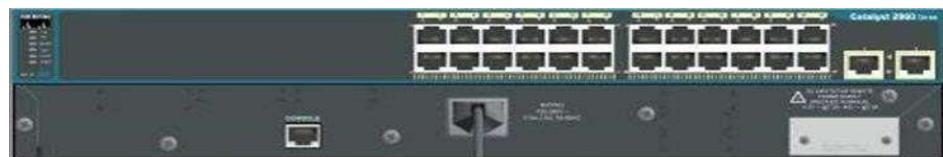
Aim:

To create a network topology using switch.

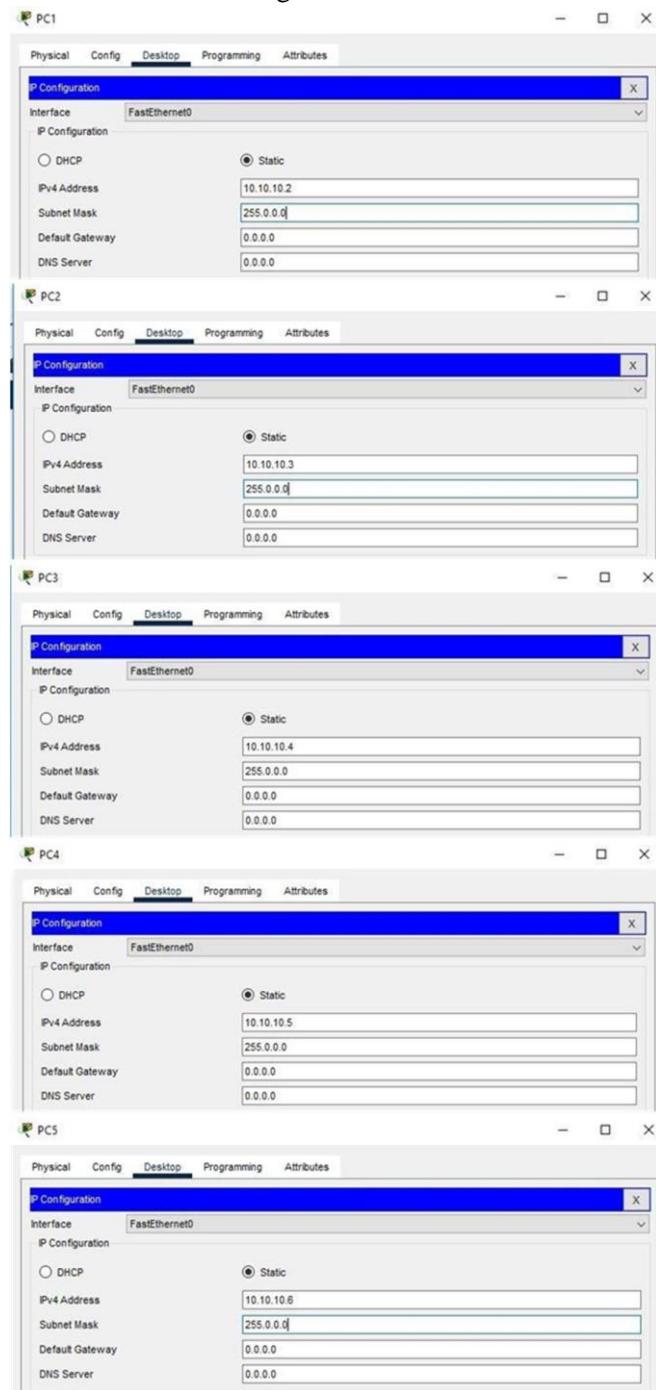
Procedure:

1. From the network component box, click on End Devices and drag and drop one Switch and six PCs on the workspace and connect the PCs with the Switch using copper straight through wire.

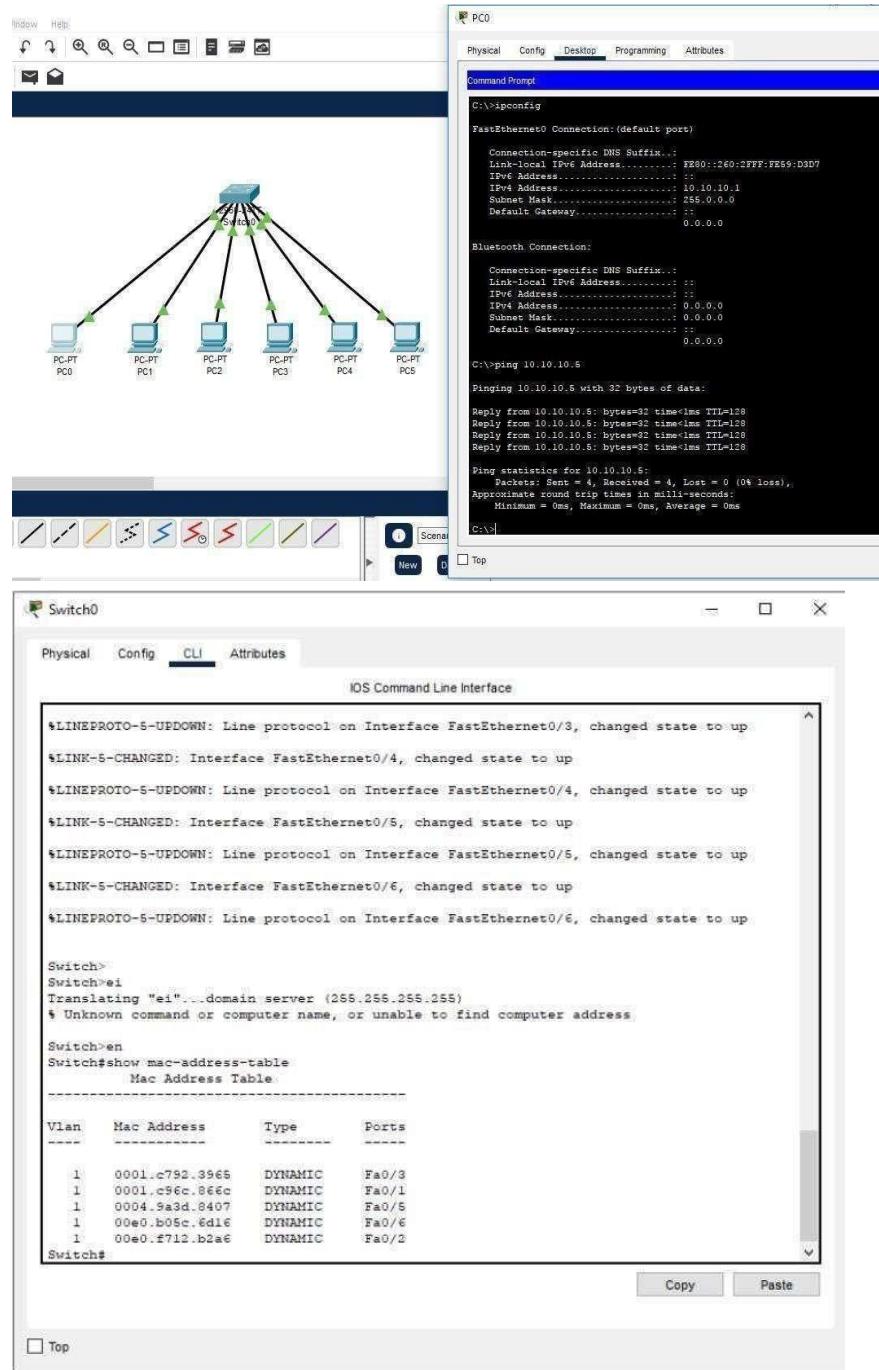
Switch View:



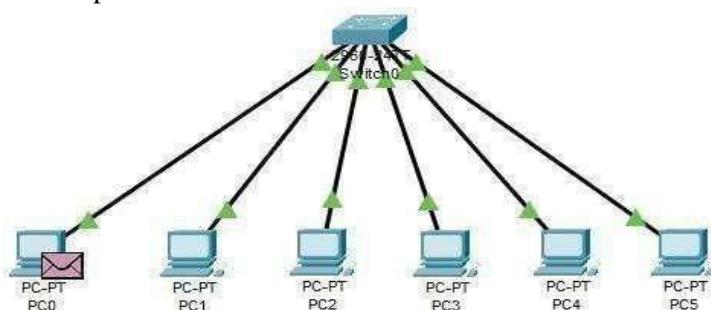
2. Connect the Switch and the PC and assign the IP address to each PC



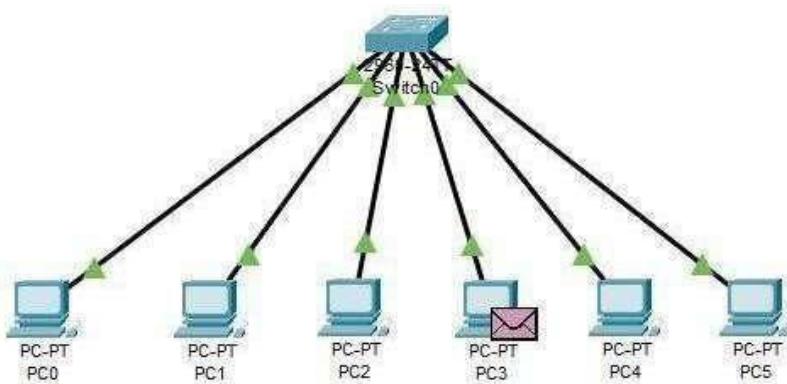
3. Close the IP configuration, open the command prompt and ping the IP address of destination pc.



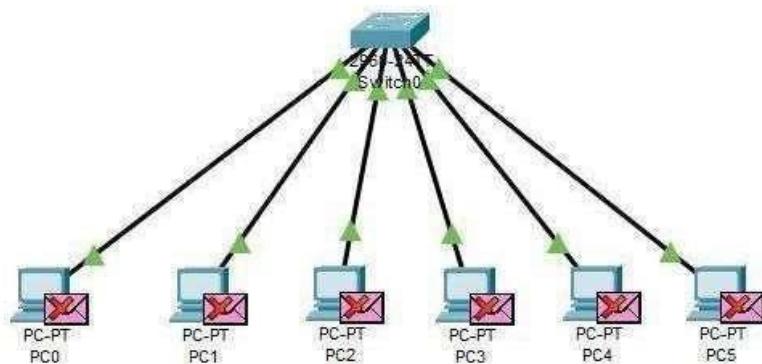
4. Add a simple PDU to one of the PCs and check the stimulation of the message from the source pc to destination pc via to the switch.



5. The message is transmitted from the source PC to the switch and then switch to destination PC



6. The switch by default unicasts the message but at the second time the switch broadcasts the message to all other PCs.



Result:

Thus a simple network topology using switch is designed, configured, tested and PDU is transmitted successfully using packet tracer.

Exp. No. 19

Creating a Network Topology using Repeater

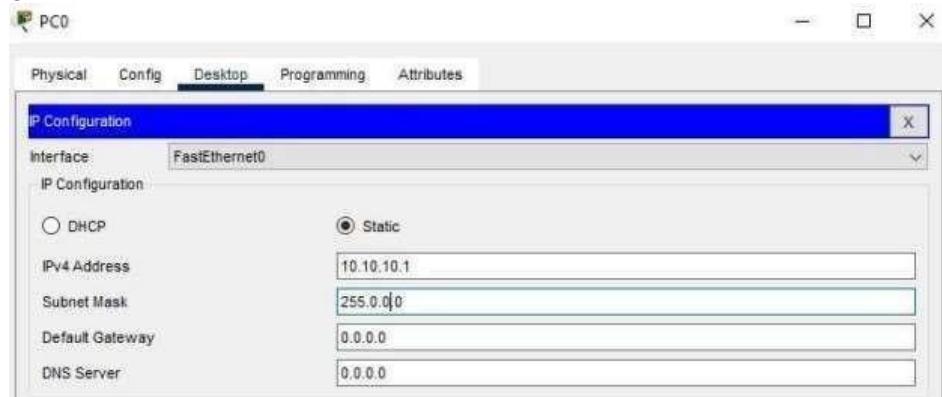
Date: 28.09.24

Aim:

To create a network topology using repeater.

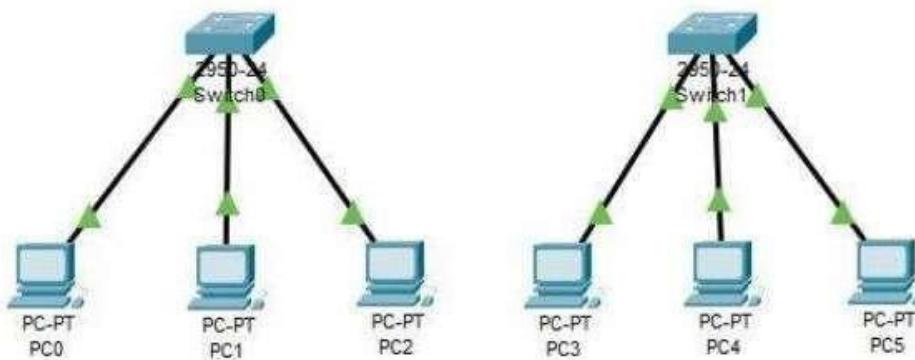
Procedure:

- From the Network Component Box click on End Devices and drag and drop six Generic pcs into the workspace.
- And assign IP address to each PC.



Similarly, assign IP address to all other PCs.

- Click on the switch from the device-type selection box and insert two switches into the workspace.

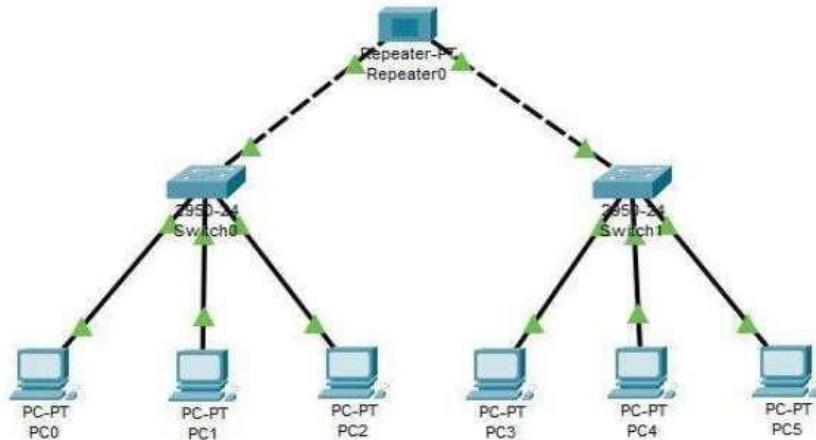


- Click on the connections, then click on copper straight through and then connect the first three pcs with the first Switch and connect the remaining three pcs with the second switch
- Physical view of the Repeater.

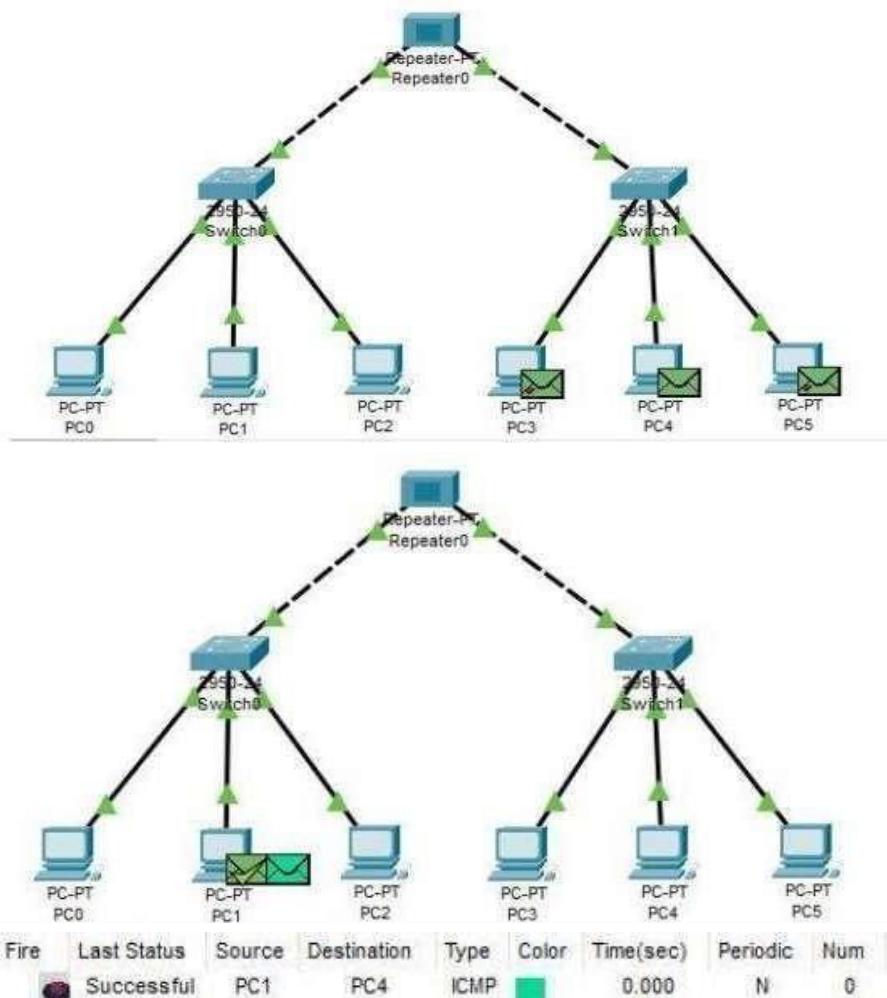


A repeater is implemented in computer networks to expand the coverage area of the network, repropagate a weak or broken signal and or service remote nodes. Repeaters amplify the received/input signal to a higher frequency domain so that it is reusable, scalable and available.

6. Drag and drop a repeater into the workspace and connect the two switches to the repeater.



7. To check the connection between the pcs, choose a PC as the sender and another PC as the receiver and transmit a simple PDU on the network.



Result:

Thus a simple network topology using repeater is designed, configured, tested and PDU is transmitted successfully using packet tracer.

Exp. No. 20	
Date: 04.10.24	

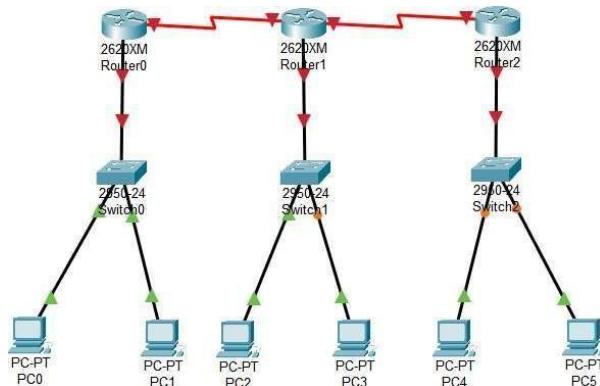
Designing a Network Using Router and Switches

Aim:

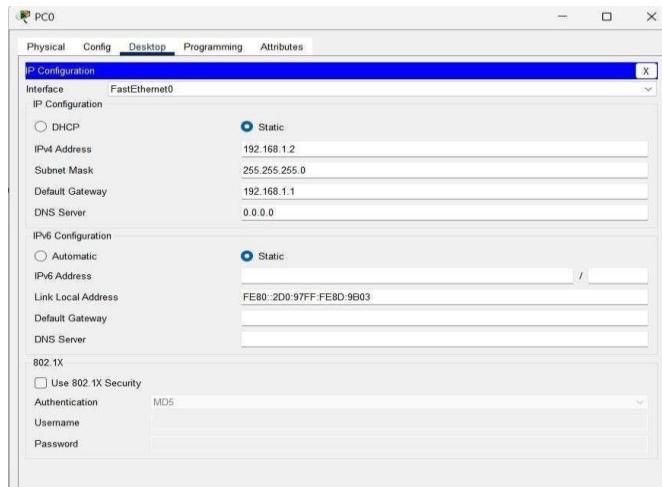
To connect the three different LANs using Router and Switches.

Procedure:

1. Drag and drop six pcs, three switches and routers from the component box into the workspace.



2. Connect the PC and the switch using copper straight through cable and assign the IP address to each PC, the PCs under the Switch 0 contains IP address 192.168.1.2 and 192.168.1.3 and the PCs under switch 1 contains IP address 192.168.2.2 and 192.168.2.3 and the PCs under the switch 2 contains the IP address 192.168.3.2 and 192.168.3.3.



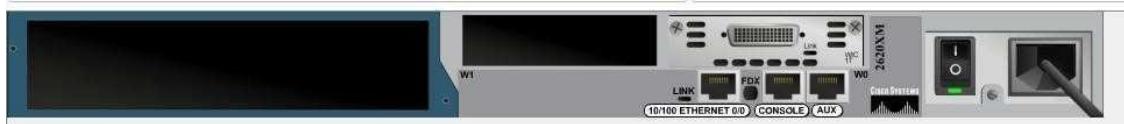
3. The physical view of the router is shown below



4. Then we need to connect each router using serial DTE cable. Before that we need to attach WIC-1T to the router.
5. WIC-1T: The WIC-1T provides a single port serial connection to remote sites or legacy serial network devices such as Synchronous Data Link Control (SDLC) concentrators, alarm systems, and packet over SONET (POS) devices.

6. We need to attach 1 WIC-1T port on router 0 and router 2 and two WIC- 1T ports on router 1 when the router is off.

Router 0:



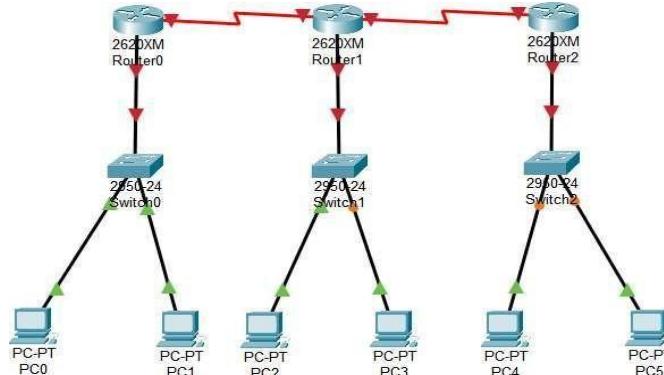
Router 1:



Router 2:

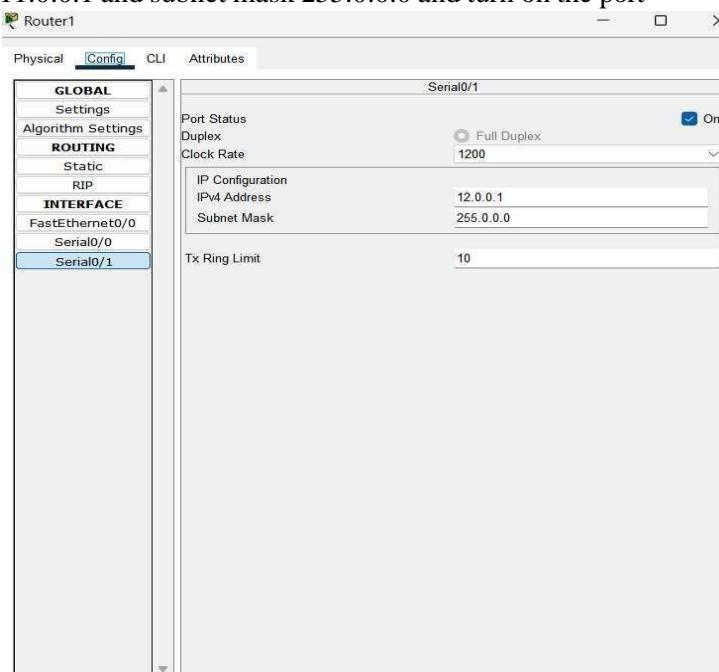


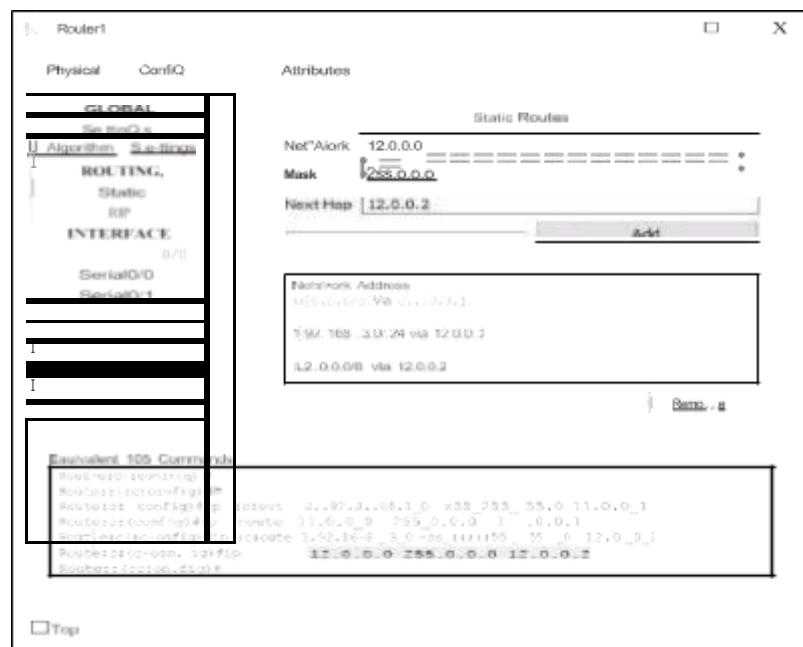
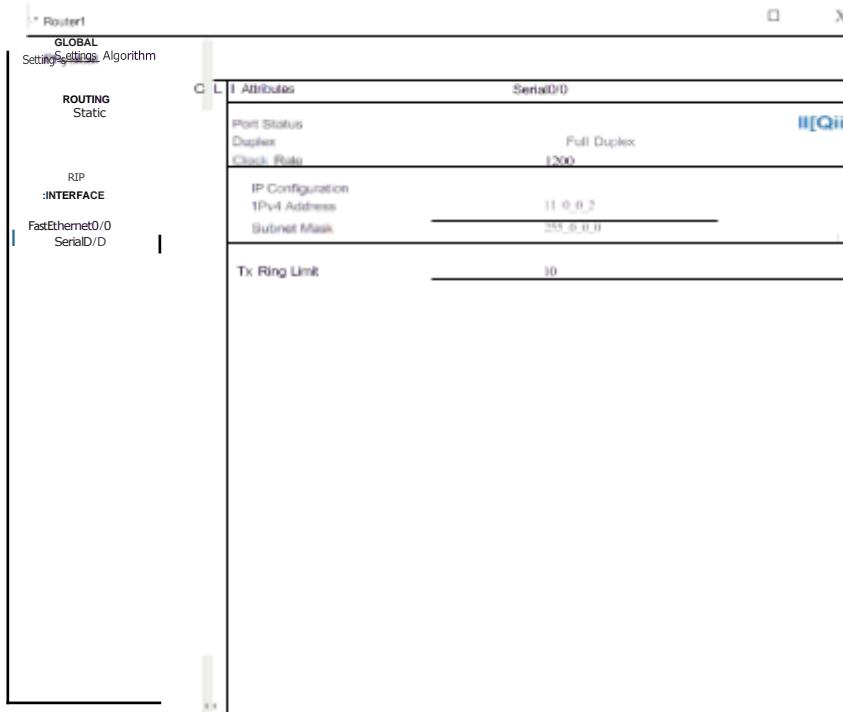
7. Then connected each router using serial DTE cable.



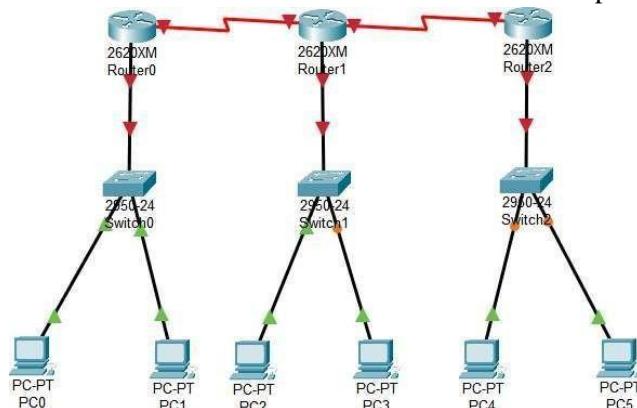
8. To transmit packets, we need to assign IP address to each router and assign routing tables to each router.
 9. In Router 0, Go to config -> Interface, under interface go to Fast Ethernet and assign IP address 192.168.1.1 and assign subnet mask 255.255.255.0 and under interface go to serial0/0 and assign IP address

11.0.0.1 and subnet mask 255.0.0.0 and turn on the port



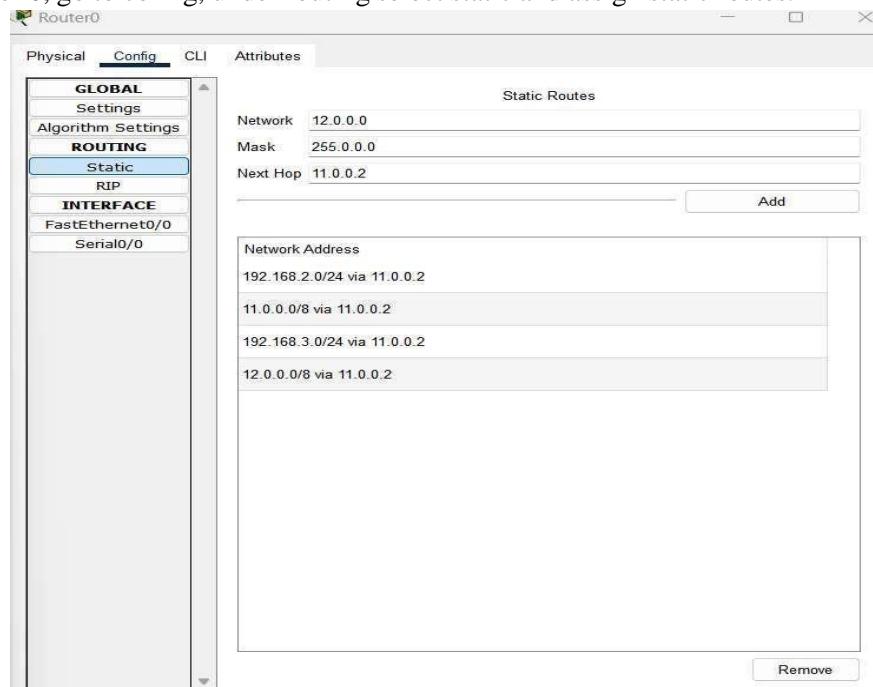


10. Similarly assign IP address to router 1 and router 2 and turn on the port status

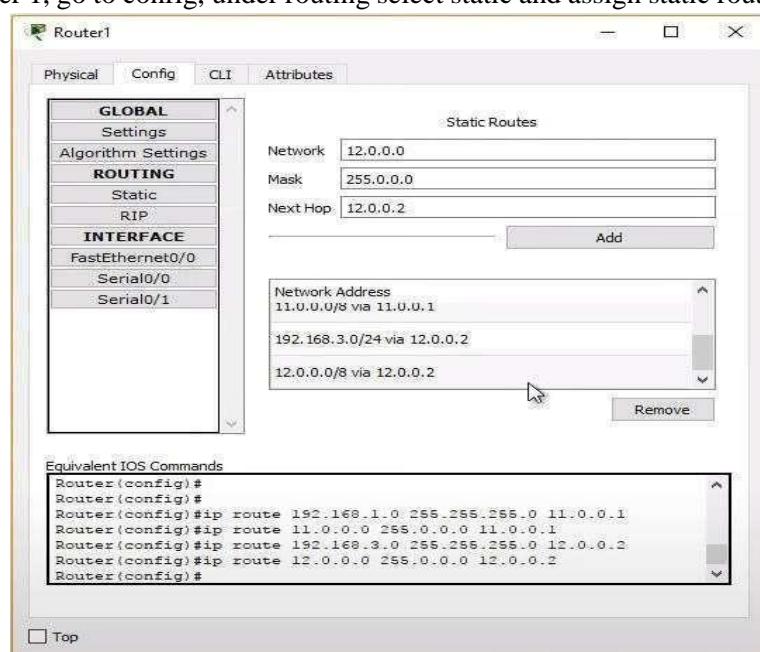


11. Then we need to configure the Routing Table in order to transmit packets from one device to another.

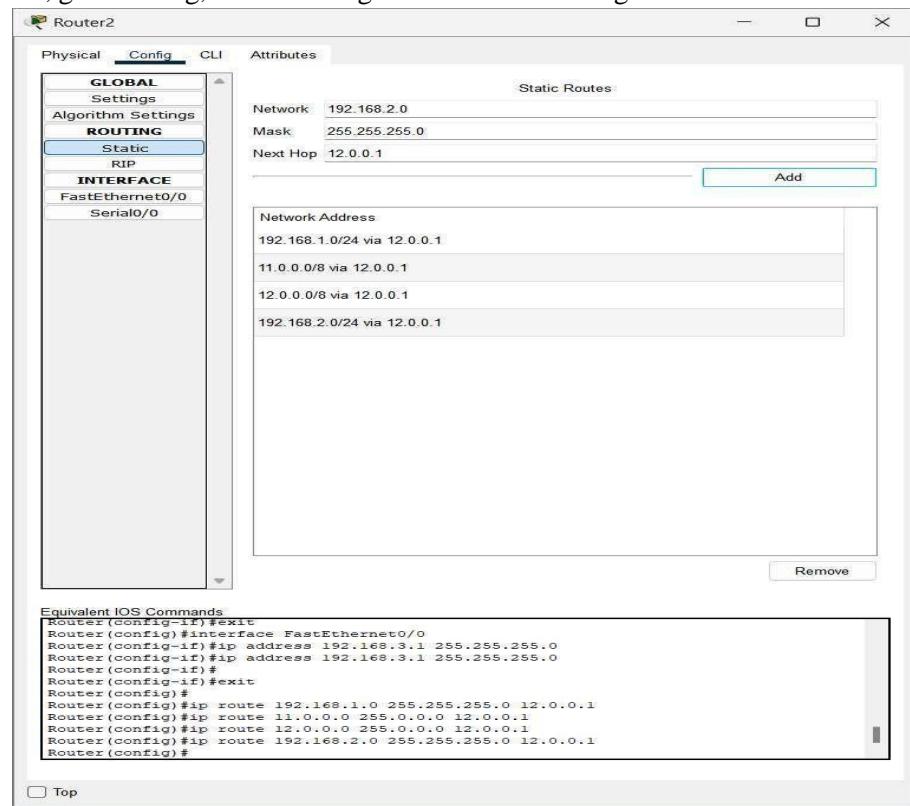
12. In Router 0, go to config, under routing select static and assign static routes.



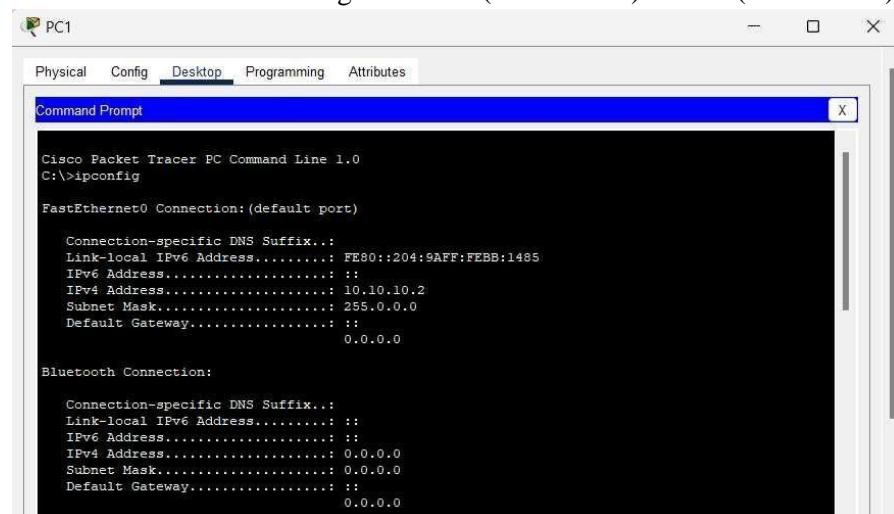
13. In Router 1, go to config, under routing select static and assign static routes.



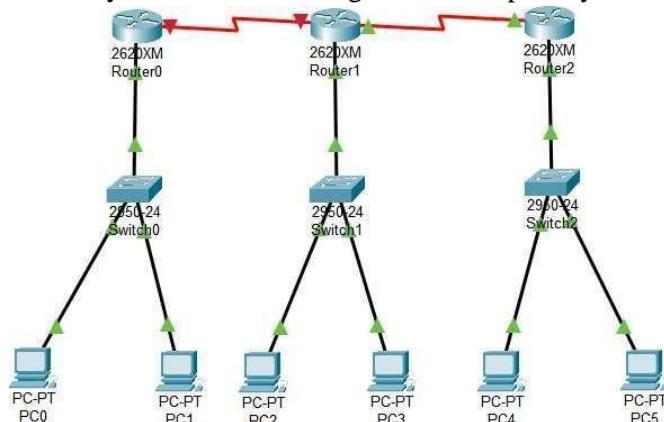
14. In Router 2, go to config, under routing select static and assign static routes.



15. After the routing table is configured for all other Routers, Check the connection by pinging packets from one PC to another. Ping from PC2 (192.168.2.2) to PC5 (192.168.3.3)



16. Add a simple PDU to PC2 and then check the Packet transfer from PC2 to PC5. The Packet is transferred successfully and the acknowledgement is accepted by the source PC.



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Failed	Laptop1	Laptop2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	Laptop1	Laptop2	ICMP		0.000	N	1	(edit)	(delete)

Result:

Thus a simple network topology using 3 routers and 3 switches is designed, configured, tested and PDU is transmitted successfully using packet tracer.

Exp. No. 21

Designing Simple Virtual LAN Configuration Using CISCO Packet Tracer

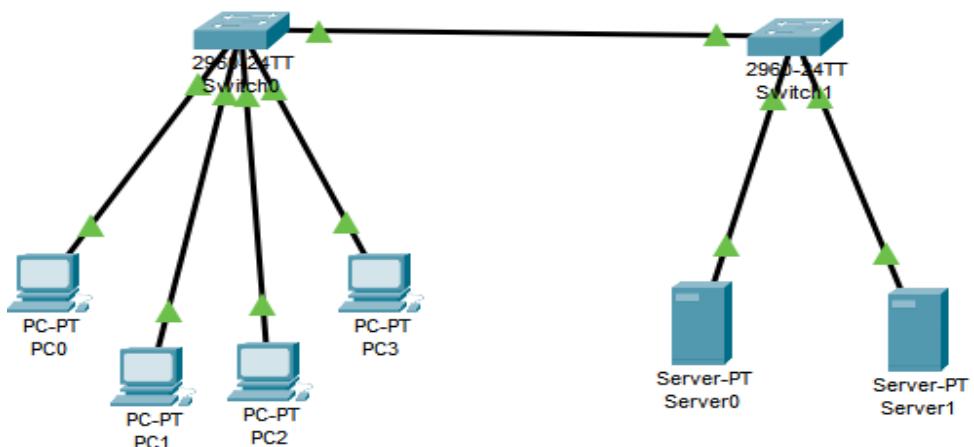
Date: 05.10.24

Aim:

To connect a Simple Virtual LAN Configuration Using CISCO Packet Tracer.

Procedure:

1. Design a simple LAN network with two switches, four PCs and two servers. Connect the four PCs under one switch using copper straight through wire and two servers under another switch using the same wire. Connect the two switches also.



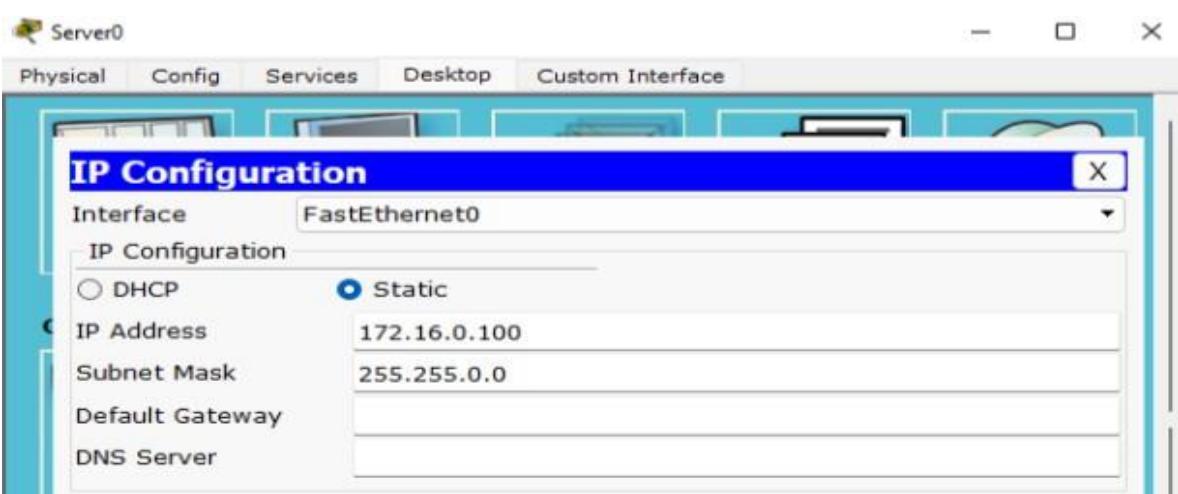
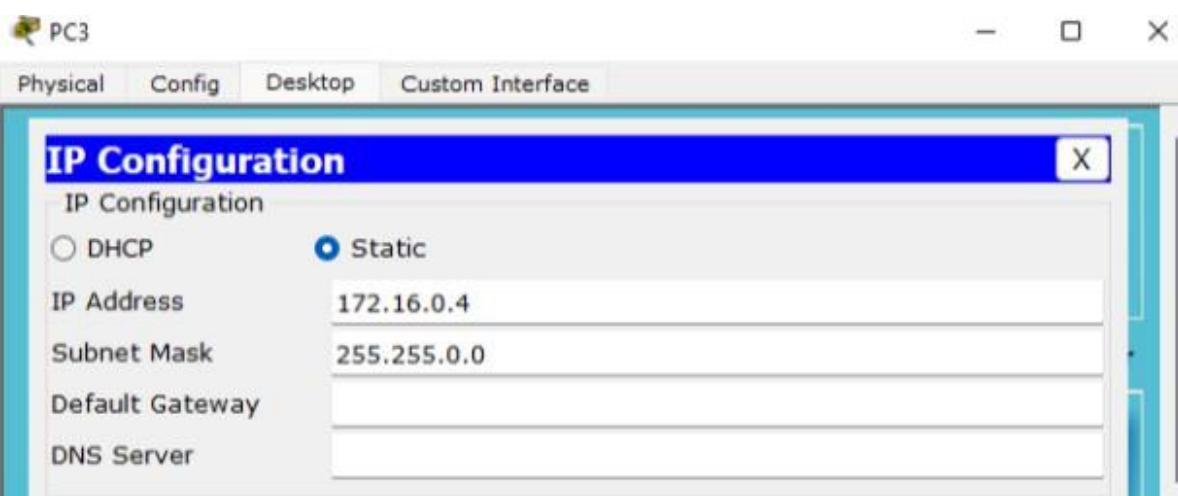
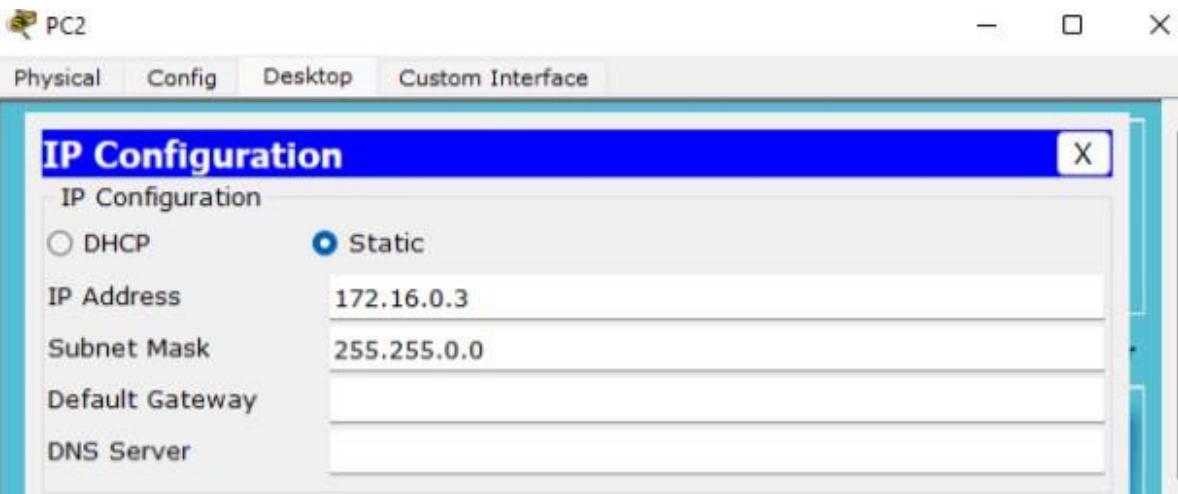
2. Assign the IP address for the PCs and the servers.

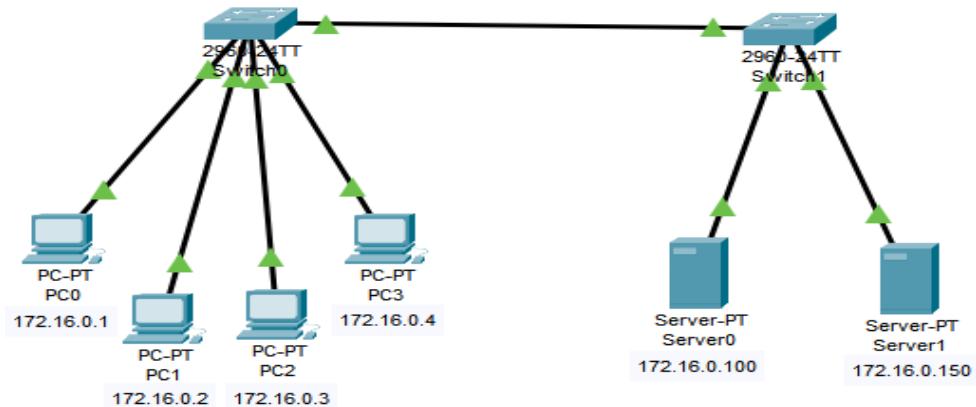
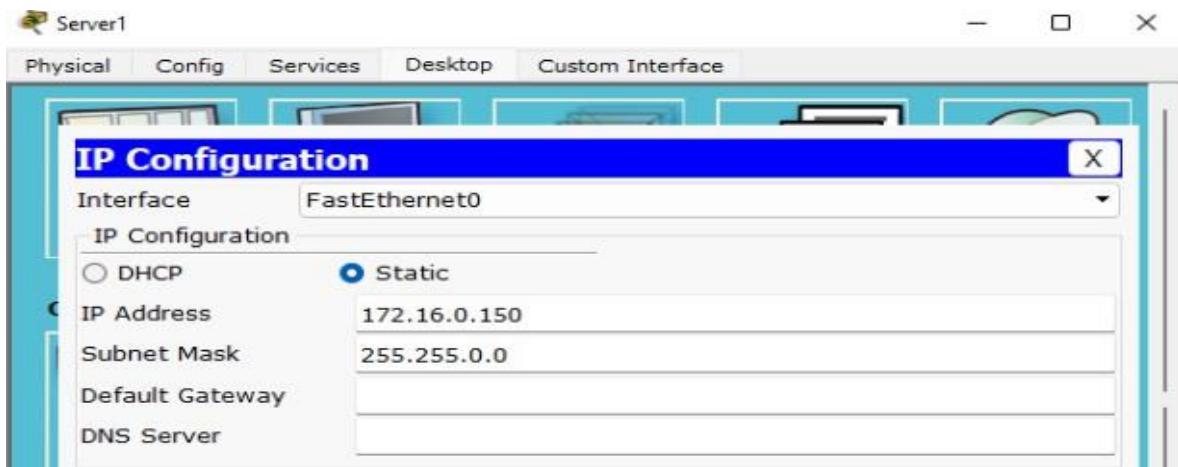
PC0 IP Configuration Dialog:

IP Configuration	<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IP Address	172.16.0.1	
Subnet Mask	255.255.0.0	
Default Gateway		
DNS Server		

PC1 IP Configuration Dialog:

IP Configuration	<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IP Address	172.16.0.2	
Subnet Mask	255.255.0.0	
Default Gateway		
DNS Server		





3. In the switch0 command line interface, name the host SW1 and interface the range of fastEthernet 0/1 – fastEthernet 0/9 under vlan 100 and interface the range of fastEthernet 0/10 – fastEthernet 0/19 under vlan 200. During this interfacing, the switchport is enabled to access mode.

```

Switch>en
Switch#show vlan brief
VLAN Name          Status      Ports
--- 
1    default        active      Fa0/1, Fa0/2, Fa0/3, Fa0/4
                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                           Fa0/9, Fa0/10, Fa0/11, Fa0/12
                           Fa0/13, Fa0/14, Fa0/15, Fa0/16
                           Fa0/17, Fa0/18, Fa0/19, Fa0/20
                           Fa0/21, Fa0/22, Fa0/23, Fa0/24
                           Gig0/1, Gig0/2
1002 fddi-default    active
1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default   active
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname SW1
SW1(config)#interface range fastEthernet 0/1 - fastEthernet 0/9
SW1(config-if-range)#switchport mode access
SW1(config-if-range)#switchport access vlan 100
% Access VLAN does not exist. Creating vlan 100
SW1(config-if-range)#^Z
SW1#
%SYS-5-CONFIG_I: Configured from console by console

```

```

SW1#show vlan brief
VLAN Name                               Status    Ports
---- -----
1   default                             active    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                         Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                         Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                         Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                         Gig0/2
100 VLAN0100                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                         Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                         Fa0/9
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                  active
1005 trnet-default                   active
SW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW1(config)#interface range fastEthernet 0/10 - fastEthernet 0/19
SW1(config-if-range)#switchport mode access
SW1(config-if-range)#switchport access vlan 200
% Access VLAN does not exist. Creating vlan 200
SW1(config-if-range)#+Z
SW1#
*SYS-5-CONFIG_I: Configured from console by console

SW1#show vlan brief
VLAN Name                               Status    Ports
---- -----
1   default                             active    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                         Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                         Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                         Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                         Gig0/2
100 VLAN0100                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                         Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                         Fa0/9
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                  active
1005 trnet-default                   active
SW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW1(config)#interface range fastEthernet 0/10 - fastEthernet 0/19
SW1(config-if-range)#switchport mode access
SW1(config-if-range)#switchport access vlan 200
% Access VLAN does not exist. Creating vlan 200
SW1(config-if-range)#+Z
SW1#
*SYS-5-CONFIG_I: Configured from console by console

```

4. In Switch Command line interface, name the host SW2 and interface the range of fast Ethernet 0/1 – fastEthernet 0/4 under vlan 100 and fastEthernet 0/5 – fastEthernet 0/9 under vlan 200. During this interfacing, the switchport is enabled to access mode.

```

SW1#show vlan brief
VLAN Name                               Status    Ports
---- -----
1   default                             active    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                         Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                         Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                         Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                         Gig0/2
100 VLAN0100                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                         Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                         Fa0/9
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                  active
1005 trnet-default                   active
SW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW1(config)#interface range fastEthernet 0/10 - fastEthernet 0/19
SW1(config-if-range)#switchport mode access
SW1(config-if-range)#switchport access vlan 200
% Access VLAN does not exist. Creating vlan 200
SW1(config-if-range)#+Z
SW1#
*SYS-5-CONFIG_I: Configured from console by console

```

```

SW1#show vlan brief
VLAN Name                               Status    Ports
---- -----
1   default                             active    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                         Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                         Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                         Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                         Gig0/2
100 VLAN0100                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                         Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                         Fa0/9
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                  active
1005 trnet-default                   active
SW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW1(config)#interface range fastEthernet 0/10 - fastEthernet 0/19
SW1(config-if-range)#switchport mode access
SW1(config-if-range)#switchport access vlan 200
% Access VLAN does not exist. Creating vlan 200
SW1(config-if-range)#+^Z
SW1#
*SYS-5-CONFIG_I: Configured from console by console

SW1#show vlan brief
VLAN Name                               Status    Ports
---- -----
1   default                             active    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                         Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                         Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                         Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                         Gig0/2
100 VLAN0100                           active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                         Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                         Fa0/9
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                  active
1005 trnet-default                   active
SW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW1(config)#interface range fastEthernet 0/10 - fastEthernet 0/19
SW1(config-if-range)#switchport mode access
SW1(config-if-range)#switchport access vlan 200
% Access VLAN does not exist. Creating vlan 200
SW1(config-if-range)#+^Z
SW1#
*SYS-5-CONFIG_I: Configured from console by console

```

5. Interface the gigabit Ethernet 0/1 in both the switches to enable the connection between the two switch networks by enabling the switchport in the trunk mode.

```

SW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW1(config)#interface gigabitEthernet 0/1
SW1(config-if)#switchport mode trunk

SW1(config-if)#
*LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to
down

*LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to
up

-----
SW1#show interfaces trunk
Port      Mode       Encapsulation  Status        Native vlan
Gig0/1    on         802.1q          trunking     1

Port      Vlans allowed on trunk
Gig0/1    1-1005

Port      Vlans allowed and active in management domain
Gig0/1    1,100,200

Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    1,100,200

SW1#

SW2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
SW2(config)#interface gigabitEthernet 0/1

```

```

SW2(config-if)#switchport mode trunk
SW2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
SW2(config-if)#^Z
SW2#
%SYS-5-CONFIG_I: Configured from console by console

SW2#show interfaces trunk
Port      Mode       Encapsulation  Status        Native vlan
Gig0/1    on         802.1q          trunking     1

Port      Vlans allowed on trunk
Gig0/1    1-1005

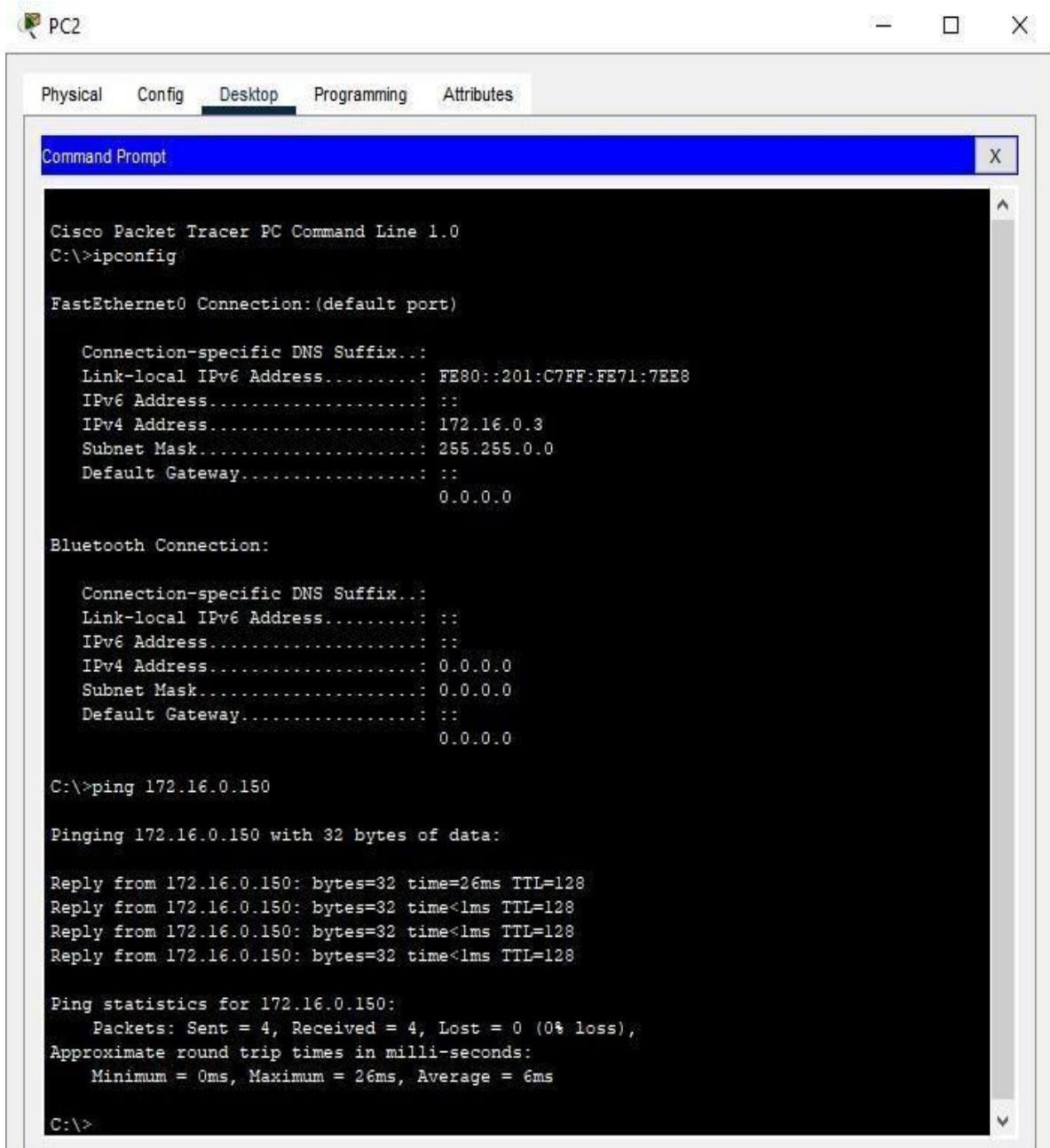
Port      Vlans allowed and active in management domain
Gig0/1    1,100,200

Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    1,100,200

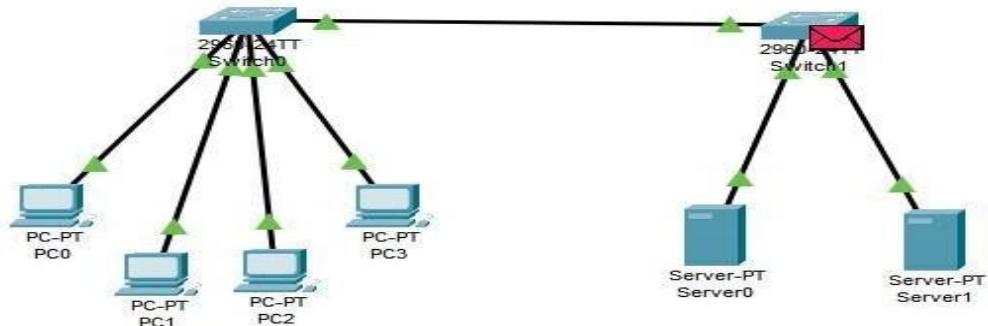
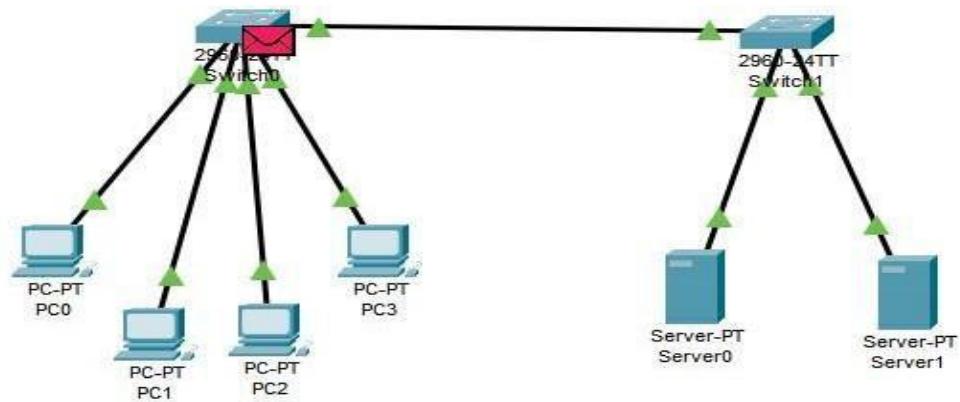
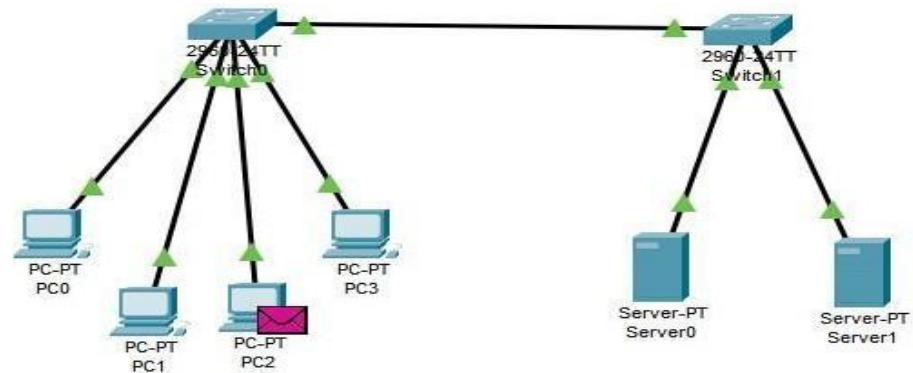
SW2#

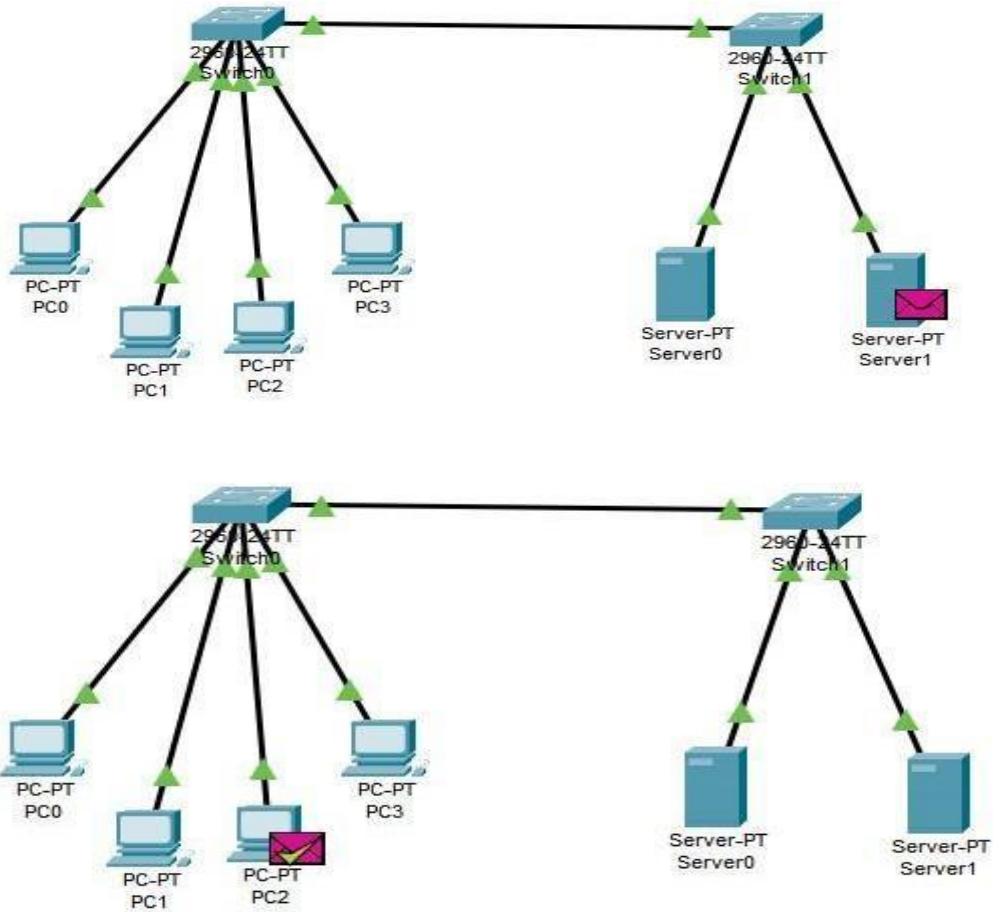
```

6. Ping the PC of the first network to the Server of another network which is connected through the switches.



7. Place the packets in the Source and the Destination. In simulation mode, check the transmission of the packets is successful.





Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit (edit)
	Successful	PC2	Server1	ICMP		0.000	N	0	

Result:

Thus a Simple Virtual LAN Configuration Using CISCO Packet Tracer has been executed Successfully.

Exp. No. 22

Date: 18.10.24

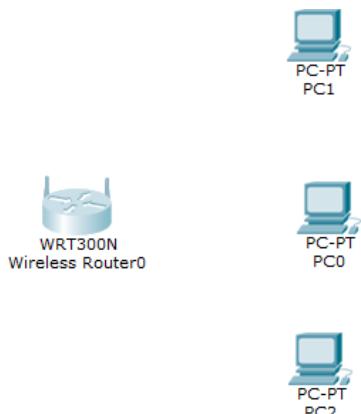
Study of Stimulation of Wireless Connection Between Router and PC

Aim:

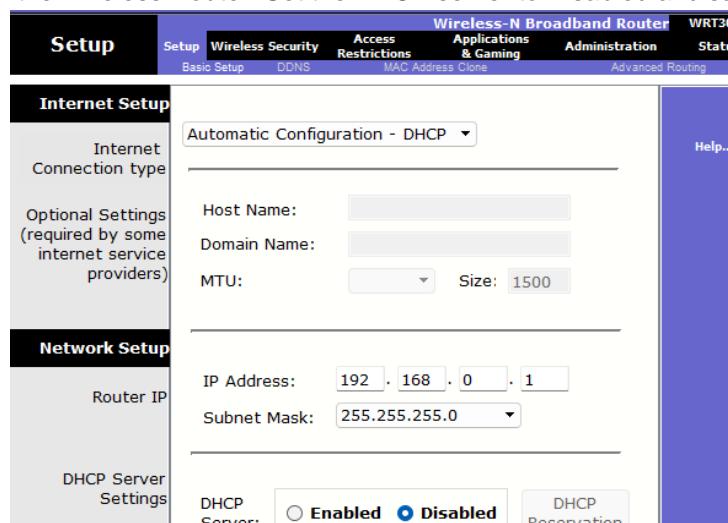
Configuration of Wireless LAN Using CISCO Packet Tracer.

Algorithm:

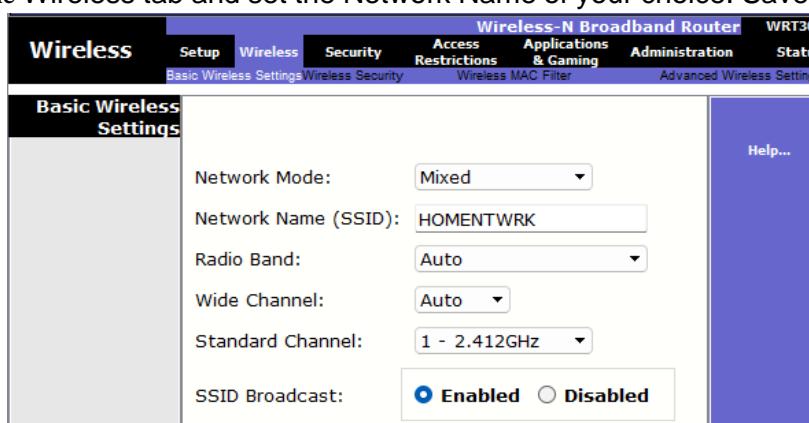
1. Arrange the Pcs and WRT300N Wireless Router.



2. Click on the Wireless Router. Set the DHCP server to Disabled and save changes.



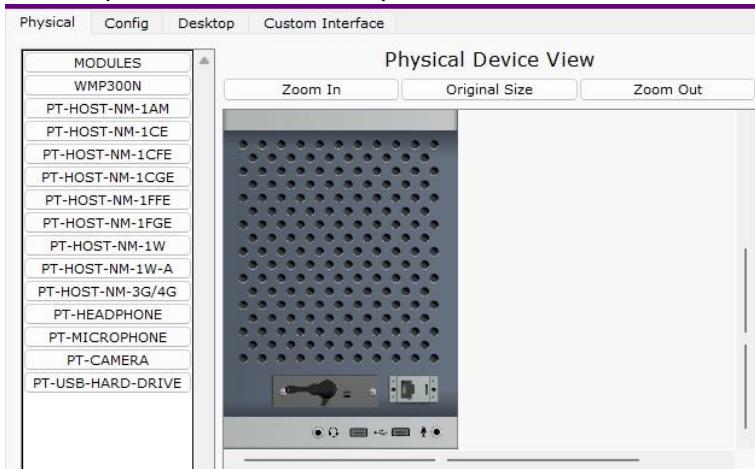
3. Go to the Wireless tab and set the Network Name of your choice. Save settings.



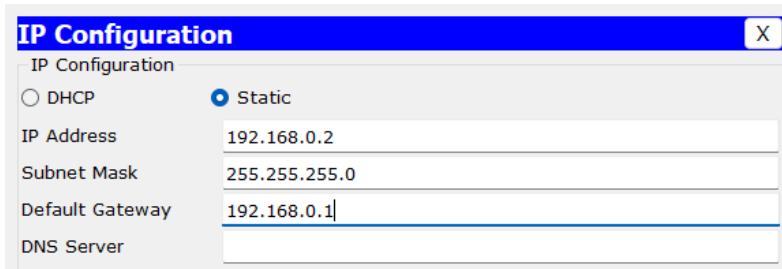
4. Click on Wireless Security and select WEP Security Mode. Set Key 1 as 10 digit HEX. Save settings.



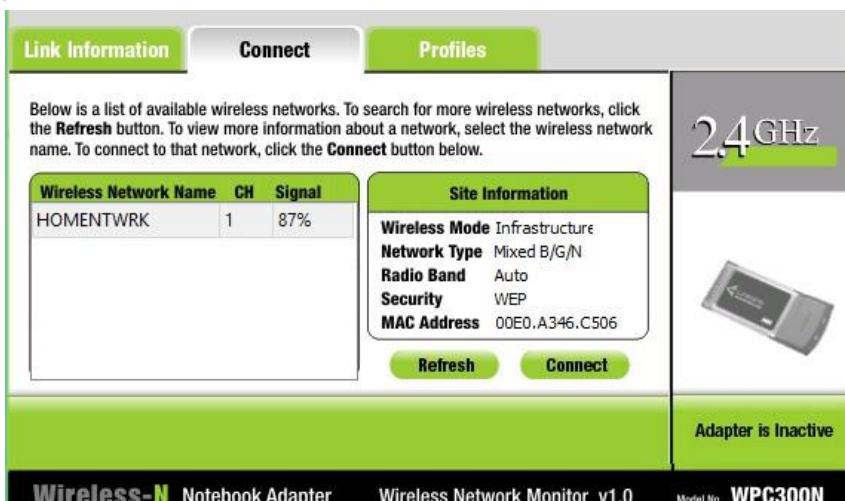
5. Select PC0. Replace Wired LAN adapter with WMP300N.



6. Configure PC0. Set IP as Static and assign IP address. Provide Default Gateway as IP of router.



7. Go to PC Wireless in GUI. Here click on Connect tab. Select the Wireless Router to connect.



8. Enter the WEP Key 1 entered in the router and press Connect.

WEP Key Needed for Connection

This wireless network has WEP encryption enabled. To connect to this network, select the level of WEP encryption. Enter the required passphrase or WEP key in the appropriate field below. Then click the Connect.

Security	WEP
WEP	64-bit
Passphrase	
WEP Key 1	0123456789

Please select the wireless security method used by your existing wireless network.

To use WEP encryption, select 64-bit or 128-bit

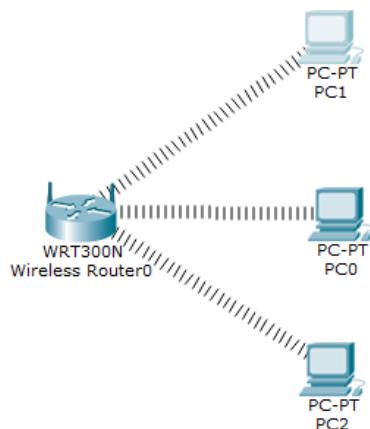
The Passphrase is case-sensitive and should be no more than 16 characters in length.

When entering this manually, it should be 10 characters for 64-bit encryption or 26 characters for 128-bit encryption. Valid hexadecimal characters are "A" through "F" and numbers "0" through "9".

| Cancel | Connect

9. Repeat Steps 5 to 8 for PC1 and PC2

As you can see below, all 3 PCs are connected to the router wirelessly.



10. Ping another PC using command prompt.

Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>
Packet Tracer PC Command Line 1.0
PC>PING 192.168.0.3

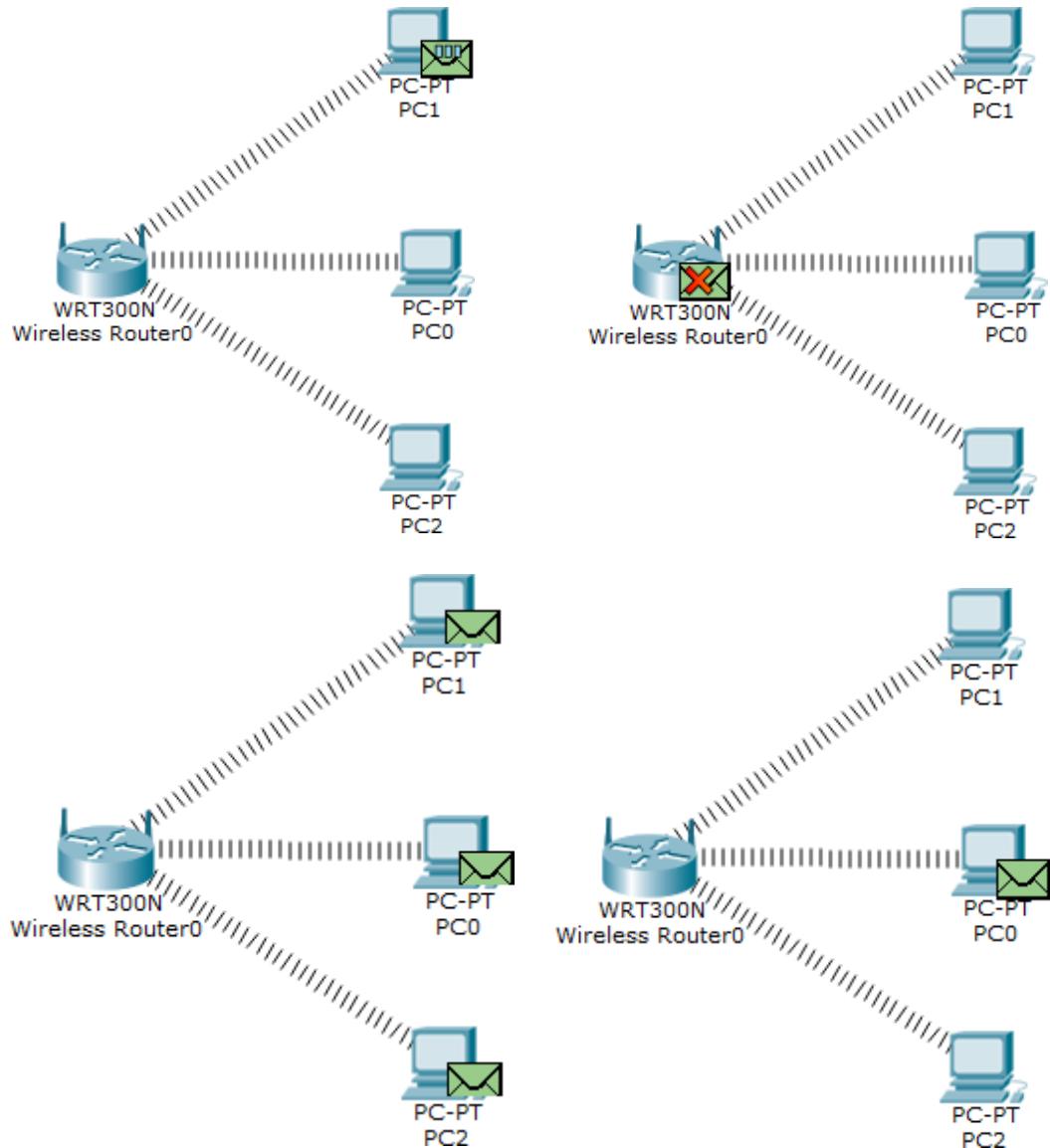
Pinging 192.168.0.3 with 32 bytes of data:

Reply from 192.168.0.3: bytes=32 time=31ms TTL=128
Reply from 192.168.0.3: bytes=32 time=20ms TTL=128
Reply from 192.168.0.3: bytes=32 time=19ms TTL=128
Reply from 192.168.0.3: bytes=32 time=19ms TTL=128

Ping statistics for 192.168.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 19ms, Maximum = 31ms, Average = 22ms

PC>
```

11. Visualize packet flow using simulation:



Result:

Thus a simple Wireless LAN Using CISCO Packet Tracer has been executed successfully.

Exp. No. 23	Study of Wireshark Tool
Date: 19.10.24	

Aim:

To analyze and study the network analysis tool wireshark.

Description:

Wireshark

Wireshark, a network analysis tool formerly known as Ethereal, captures packets in real time and display them in human-readable format. Wireshark includes filters, color coding, and other features that let you dig deep into network traffic and inspect individual packets. You can use Wireshark to inspect a suspicious program's network traffic, analyze the traffic flow on your network, or troubleshoot network problems.

What we can do with Wireshark:

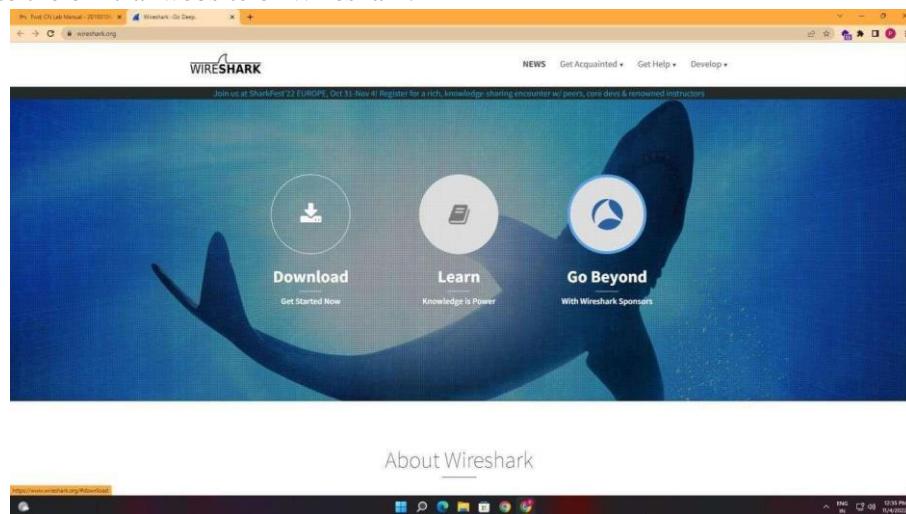
1. Capture network traffic
2. Decode packet protocols using dissectors
3. Define filters – capture and display
4. Watch smart statistics
5. Analyze problems
6. Interactively browse that traffic

Wireshark used for:

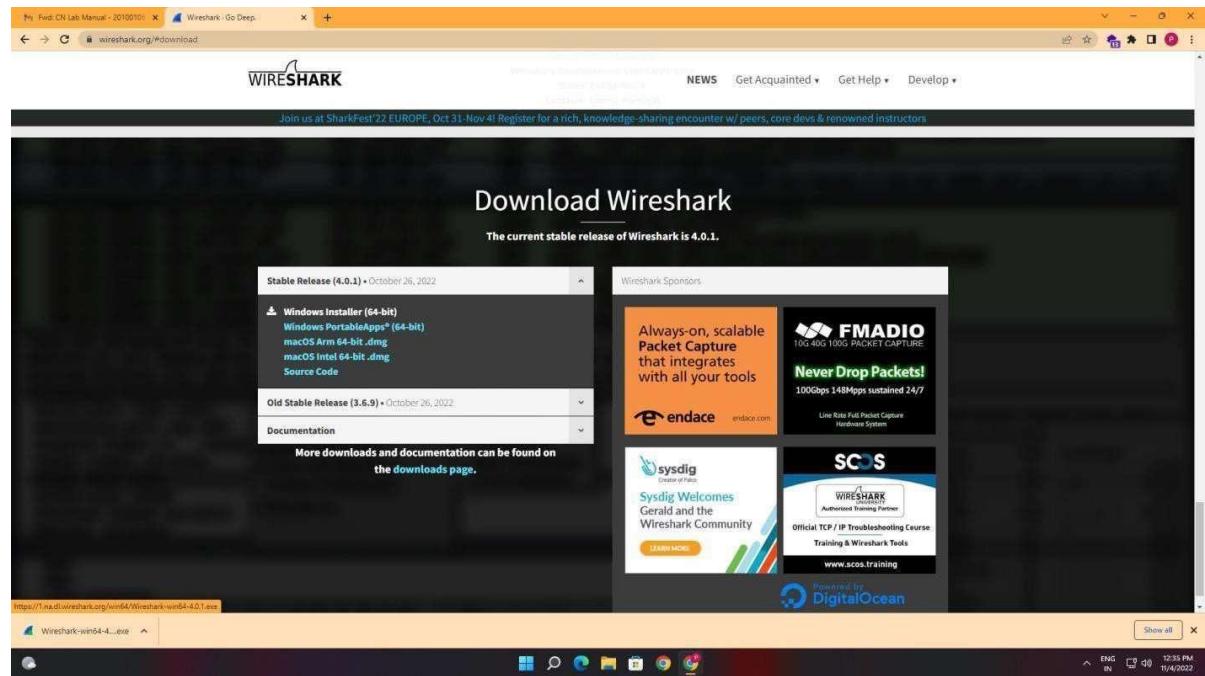
1. Network administrators: troubleshoot network problems
2. Network security engineers: examine security problems
3. Developers: debug protocol implementations
4. People: learn network protocol internals.

Getting Wireshark:

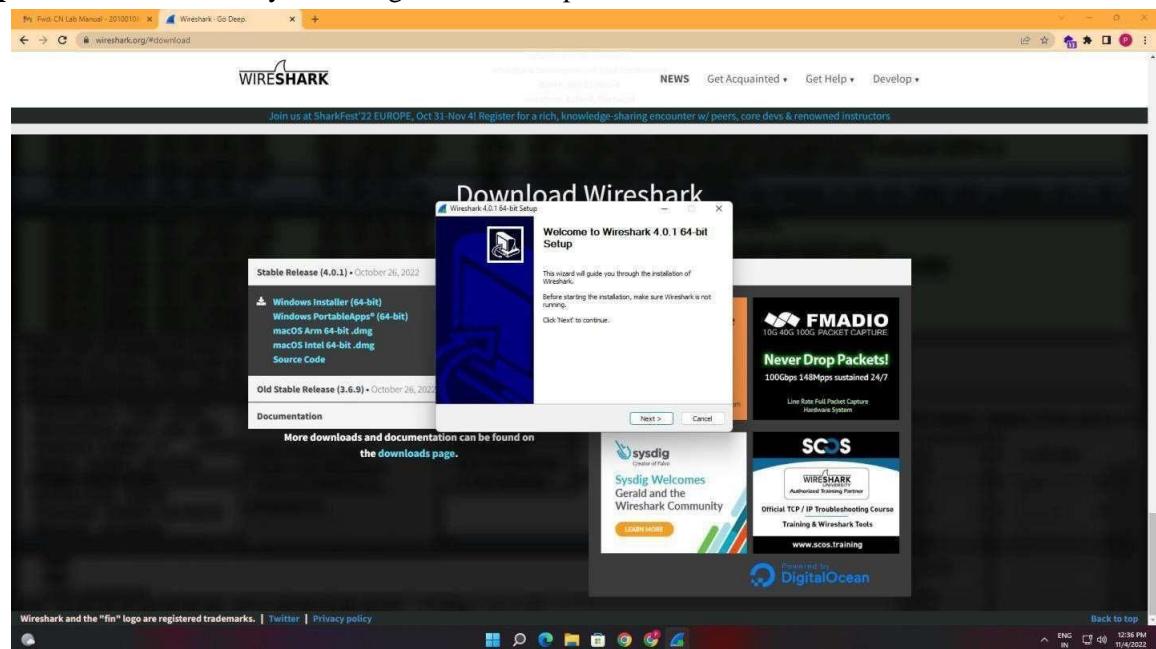
Step 1: Go to the official website of Wireshark.

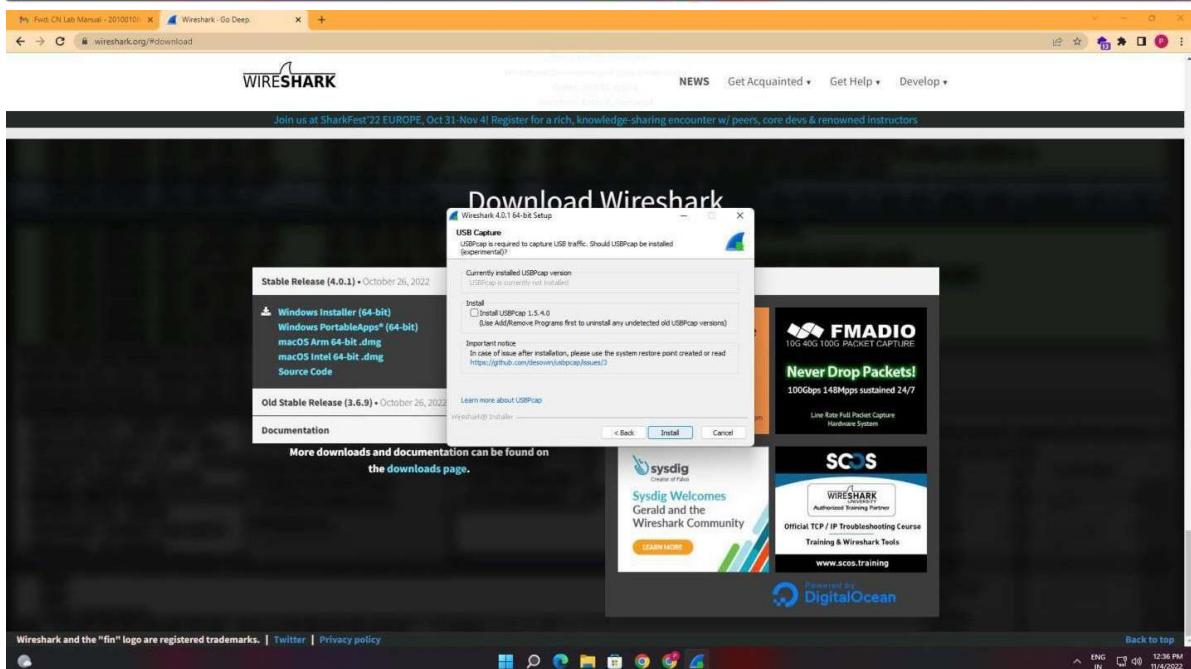
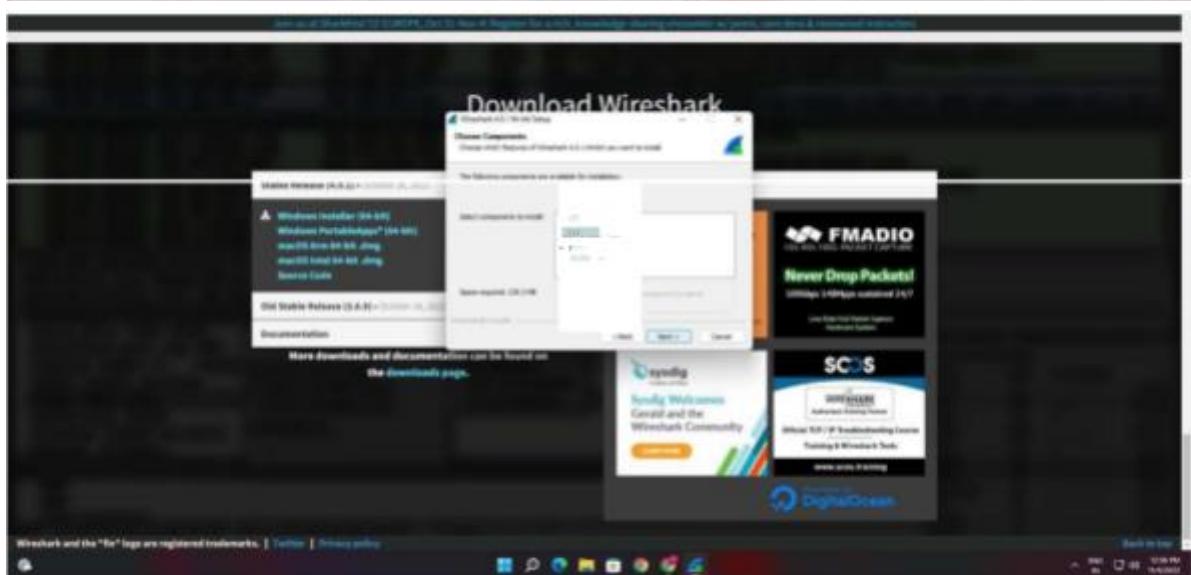
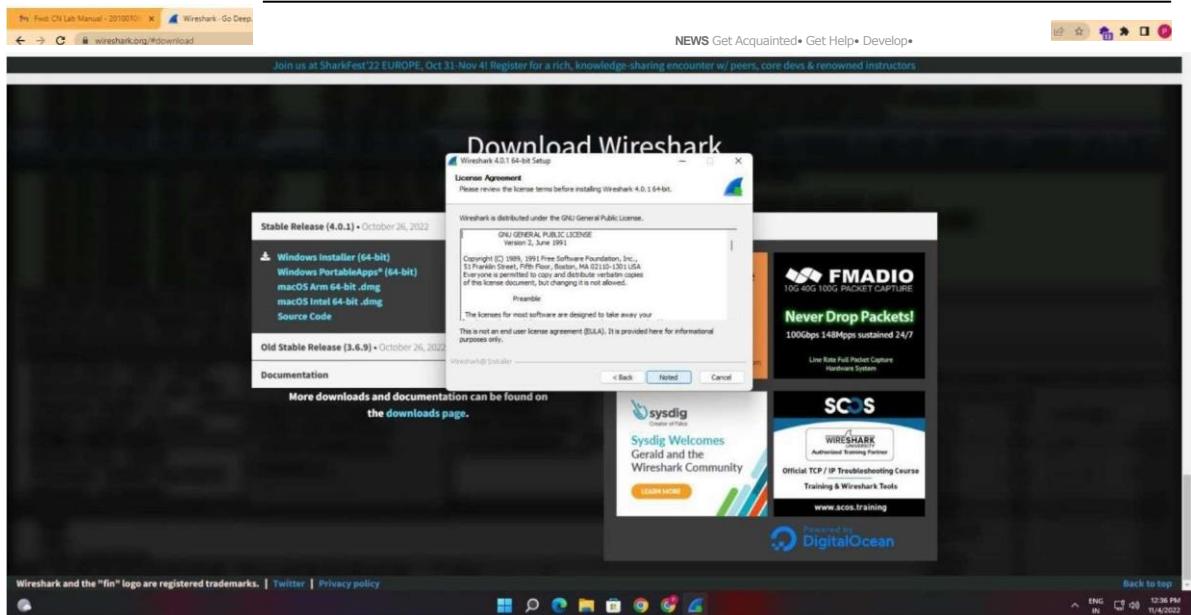


Step 2: Download the stable version of wireshark.



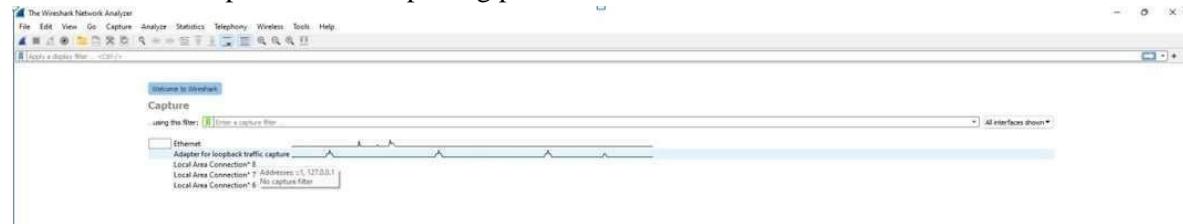
Step 3: Install wireshark by following the below steps.





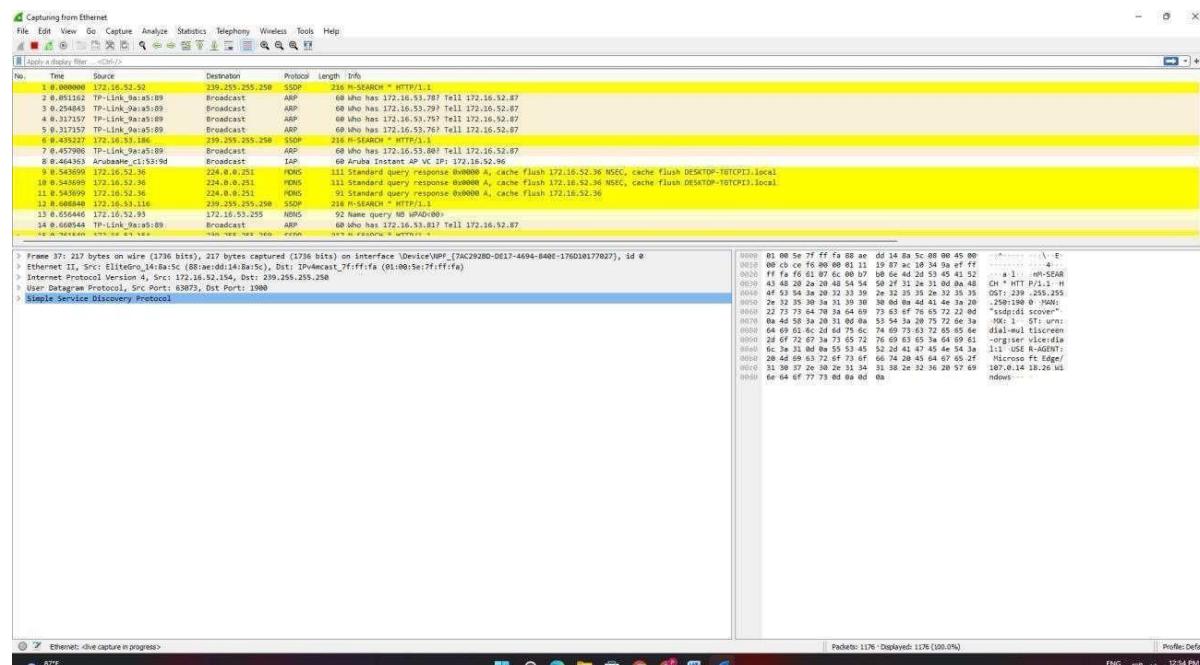
Capturing Packets:

After downloading and installing wireshark, launch it and double-click the name of a network interface under Capture to start capturing packets on that interface.



As soon as you click the interface name, you'll see the packets start to appear in real time. Wireshark captures each packet sent to or from your systems.

If you have promiscuous mode enabled—it's enabled by default—you'll also see all the other packets on the network instead of only packets addressed to your network adapter. To check if promiscuous mode is enabled, click Capture > Options and verify the “Enable promiscuous mode on all interfaces” checkbox is activated at the bottom of this window.



Click the red “Stop” button near the top left corner of the window when you want to stop capturing traffic.

The “Packet List” Pane

The packet list pane displays all the packets in the current capture file. The “Packet List” pane Each line in the packet list corresponds to one packet in the capture file. If you select a line in this pane, more details will be displayed in the “Packet Details” and “Packet Bytes” panes.

The “Packet Details” Pane

The packet details pane shows the current packet (selected in the “Packet List” pane) in a more detailed form. This pane shows the protocols and protocol fields of the packet selected in the “Packet List” pane. The protocols and fields of the packet shown in a tree which can be expanded and collapsed.

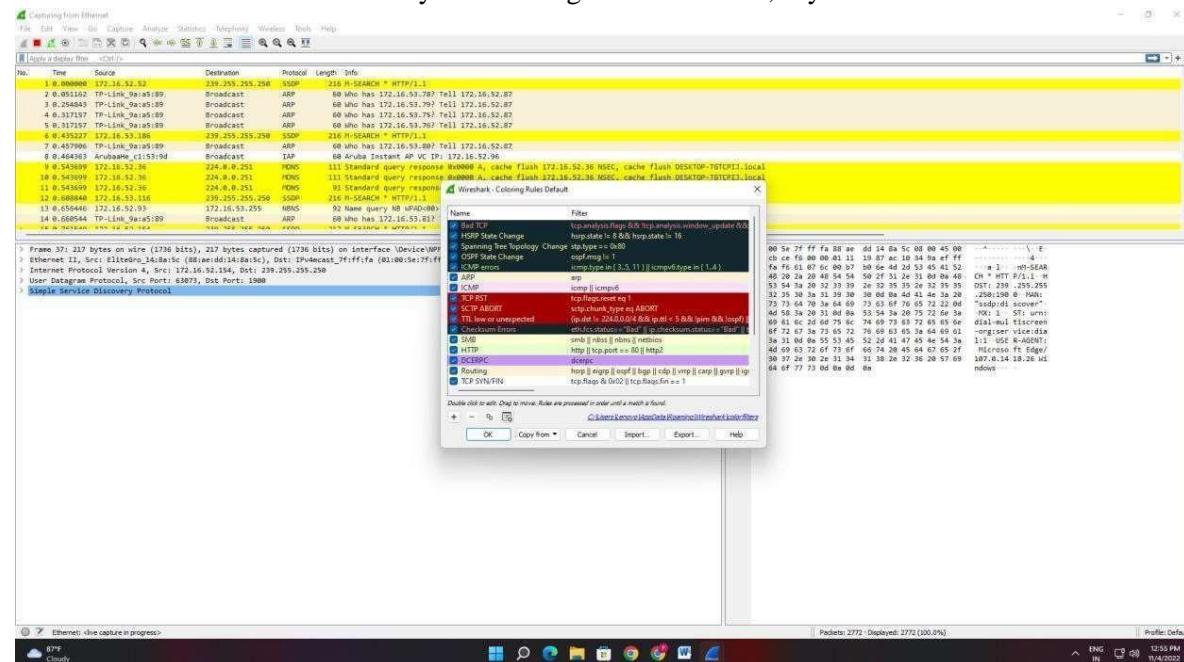
The “Packet Bytes” Pane

The packet bytes pane shows the data of the current packet (selected in the “Packet List” pane) in a hexdump style.

Color Coding

You'll probably see packets highlighted in a variety of different colors. Wireshark uses colors to help you identify the types of traffic at a glance. By default, light purple is TCP traffic, light blue is UDP traffic, and black identifies packets with errors—for example, they could have been delivered out of order.

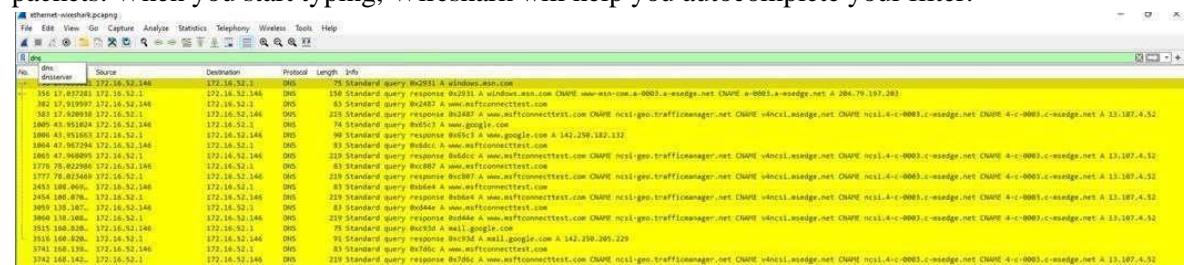
To view exactly what the color codes mean, click View > Coloring Rules. You can also customize and modify the coloring rules from here, if you like.



Filtering Packets:

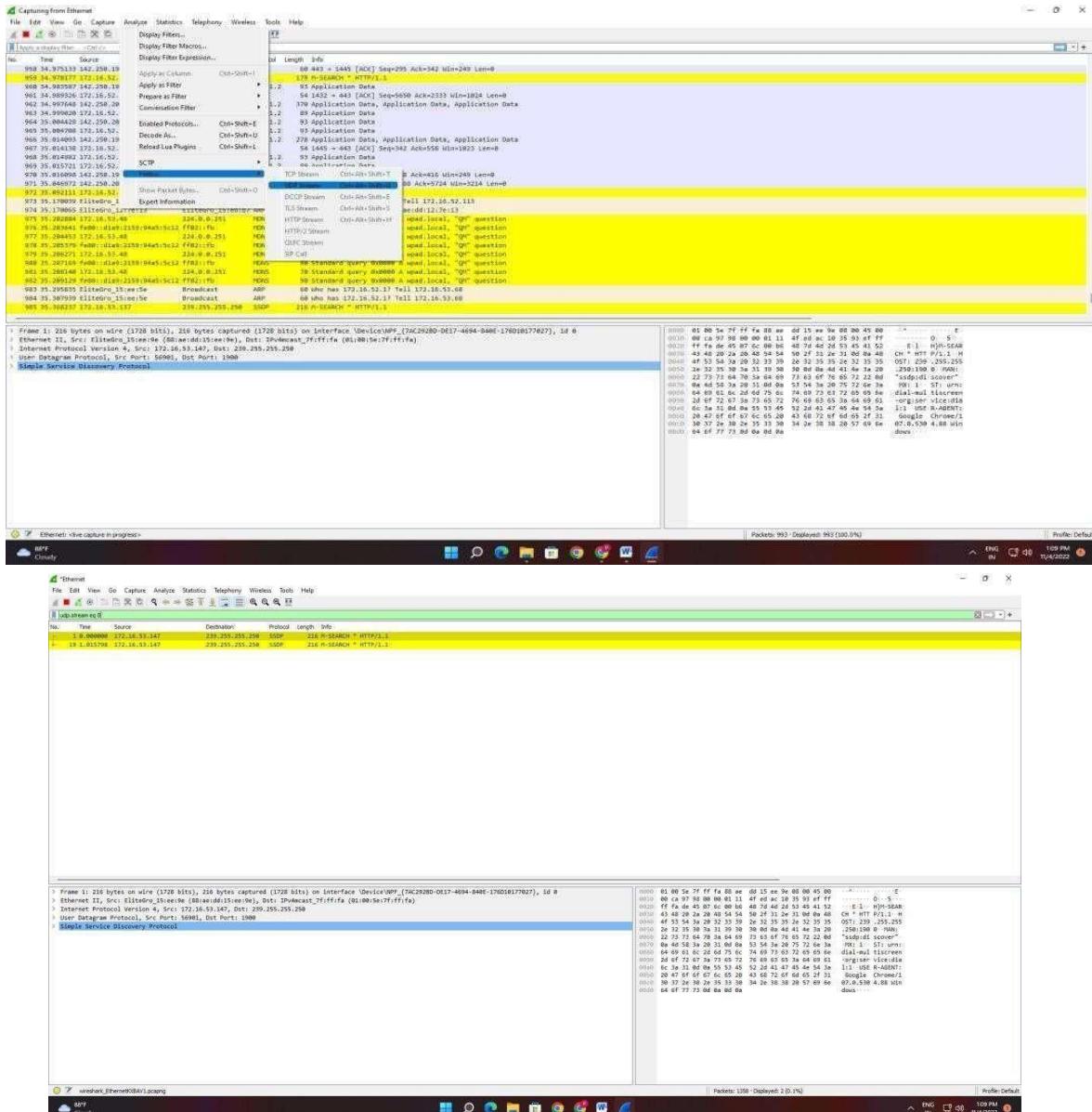
If you're trying to inspect something specific, such as the traffic a program sends when phoning home, it helps to close down all other applications using the network so you can narrow down the traffic. Still, you'll likely have a large amount of packets to sift through. That's where Wireshark's filters come in.

The most basic way to apply a filter is by typing it into the filter box at the top of the window and clicking Apply (or pressing Enter). For example, type "dns" and you'll see only DNS packets. When you start typing, Wireshark will help you autocomplete your filter.

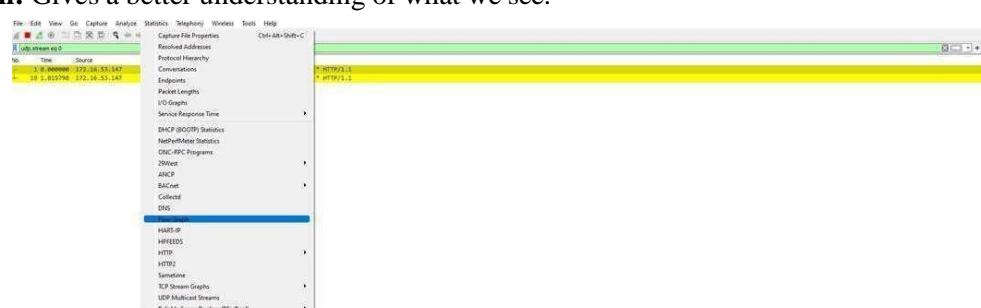


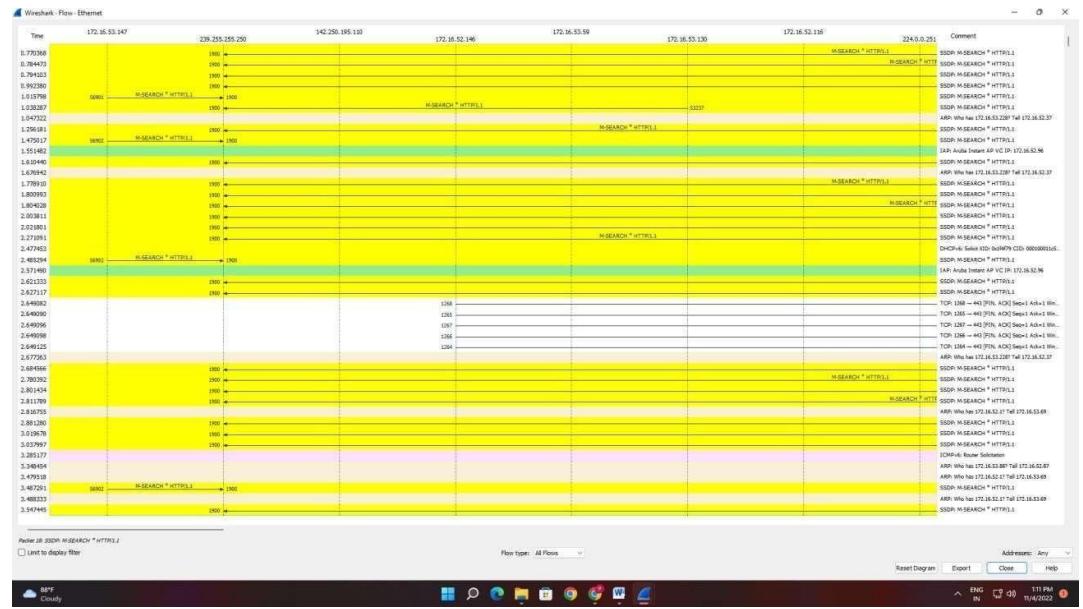
You can also click Analyze > Display Filters to choose a filter from among the default filters included in Wireshark. From here, you can add your own custom filters and save them to easily access them in the future.

Another interesting thing you can do is right-click a packet and select Follow > UDP Stream. You'll see the full UDP conversation between the client and the server. You can also click other protocols in the Follow menu to see the full conversations for other protocols, if applicable.



Flow Graph: Gives a better understanding of what we see.





Result:

Thus the study of wireshark tools has been completed successfully.

Exp. No. 24

Capturing and Analyzing Packets Using Wireshark Tool

Date: 25.10.24

Aim:

To capture and analyze packets using wireshark tool.

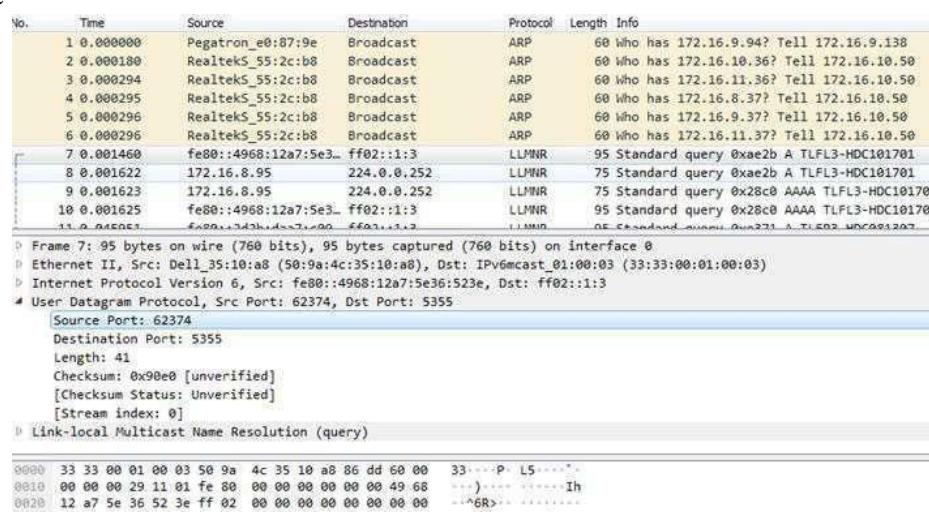
Exercises:

- Capture 100 packets from the Ethernet: IEEE 802.3 LAN Interface and save it.

Procedure

- Select Local Area Connection in wireshark.
- Go to capture option
- Select stop capture automatically after 100 packets.
- Then click start capture.
- Save the packets.

Output

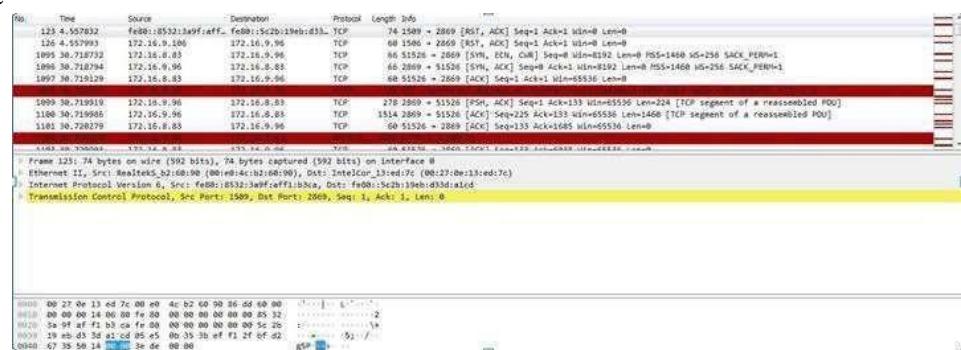


- Create a Filter to display only TCP/UDP packets, inspect the packets and provide the flow graph.

Procedure

- Select Local Area Connection in wireshark.
- Go to capture option
- Select stop capture automatically after 100 packets.
- Then click start capture.
- Search TCP packets in the search bar.
- To see the flow graph click the Statistics Flow graph.
- Save the packets.

Output



Flow Graph



3. Create a filter to display only ARP Packets and Inspect the Packet.

Procedure

- Select Local Area Connection in wireshark.
- Go to capture option
- Select stop capture automatically after 100 packets.
- Then click start capture.
- Search ARP packets in the search bar.
- Save the packets.

Output

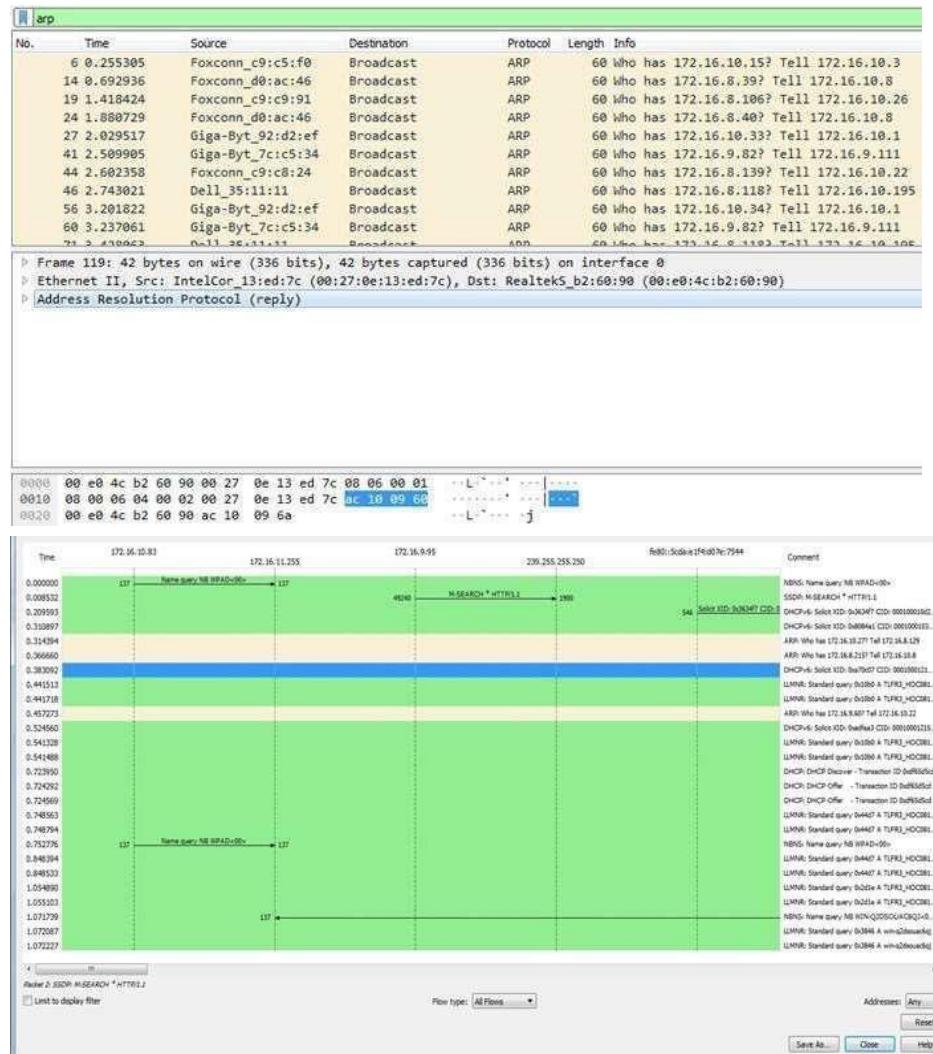
No.	Time	Source	Destination	Protocol	Length	Info
6	0.255305	Foxconn_c9:c5:f0:	Broadcast	ARP	60	Who has 172.16.10.1? Tell 172.16.10.3
14	0.692936	Foxconn_d0:ac:46	Broadcast	ARP	60	Who has 172.16.8.39? Tell 172.16.10.8
19	1.418424	Foxconn_c9:c9:91	Broadcast	ARP	60	Who has 172.16.8.186? Tell 172.16.10.26
24	1.880729	Foxconn_d0:ac:46	Broadcast	ARP	60	Who has 172.16.8.40? Tell 172.16.10.8
27	2.029517	Giga-Byt_92:d2:ef	Broadcast	ARP	60	Who has 172.16.10.33? Tell 172.16.10.1
41	2.589905	Giga-Byt_7:c5:34	Broadcast	ARP	60	Who has 172.16.9.82? Tell 172.16.9.111
44	2.682358	Foxconn_c9:c8:24	Broadcast	ARP	60	Who has 172.16.8.139? Tell 172.16.10.22
46	2.743021	Dell_35:11:11	Broadcast	ARP	60	Who has 172.16.8.118? Tell 172.16.10.195
56	3.201822	Giga-Byt_92:d2:ef	Broadcast	ARP	60	Who has 172.16.10.34? Tell 172.16.10.1
60	3.237061	Giga-Byt_7:c5:34	Broadcast	ARP	60	Who has 172.16.9.82? Tell 172.16.9.111
74	3.400823	0:11:9E:11:51:51	Broadcast	ARP	60	Who has 172.16.8.139? Tell 172.16.10.105
Frame 119: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0						
Ethernet II, Src: IntelCor_13:ed:7c (00:27:0e:13:ed:7c), Dst: Realtek5_b2:60:90 (00:e0:4c:b2:60:90)						
Address Resolution Protocol (reply)						

4. Create a Filter to display only DNS packets and provide the Flowgraph.

Procedure

- Select Local Area Connection in wireshark.
- Go to capture option
- Select stop capture automatically after 100 packets.
- Then click start capture.
- Search DNS packets in the search bar.
- To see the flow graph click the Statistics Flow graph.
- Save the packets.

Output

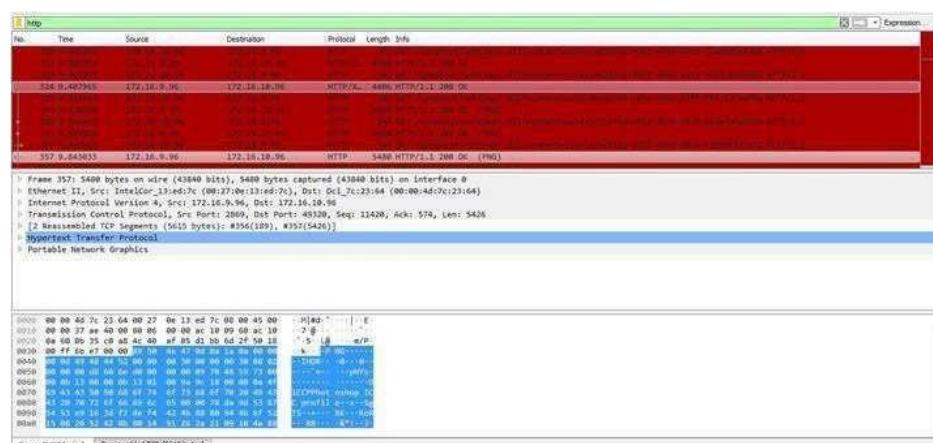


- Create a Filter to display only HTTP Packets and inspect the packet.

Procedure

- Select Local Area Connection in wireshark.
- Go to capture option
- Select stop capture automatically after 100 packets.
- Then click start capture.
- Search HTTP packets in the search bar.
- Save the packets.

Output



6. Create a Filter to display only IP/ICMP Packets and inspect the packet.

Procedure

- Select Local Area Connection in wireshark.
 - Go to capture option
 - Select stop capture automatically after 100 packets.
 - Then click start capture.
 - Search ICMP/IP packets in the search bar.
 - Save the packets.

Output

7. Create a Filter to Display only the DHCP Packets and inspect the packet.

Procedure

- Select Local Area Connection in wireshark.
 - Go to capture option
 - Select stop capture automatically after 100 packets.
 - Then click start capture.
 - Search HTTP packets in the search bar.
 - Save the packets.

Output

Result:

Thus the capturing and analyzing of packets using wireshark tools has been executed successfully.

Exp. No. 25	Analyze Weblogs Using Webalizer
Date: 26.10.24	

Aim:

To analyze weblogs using webalizer.

Description:

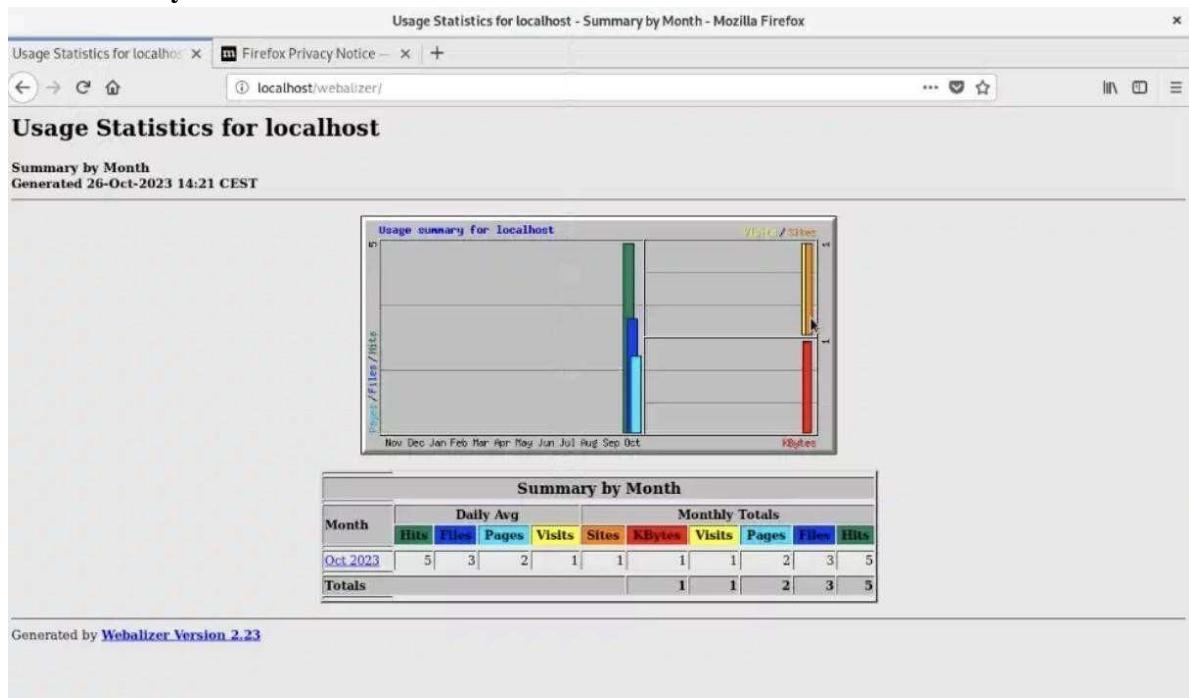
The Webalizer is a web log analysis software, which generates webpages of analysis, from access and usage logs. It is one of the most commonly used web server administrative tools.

Procedure:

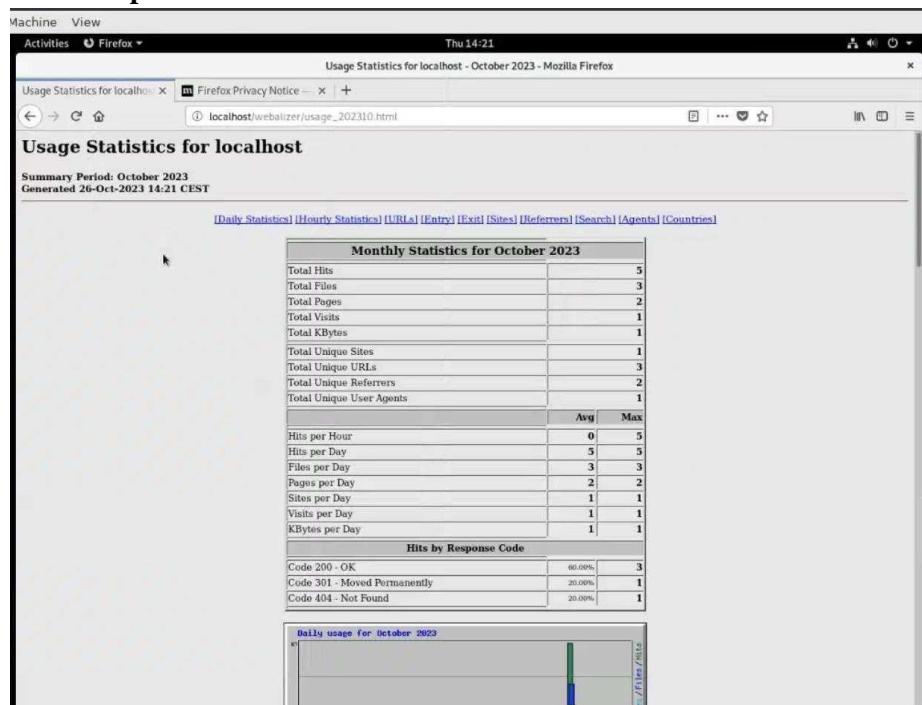
1. Open your Linux/Fedora terminal.
2. Switch to the root user using the ‘su’ command.
3. Install the Apache HTTP server using the DNF package manager command: dnf install httpd
4. Open the SELinux configuration file using the command: vi /etc/sysconfig/selinux
5. Change the SELinux configuration to ‘permissive’ mode from ‘enforcing’ mode as:
SELinux=permissive
6. Enable the Apache HTTP service using the command: systemctl enable httpd.service
7. Start the Apache HTTP service using the command: systemctl start httpd.service
8. Create an output directory for the webalizer reports using the command: mkdir /var/www/html/webalizer
9. Install Webalizer using DNF as: dnf install webalizer
10. Copy all the files of the usage directory to the html directory using the command: cp* /var/www/usage /var/www/html
11. Open the Webalizer configuration file using the command: vi /etc/webalizer.conf
12. Inside the file,
 - a. Uncomment the command: LogType clf
 - b. Uncomment the command: Hostname localhost
 - c. Change the OutputDir to: OutputDir /var/www/html/webalizer
 - d. Ensure that the following line is present:LogFile /var/log/httpd/access_log
13. After that, restart the Apache HTTP service using the command: systemctl restart httpd.service
14. Open a browser and navigate to the Link <http://localhost/webalizer>
15. Click on a month to get its reports.

Output:

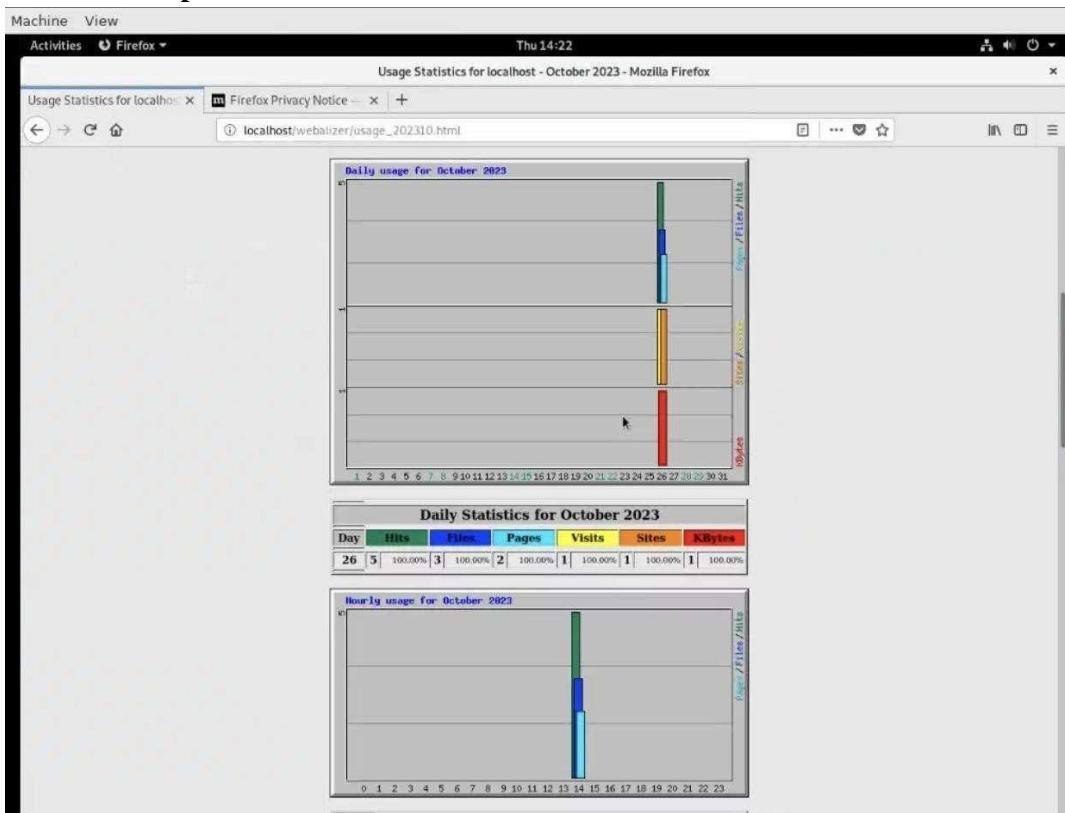
Month-wise Summary:



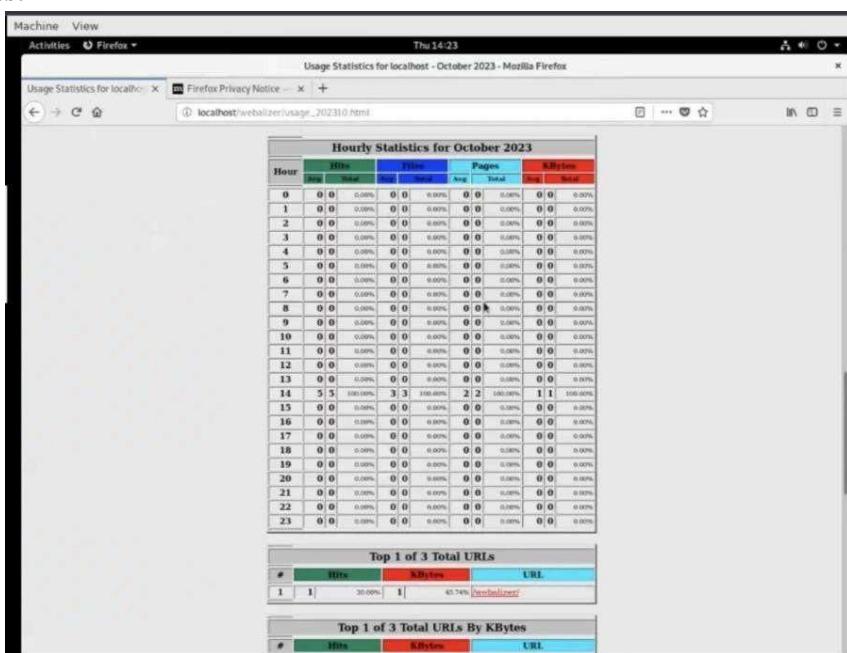
Monthly Statistics for a Specific Month:



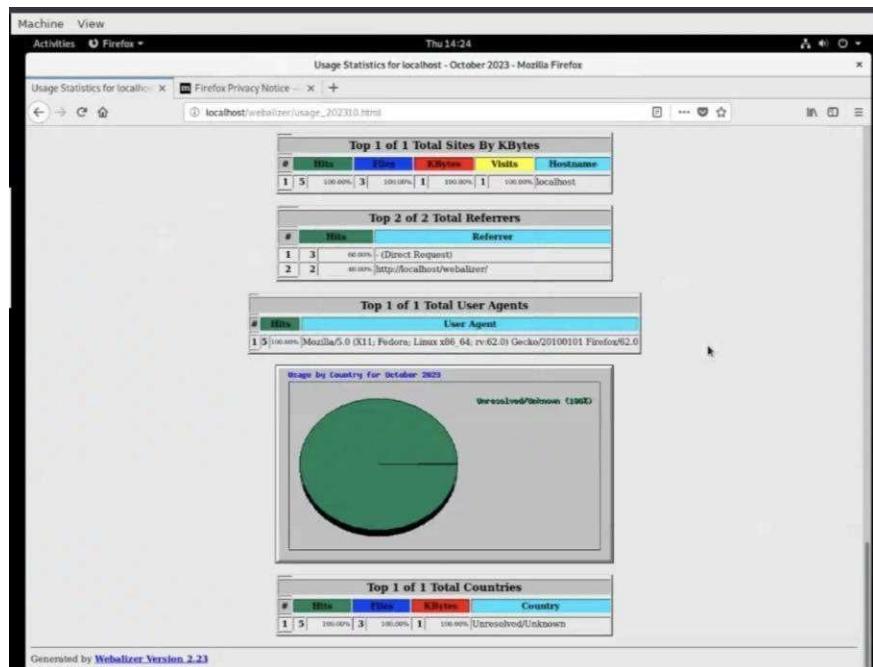
Daily Statistics for a Specific Month:



Hourly Statistics:



User Agents and Countries:



Result:

Thus the analyze of weblogs using webalizer has been executed successfully.