PERIYAR UNIVERSITY

(NAAC 'A++' Grade with CGPA 3.61 (Cycle - 3)
State University - NIRF Rank 59 - NIRF Innovation Band of 11-50)
SALEM - 636 011, Tamil Nadu, India.

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)

MASTER OF COMPUTER APPLICATIONS

SEMESTER – I

Elective: NETWORK PROTOCOL LAB

(Candidates admitted from 2024 onwards)

PERIYAR UNIVERSITY

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
MCA 2024 admission onwards

Elective Course Lab
NETWORK PROTOCOL LAB [24DLCSAE02]

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SYLLABUS

Course Code: 24DLCSAE02 **Credits: 1**

Network Protocol Lab

Course Objectives

- To understand and implement the basic concepts of Transmission Control Protocol/Internet Protocol and associated functions.
- To acquire programming skills in Implement various technologies and services associated with network protocols along with the challenges of data transfer.
- Implement the importance and functioning of Routing Protocols over communication service.
- To acquire skills to connect two routers and any two switches.
- To comprehend related to SSH protocols and accessing the remote device.

Implement the following using Linux / Windows environments

1. Implement the following commands
    a. ipconfig
    b. ping
    c. traceroute
    d. netsat
    e. nslookup
2. Implement the following server commands
    a. ifconfig
    b. ip
    c. tracepath
    d. ss
    e. tcpdum
3. Connect and place the given file in the FTP server
4. Install packet tracer and connect a computer to router, switch and get a Icmp request
5. Implement the SSH protocols and accessing the remote device
6. Connect any two switches and get the status of each switches
7. Connect two routers and get packets from the routers.
8. Get the access of the router by connecting with working computer
9. Identify the route password of server and get the connection using telnet
10. Install wire shark for capture and analyse the packets (TCP /UDP)

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Comprehend the programming skills the SSH protocols and accessing the remote device	K1-K6
CO2:	Understand and implement the various functioning of Routing Protocols over communication service	K1-K6
CO3:	Evaluate the use of FTP server	K1-K6
CO4:	Design to Connect any two switches and get the status of each switches	K1-K6
CO5:	Solve to Connect two routers and get packets from the routers	K1-K6

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5- Evaluate, K6- Create

Mapping Course outcomes with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

S-Strong; M-Medium; L-Low

Extra lab tips & checklist

- Always run privileged commands as **Administrator** (Windows) or **sudo/root** (Linux).
- Use ss instead of netstat on newer Linux distributions.
- Prefer **SSH** over Telnet in real environments. Telnet is insecure (cleartext credentials).
- When using packet capture tools, get written permission for networks you do not own.
- For Cisco devices in Packet Tracer use show running-config, show interfaces, show ip route, debug ip icmp (lab-only) to inspect behavior.
- When showing sample outputs in reports, label them as example output.

Important Safety & Access Notes

- Run commands requiring elevated privileges as Administrator (Windows) or with sudo/root (Linux).
- Use SSH (secure) instead of Telnet (insecure) for real networks. Telnet is only shown for controlled lab environments.
- Only capture traffic or attempt password recovery on devices and networks you own or have explicit permission to test.

CONTENTS

Ex. No. 1	Implement the following client/host commands

a) ipconfig (Windows) / ifconfig (Linux) / ip addr (modern Linux)

Aim:

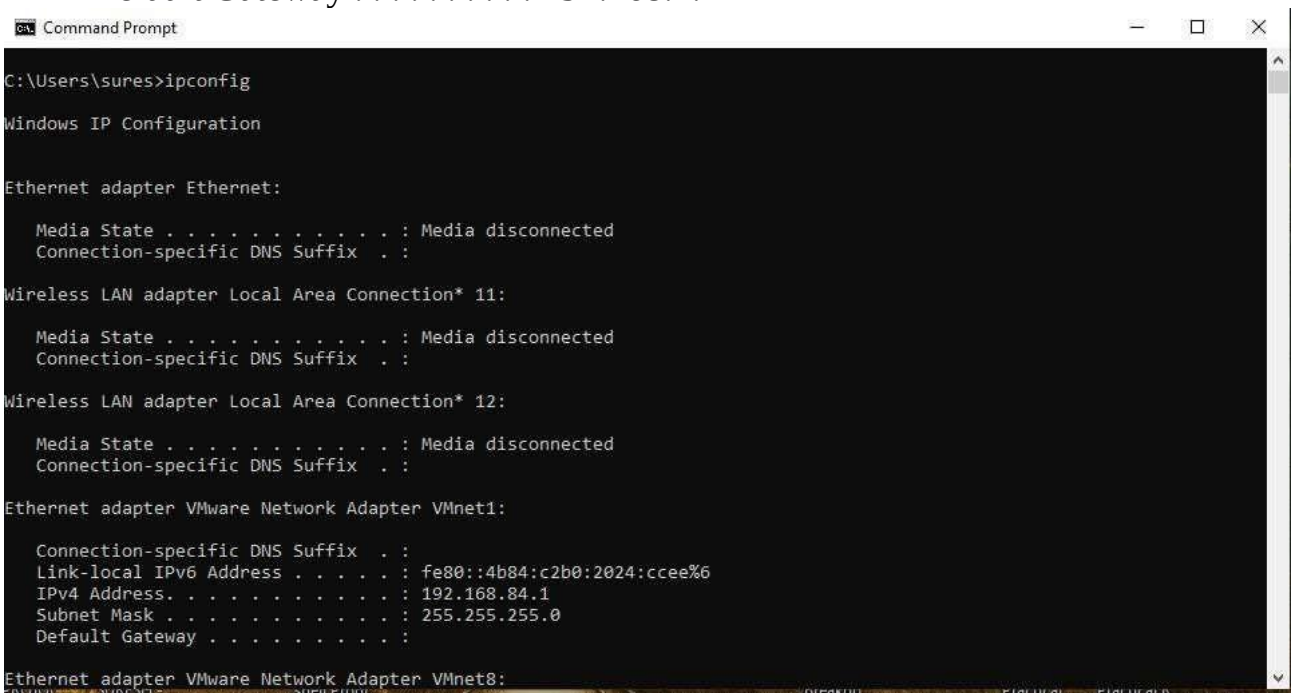
Display network interface configuration (IP, mask, gateway, MAC).

Procedure (Windows):

1. Open Command Prompt as Administrator.
2. Run: ipconfig /all

Sample Input & output Screenshot (Windows ipconfig /all):

Ethernet adapter Ethernet:
Connection-specific DNS Suffix. :
Description . . . . . : Intel(R) Ethernet
Physical Address. . . . . : 00-1A-2B-3C-4D-5E
DHCP Enabled. . . . . : Yes
IPv4 Address. . . . . : 192.168.1.50(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.1.1

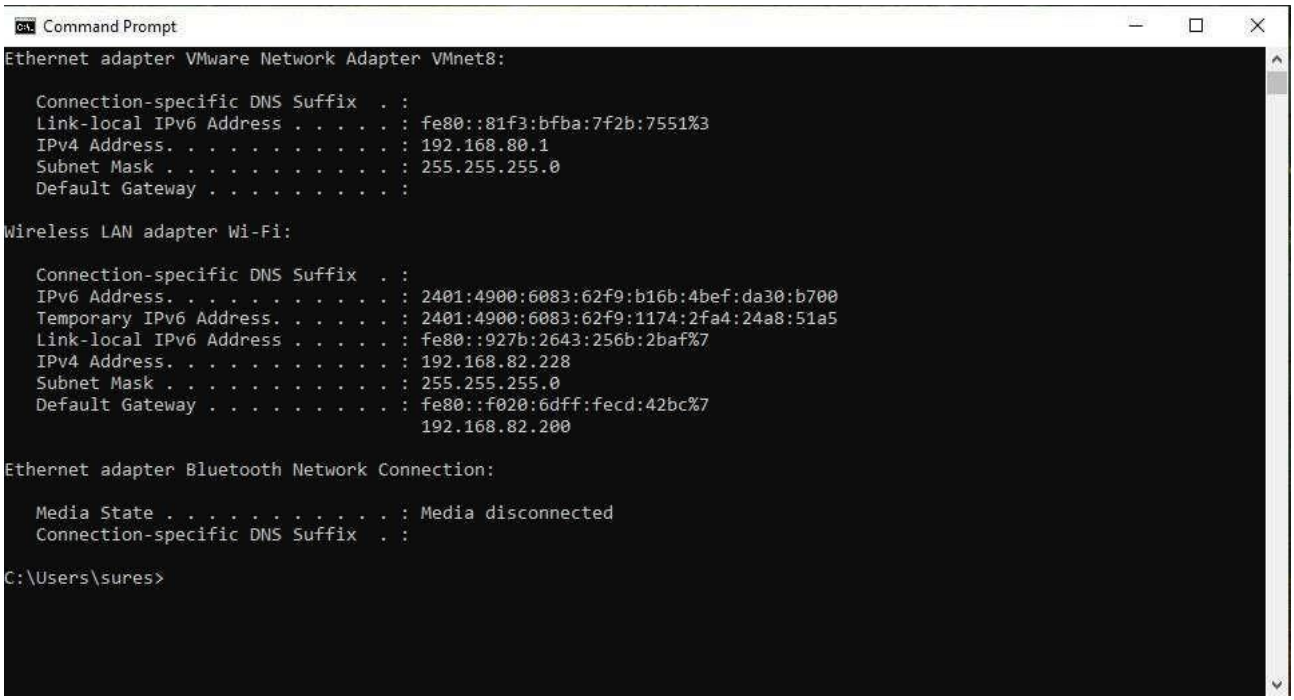


Procedure (Linux):

1. Open terminal. For legacy: sudo ifconfig -a
2. Modern: ip addr show or sudo ip a

Sample Input & output Screenshot (Linux):

2: enp3s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP
link/ether 00:1a:2b:3c:4d:5e brd ff:ff:ff:ff:ff:ff
inet 192.168.1.50/24 brd 192.168.1.255 scope global dynamic enp3s0



b) ping

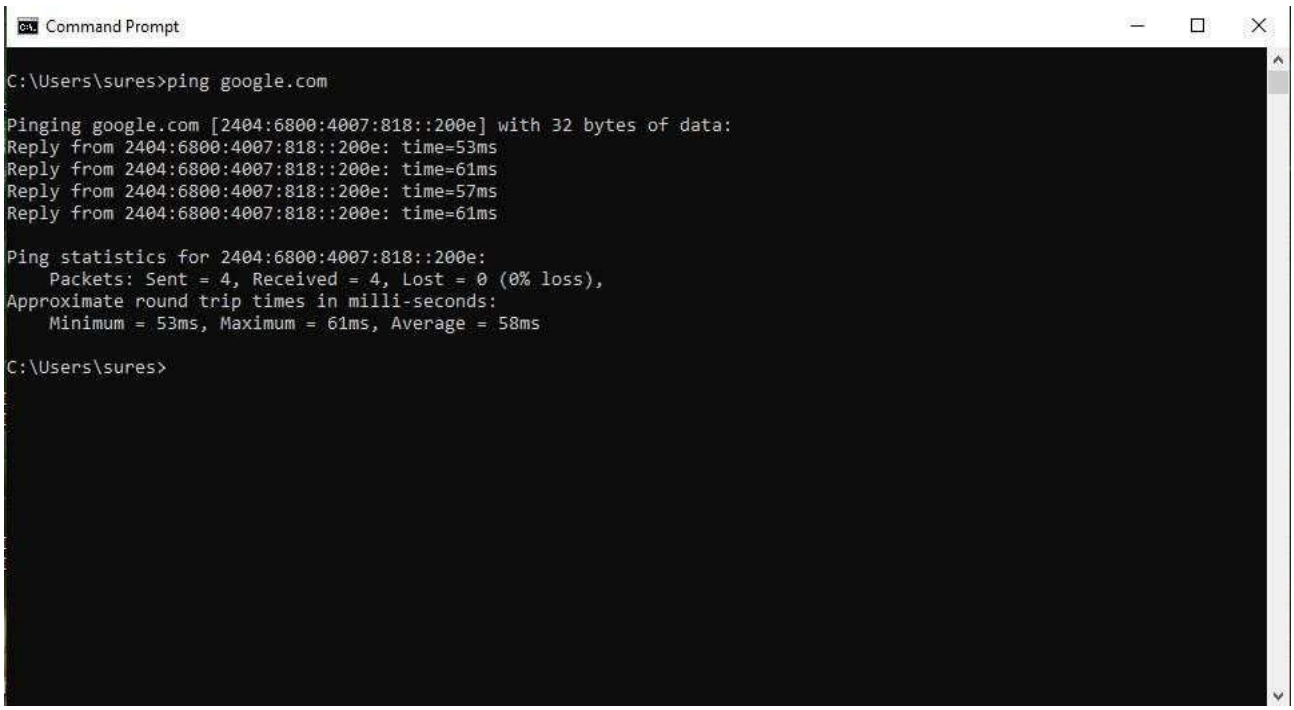
Aim: Test reach ability and measure round-trip time (ICMP).

Procedure (Windows & Linux):

1. Open terminal.
2. Run: ping <destination> (Windows defaults to 4 pings; Linux continues until stopped — use -c to set count).
   Examples:
   ping -n 4 8.8.8.8 (Windows)
   ping -c 4 8.8.8.8 (Linux)

Sample Input & output Screenshot:

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=18ms TTL=118
Reply from 8.8.8.8: bytes=32 time=19ms TTL=118
Ping statistics for 8.8.8.8:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)
Approximate round trip times in milli-seconds:
Minimum = 18ms, Maximum = 19ms, Average = 18ms



c) traceroute (Linux)/tracert (Windows)

Aim: Show the path (hops) packets take to reach a host.

Procedure (Windows):

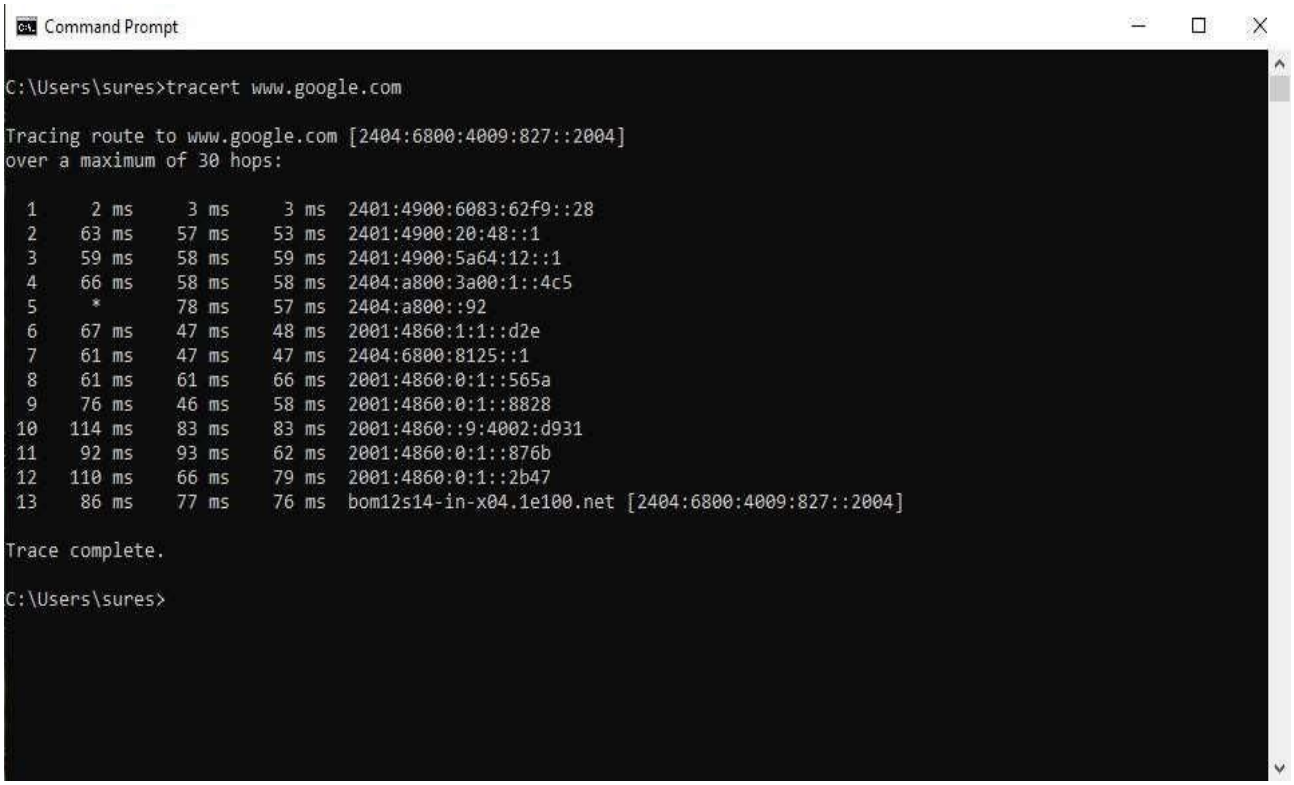
- tracert example.com

Procedure (Linux):

- traceroute example.com or tracepath example.com

Sample output Screenshot (tracert):

Tracing route to example.com [93.184.216.34]
1 <1 ms <1 ms <1 ms 192.168.1.1
2 10 ms 9 ms 9 ms 10.0.0.1
3 18 ms 17 ms 17 ms 203.0.113.1
4 21 ms 21 ms 21 ms 93.184.216.34
Trace complete.



d) netsat — likely netstat (Windows/Linux)

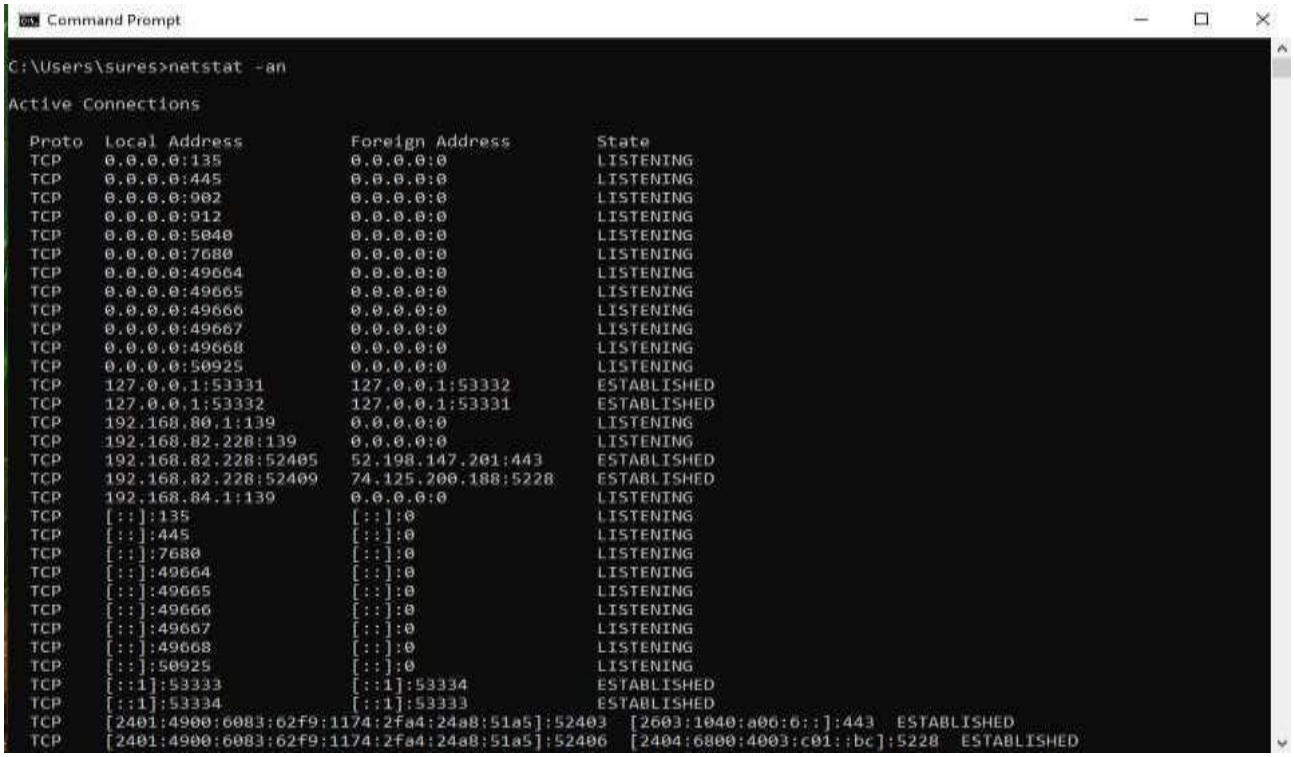
Aim: Display network connections, listening ports, and routing table.

Procedure:

1. Windows: netstat -ano (shows PID)
2. Linux: sudo netstat -tulpn or ss -tulpn (ss is preferred)

Sample output Screenshot (netstat -ano):

Proto	Local Address	Foreign Address	State	PID
TCP	0.0.0.0:80	0.0.0.0:0	LISTENING	1234
TCP	192.168.1.50:5000	203.0.113.5:443	ESTABLISHED	4321



e) nslookup

Aim: Query DNS servers to resolve domain names to IPs and vice-versa.

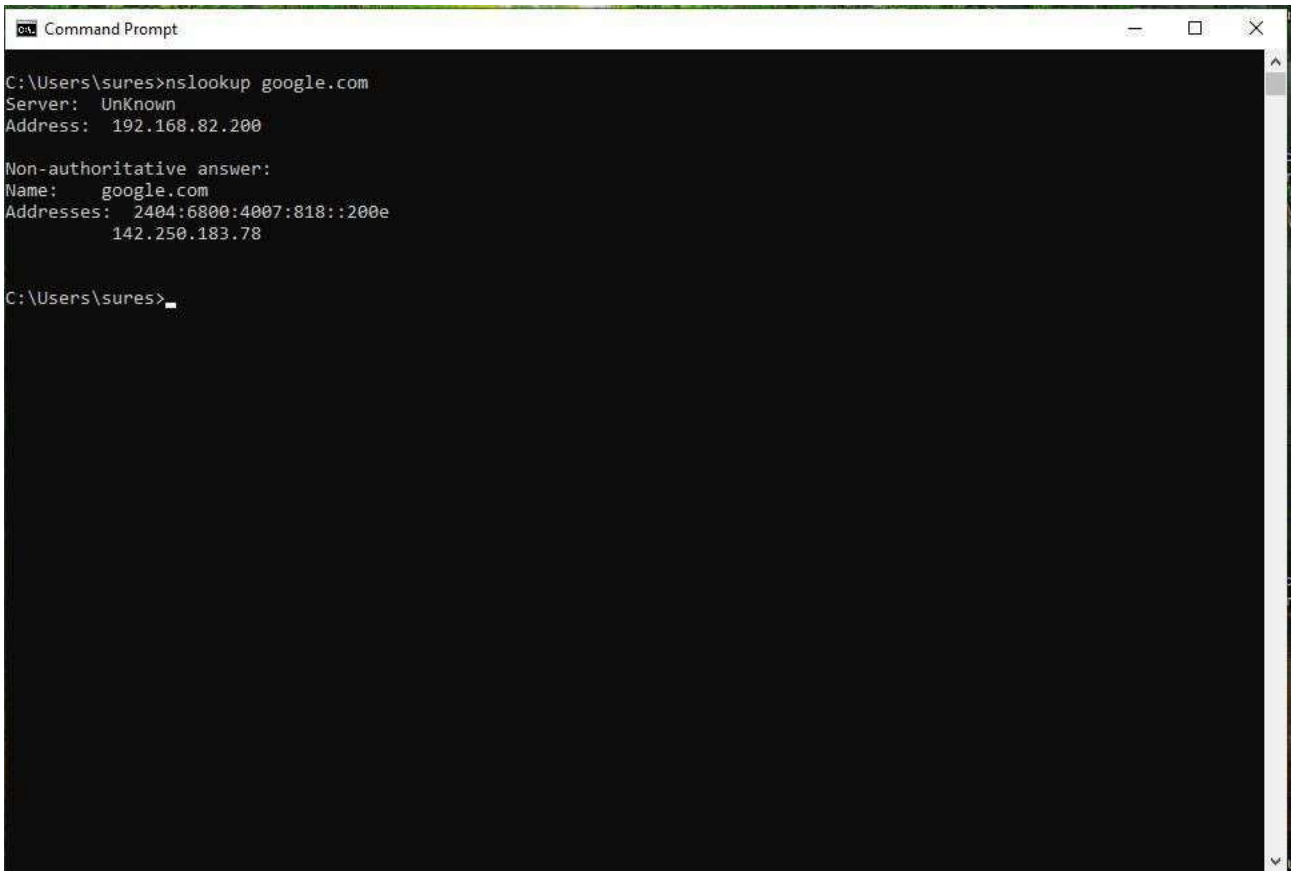
Procedure (Windows & Linux):

1. nslookup example.com
2. (Optional) nslookup then server 8.8.8.8 then set type=mx etc.

Sample output Screenshot:

Server: dns.google
Address: 8.8.8.8

Non-authoritative answer:
Name: example.com
Address: 93.184.216.34



RESULT:

Thus all the network protocol client commends are successfully tested and executed.

Ex. No. 2	Implement the server commands

a) ifconfig (legacy) & b) ip (modern)

Aim:

Configure and display network interfaces and addresses.

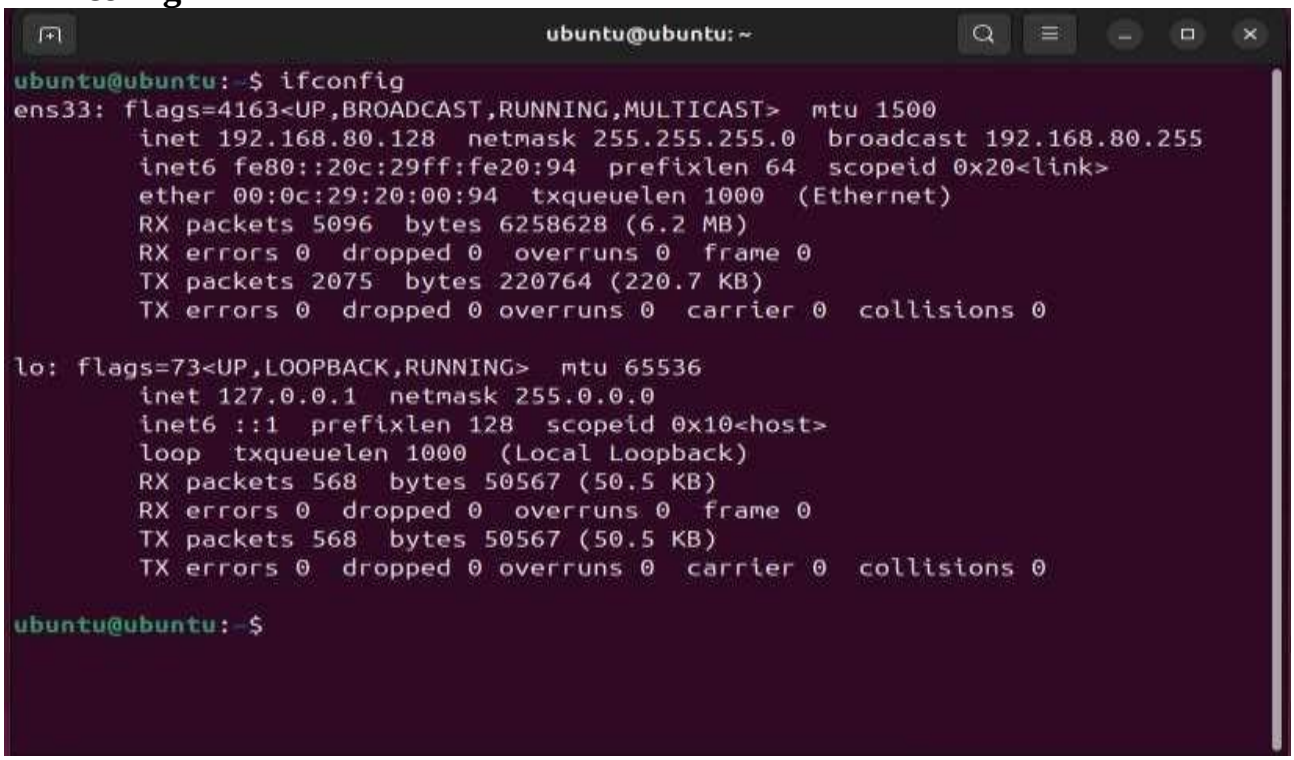
Procedure (Linux):

- Display: sudo ip addr show or sudo ifconfig -a
- Assign IP (example): sudo ip addr add 192.168.10.10/24 dev eth0
- Bring interface up/down: sudo ip link set eth0 up / down

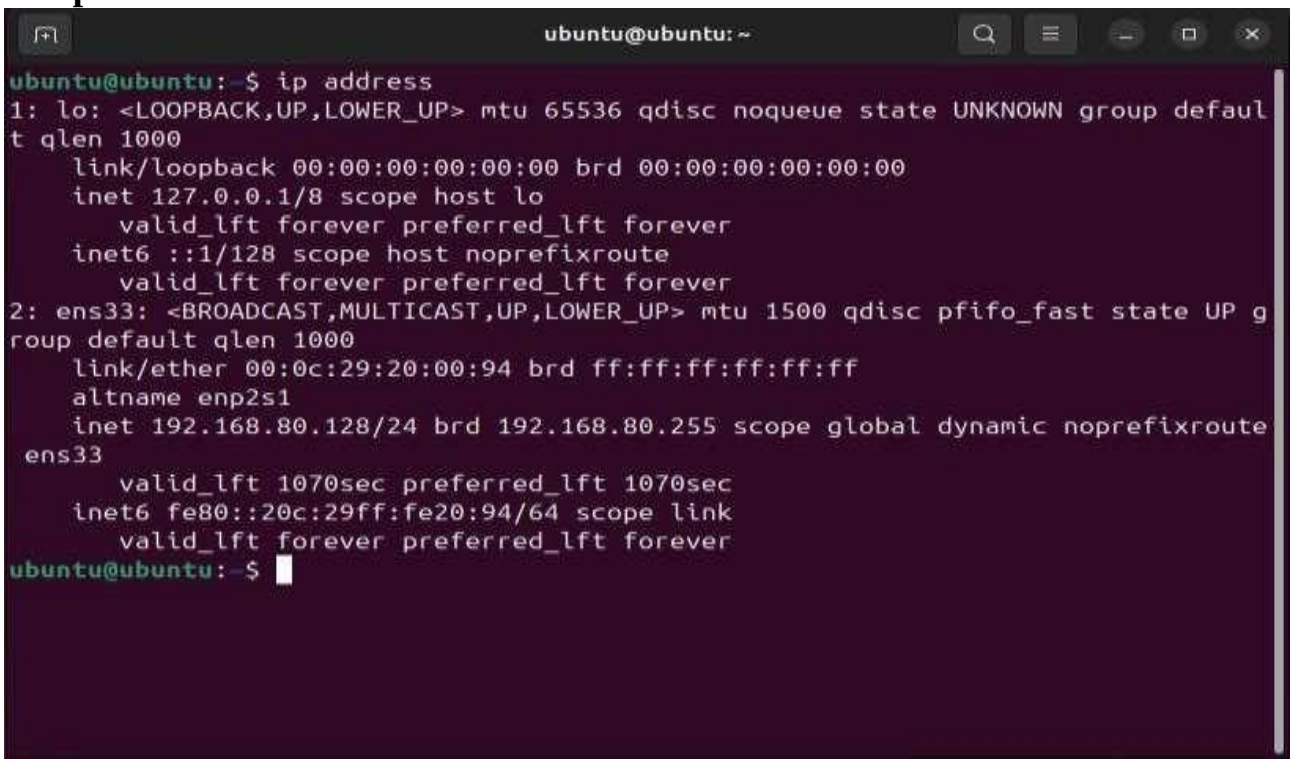
Sample output Screenshot (ip addr show):

3: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500
inet 192.168.10.10/24 brd 192.168.10.255 scope global eth0

a) ifconfig



b) ip


ubuntu@ubuntu: ~
ubuntu@ubuntu:~$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t 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 noprefixroute
valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP g
roup default qlen 1000
link/ether 00:0c:29:20:00:94 brd ff:ff:ff:ff:ff:ff
altname enp2s1
inet 192.168.80.128/24 brd 192.168.80.255 scope global dynamic noprefixroute
ens33
valid_lft 1070sec preferred_lft 1070sec
inet6 fe80::20c:29ff:fe20:94/64 scope link
valid_lft forever preferred_lft forever
ubuntu@ubuntu:~$

c) tracepath

Aim:

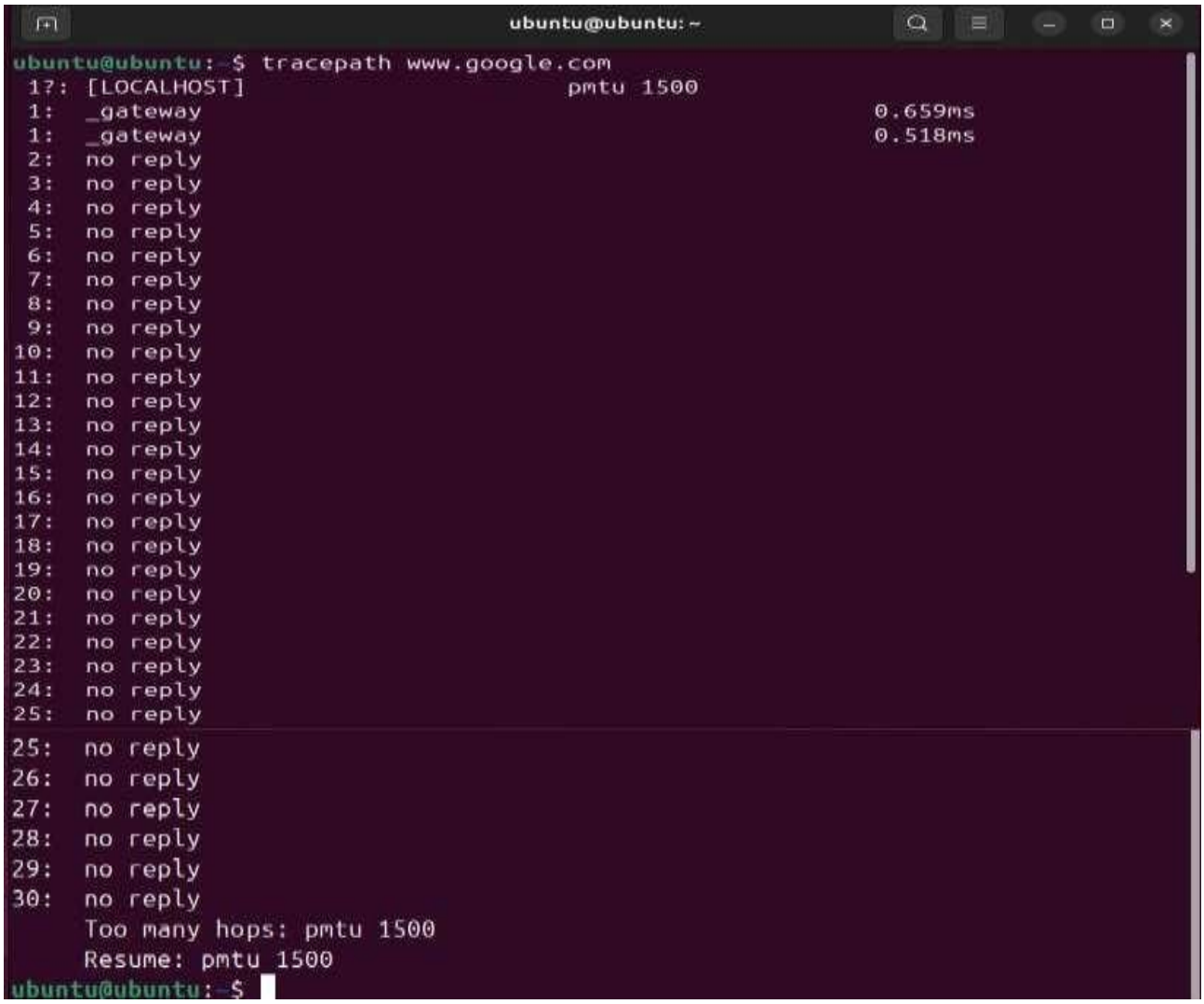
Determine path to destination and MTU along the path (Linux).

Procedure:

tracepath example.com

Sample output Screenshot:

1?: [LOCALHOST]	pmtu 1500
1: 192.168.1.1	0.281ms
2: 10.0.0.1	8.760ms
3: 93.184.216.34	20.112ms reached



d) ss

Aim:

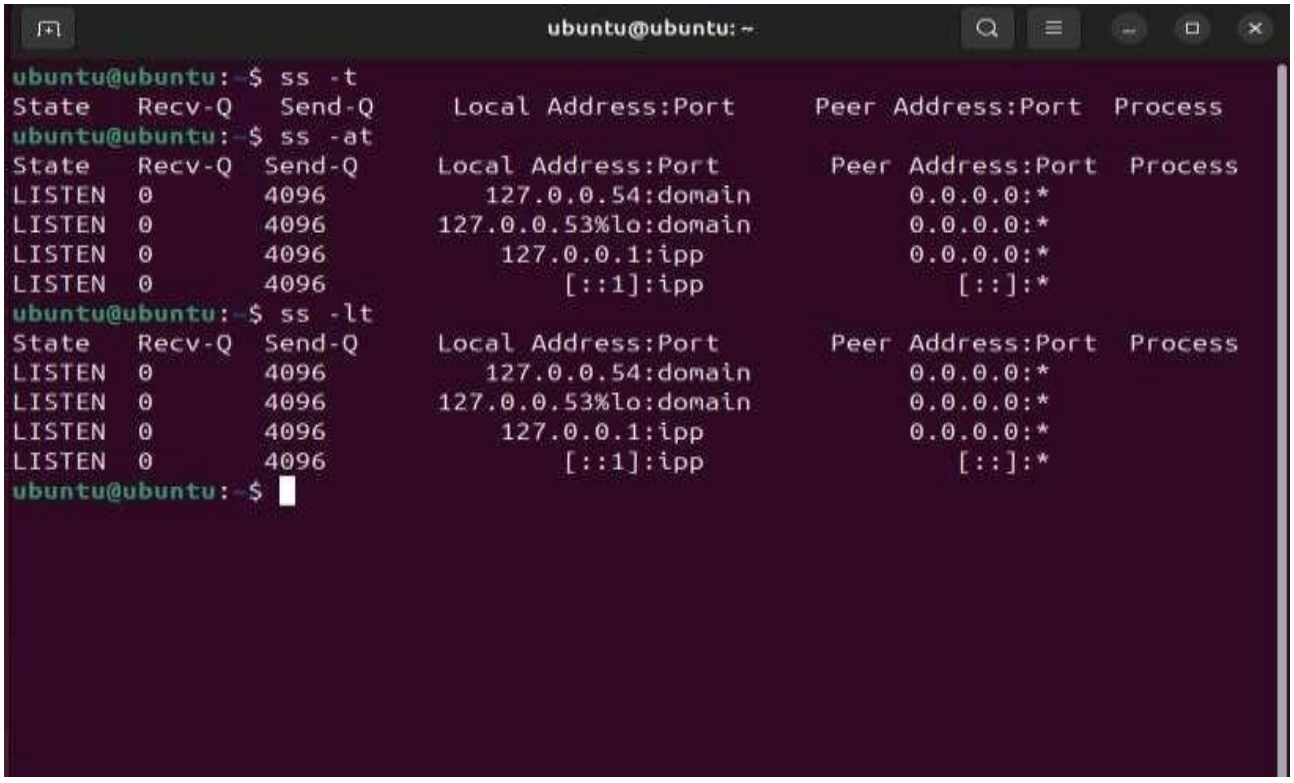
Socket statistics; view listening ports and established connections (replacement for netstat).

Procedure:

- Enter “sudo ss –tulpn” in commend line in console

Sample output Screenshot:

Netid State Recv-Q Send-Q Local Address:Port Peer Address:Port Process
tcp LISTEN 0 128 0.0.0.0:22 *:* users:(("sshd",pid=1111,fd=3))
tcp ESTAB 0 0 192.168.10.10:22 203.0.113.5:54321 users:(("sshd",pid=2222,fd=4))



e) tcpdum

Aim:

Capture and display network packets for analysis.

Procedure:

1. sudo tcpdump -i eth0 (live capture)
2. Save to file: sudo tcpdump -i eth0 -w capture.pcap
3. Filter e.g., sudo tcpdump -i eth0 tcp port 80

Sample output Screenshot (text summary):

14:22:31.123456 IP 192.168.1.50.54321 > 93.184.216.34.80: Flags [S], seq 0, win 64240, options [mss 1460,sackOK,TS], length 0

RESULT:

Thus all the network protocol server commends are successfully tested and executed.

Ex. No. 3	Connect and place the given file in the FTP server

Aim: Upload a file from a client to an FTP server.

Procedure (Windows CLI ftp):

1. ftp <server-ip>
2. Login with username/password.
3. binary (if binary file)
4. put localfile.txt remotefile.txt

Procedure (Linux using ftp or curl/lftp):

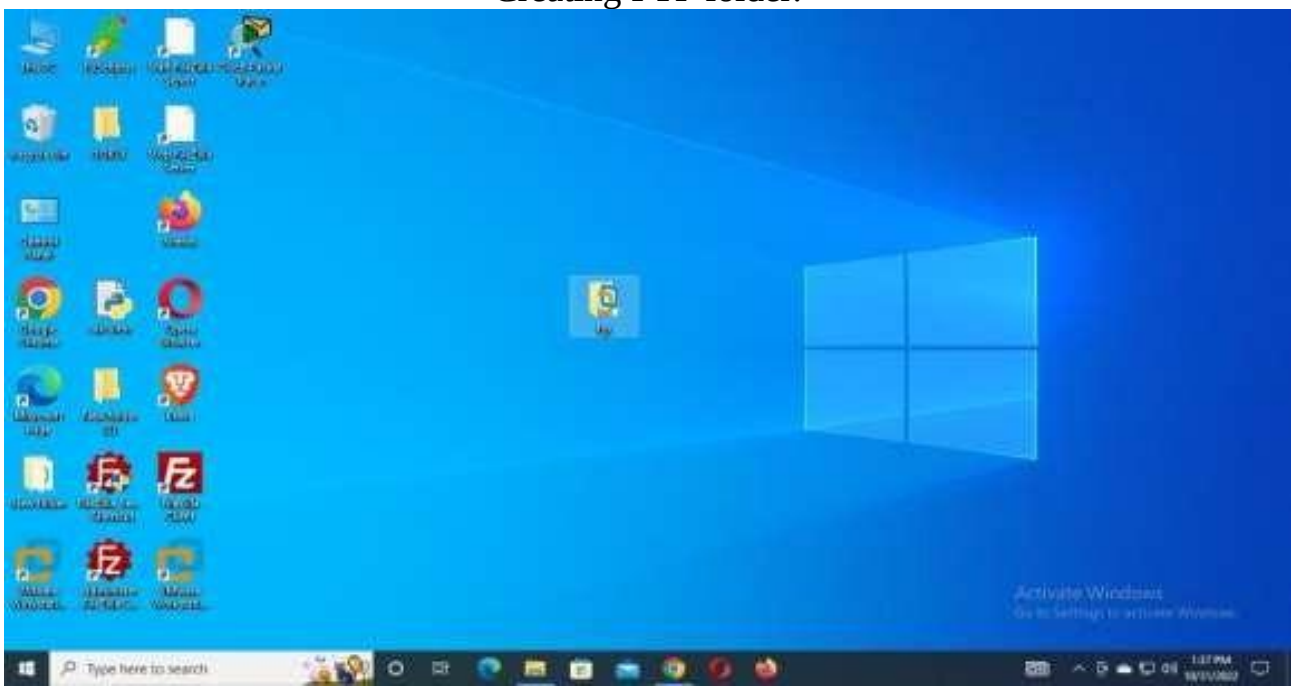
1. ftp <server-ip> or
2. curl -T localfile.txt ftp://user:pass@server-ip/remotefile.txt
3. Or use lftp -u user,password -e "put localfile.txt; bye" ftp://server-ip

Sample FTP session:

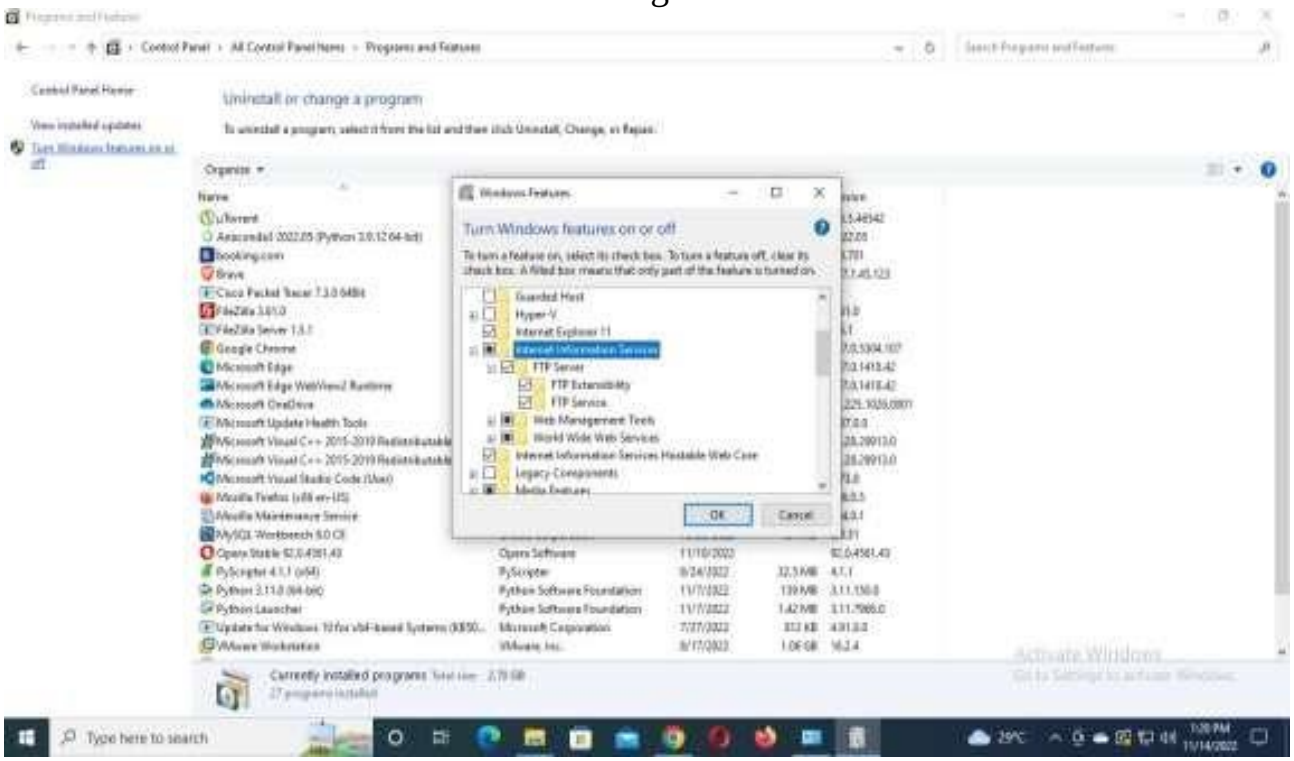
Connected to 192.168.10.100.
220 (vsFTPd 3.0.3)
Name (192.168.10.100:admin): user1
331 Please specify the password.
Password:
230 Login successful.
ftp> binary
ftp> put report.pdf
200 PORT command successful.
150 Ok to send data.
226 Transfer complete.
ftp> quit

Screenshots:

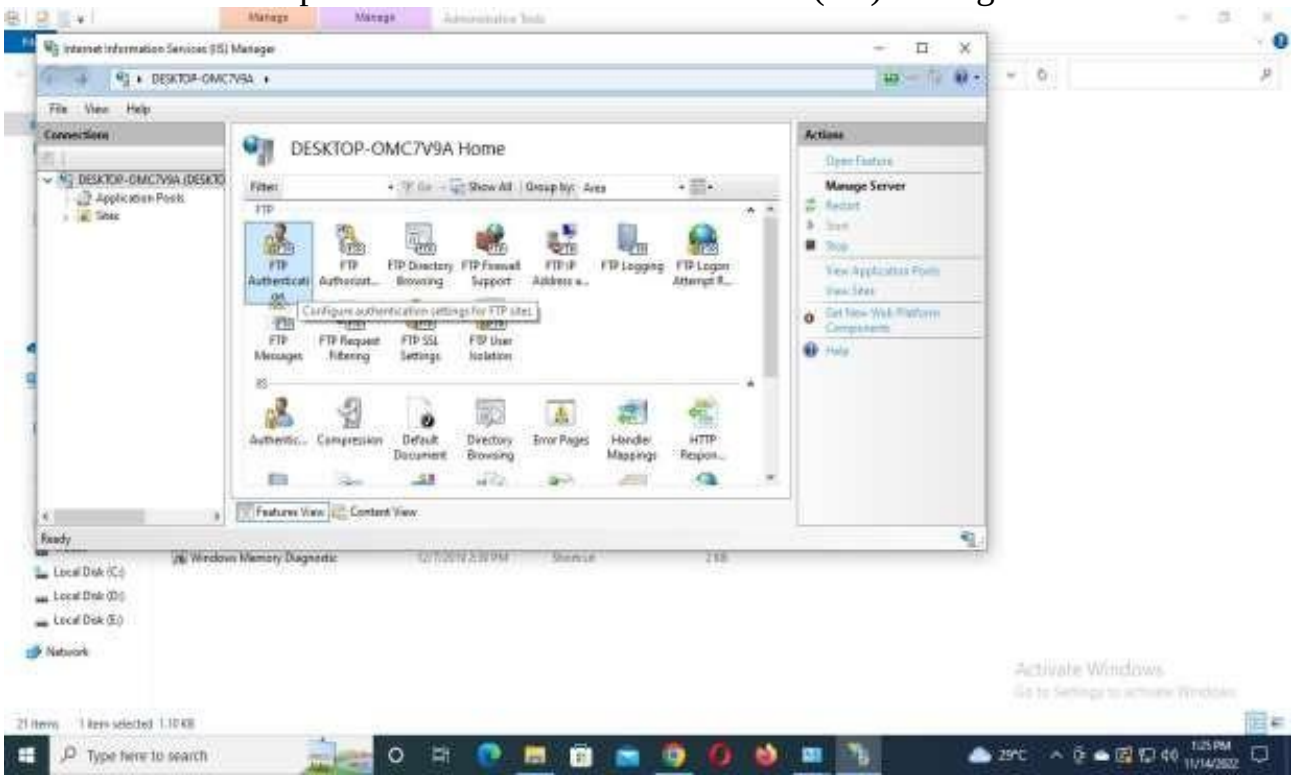
Creating FTP folder:



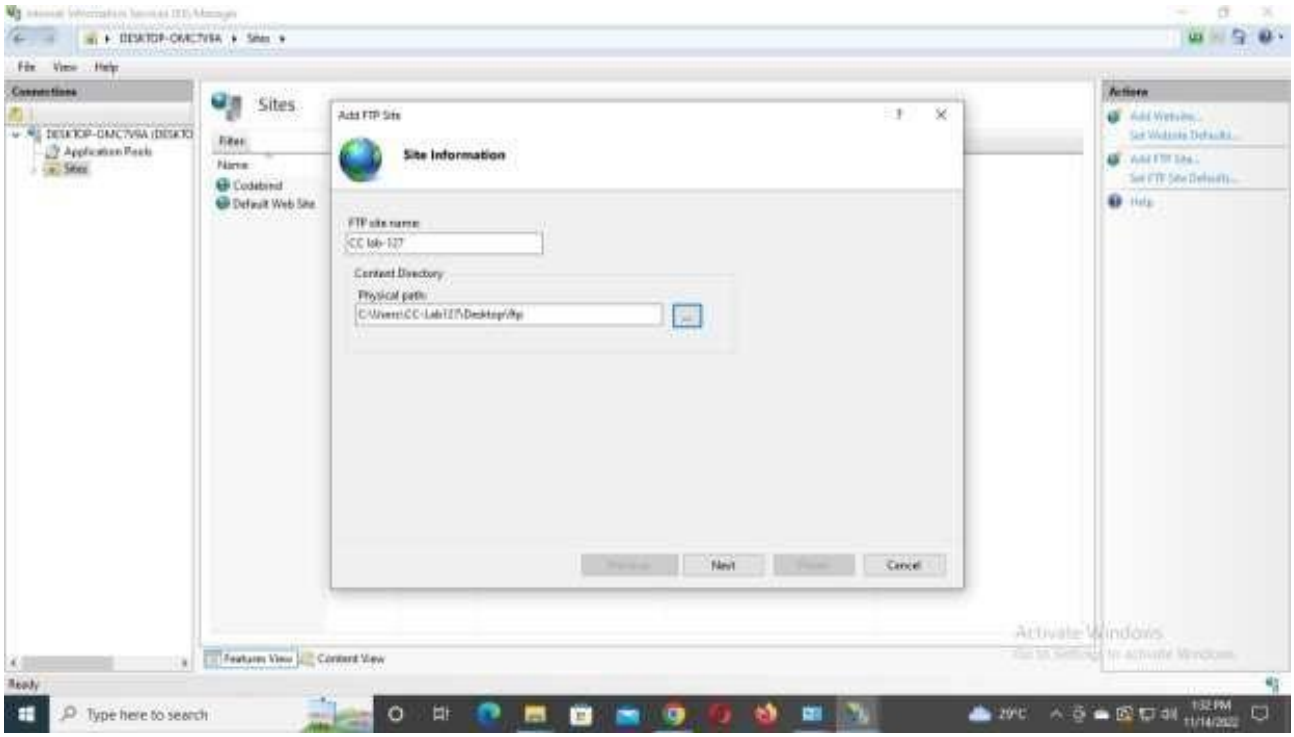
Enable and Configure FTP Server:

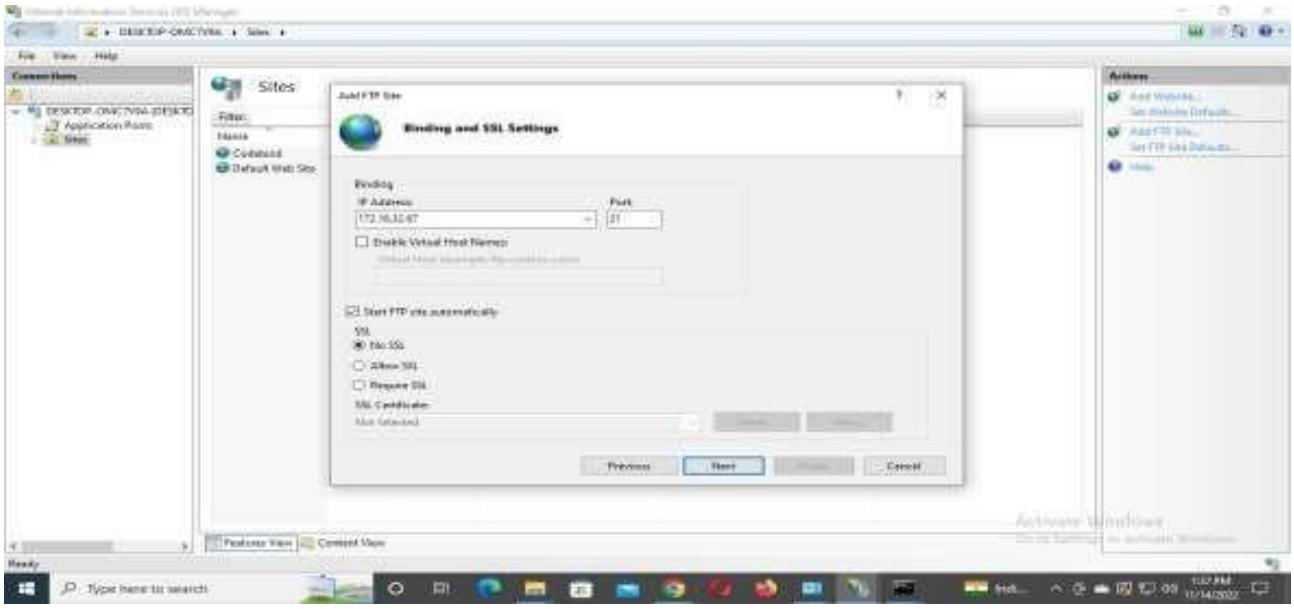


Open Internet Information Services (IIS) Manager

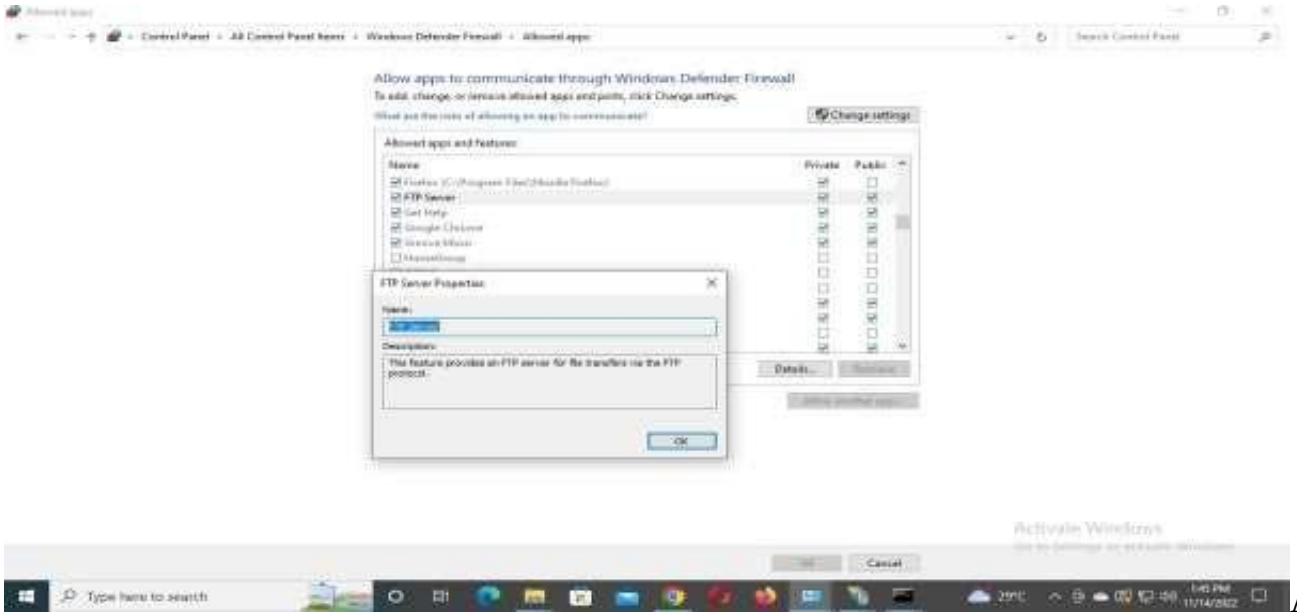


Add FTP Site

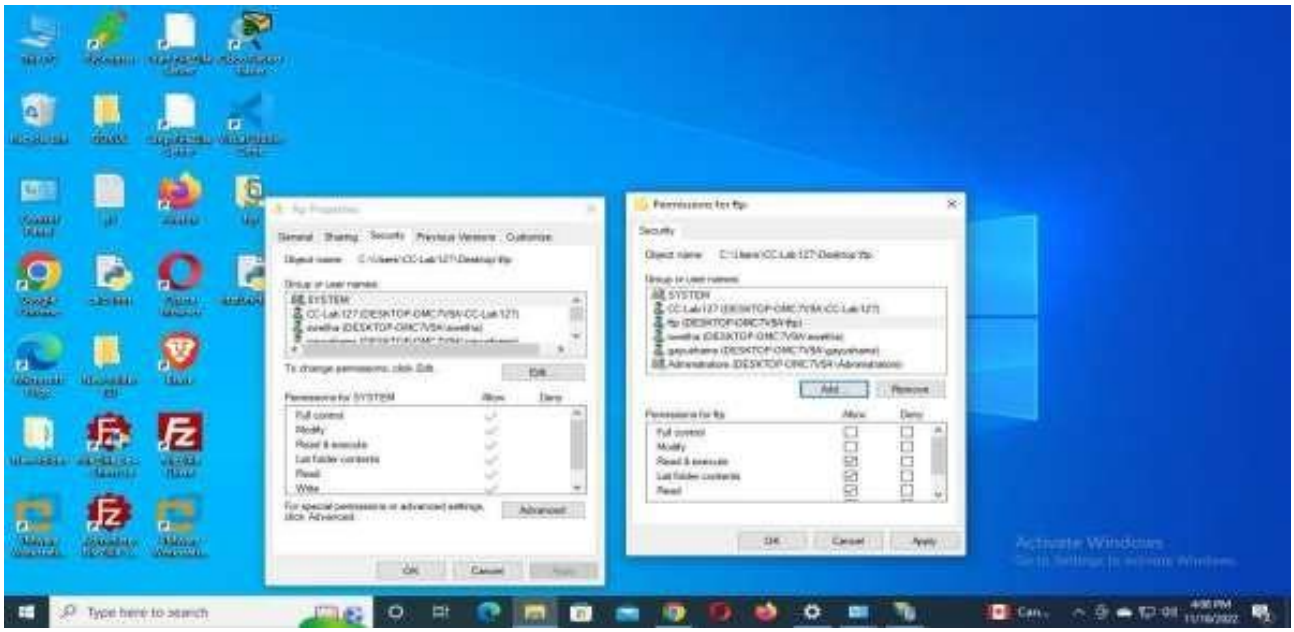




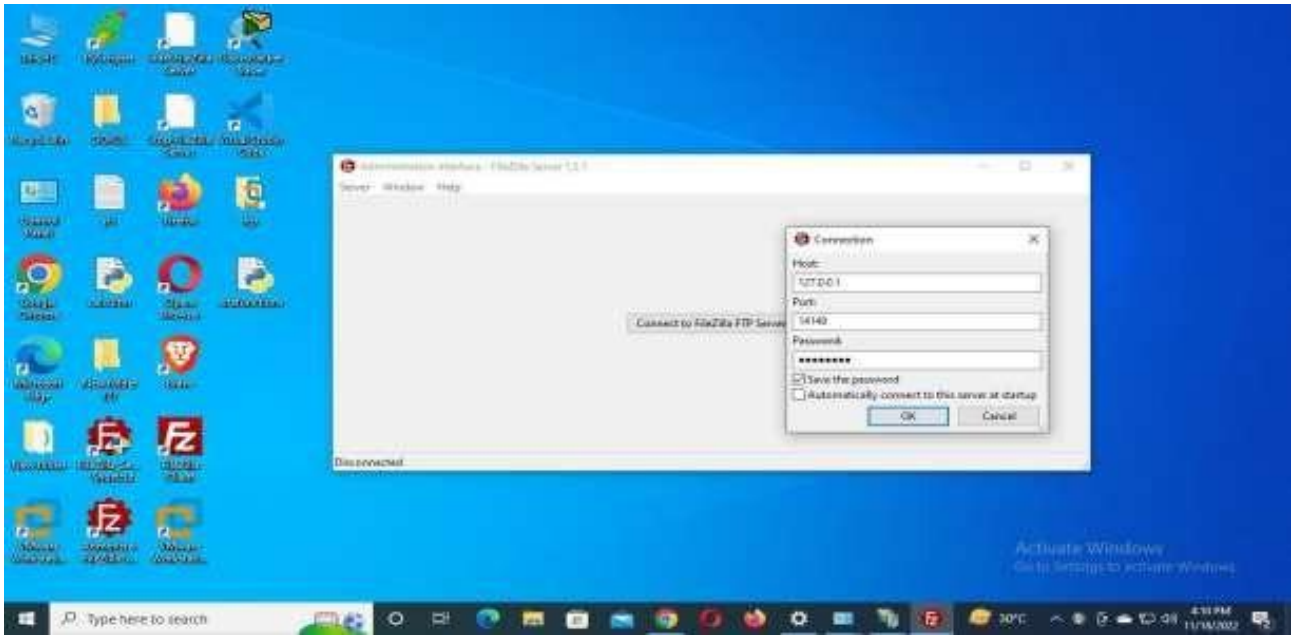
Allow Firewall Defender for FTP Server



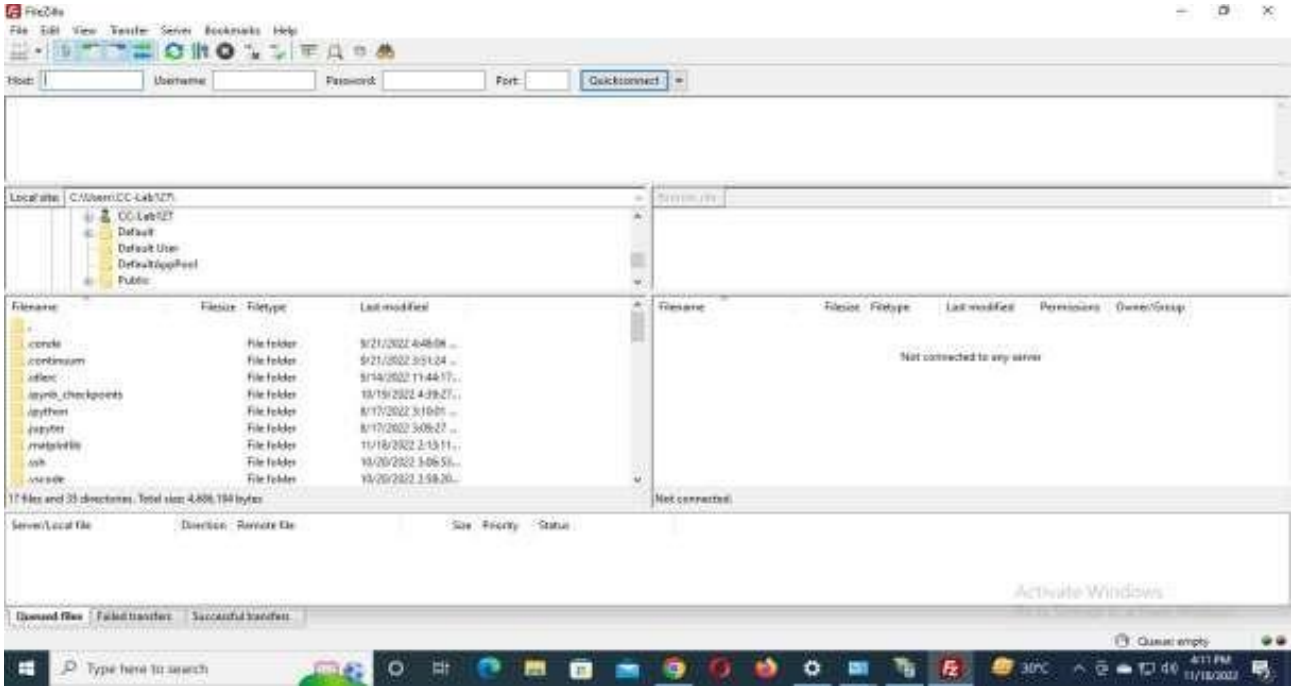
Add Administrative Permission



Connect the Server with FILEZILLA



Establish Connection from Client Side using FILEZILLA CLIENT



RESULT:

Thus all the FTP Operations are successfully tested and executed.

Ex. No. 4	Install packet tracer and connect a computer to router, switch and get a Icmp request

Aim:

Use Packet Tracer to simulate a small network and validate ICMP (ping) between PC and router.

Procedure:

1. Install Cisco Packet Tracer on Windows/Linux (follow installer).
2. Create topology: add PC — Switch — Router; connect with appropriate cables.
3. Assign IPs (PC: 192.168.1.10/24, Router interface: 192.168.1.1/24).
4. On PC, open command prompt (in Packet Tracer) and run ping 192.168.1.1.

Sample output (Packet Tracer PC):

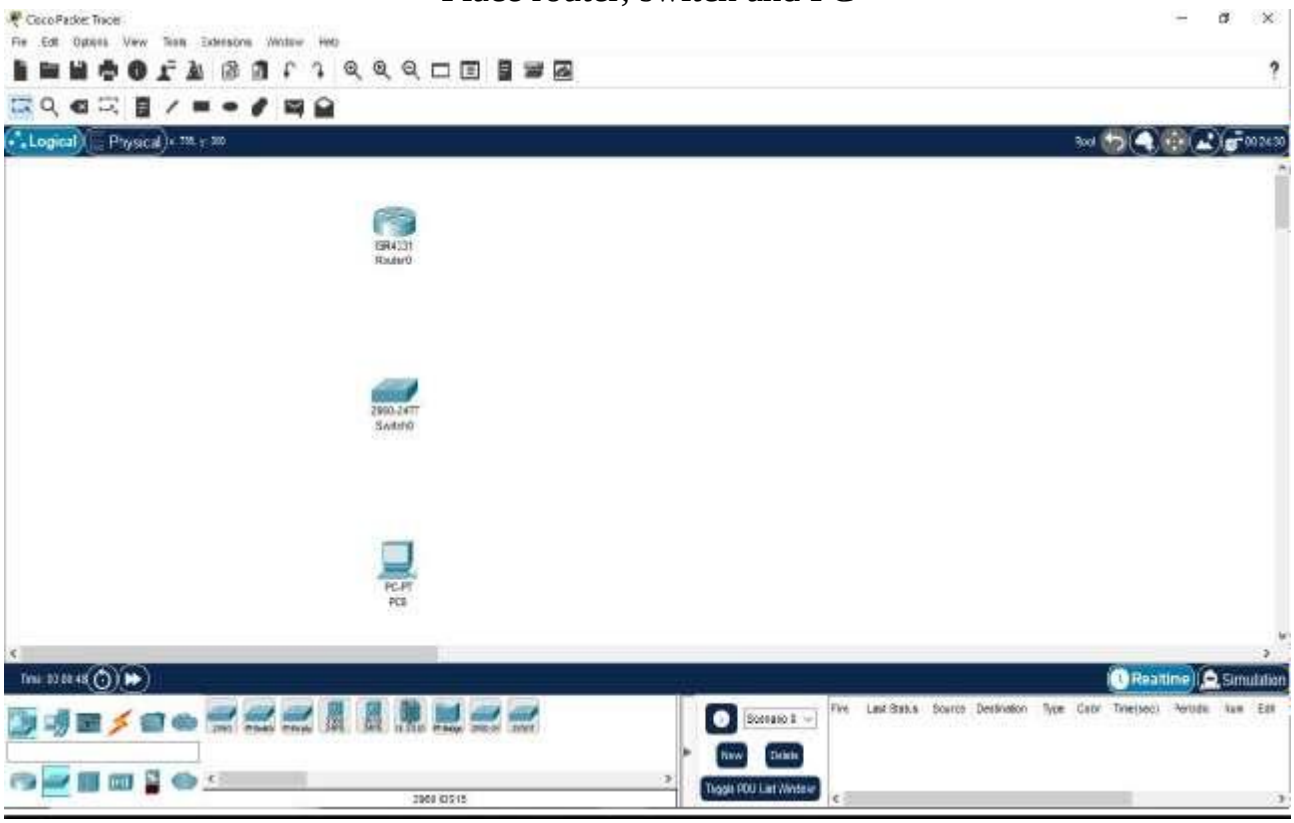
Pinging 192.168.1.1 with 32 bytes of data:
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255

Notes:

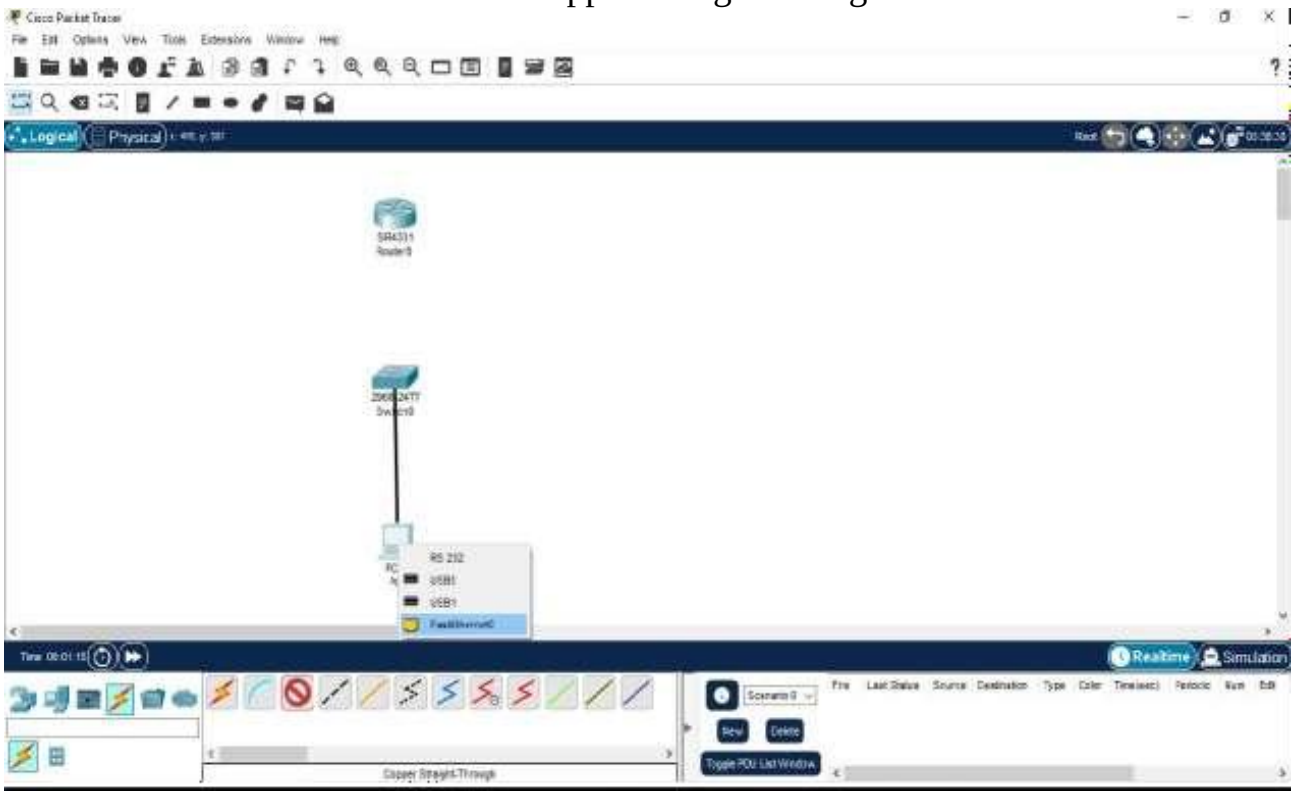
If no reply, check interface state (no shutdown) and cabling.

Sample Input & output Screenshot:

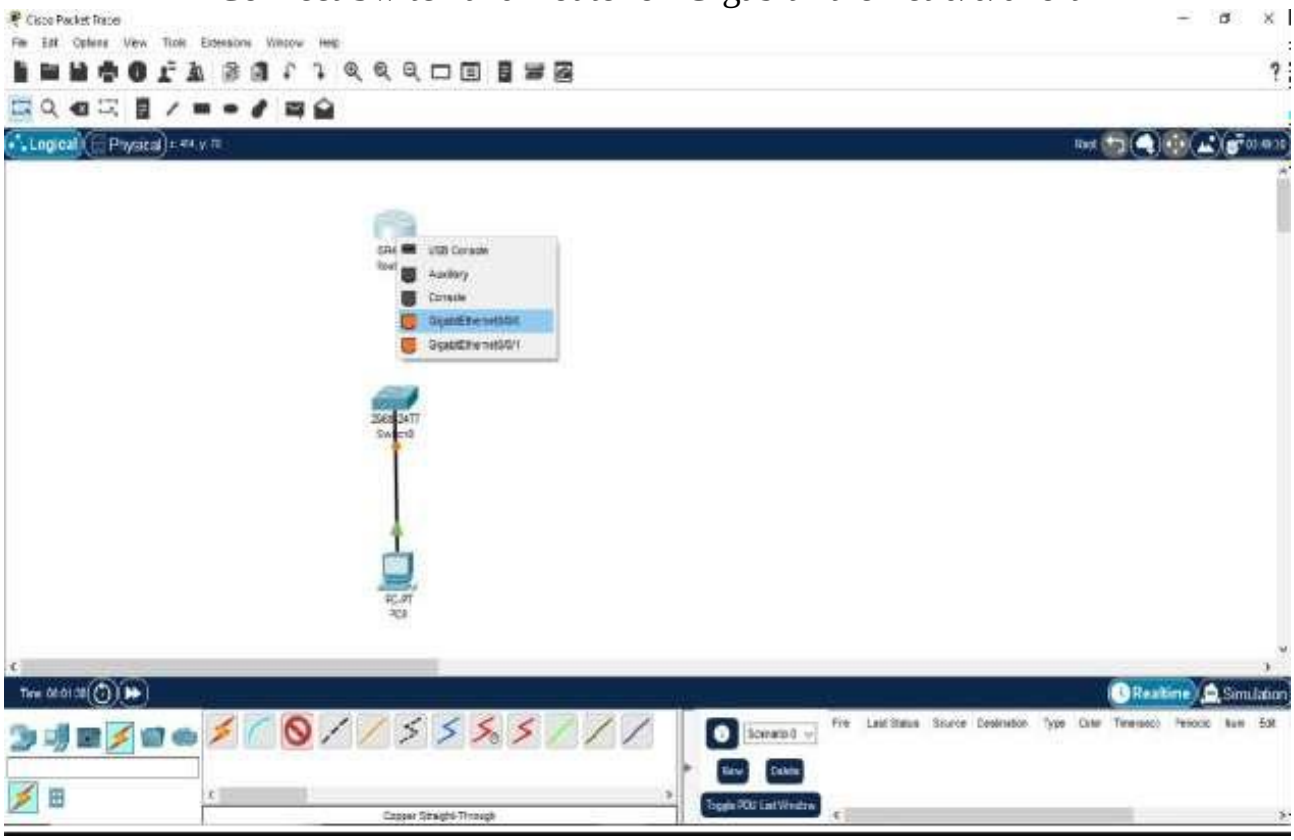
Place router, switch and PC



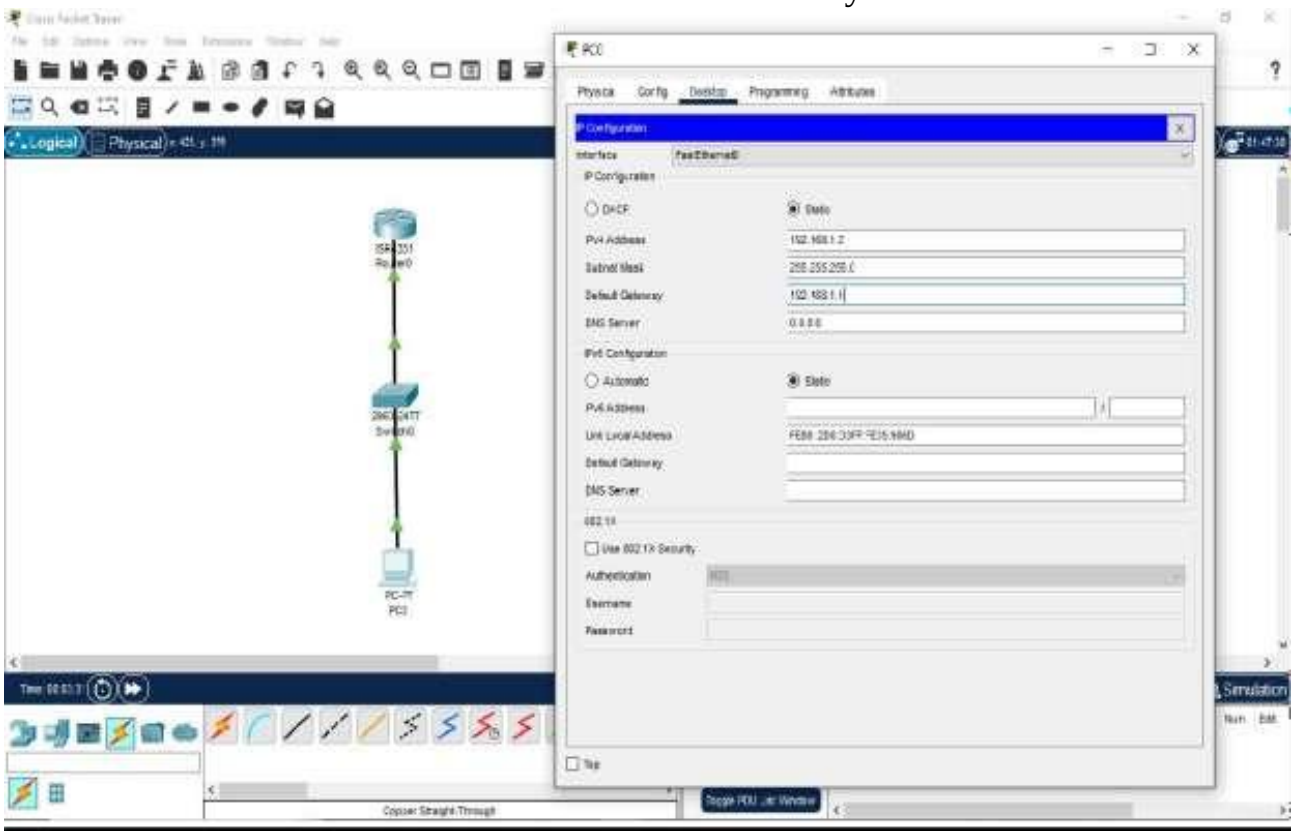
Connect with Copper Straight through Cable



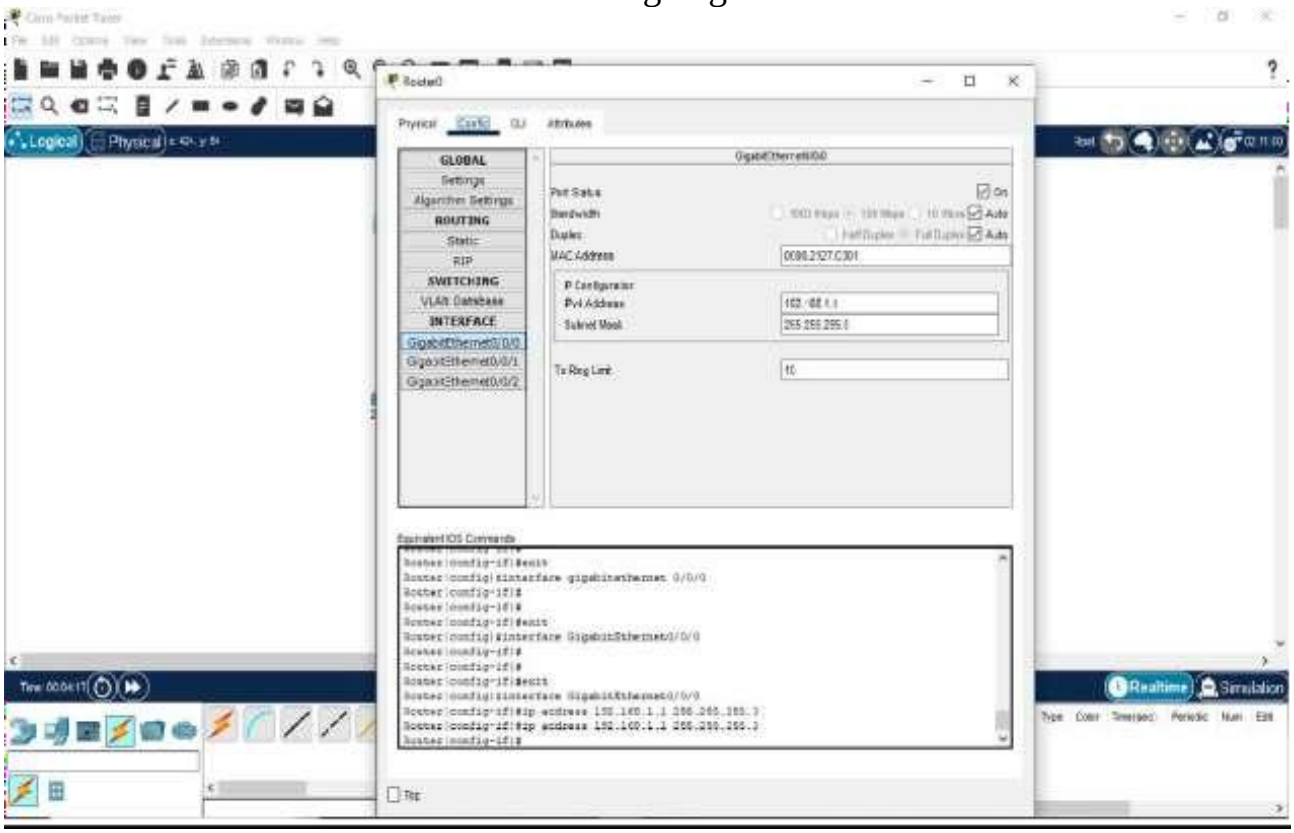
Connect Switch and Router on Gigabit Ethernet 0/0/0Port



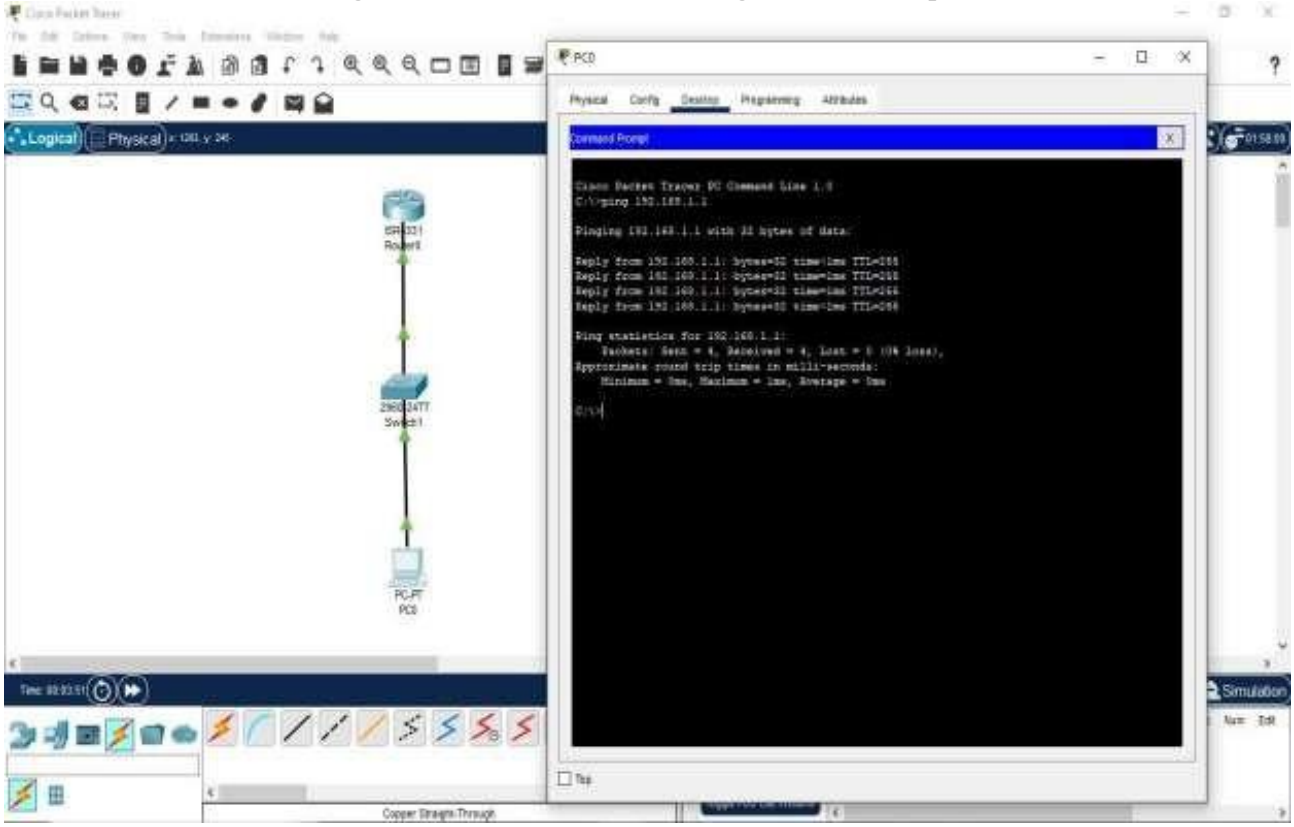
Set IP address and Default Gateway for PC



Set Router IP Address Using Gigabit Ethernet 0/0/0Port



Ping the router IP address to get ICMP request



RESULT:

Thus all the Router Operations are successfully tested and executed.

Ex. No. 5	Implement the SSH protocols and accessing the remote device

Aim: Securely connect to a remote device using SSH and verify authentication and connectivity.

Procedure (Linux client to server):

1. Ensure SSH server installed on target: sudo apt install openssh-server and sudo systemctl start ssh.
2. From client: ssh user@server-ip (or ssh -p 2222 user@server-ip if custom port).
3. Use key-based auth: generate key ssh-keygen, copy public key: ssh-copy-id user@server-ip.

Sample output (client):

```
$ ssh user@192.168.10.100
user@192.168.10.100's password:
Welcome to Ubuntu 22.04 LTS (GNU/Linux 5.15.0-...)
user@server:~$
```

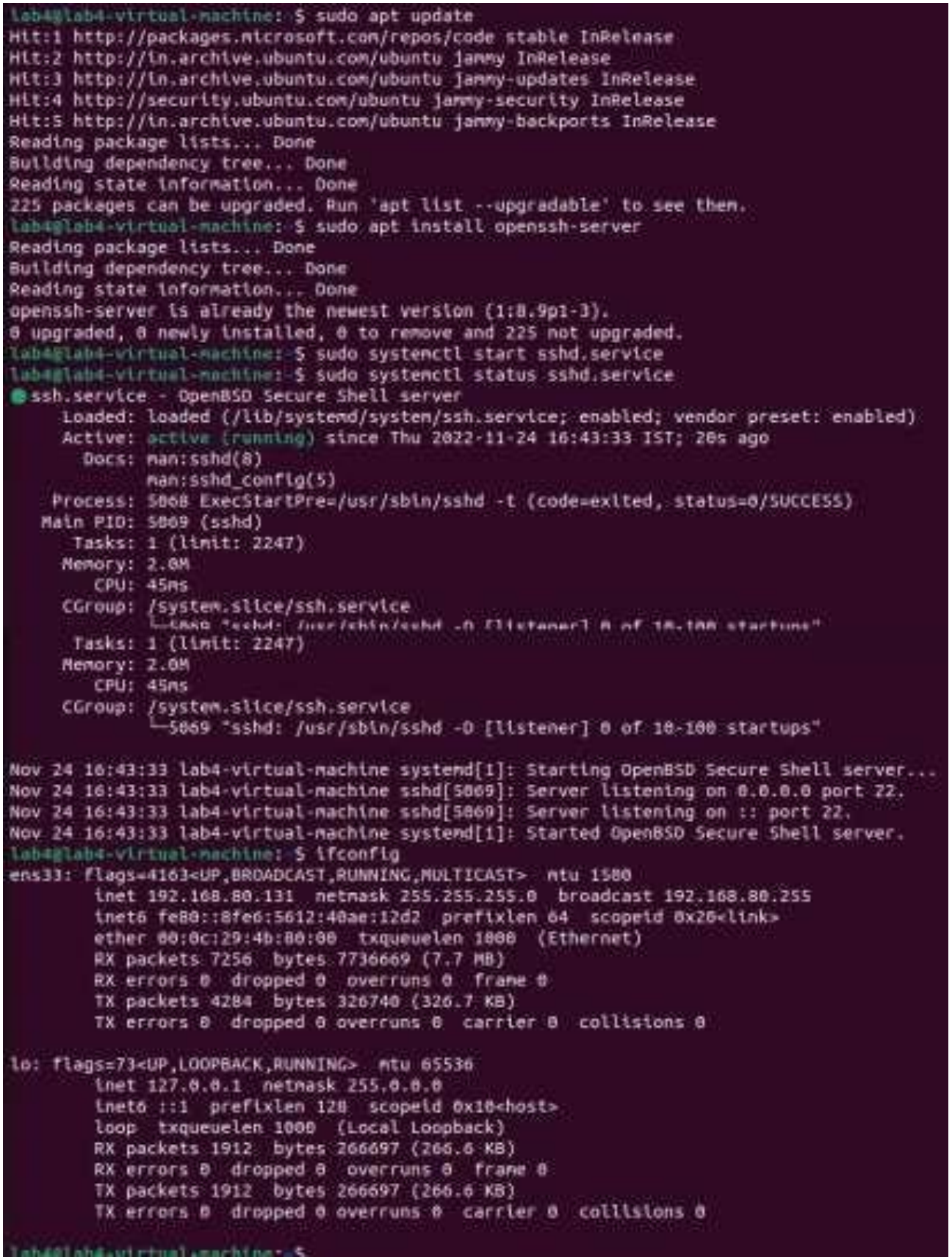
Windows:

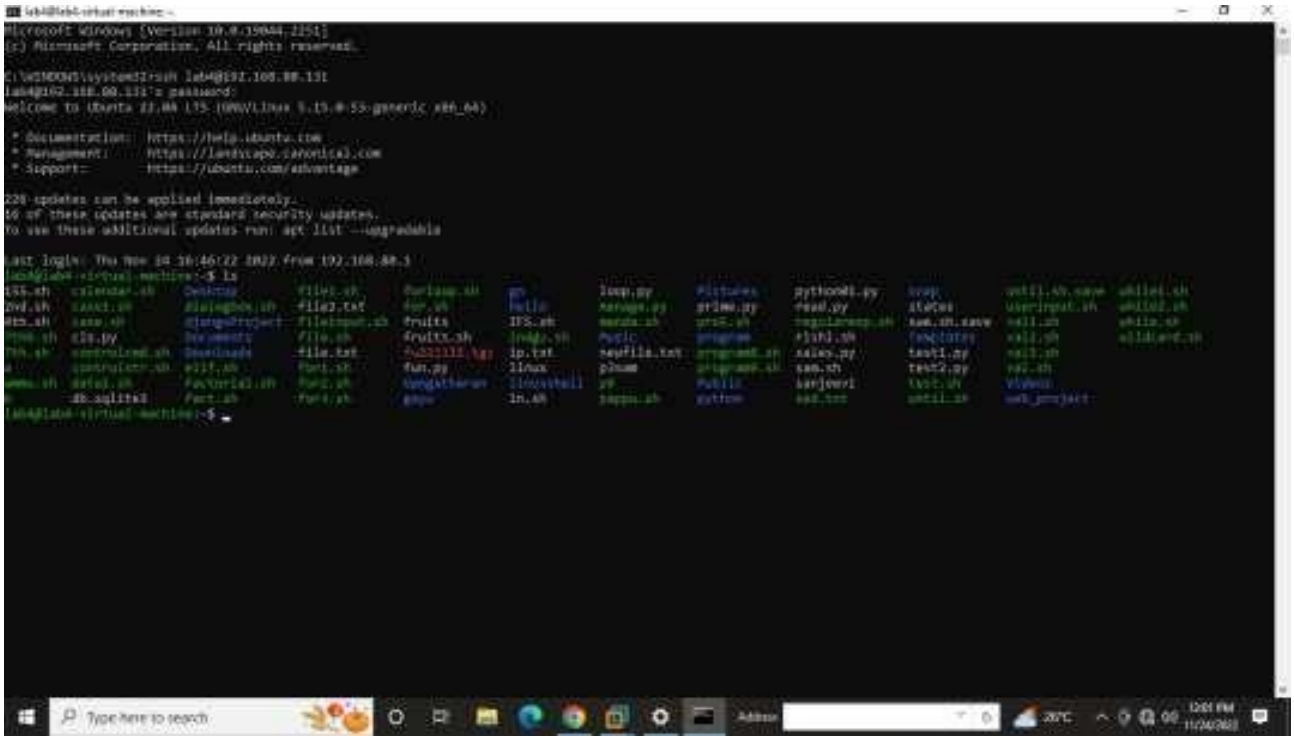
- Use PowerShell ssh user@server-ip or PuTTY.

Security note:

Disable password auth if using keys, change default port, and allow only required users in /etc/ssh/sshd_config.

Sample Input & output Screenshot:





RESULT:

Thus the SSH Protocol are successfully tested and executed.

Ex. No. 6	Connect any two switches and get the status of each switches

Aim:

Physically or virtually connect switches and verify interface and VLAN/status information.

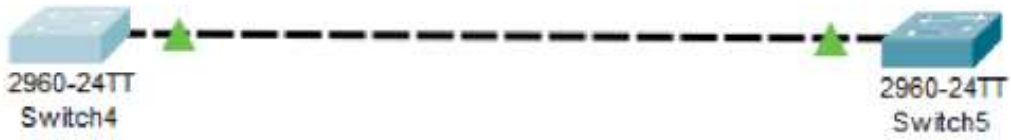
Procedure (in Packet Tracer or real Cisco switches):

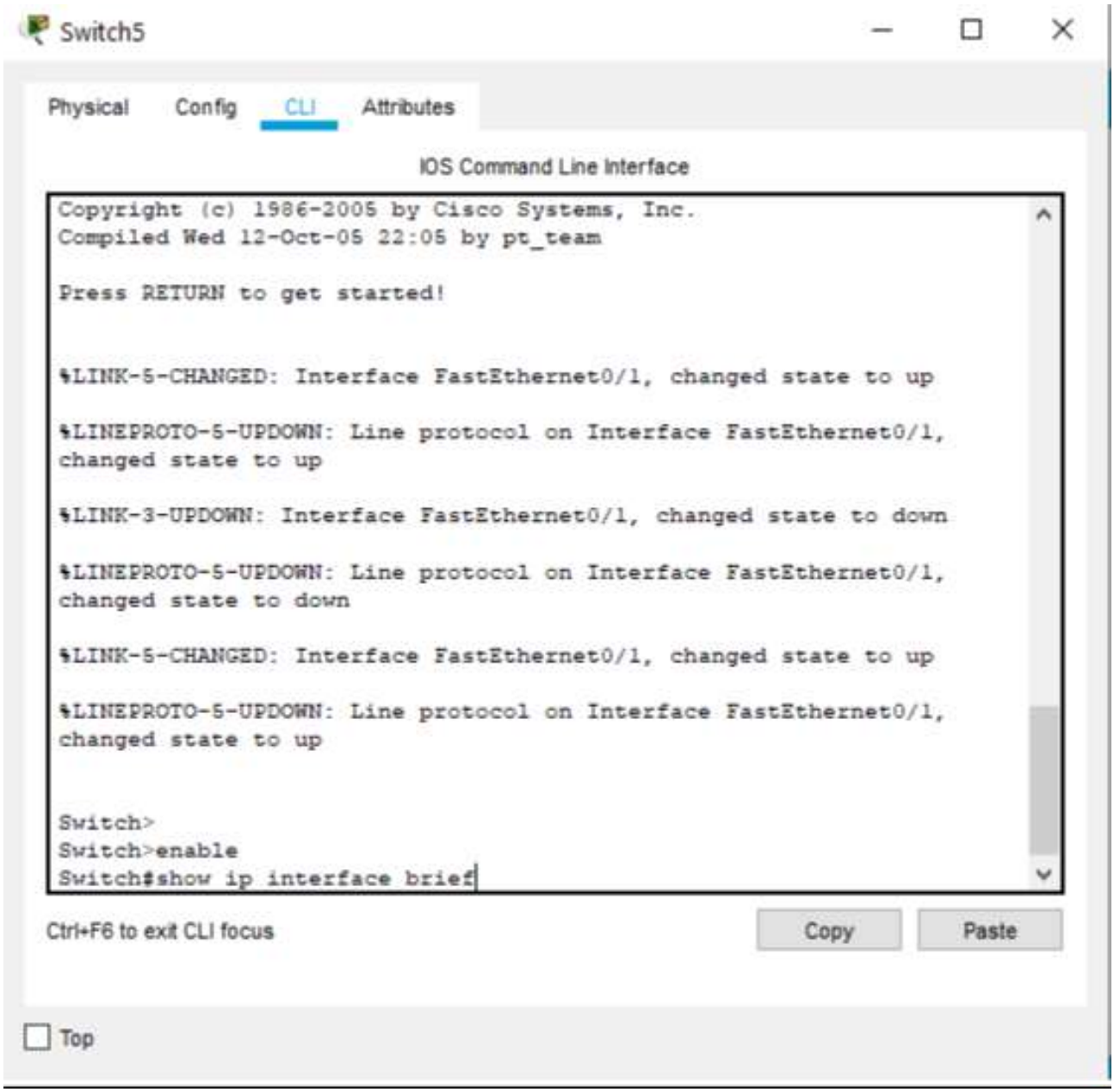
1. Connect switch1 port Fa0/1 to switch2 Fa0/1.
2. On each switch, enable and check interfaces:
   show interfaces status
   show vlan brief
   show cdp neighbors (if CDP enabled)

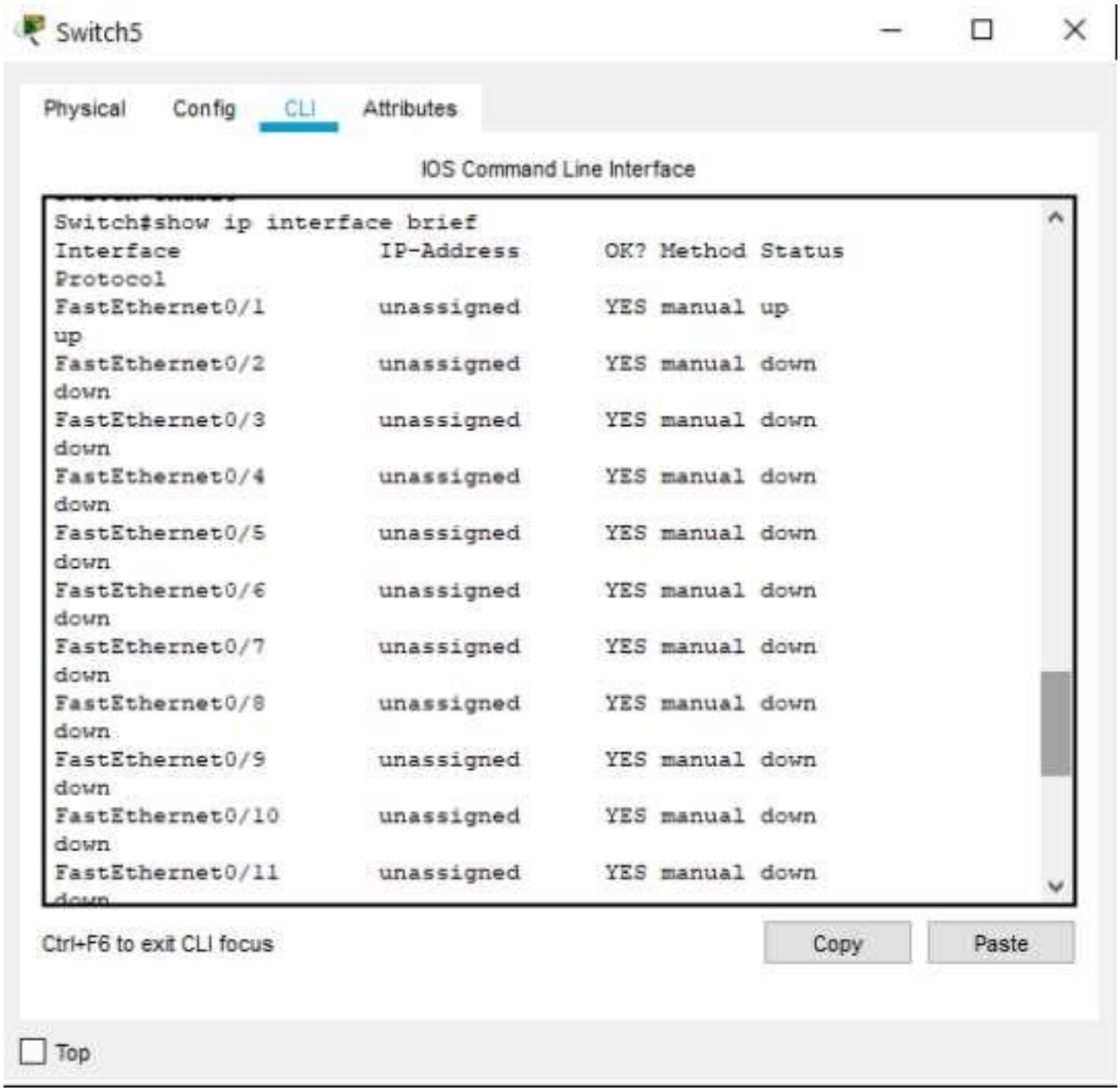
Sample outputs:

```
Switch# show interfaces status
Port    Name    Status      Vlan    Duplex  Speed Type
Fa0/1           connected   1       a-full a-100 10/100BaseTX
Fa0/2           notconnect  1       auto   auto
Switch# show cdp neighbors
Device ID       Local Intrfce     Holdtme  Capability  Platform  Port ID
Switch2         Fa0/1             120      S I         WS-C2960  Fa0/1
```

Sample Input & output Screenshot







RESULT:

Thus the two Switches are connected successfully and tested.

Ex. No. 7	Connect two routers and get packets from the routers

Aim:

Configure routing between two routers and verify inter-router connectivity and packet flow.

Procedure (Packet Tracer / Cisco IOS):

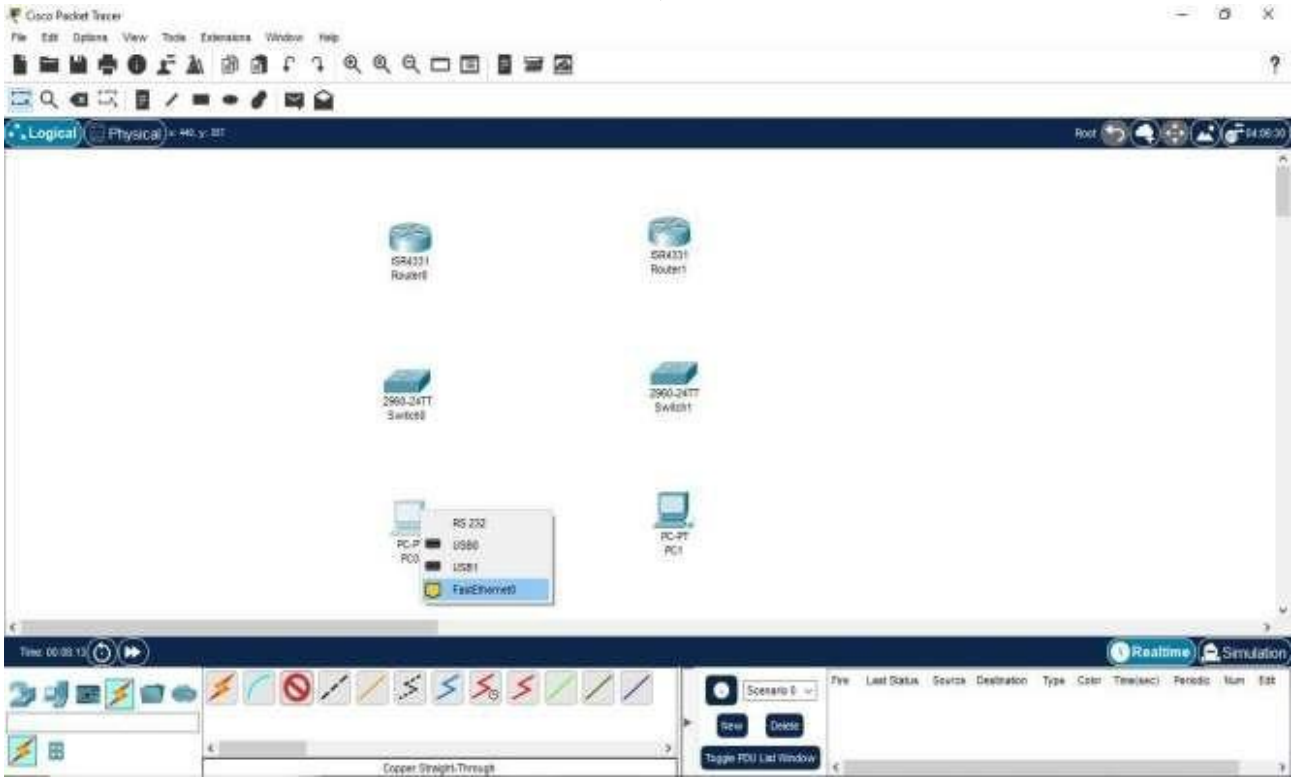
1. Connect routers R1 and R2 via serial or Ethernet.
2. Configure interfaces and IPs:
3. R1(config)# interface Gig0/0
4. R1(config-if)# ip address 10.0.0.1 255.255.255.0
5. R1(config-if)# no shutdown
6. Configure R2 accordingly (10.0.0.2/24).
7. Test: ping 10.0.0.2 from R1.
8. Optionally configure static routes or dynamic routing (e.g., router ospf 1 / network ...).

Sample output (ping between routers):

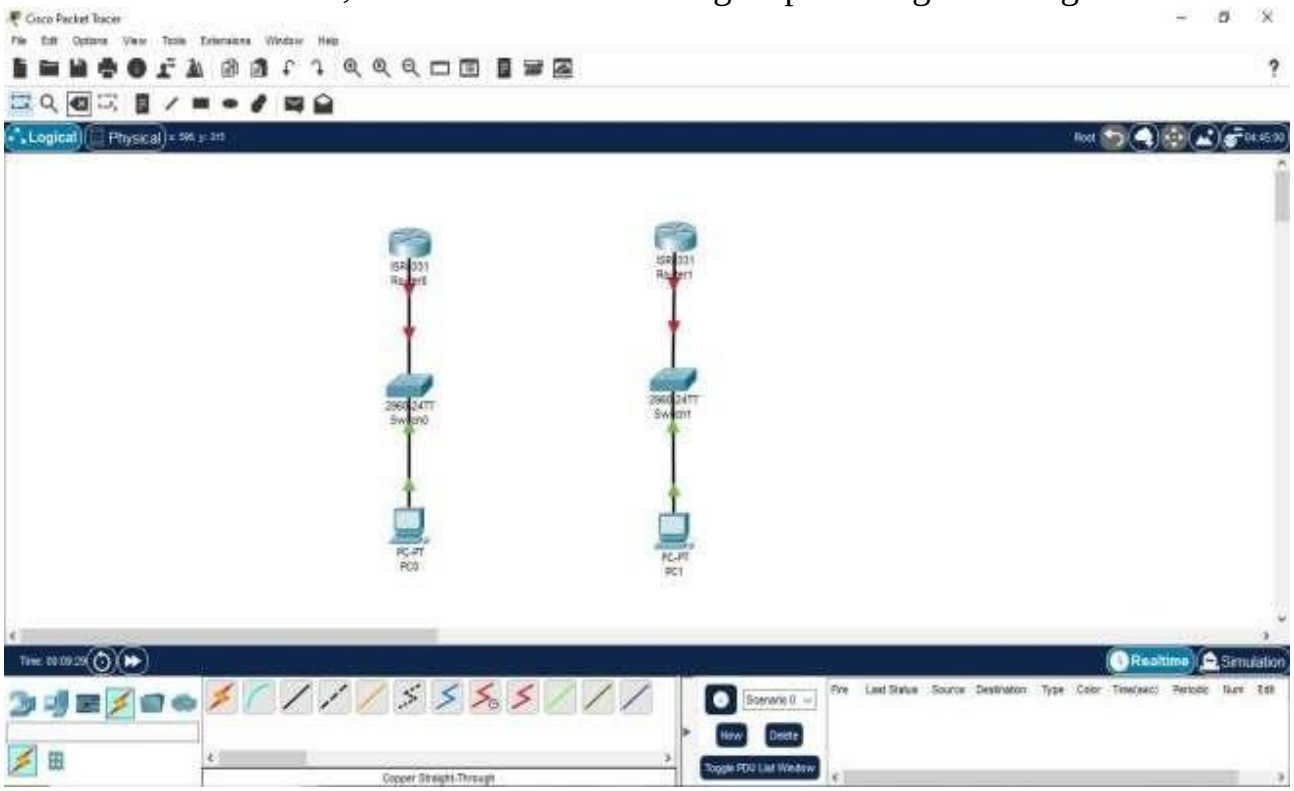
R1# ping 10.0.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

Sample Input & output Screenshot

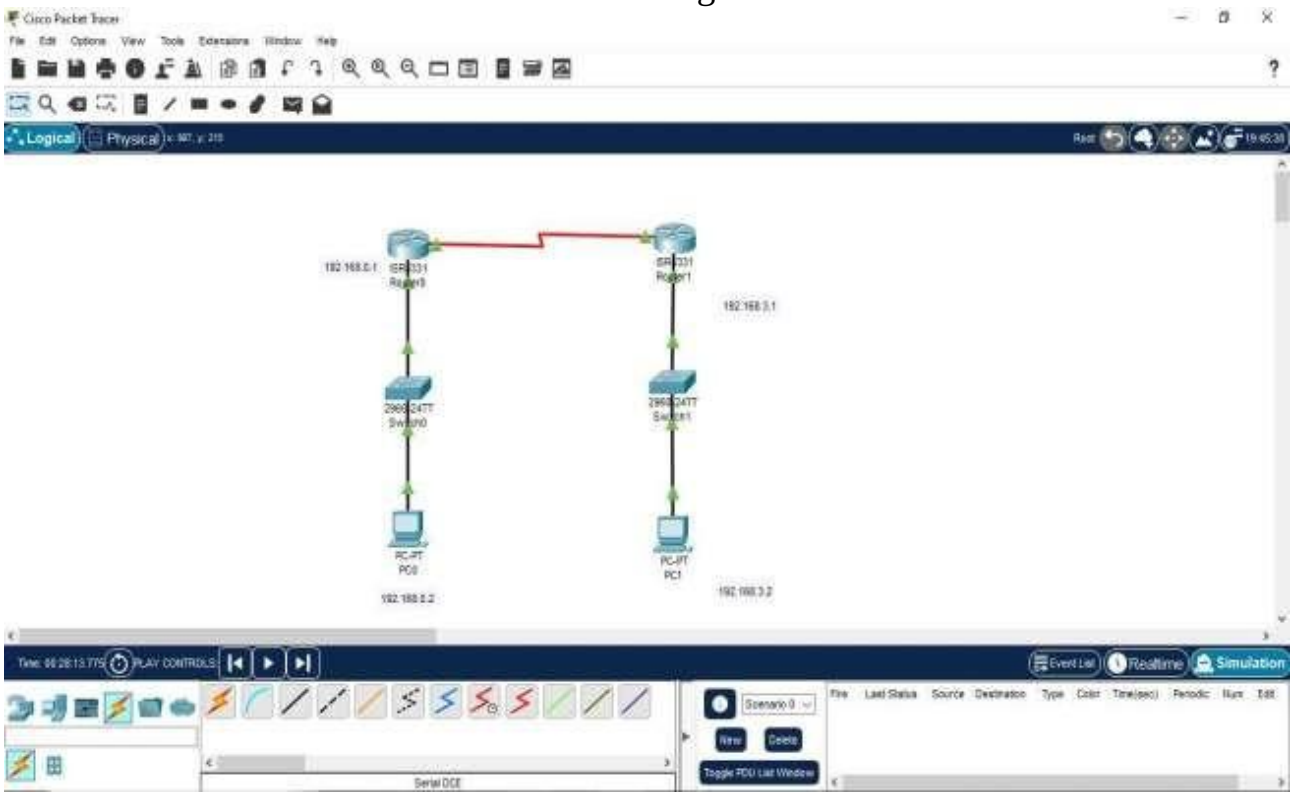
Add or Place Routers, Switches and PC's



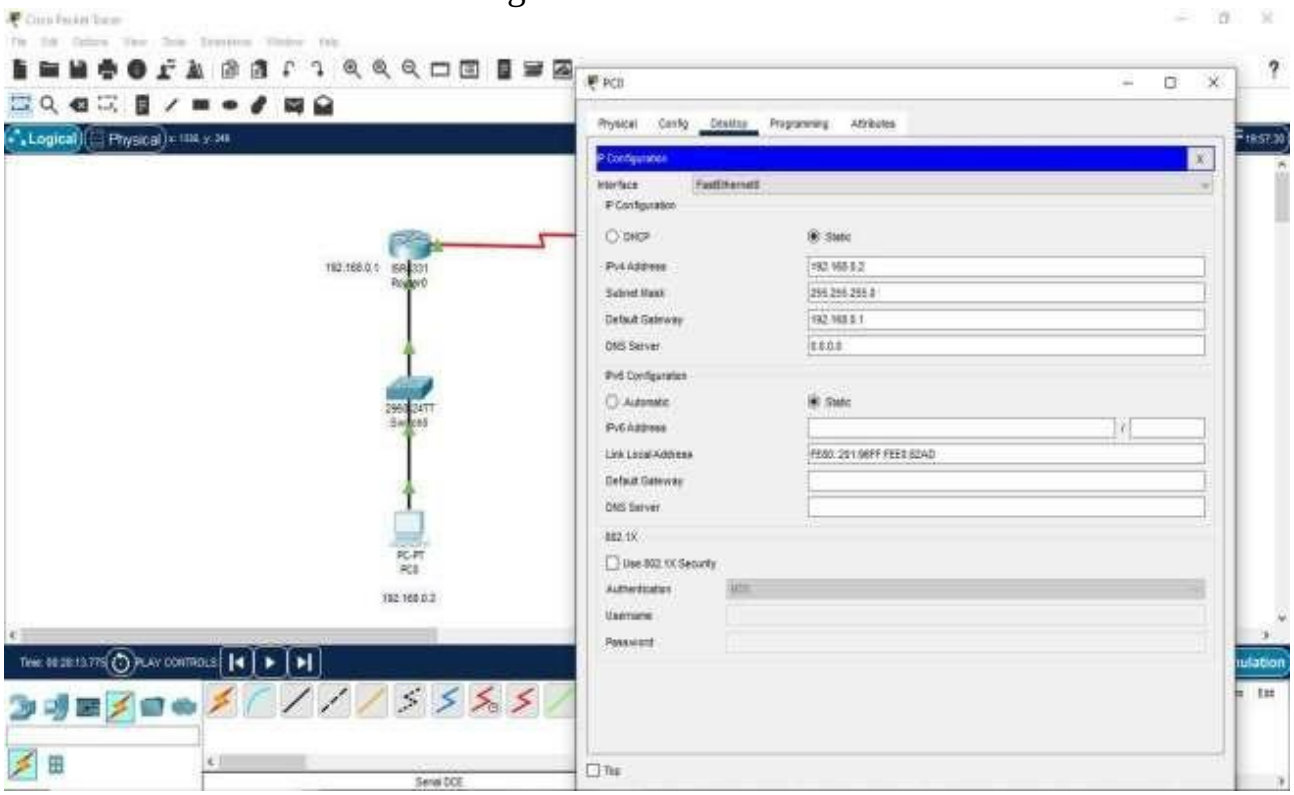
Connect Routers, Switches and PC's using Coper Straight Through Cable:



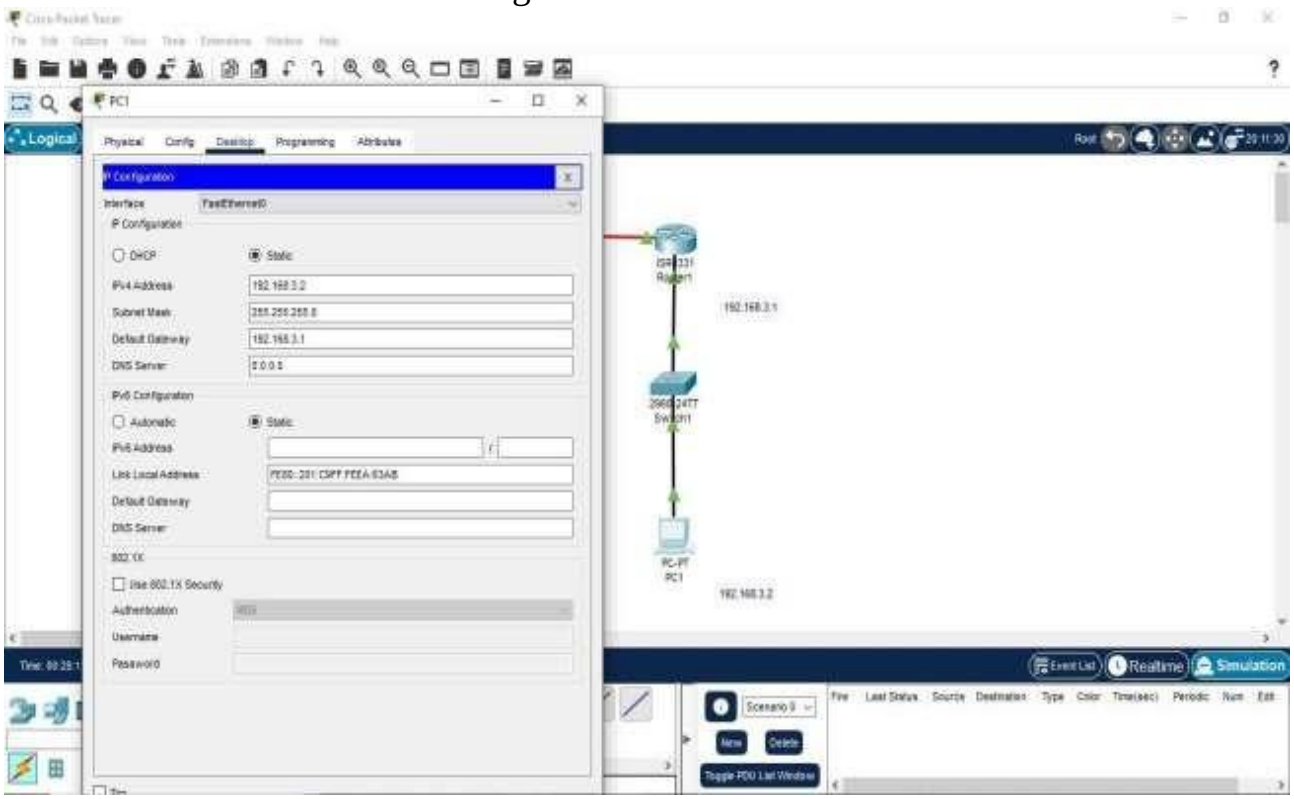
Connect Between Two Routers using DCE Cable with Serial Port



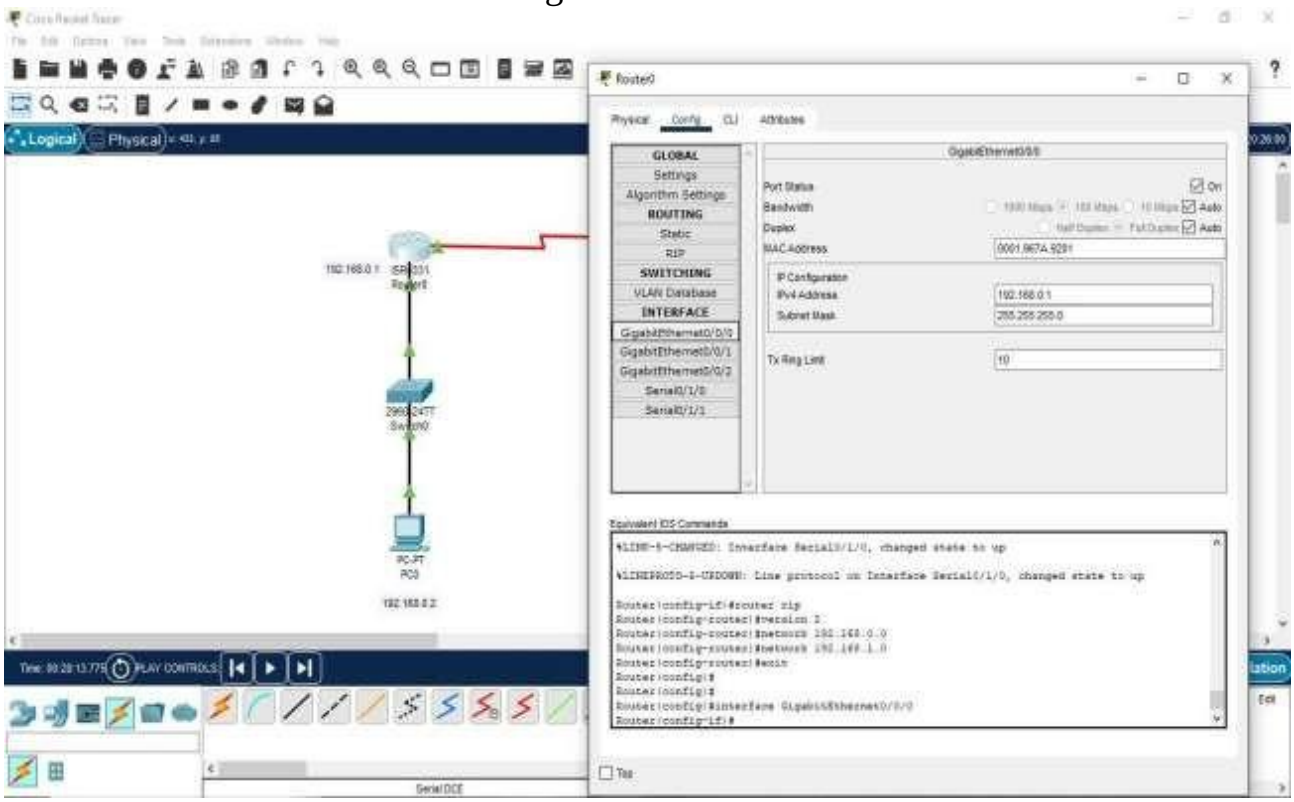
Assign IP Address for PC0:



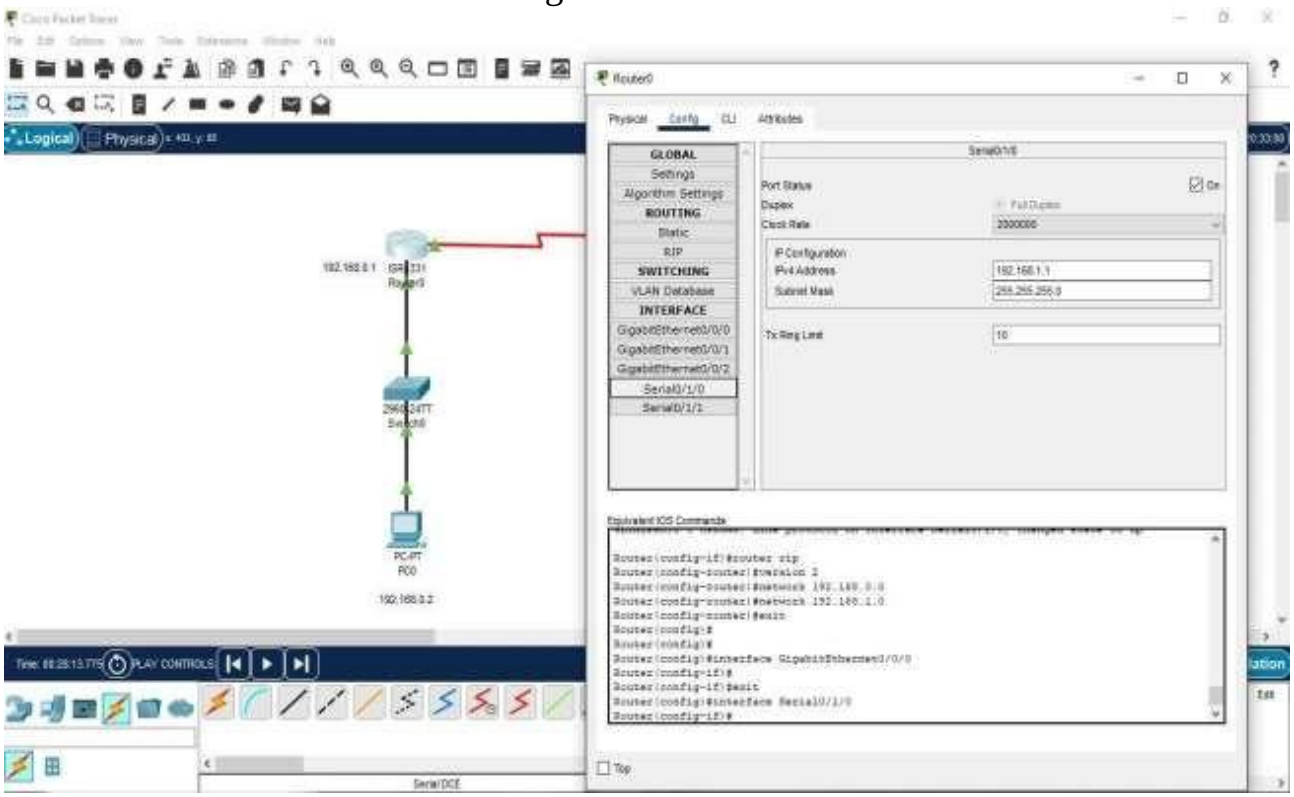
Assign IP Address for PC1



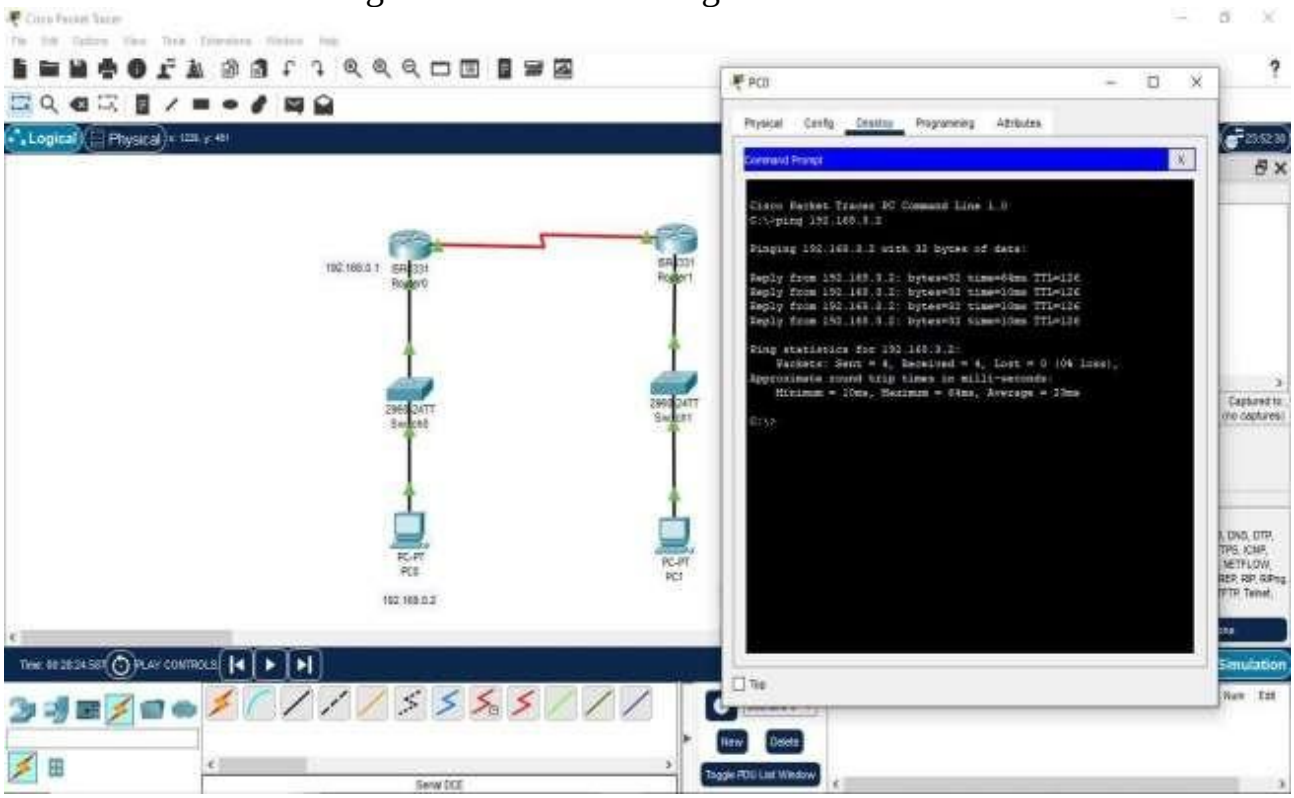
Assign IP for Router0:



Assign IP for Router1:



PingPC1fromthePC0UsingIPAddressofPC1:



RESULT:

Thus the Router Protocol commends are successfully tested and executed.

Ex. No. 8	Get the access of the router by connecting with working computer

Aim:

Access router CLI from a PC via console, SSH, or Telnet.

Procedure:

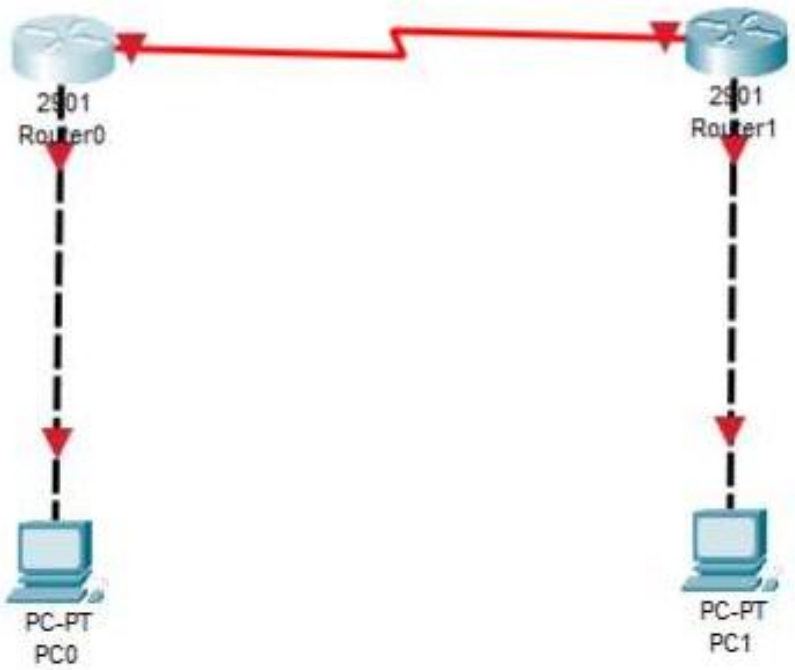
- **Console cable:** Use terminal emulator (PuTTY, minicom) on PC, set baud 9600,8,N,1.
- **SSH/Telnet (networked):** ssh admin@router-ip or telnet router-ip (Telnet insecure).

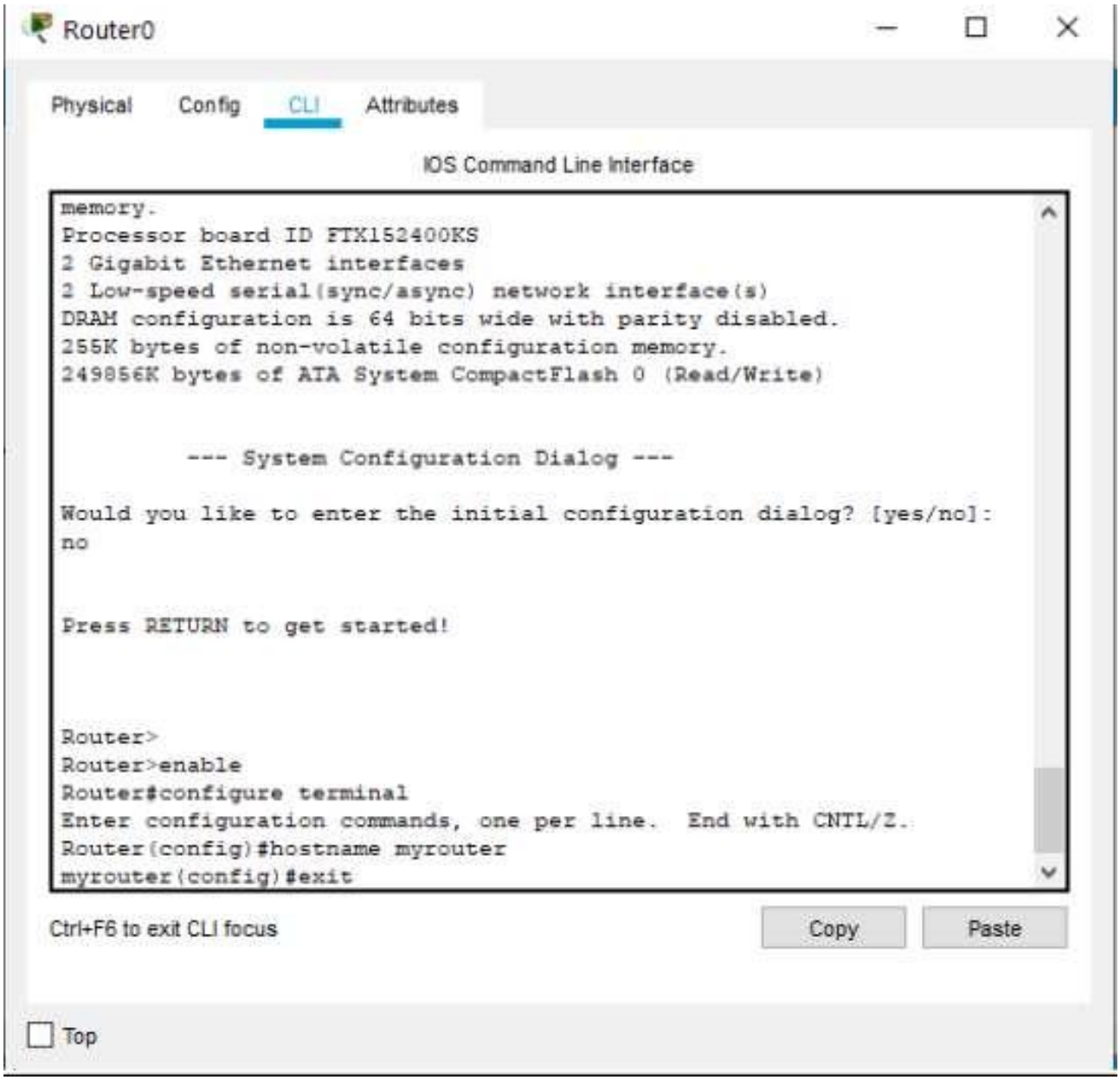
Sample console connection (login):

Router con0 is now available
Press RETURN to get started!

Router> enable
Router# configure terminal
Router(config)#

Sample Input & output Screenshot:





RESULT:

Thus the Router Protocol commends are successfully tested and executed with Computer System.

Ex. No. 9	Identify the route password of server and get the connection using telnet

Important safety note:

Attempting to discover or crack passwords is **unauthorized** and often illegal. No one cannot help with instructions to discover or bypass passwords on devices you do not own or have explicit permission to test. Below is the **safe, permitted** lab version.

Aim:

Demonstrate Telnet access to a router/server using a known username/password in a lab environment (or show how to reset/recover access on devices you own).

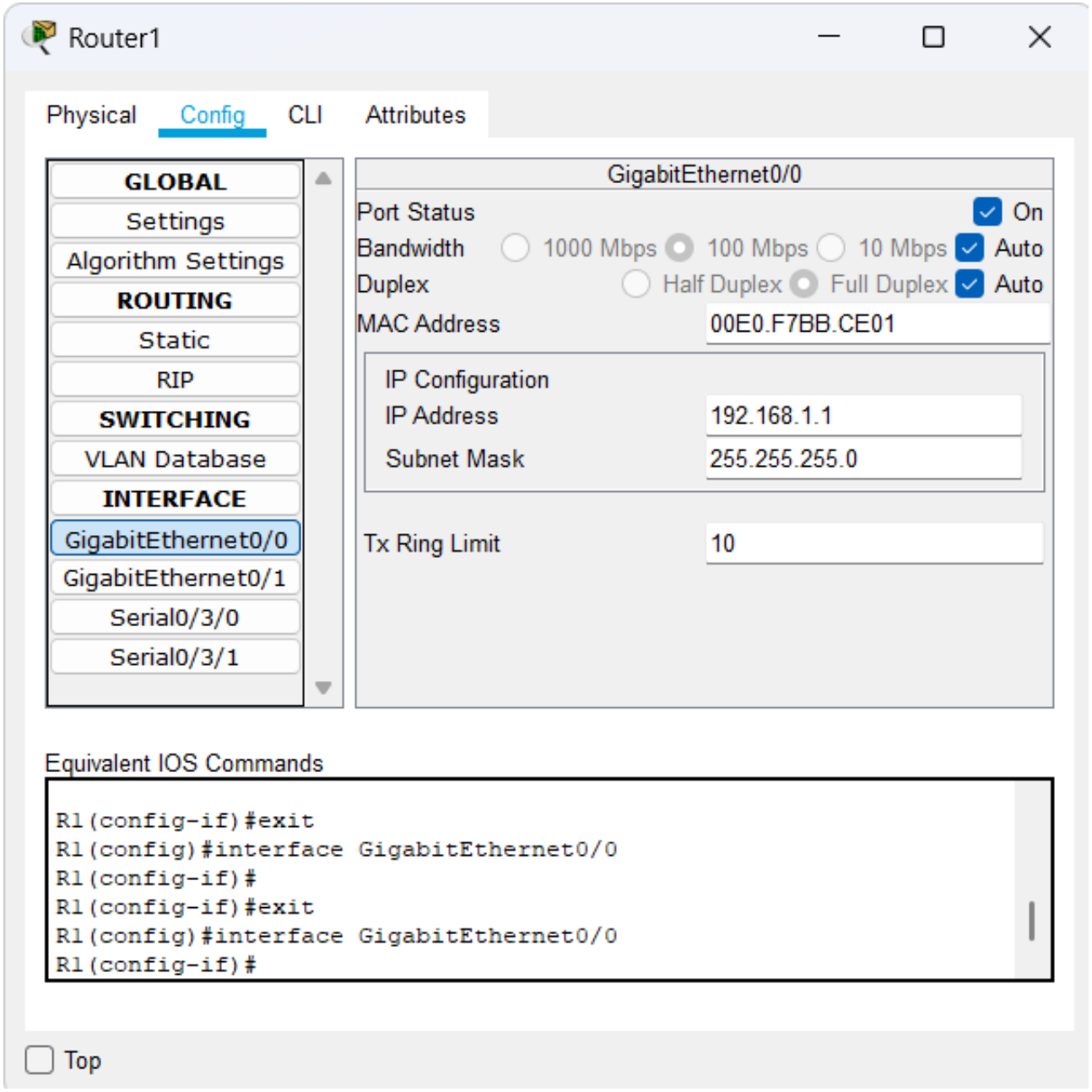
Procedure (lab):

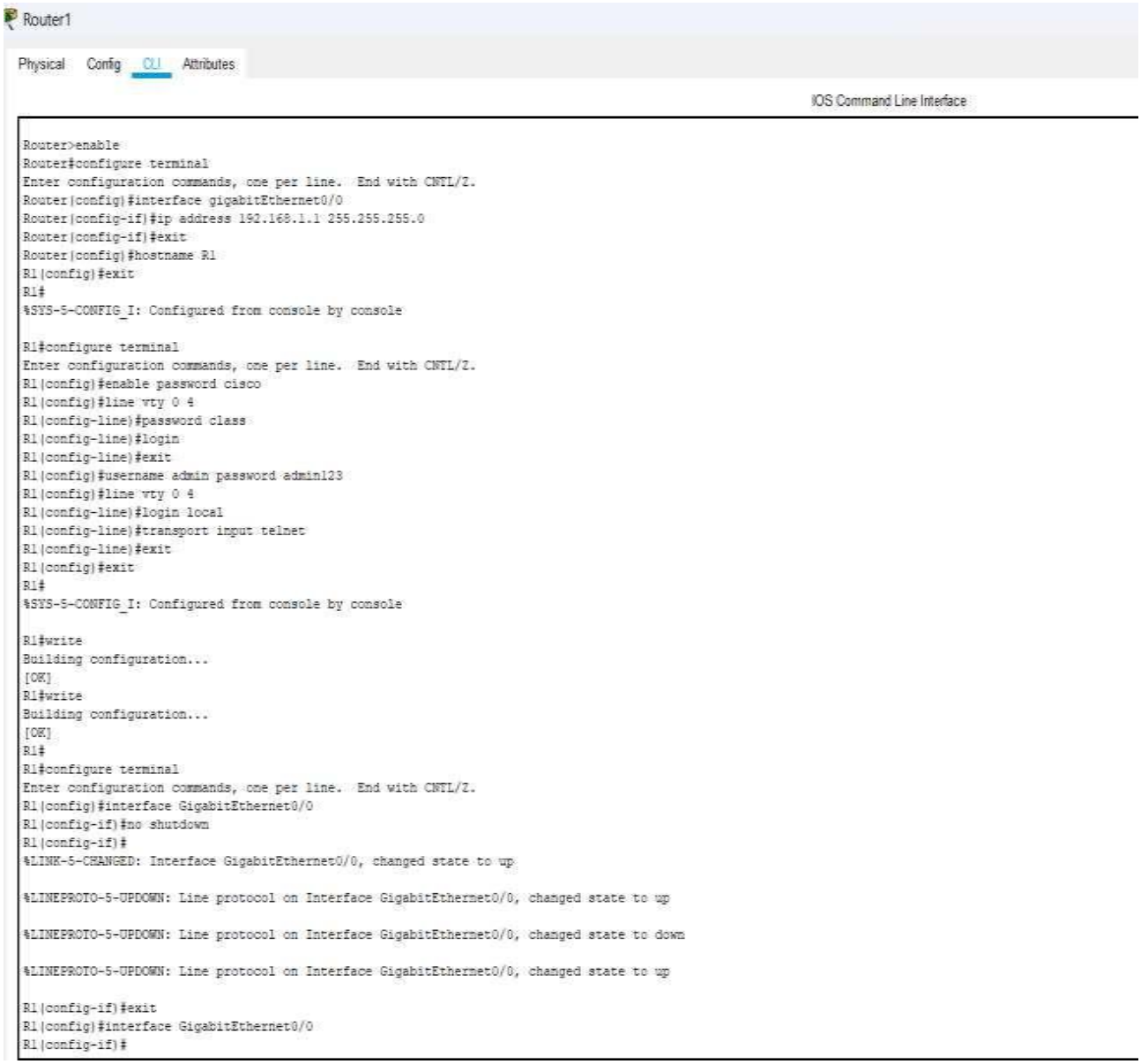
1. Ensure Telnet server enabled on target (for lab only): sudo apt install xinetd telnetd (or enable on router). **Note:** Telnet is insecure — prefer SSH.
2. From client: telnet server-ip then login with provided lab credentials (e.g., labuser / labpass).
3. If you **own** the router and forgot the password, follow vendor's official password recovery procedure (console access + reload + break sequence). Consult router vendor docs.

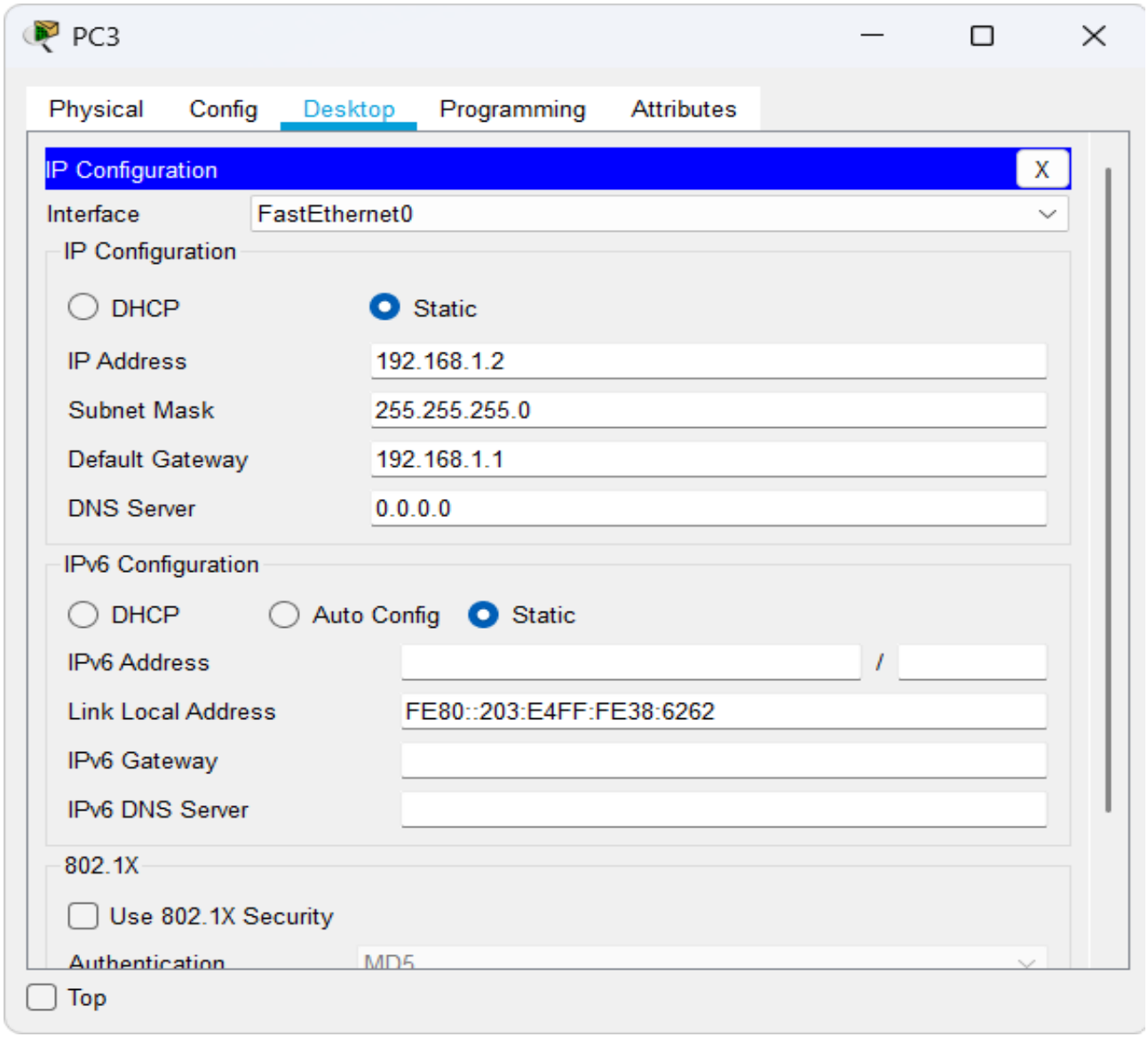
Sample Telnet session (lab credentials):

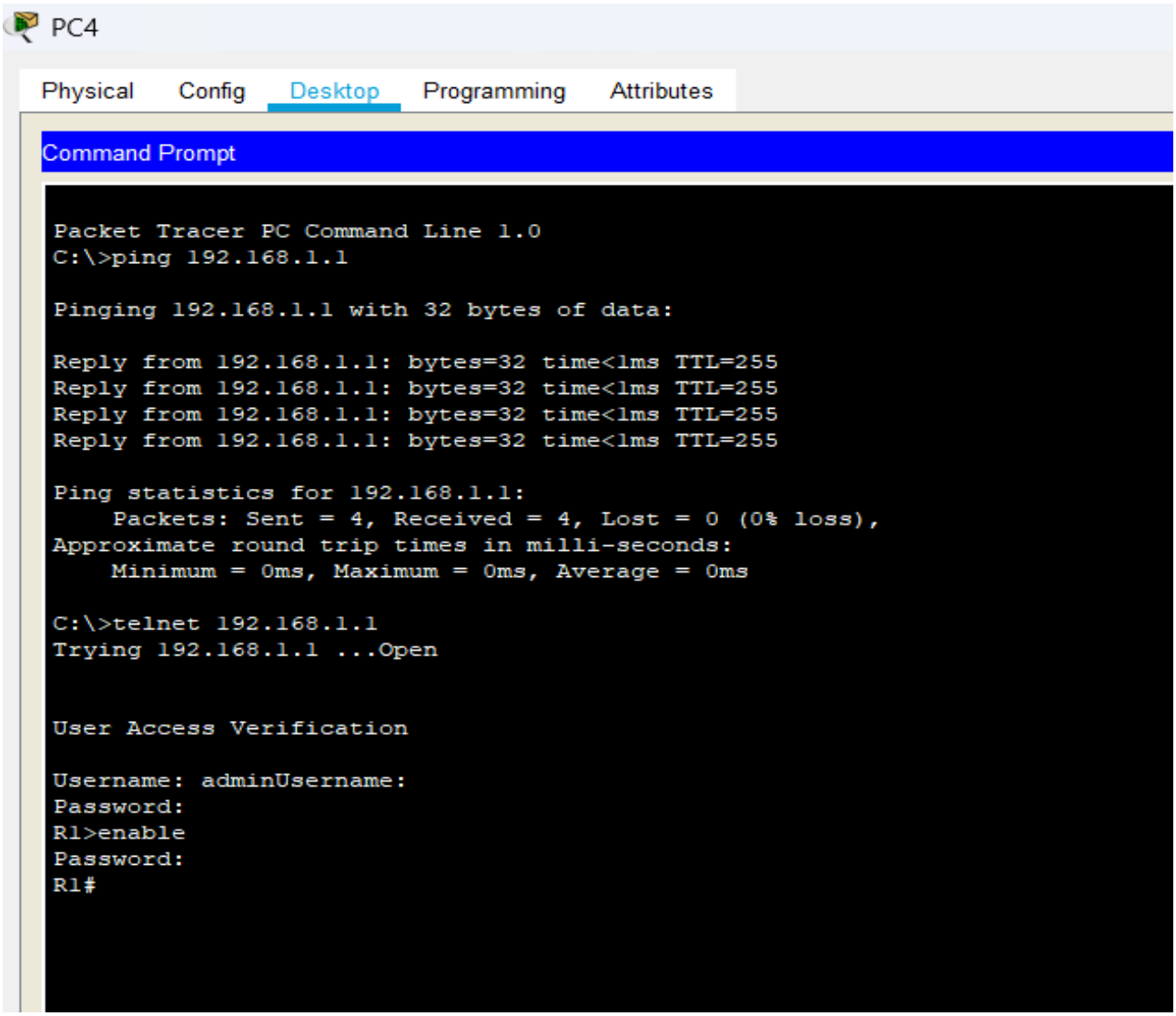
```
$ telnet 192.168.10.100
Trying 192.168.10.100...
Connected to 192.168.10.100.
Escape character is '^]'.
login: labuser
Password:
Welcome to LabRouter
LabRouter> enable
LabRouter#
```

Sample Input & output Screenshot:




Router1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabitEthernet0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#exit
Router(config)#hostname R1
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#enable password cisco
R1(config)#line vty 0 4
R1(config-line)#password class
R1(config-line)#login
R1(config-line)#exit
R1(config)#username admin password admin123
R1(config)#line vty 0 4
R1(config-line)#login local
R1(config-line)#transport input telnet
R1(config-line)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
R1#write
Building configuration...
[OK]
R1#write
Building configuration...
[OK]
R1#
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface GigabitEthernet0/0
R1(config-if)#no shutdown
R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#interface GigabitEthernet0/0
R1(config-if)#


PC3
Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IP Address
192.168.1.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.1.1
DNS Server
0.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
/
Link Local Address
FE80::203:E4FF:FE38:6262
IPv6 Gateway
IPv6 DNS Server
802.1X
Use 802.1X Security
Authentication
MD5
Top



RESULT:

Thus the Telnet commends are successfully tested and executed.

Ex. No. 10	Install wireshark for capture and analyse the packets (TCP /UDP)

Aim:

Capture network traffic and analyze TCP and UDP flows.

Procedure:

1. Install Wireshark (Windows installer / sudo apt install wireshark on Debian/Ubuntu).
2. Start Wireshark as Administrator/root or allow non-root capture per OS docs.
3. Choose interface and click Start.
4. Use capture filter (optional): tcp, udp, host 192.168.1.50, or port 80.
5. Stop capture and analyze: follow TCP stream (right-click → Follow → TCP Stream), inspect headers and flags, use display filters like tcp.port==80 && ip.addr==93.184.216.34.

Sample Wireshark:

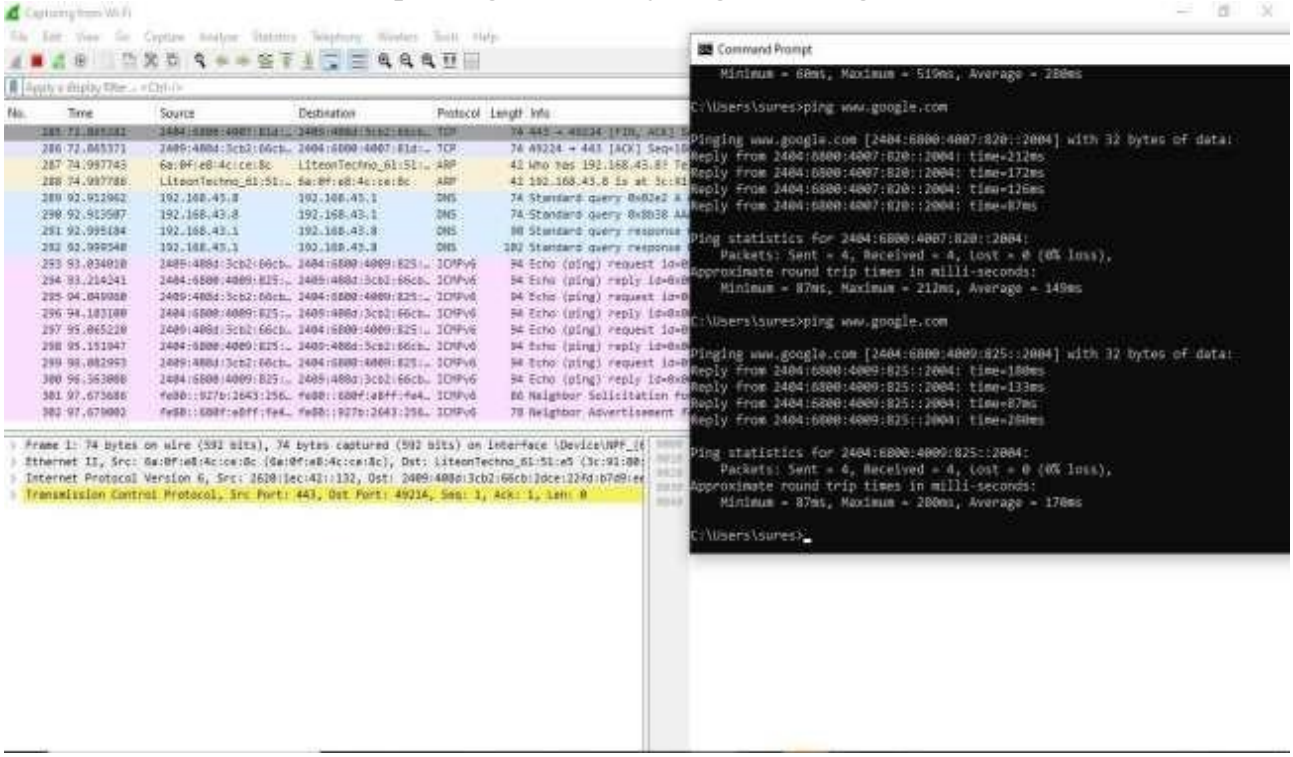
Frame 124: 74 bytes on wire (592 bits), 74 bytes captured
Ethernet II, Src: 00:1a:2b:3c:4d:5e, Dst: 00:0c:29:6d:8e:2a
Internet Protocol Version 4, Src: 192.168.1.50, Dst: 93.184.216.34
Transmission Control Protocol, Src Port: 54321, Dst Port: 80, Seq: 1, Ack: 1, Flags [S, ACK]

Tip:

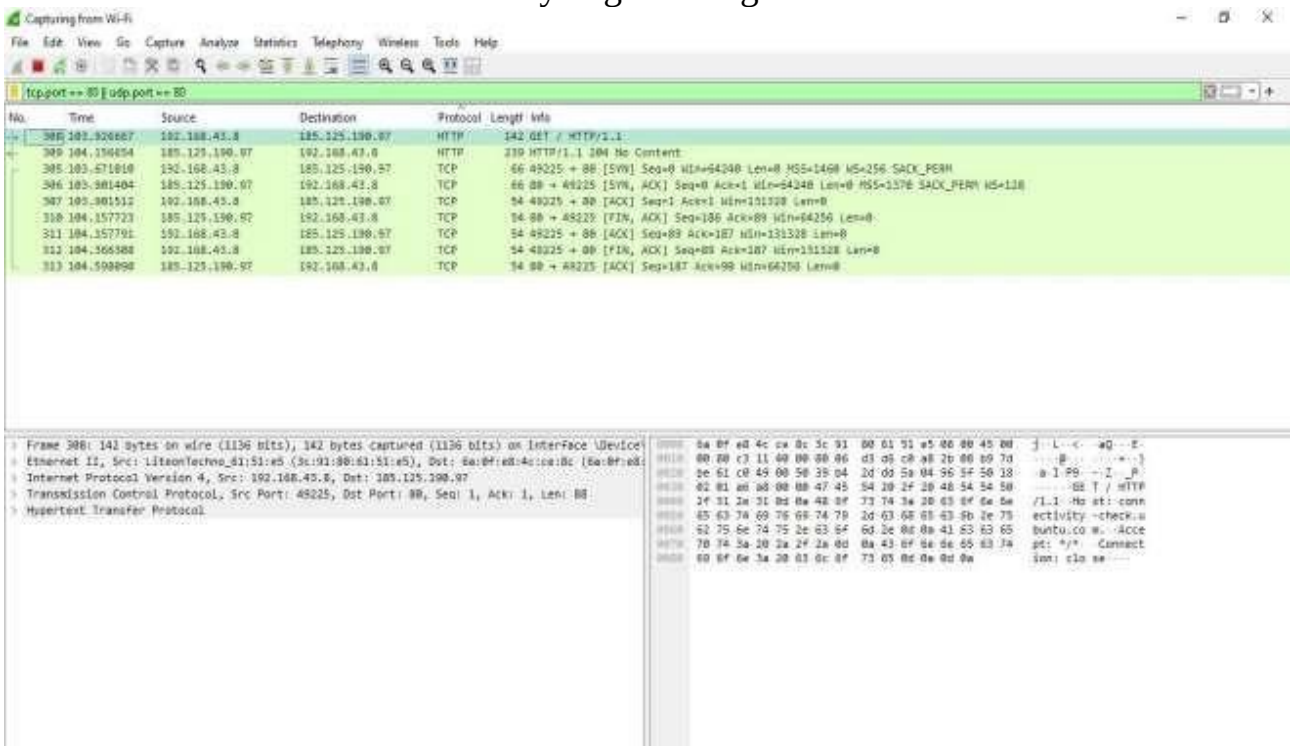
Save capture as .pcap and open later or import into analysis tools.

Sample Input & output Screenshot:

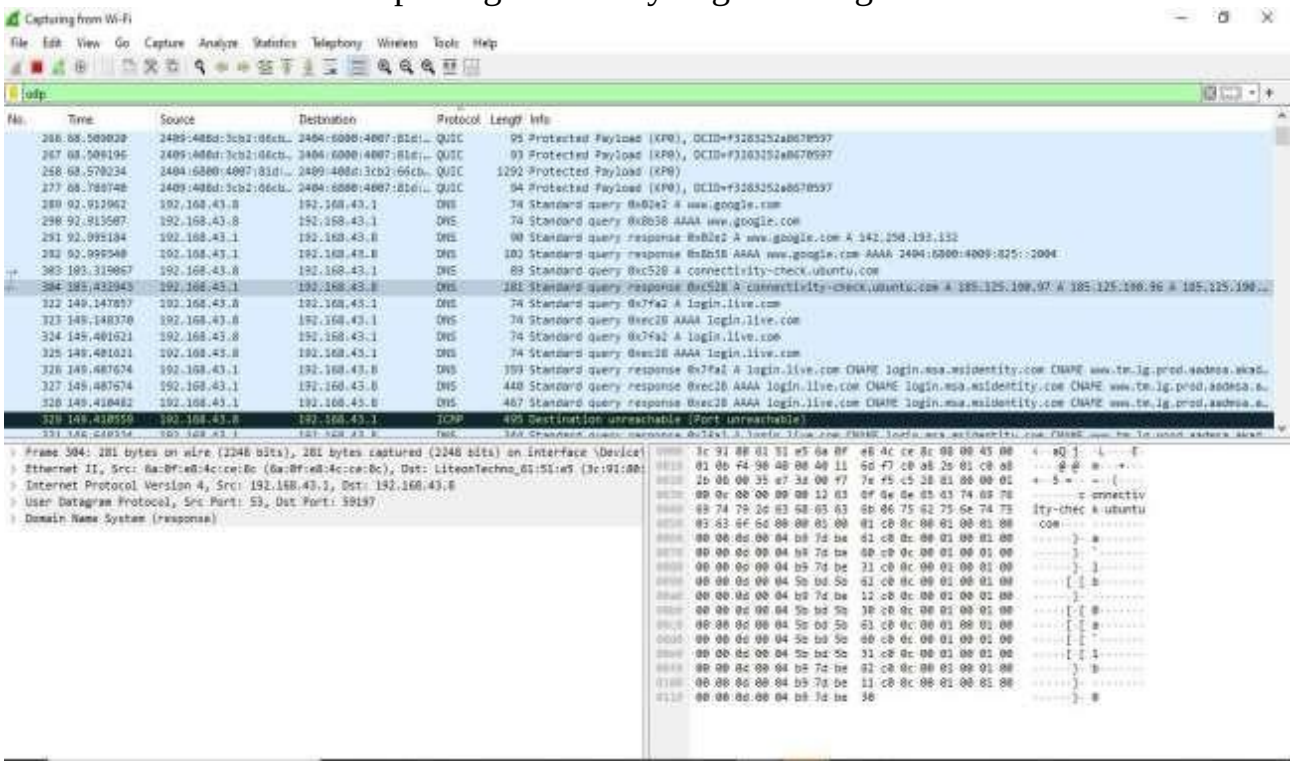
Capturing and Analyzing WIFI signals:



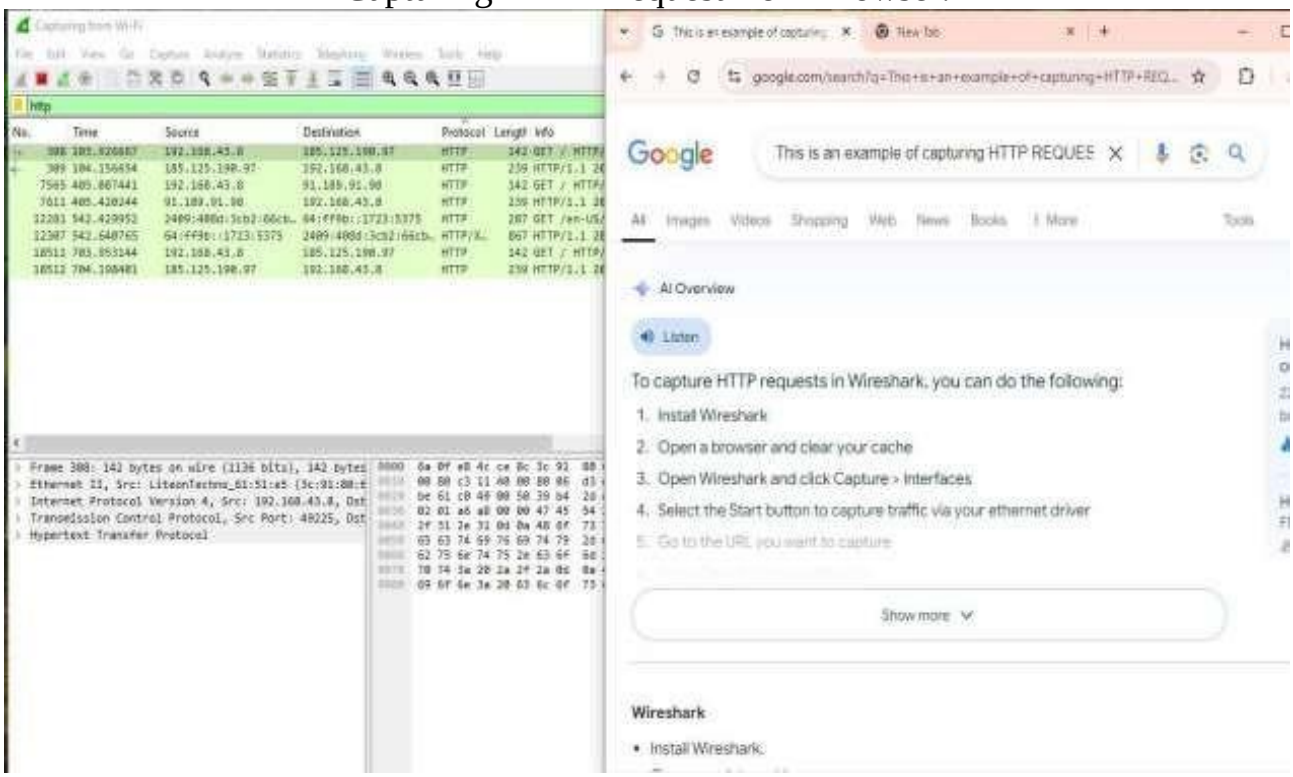
Analyzing TCP Signals:



Capturing and Analyzing UDP Signals:



Capturing HTTP Request from Browser:



RESULT:

Thus the TCP/UDP Protocol analysis are successfully tested and executed using wireshark.

Reference Books:

- Nathan J. Muller, Network Manager's Handbook, 1st Edition, McGraw-Hill Professional, 2002, ISBN-10: 0071405674, ISBN-13: 978-0071405676.

Website References:

- Netlab: a Virtual Networking Labbing Tool. https://netlab.tools/