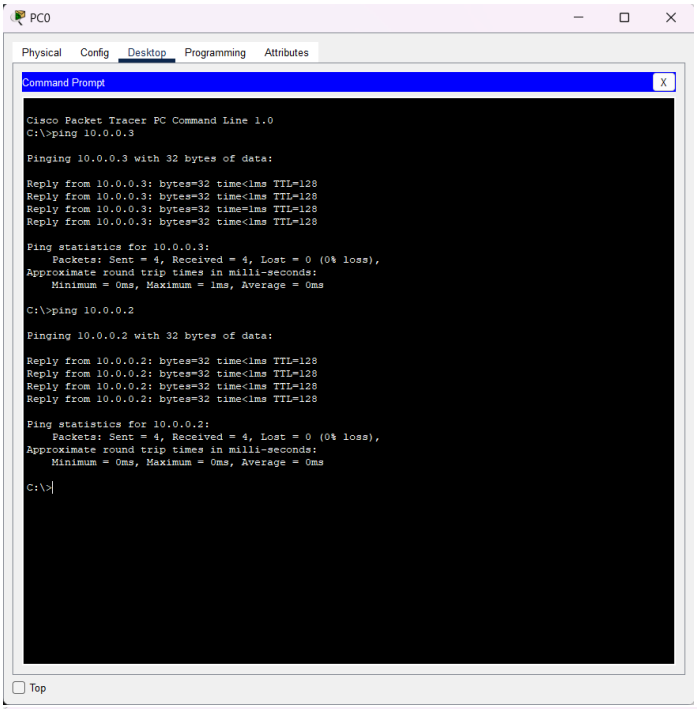
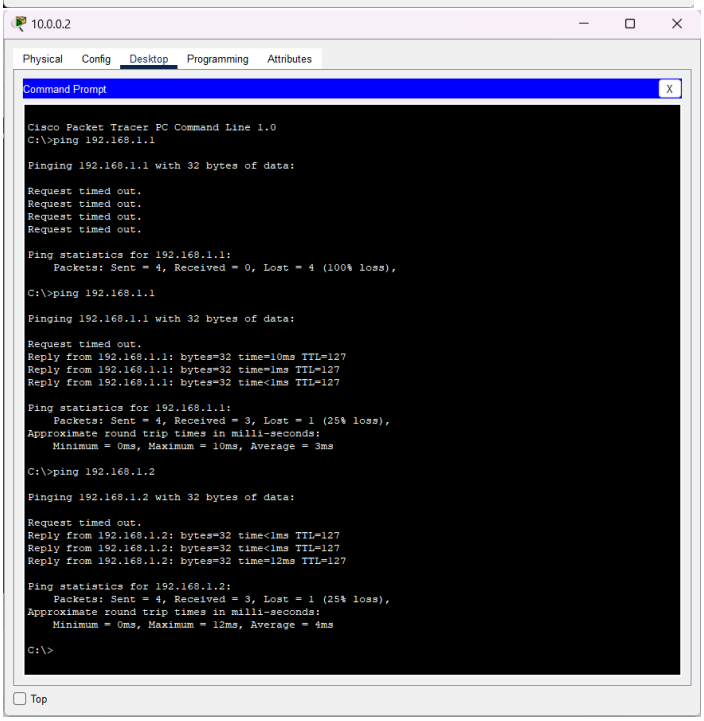
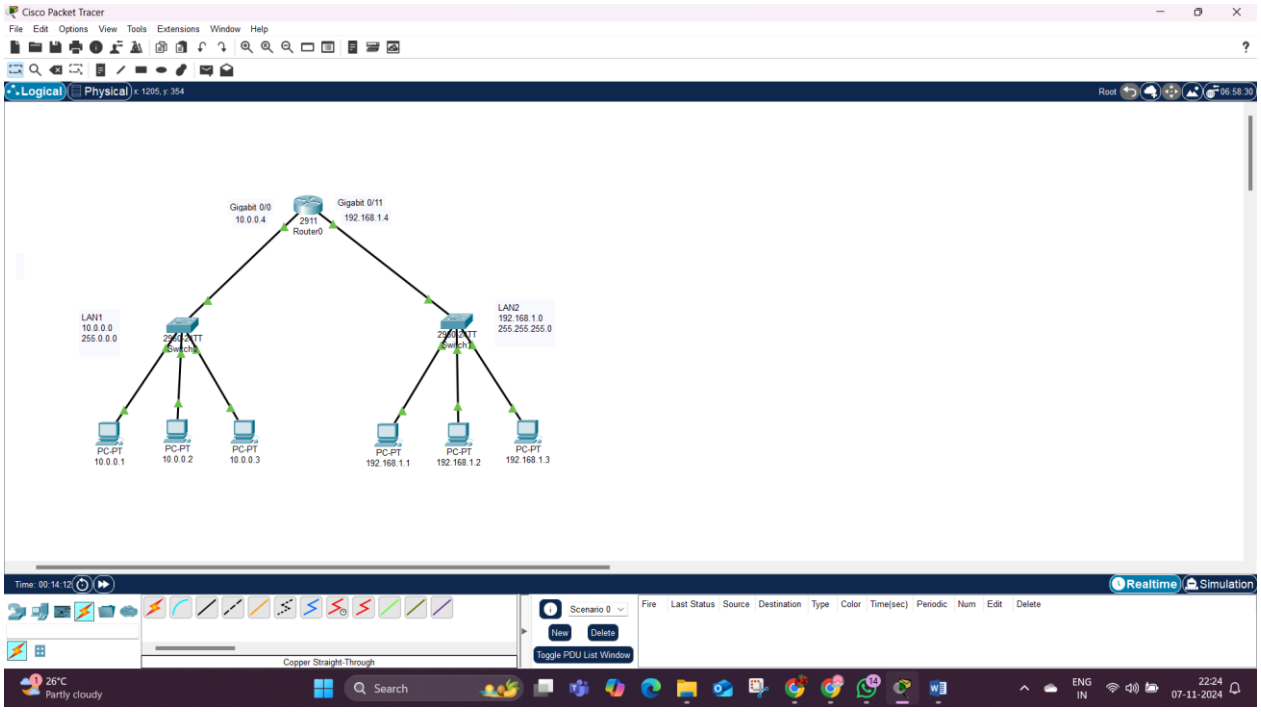
EXPERIMENT – 10

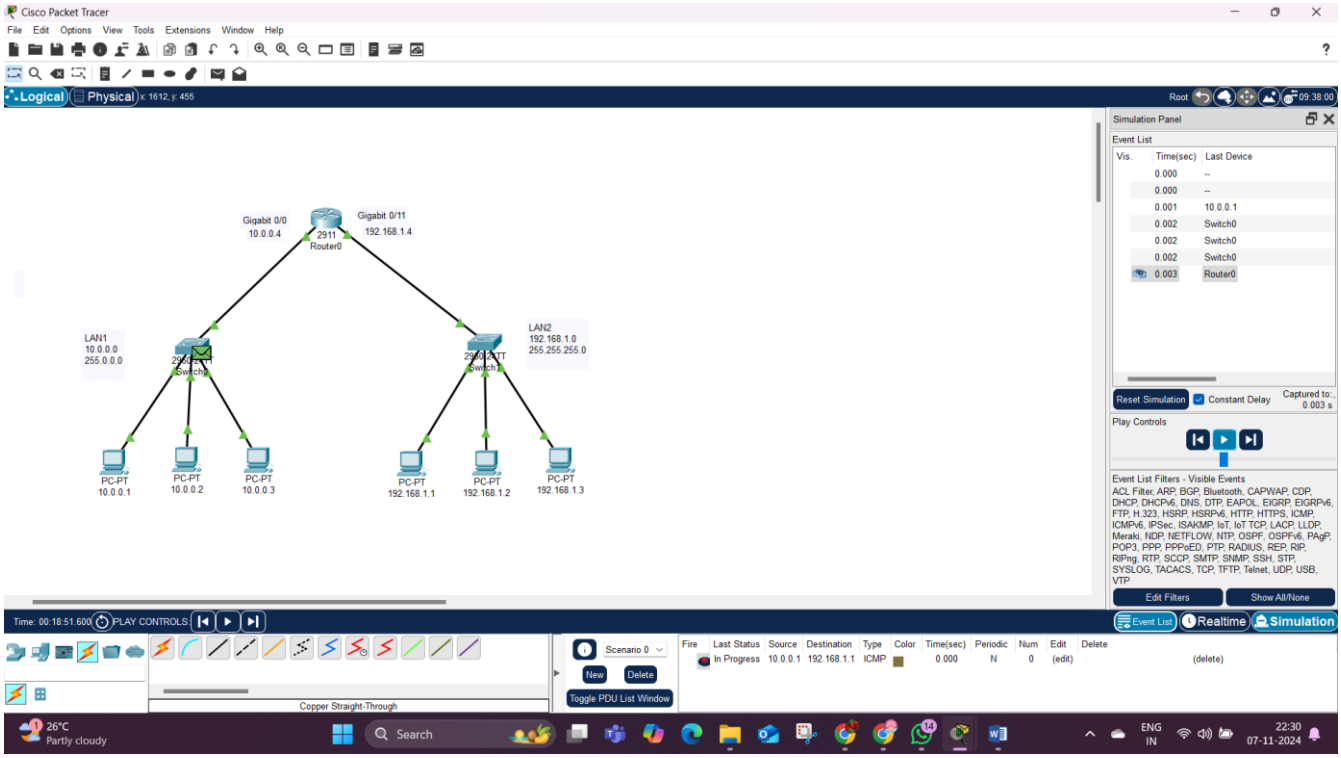
AIM: - a) Internetworking with routers in CISCO PACKET TRACER simulator.

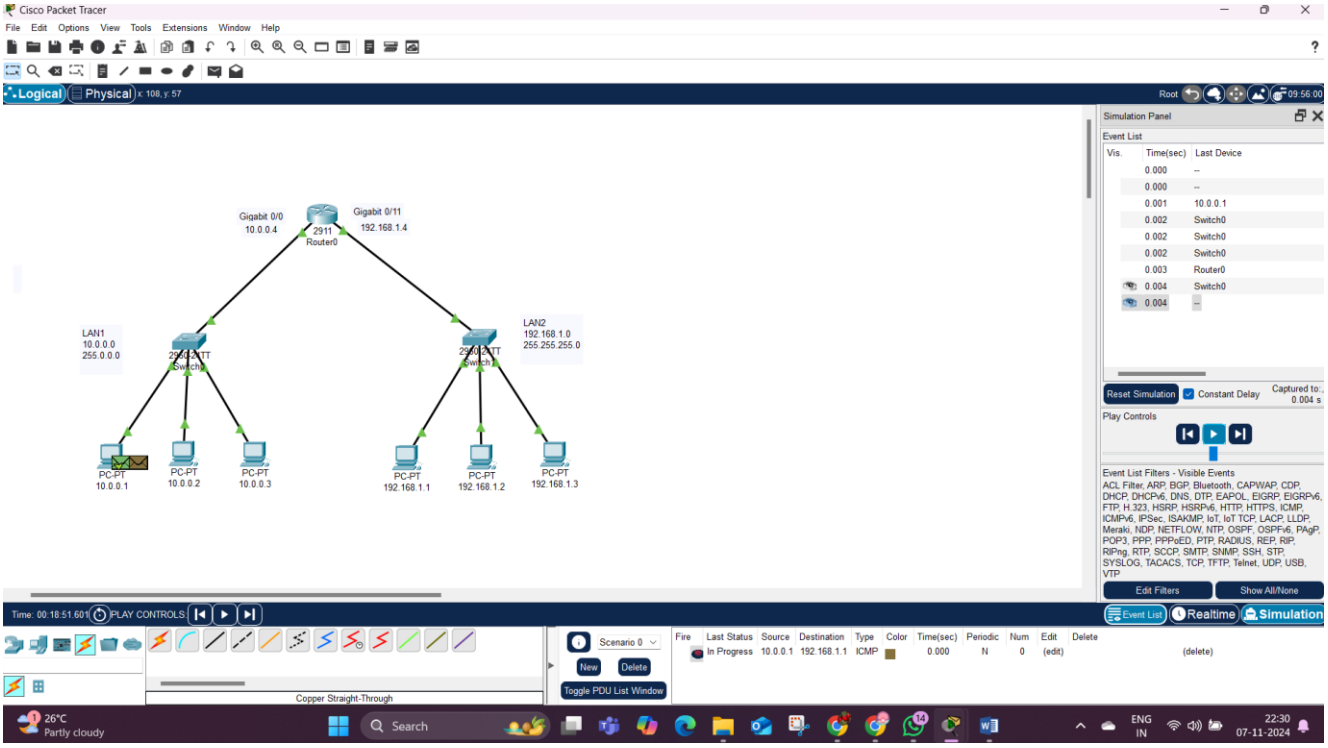
OUTPUT: -

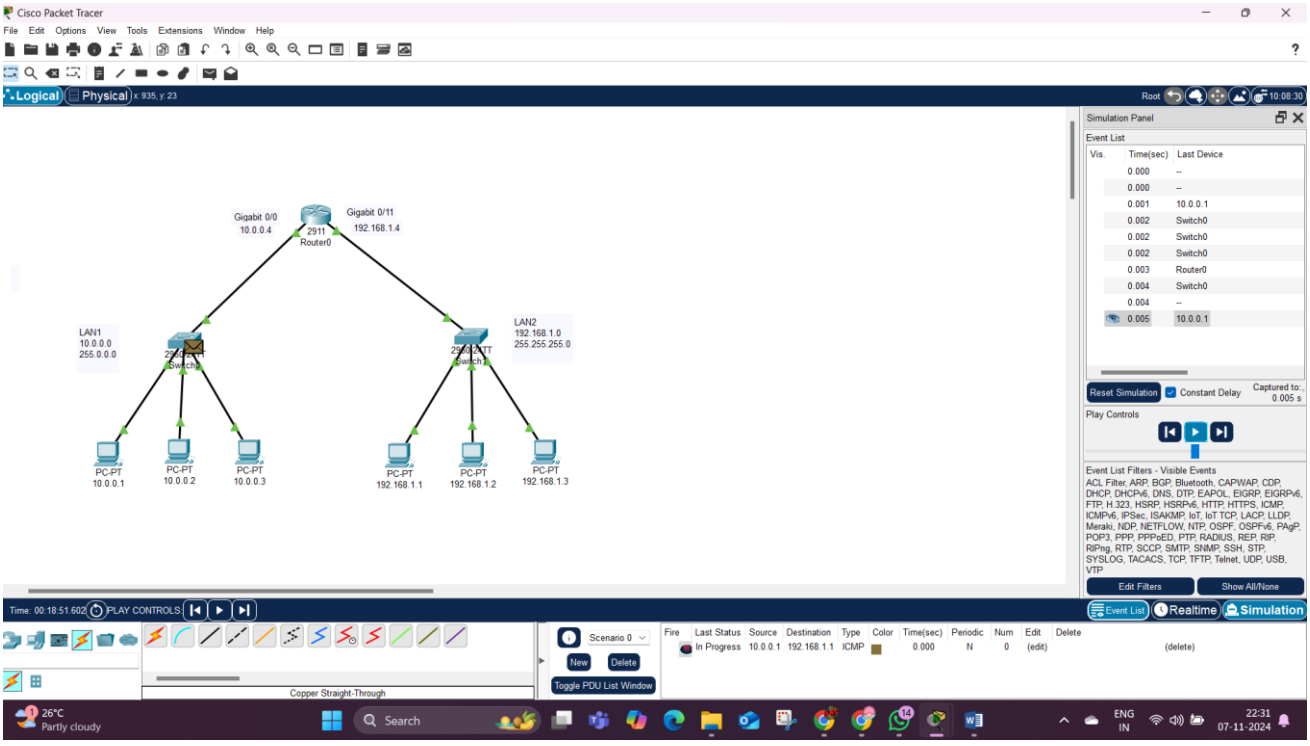


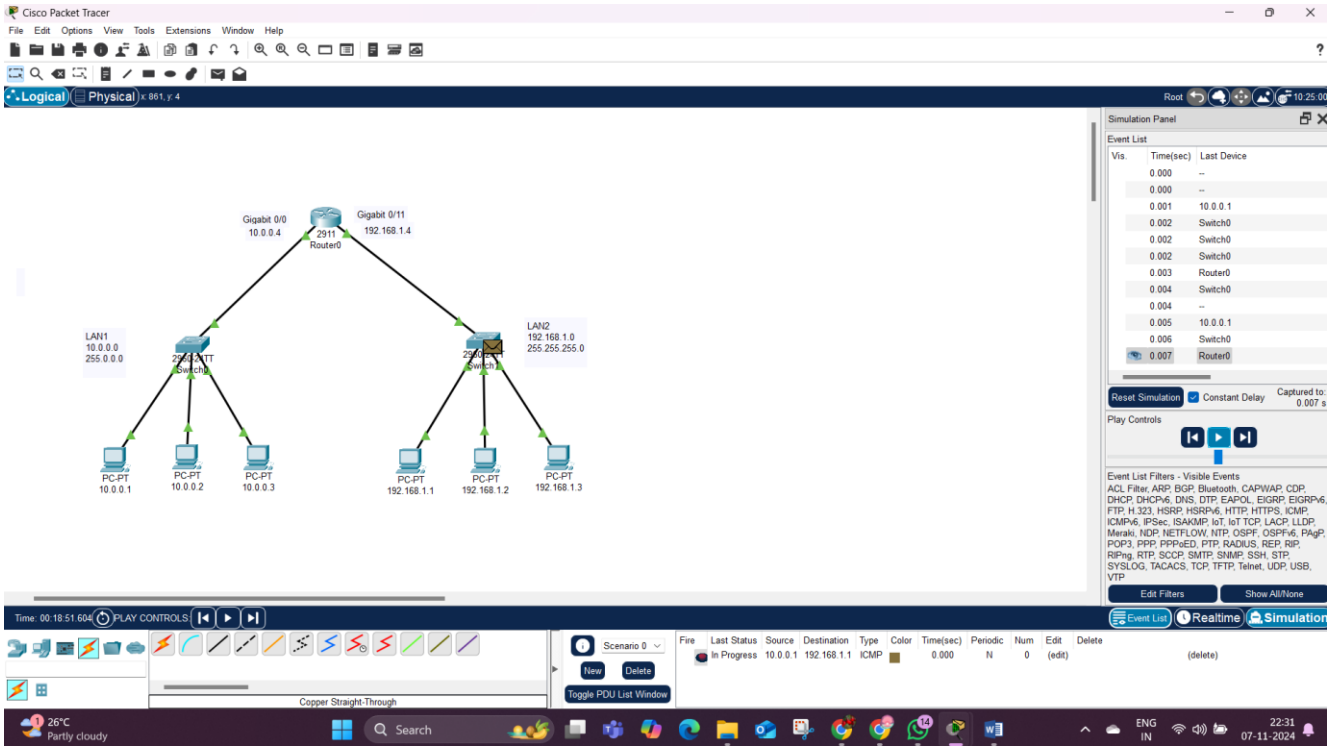


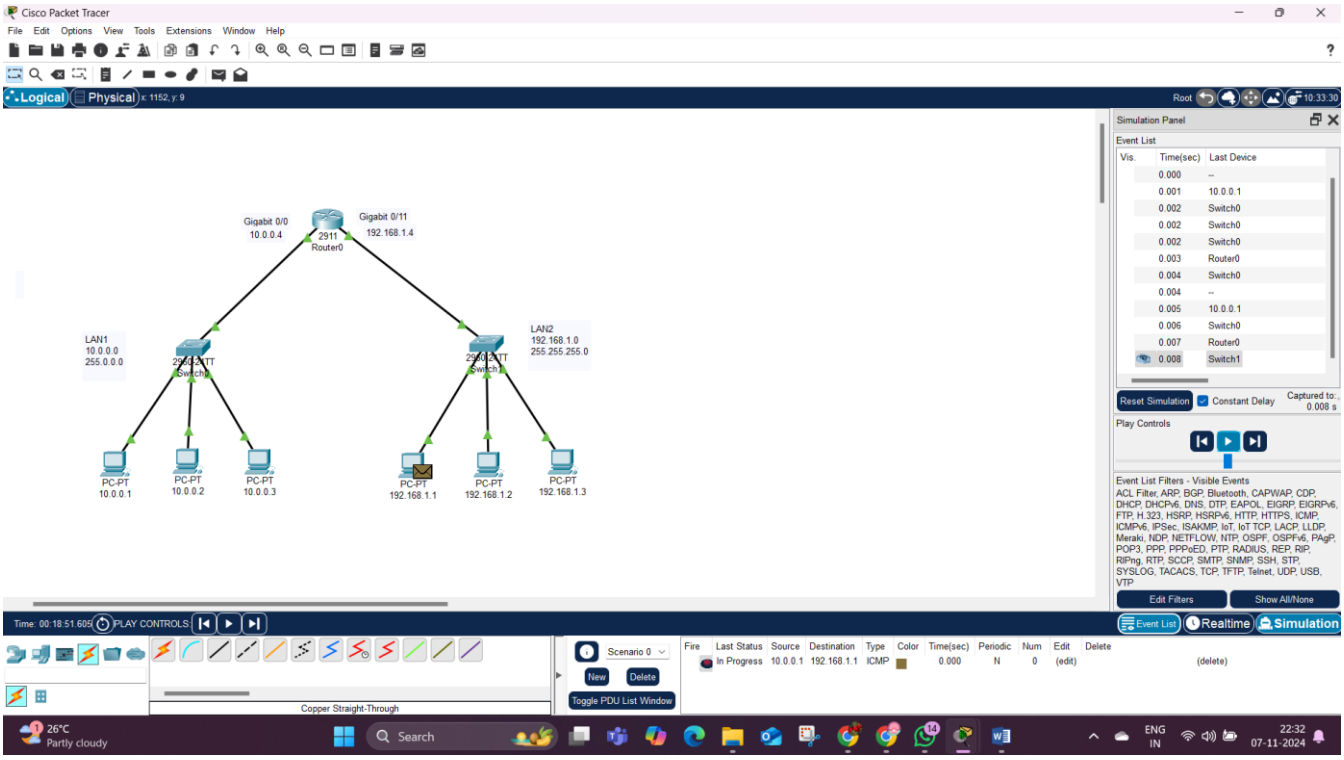

Cisco Packet Tracer
File Edit Options View Tools Extensions Window Help
Logical Physical
Gigabit 0/0
10.0.0.4
2911
Router0
Gigabit 0/11
192.168.1.4
LAN1
10.0.0.0
255.0.0.0
LAN2
192.168.1.0
255.255.255.0
PC-PT
10.0.0.1
PC-PT
10.0.0.2
PC-PT
10.0.0.3
PC-PT
192.168.1.1
PC-PT
192.168.1.2
PC-PT
192.168.1.3
Realtime
Simulation
Copper Straight-Through
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Delete
26°C
Partly cloudy
Search
ENG
IN
22:24
07-11-2024

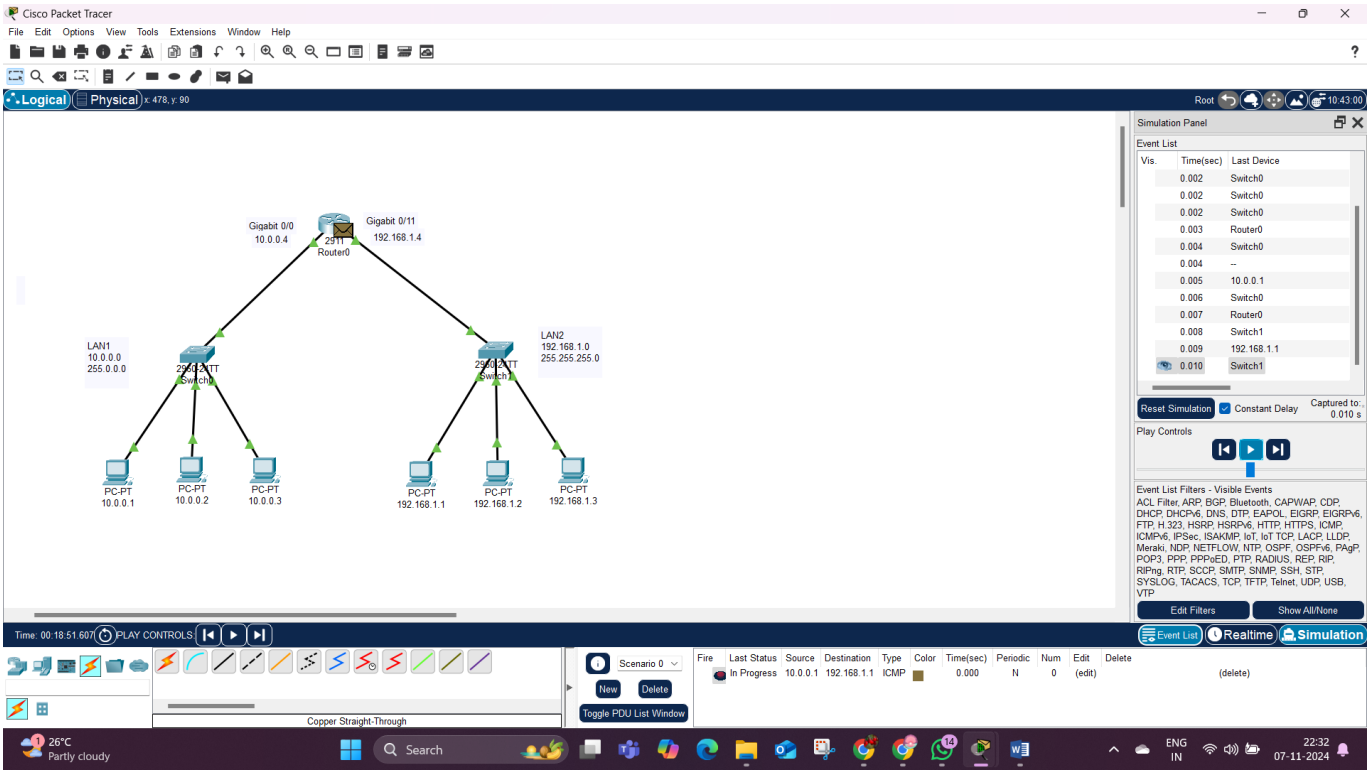

Cisco Packet Tracer
File Edit Options View Tools Extensions Window Help
Logical Physical
Simulation Panel
Event List
Vis.
Time(sec)
Last Device
0.000
0.000
0.001
10.0.0.1
0.002
Switch0
0.002
Switch0
0.002
Switch0
0.003
Router0
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
Show All/None
Gigabit 0/0
10.0.0.4
2911
Router0
Gigabit 0/11
192.168.1.4
LAN1
10.0.0.0
255.0.0.0
LAN2
192.168.1.0
255.255.255.0
PC-PT
10.0.0.1
PC-PT
10.0.0.2
PC-PT
10.0.0.3
PC-PT
192.168.1.1
PC-PT
192.168.1.2
PC-PT
192.168.1.3
Realtime
Simulation
Copper Straight-Through
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Delete
In Progress
10.0.0.1
192.168.1.1
ICMP
0.000
N
0
(edit)
(delete)
26°C
Partly cloudy
Search
ENG
IN
22:30
07-11-2024

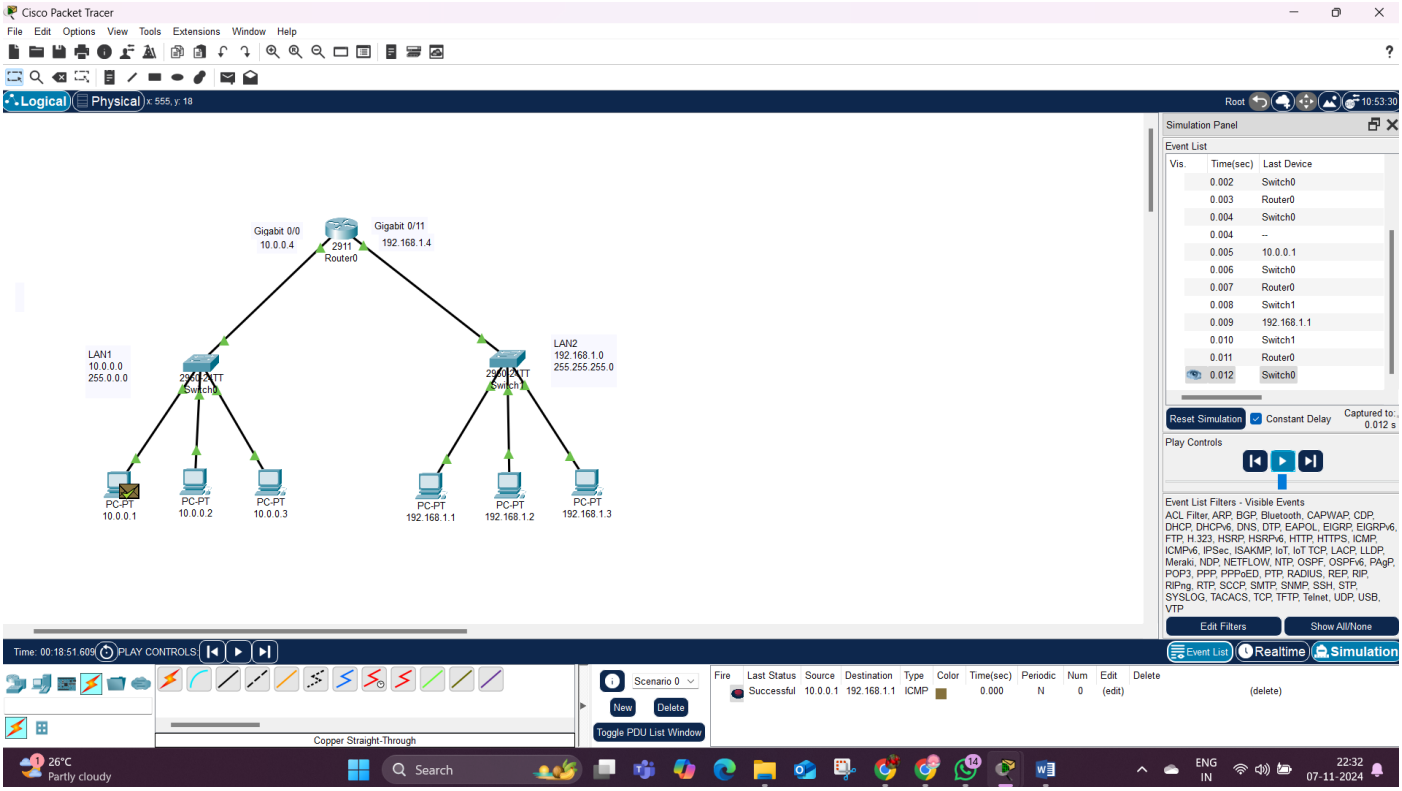

Cisco Packet Tracer
File Edit Options View Tools Extensions Window Help
Logical Physical x: 108, y: 57
Root 09:56:00
Gigabit 0/0
10.0.0.4
2911
Router0
Gigabit 0/11
192.168.1.4
LAN1
10.0.0.0
255.0.0.0
LAN2
192.168.1.0
255.255.255.0
PC-PT
10.0.0.1
PC-PT
10.0.0.2
PC-PT
10.0.0.3
PC-PT
192.168.1.1
PC-PT
192.168.1.2
PC-PT
192.168.1.3
Simulation Panel
Event List
Vis. Time(sec) Last Device
0.000 --
0.000 --
0.001 10.0.0.1
0.002 Switch0
0.002 Switch0
0.002 Switch0
0.003 Router0
0.004 Switch0
0.004 --
Reset Simulation
Constant Delay
Captured to: 0.004 s
Play Controls
Event List Filters - Visible Events
ACL Filter, ARP, BGP, Bluetooth, CAPWAP, CDP, DHCP, DHCPv6, DNS, DTP, EAPOL, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, IoT, IoT TCP, LACP, LLDP, Meraki, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, PPP, PPPoED, PTP, RADIUS, REP, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, USB, VTP
Edit Filters
Show All/None
Time: 00:18:51.601
PLAY CONTROLS:
Event List
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete
In Progress 10.0.0.1 192.168.1.1 ICMP 0.000 N 0 (edit) (delete)
Copper Straight-Through
26°C
Partly cloudy
Search
ENG
IN
22:30
07-11-2024


Cisco Packet Tracer
File Edit Options View Tools Extensions Window Help
Logical Physical x: 935, y: 23
Root 10:08:30
Gigabit 0/0
10.0.0.4
2911
Router0
Gigabit 0/11
192.168.1.4
LAN1
10.0.0.0
255.0.0.0
LAN2
192.168.1.0
255.255.255.0
PC-PT
10.0.0.1
PC-PT
10.0.0.2
PC-PT
10.0.0.3
PC-PT
192.168.1.1
PC-PT
192.168.1.2
PC-PT
192.168.1.3
Simulation Panel
Event List
Vis. Time(sec) Last Device
0.000 --
0.000 --
0.001 10.0.0.1
0.002 Switch0
0.002 Switch0
0.002 Switch0
0.003 Router0
0.004 Switch0
0.004 --
0.005 10.0.0.1
Reset Simulation
Constant Delay
Captured to: 0.005 s
Play Controls
Event List Filters - Visible Events
ACL Filter, ARP, BGP, Bluetooth, CAPWAP, CDP, DHCP, DHCPv6, DNS, DTP, EAPOL, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, IoT, IoT TCP, LACP, LLDP, Meraki, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, PPP, PPPoED, PTP, RADIUS, REP, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, USB, VTP
Edit Filters
Show All/None
Time: 00:18:51.602
PLAY CONTROLS:
Event List
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete
In Progress 10.0.0.1 192.168.1.1 ICMP 0.000 N 0 (edit) (delete)
Copper Straight-Through
26°C
Partly cloudy
Search
ENG
IN
22:31
07-11-2024


Cisco Packet Tracer
File Edit Options View Tools Extensions Window Help
Logical Physical
Gigabit 0/0
10.0.0.4
2911
Router0
Gigabit 0/11
192.168.1.4
LAN1
10.0.0.0
255.0.0.0
LAN2
192.168.1.0
255.255.255.0
PC-PT
10.0.0.1
PC-PT
10.0.0.2
PC-PT
10.0.0.3
PC-PT
192.168.1.1
PC-PT
192.168.1.2
PC-PT
192.168.1.3
Simulation Panel
Event List
Vis. Time(sec) Last Device
0.000 --
0.000 --
0.001 10.0.0.1
0.002 Switch0
0.002 Switch0
0.002 Switch0
0.003 Router0
0.004 Switch0
0.004 --
0.005 10.0.0.1
0.006 Switch0
0.007 Router0
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
Show All/None
Time: 00:18:51.604
PLAY CONTROLS
Event List
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete
In Progress 10.0.0.1 192.168.1.1 ICMP 0.000 N 0 (edit) (delete)
Copper Straight-Through
26°C
Partly cloudy
Search
ENG
IN
22:31
07-11-2024


Cisco Packet Tracer
File Edit Options View Tools Extensions Window Help
Logical Physical
Gigabit 0/0
10.0.0.4
2911
Router0
Gigabit 0/11
192.168.1.4
LAN1
10.0.0.0
255.0.0.0
LAN2
192.168.1.0
255.255.255.0
PC-PT
10.0.0.1
PC-PT
10.0.0.2
PC-PT
10.0.0.3
PC-PT
192.168.1.1
PC-PT
192.168.1.2
PC-PT
192.168.1.3
Simulation Panel
Event List
Vis. Time(sec) Last Device
0.000 --
0.001 10.0.0.1
0.002 Switch0
0.002 Switch0
0.002 Switch0
0.003 Router0
0.004 Switch0
0.004 --
0.005 10.0.0.1
0.006 Switch0
0.007 Router0
0.008 Switch1
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
Show All/None
Time: 00:18:51.605
PLAY CONTROLS
Event List
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delete
In Progress 10.0.0.1 192.168.1.1 ICMP 0.000 N 0 (edit) (delete)
Copper Straight-Through
26°C
Partly cloudy
Search
ENG
IN
22:32
07-11-2024





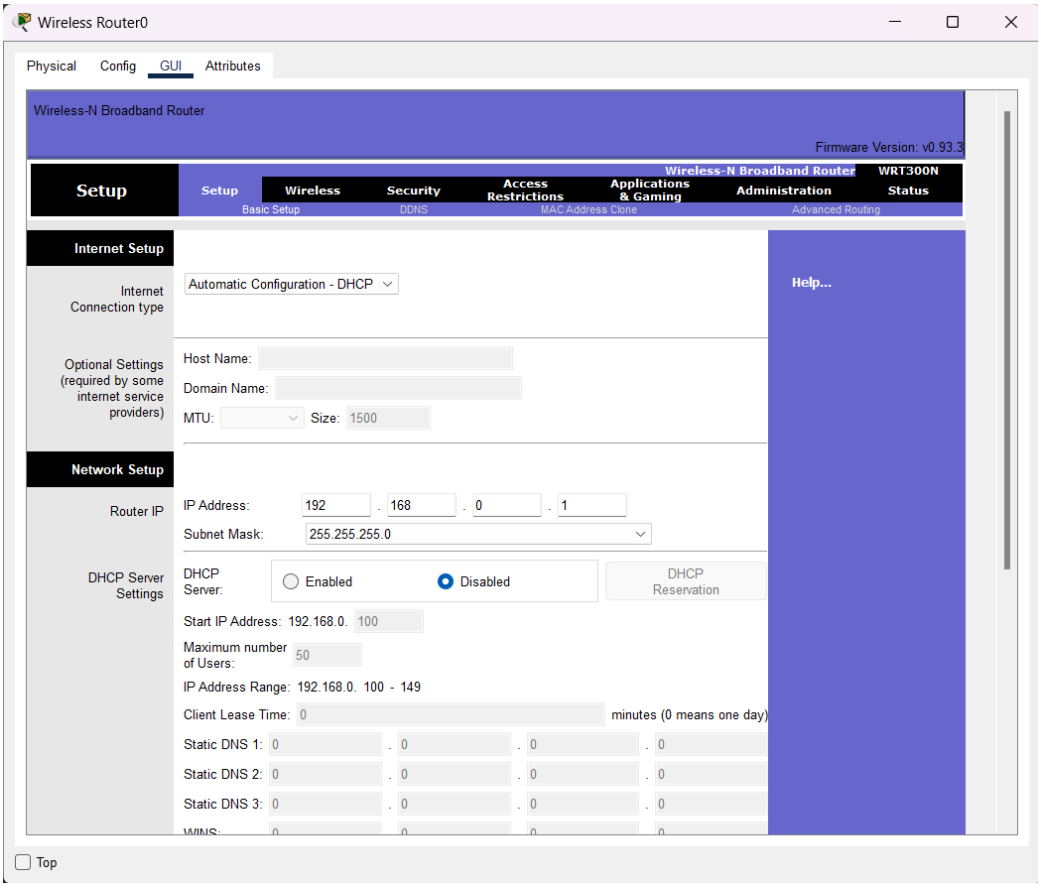
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	10.0.0.1	192.168.1.1	ICMP		0.000	N	0	(edit)	(delete)

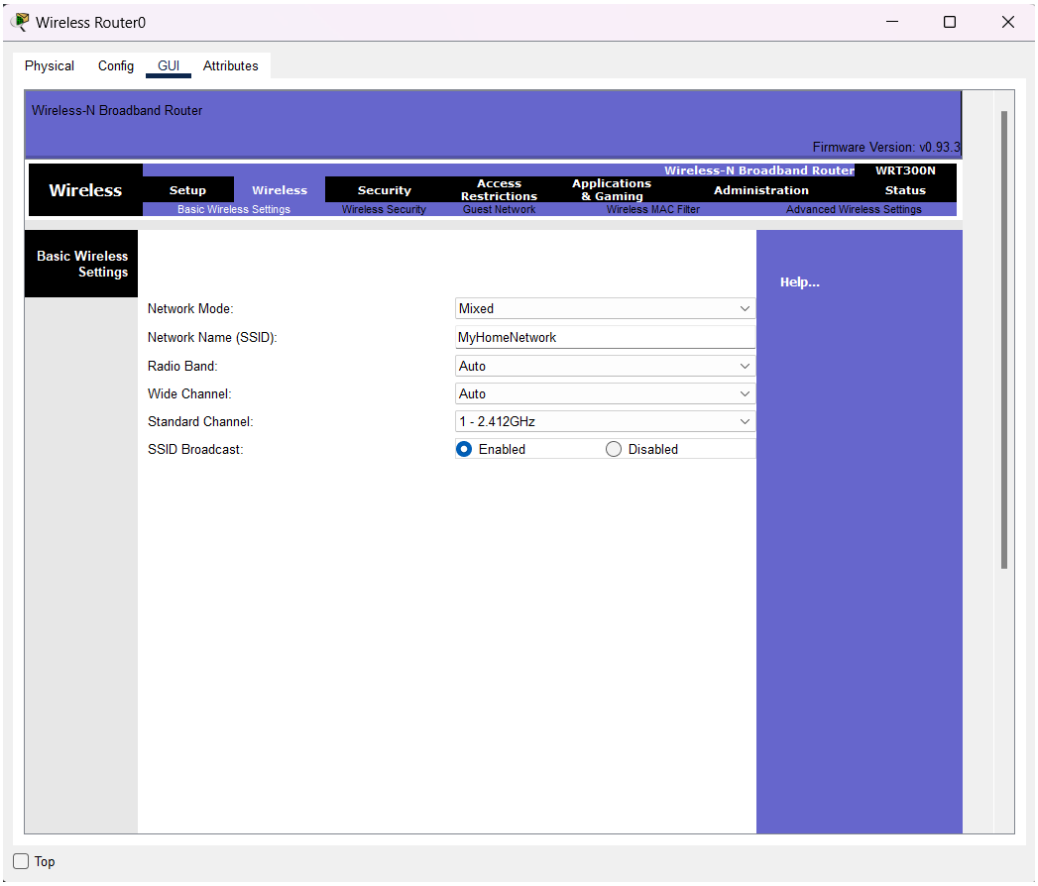
RESULT: -

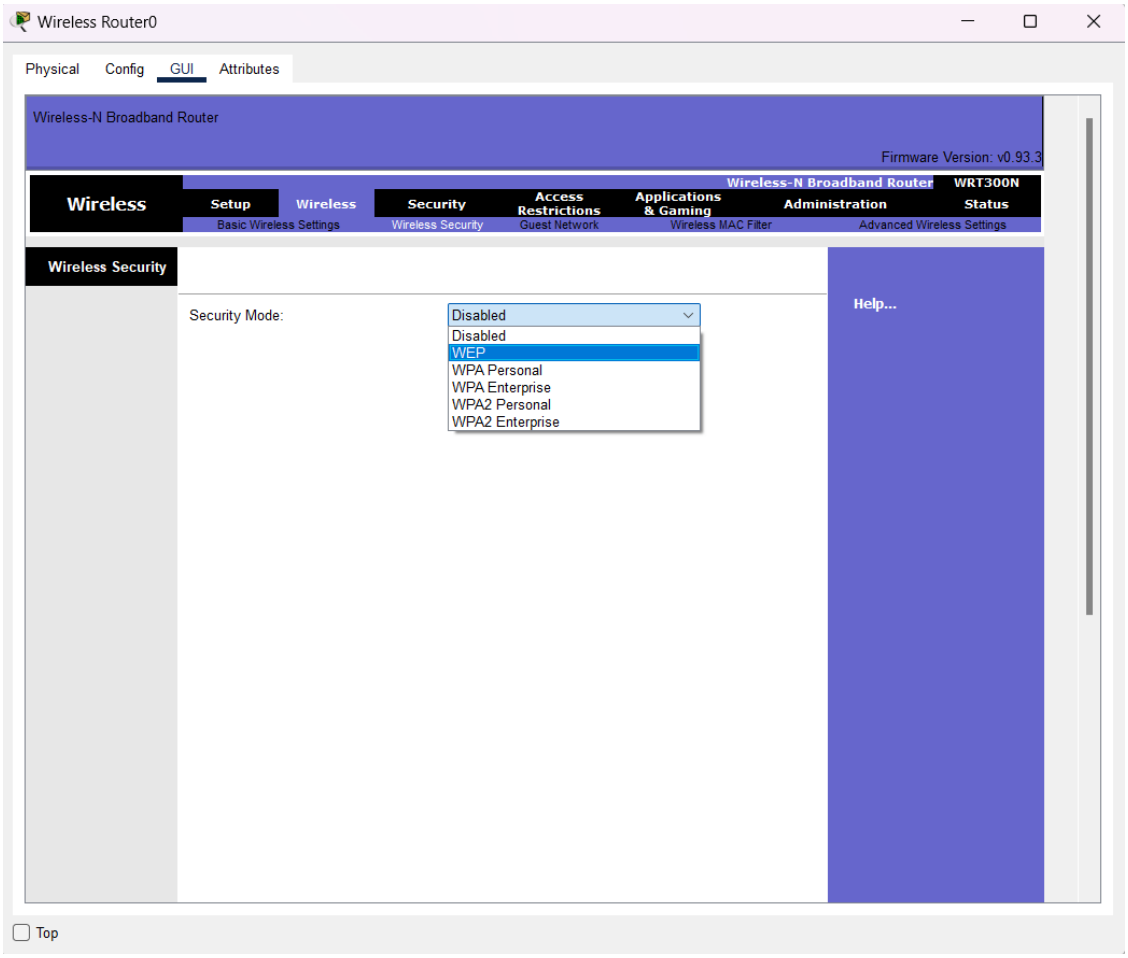
Router have been successfully done in CISCO PACKET TRACER.

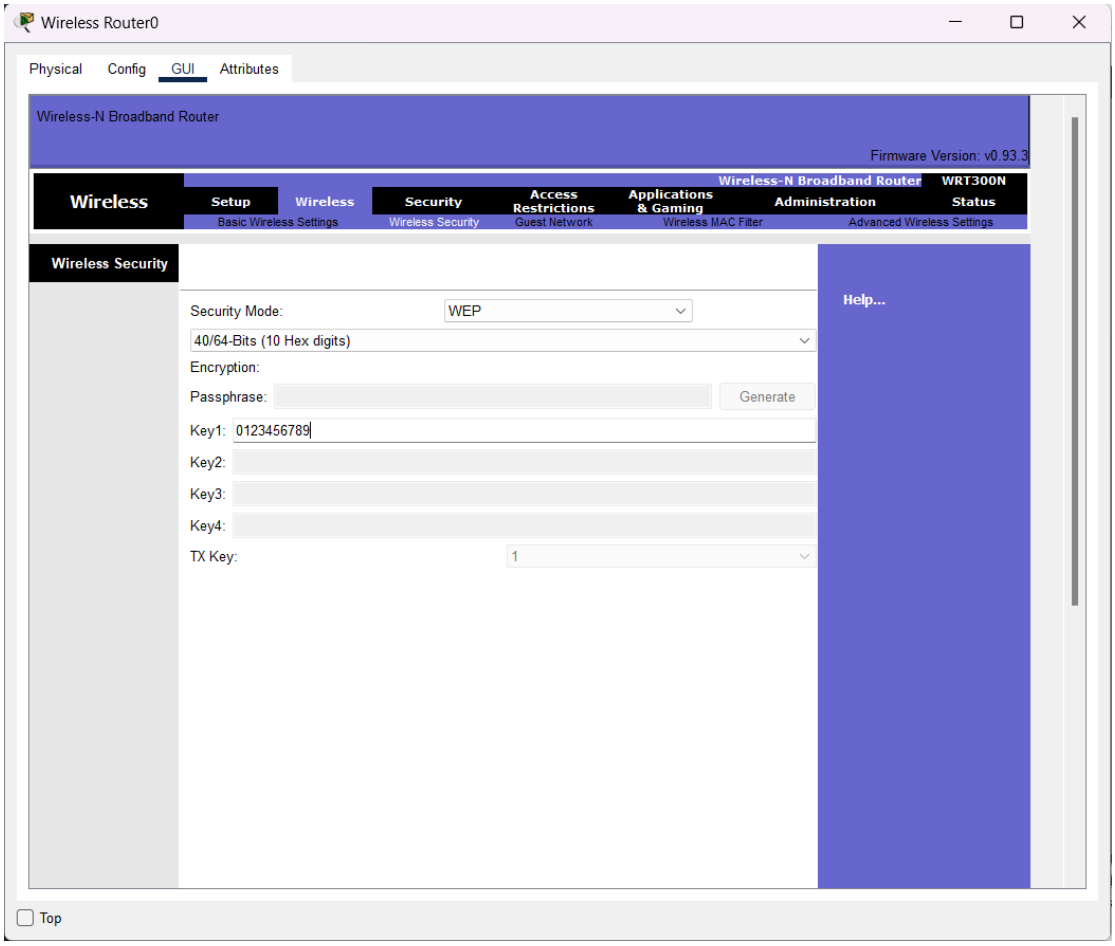
AIM: - b) Design and configure an internetwork using wireless router, DHCP server and internet cloud.

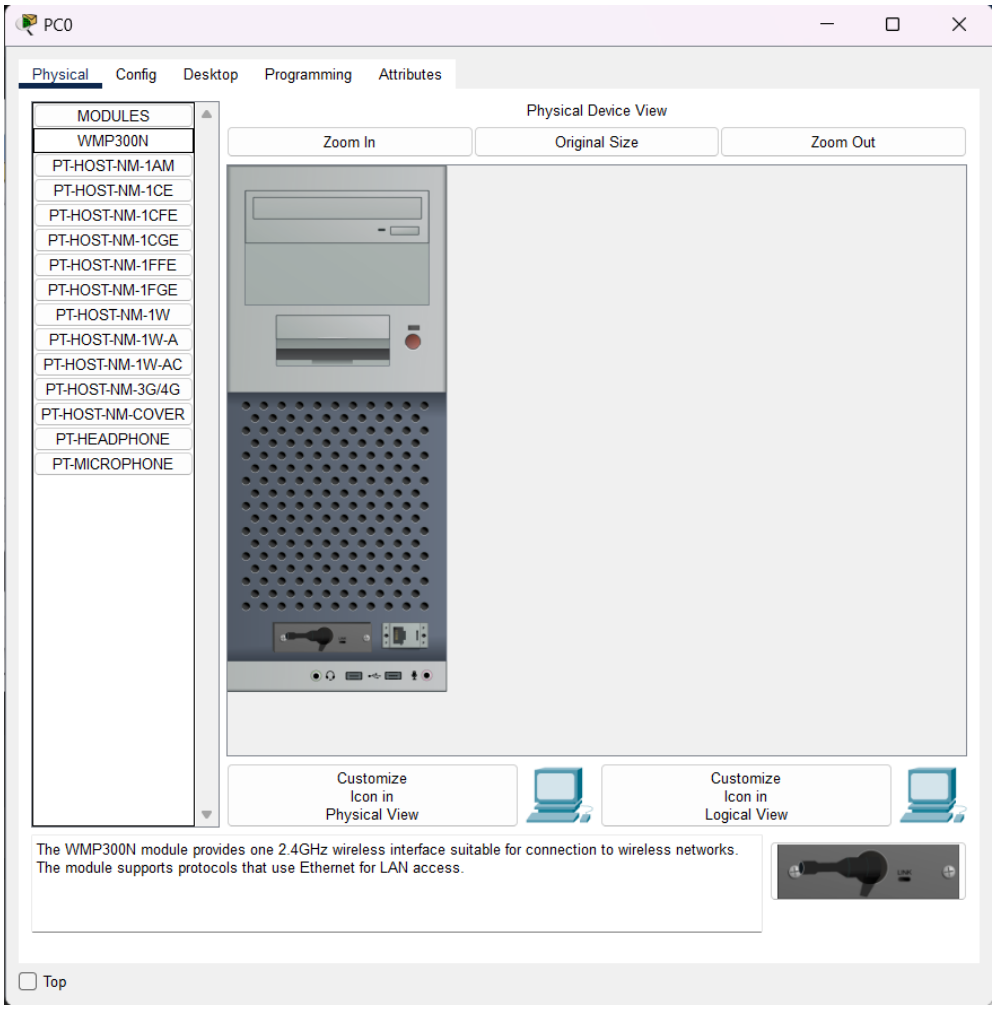
OUTPUT: -

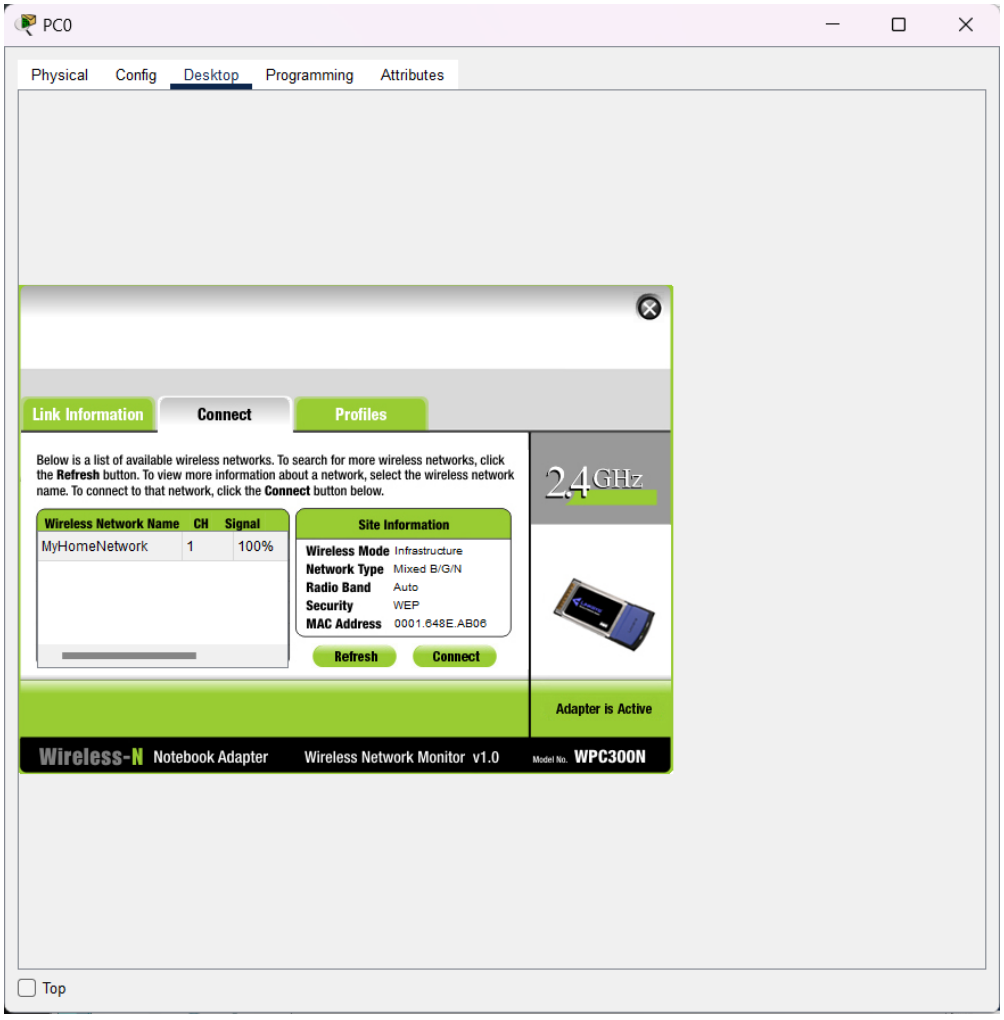


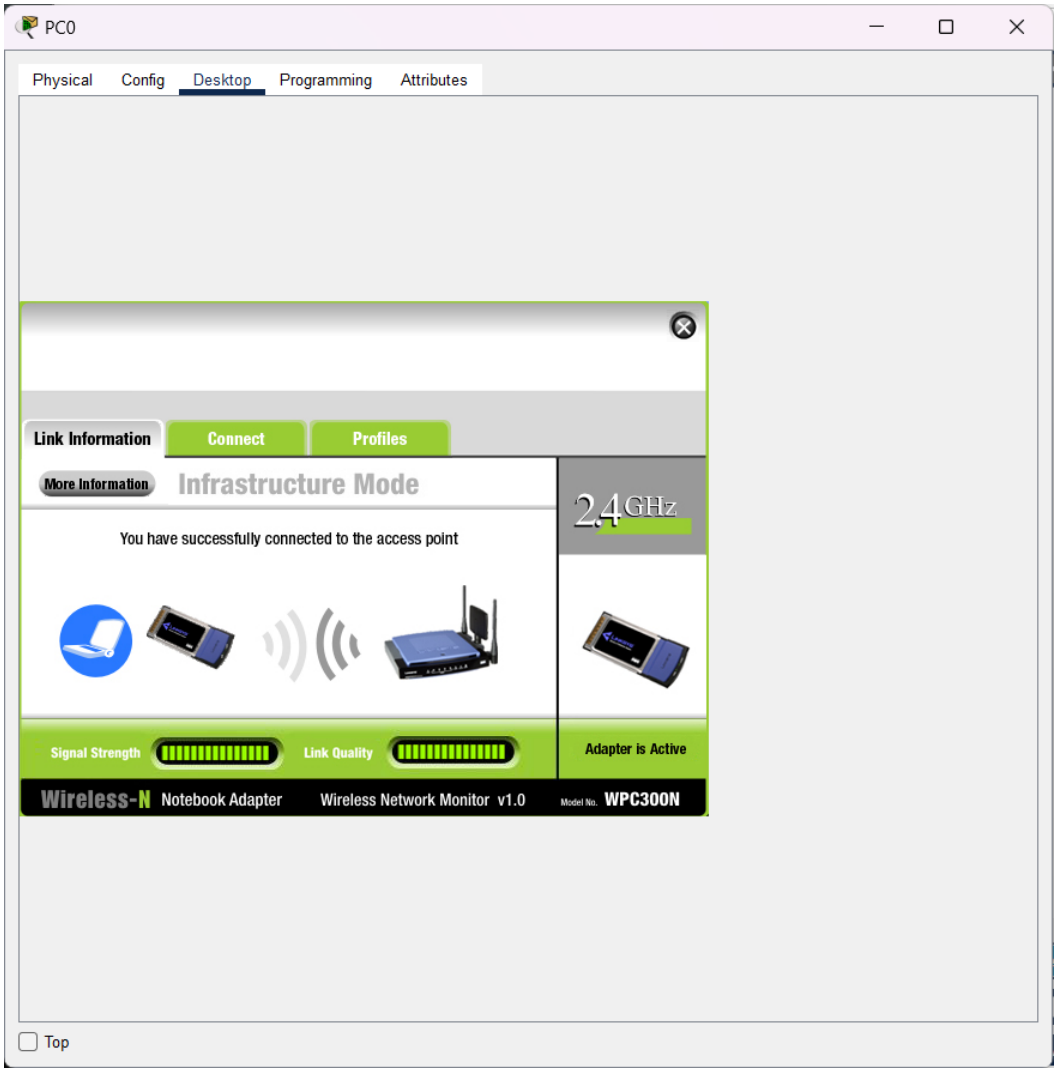

Wireless Router0
Physical
Config
GUI
Attributes
Wireless-N Broadband Router
Firmware Version: v0.93.3
Wireless
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Wireless-N Broadband Router WRT300N
Basic Wireless Settings
Wireless Security
Guest Network
Wireless MAC Filter
Advanced Wireless Settings
Basic Wireless Settings
Help...
Network Mode:
Mixed
Network Name (SSID):
MyHomeNetwork
Radio Band:
Auto
Wide Channel:
Auto
Standard Channel:
1 - 2.412GHz
SSID Broadcast:
Enabled
Disabled
Top

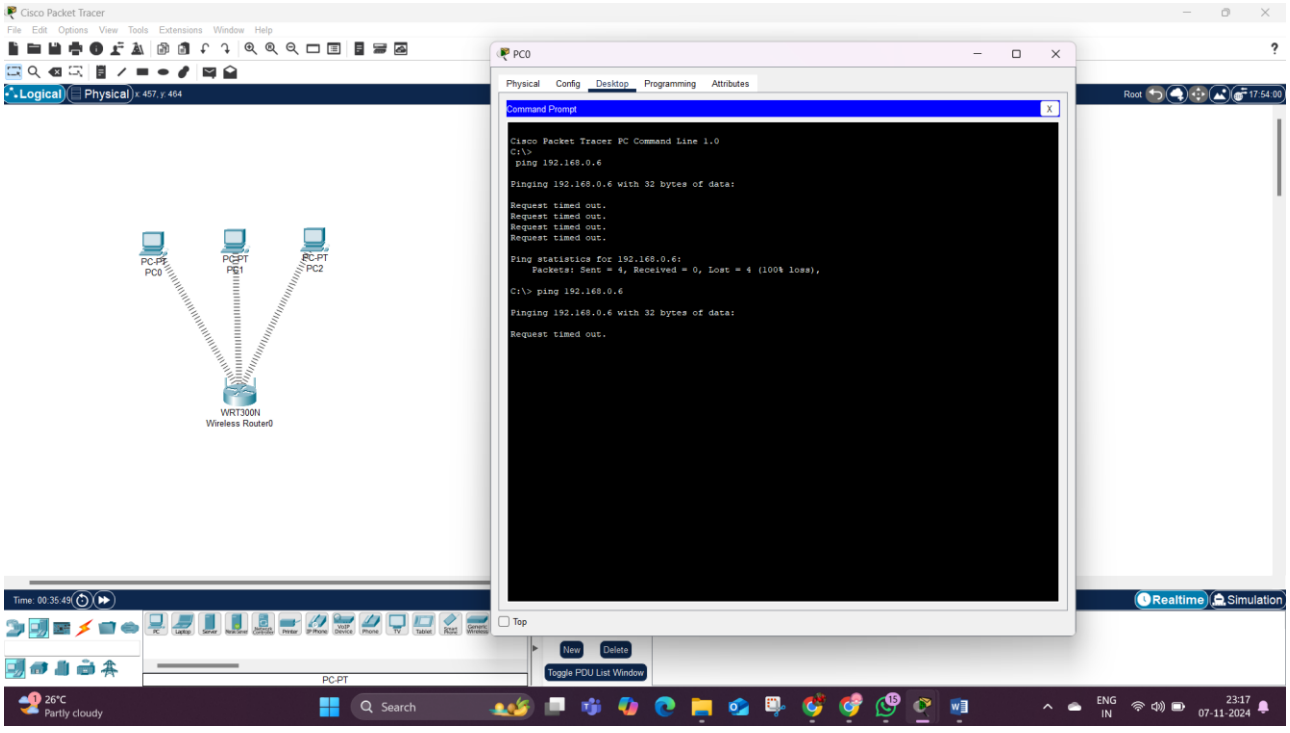

Wireless Router0
Physical
Config
GUI
Attributes
Wireless-N Broadband Router
Firmware Version: v0.93.3
Wireless
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Wireless-N Broadband Router WRT300N
Basic Wireless Settings
Wireless Security
Guest Network
Wireless MAC Filter
Advanced Wireless Settings
Wireless Security
Help...
Security Mode:
Disabled
Disabled
WEP
WPA Personal
WPA Enterprise
WPA2 Personal
WPA2 Enterprise
Top


Wireless Router0
Physical
Config
GUI
Attributes
Wireless-N Broadband Router
Firmware Version: v0.93.3
Wireless-N Broadband Router WRT300N
Wireless
Setup
Wireless
Security
Access Restrictions
Applications & Gaming
Administration
Status
Basic Wireless Settings
Wireless Security
Guest Network
Wireless MAC Filter
Advanced Wireless Settings
Wireless Security
Security Mode:
WEP
40/64-Bits (10 Hex digits)
Encryption:
Passphrase:
Generate
Key1: 0123456789
Key2:
Key3:
Key4:
TX Key:
1
Help...
Top


PC0
Physical
Config
Desktop
Programming
Attributes
MODULES
WMP300N
PT-HOST-NM-1AM
PT-HOST-NM-1CE
PT-HOST-NM-1CFE
PT-HOST-NM-1CGE
PT-HOST-NM-1FFE
PT-HOST-NM-1FGE
PT-HOST-NM-1W
PT-HOST-NM-1W-A
PT-HOST-NM-1W-AC
PT-HOST-NM-3G/4G
PT-HOST-NM-COVER
PT-HEADPHONE
PT-MICROPHONE
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The WMP300N module provides one 2.4GHz wireless interface suitable for connection to wireless networks.
The module supports protocols that use Ethernet for LAN access.
Top


PC0
Physical
Config
Desktop
Programming
Attributes
Link Information
Connect
Profiles
Below is a list of available wireless networks. To search for more wireless networks, click the Refresh button. To view more information about a network, select the wireless network name. To connect to that network, click the Connect button below.
Wireless Network Name
CH
Signal
MyHomeNetwork
1
100%
Site Information
Wireless Mode Infrastructure
Network Type Mixed B/G/N
Radio Band Auto
Security WEP
MAC Address 0001.648E.AB06
Refresh
Connect
2.4GHz
Adapter is Active
Wireless-N Notebook Adapter
Wireless Network Monitor v1.0
Model No. WPC300N
Top





RESULT: -

Wireless Router have been successfully done in CISCO PACKET TRACER.

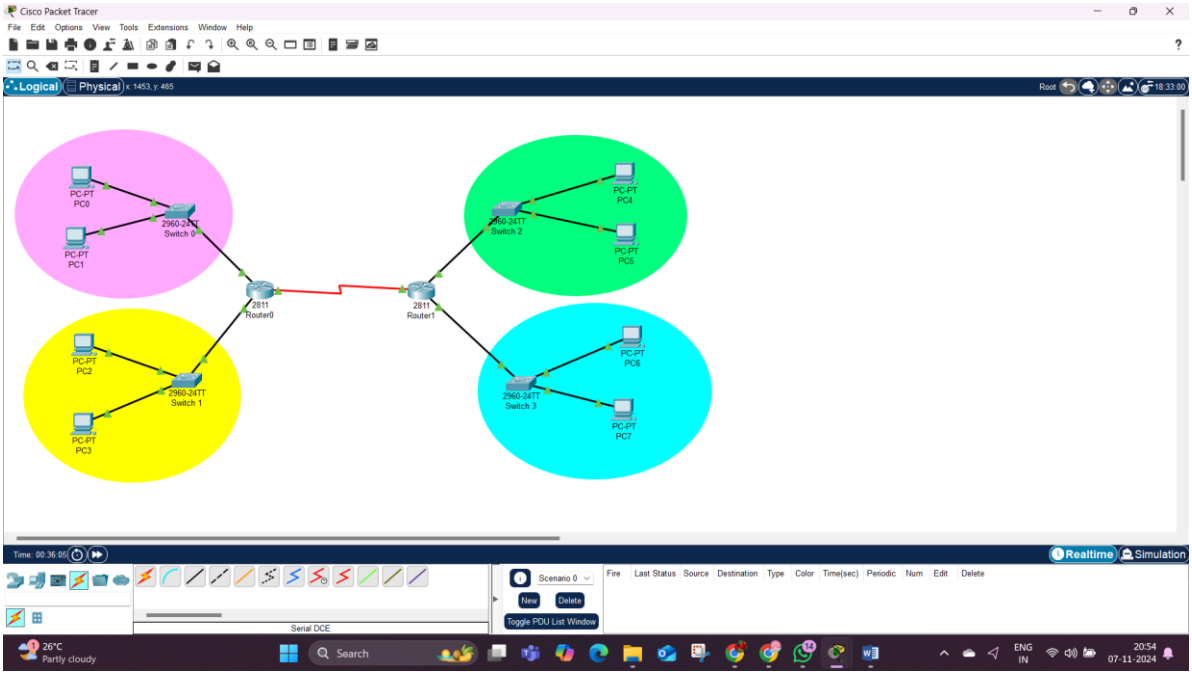
EXPERIMENT – 9

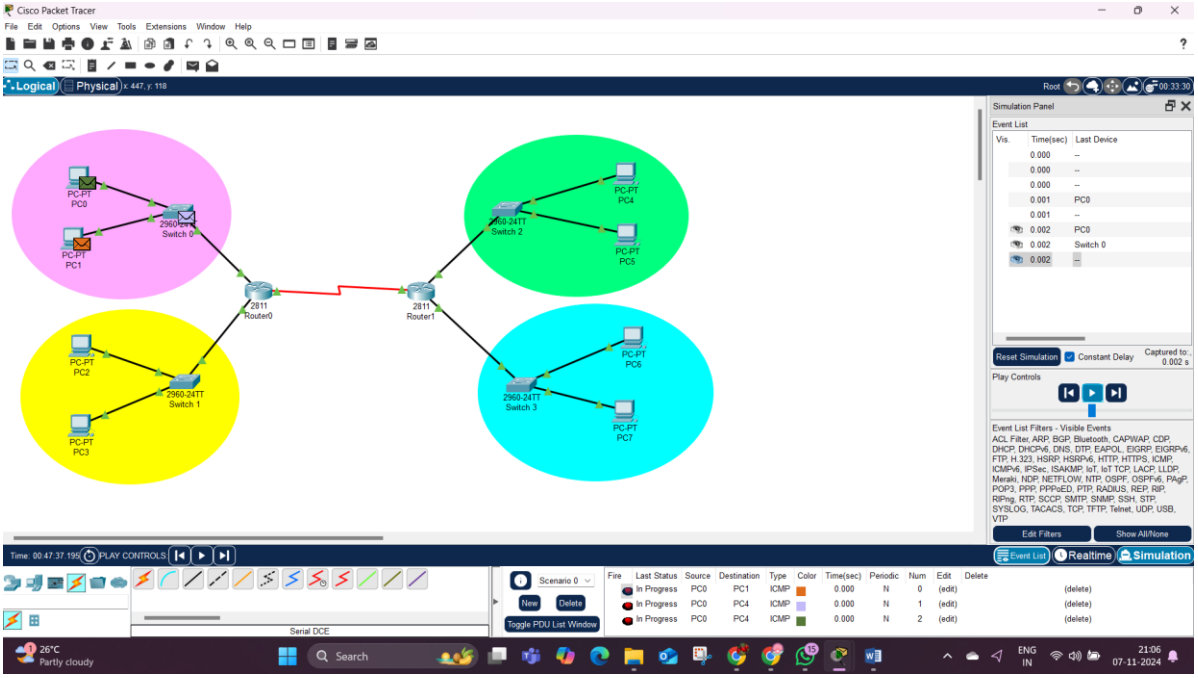
AIM: - Implementation of SUBNETTING in CISCO PACKET TRACER simulator.

What is subnetting?

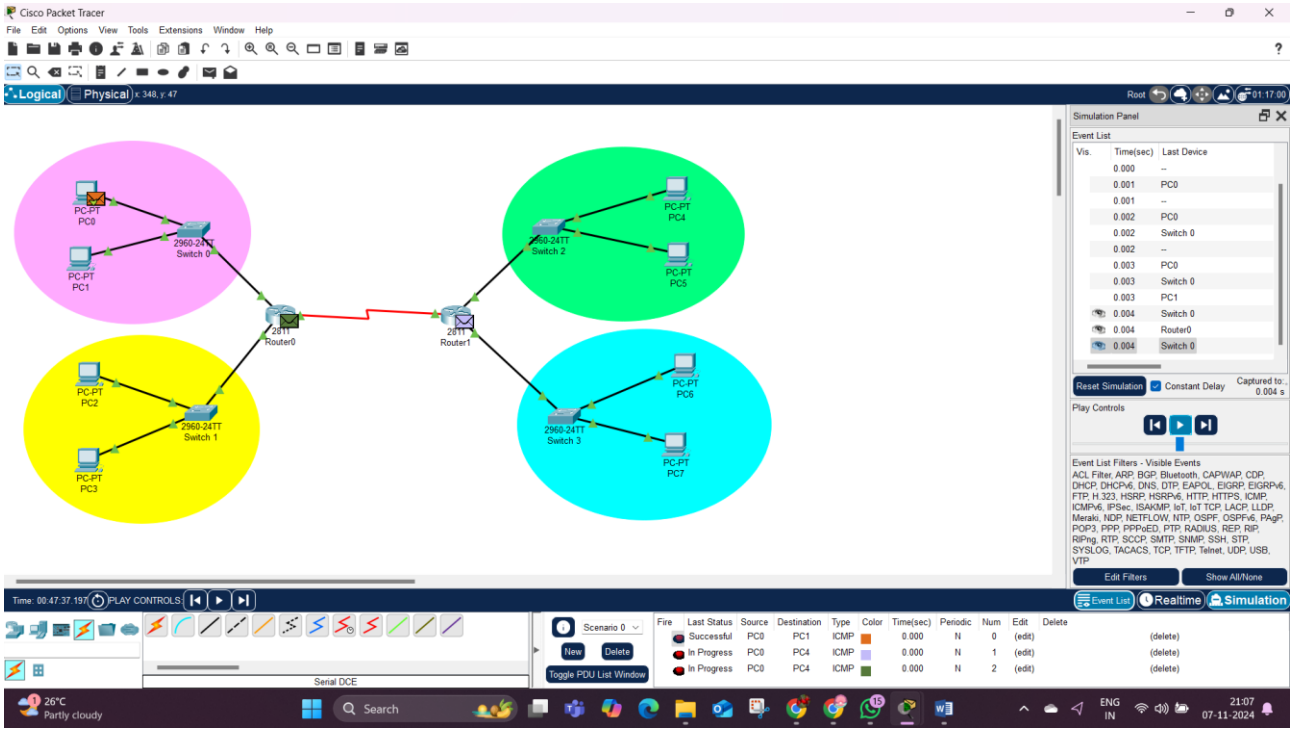
Classless IP subnetting is a technique that allows for more efficient use of IP addresses by allowing for subnet masks that are not just the default masks for each IP class. This means that we can divide our IP address space into smaller subnets, which can be useful when we have a limited number of IP addresses but need to create multiple networks.

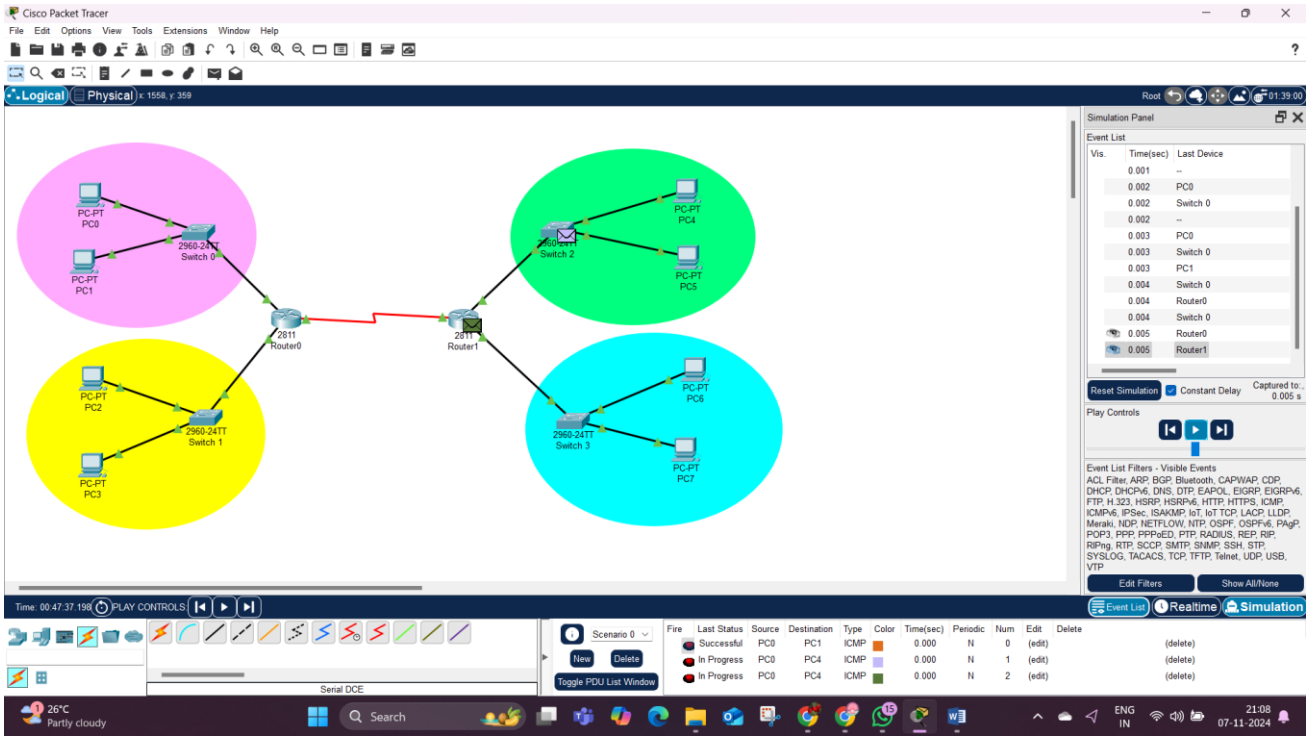
OUTPUT: -

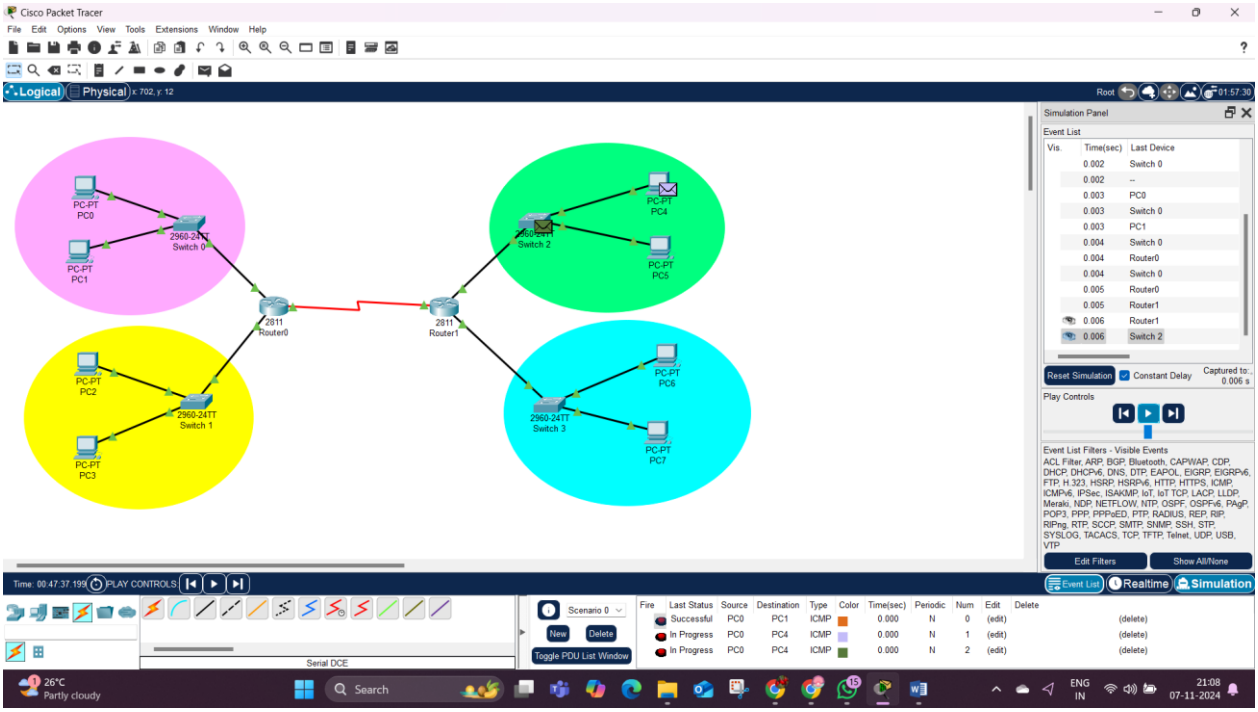


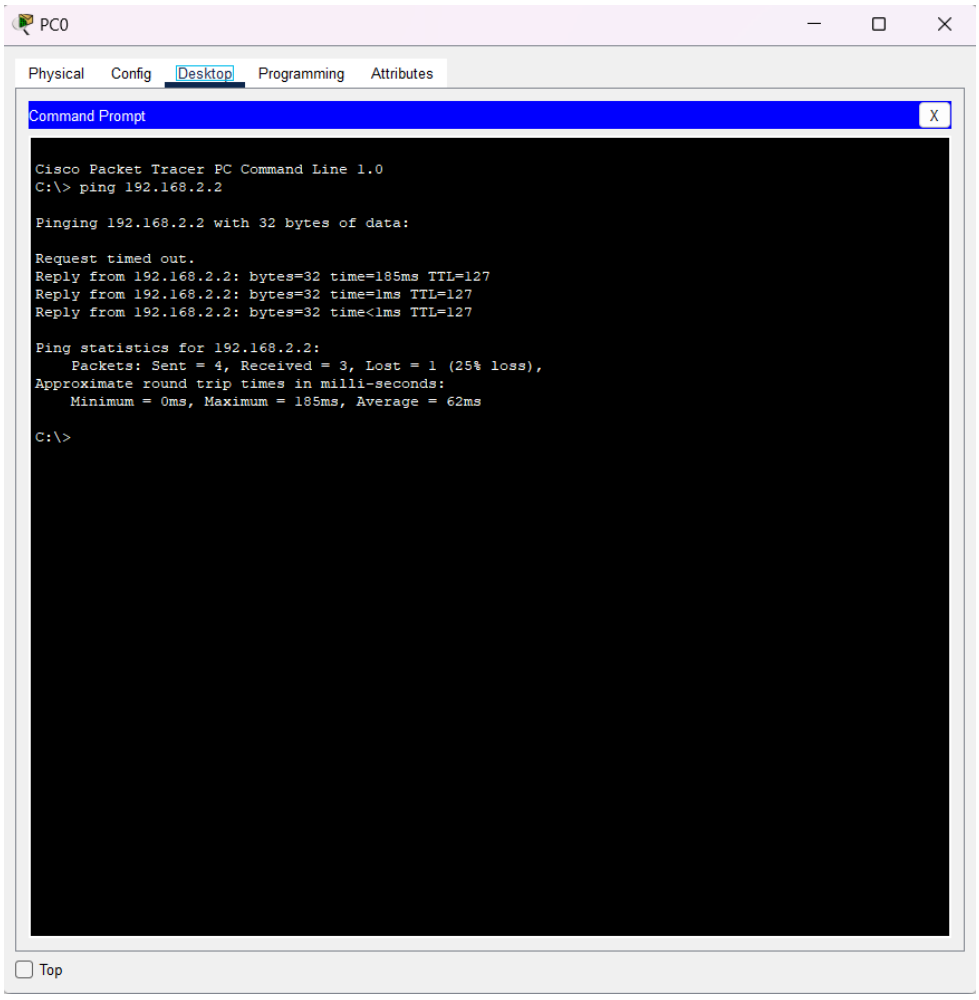


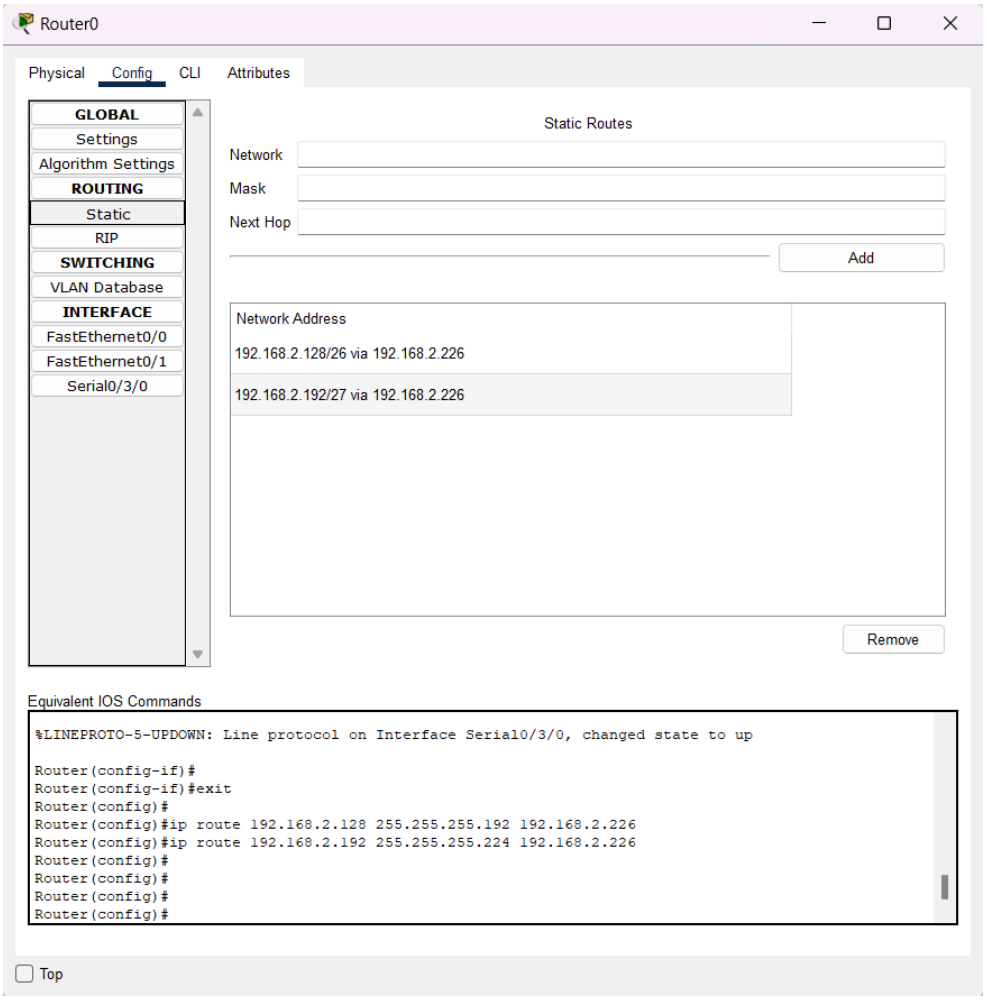
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	ICMP		0.000	N	0	(edit)	(delete)
	Failed	PC0	PC4	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC0	PC4	ICMP		0.000	N	2	(edit)	(delete)

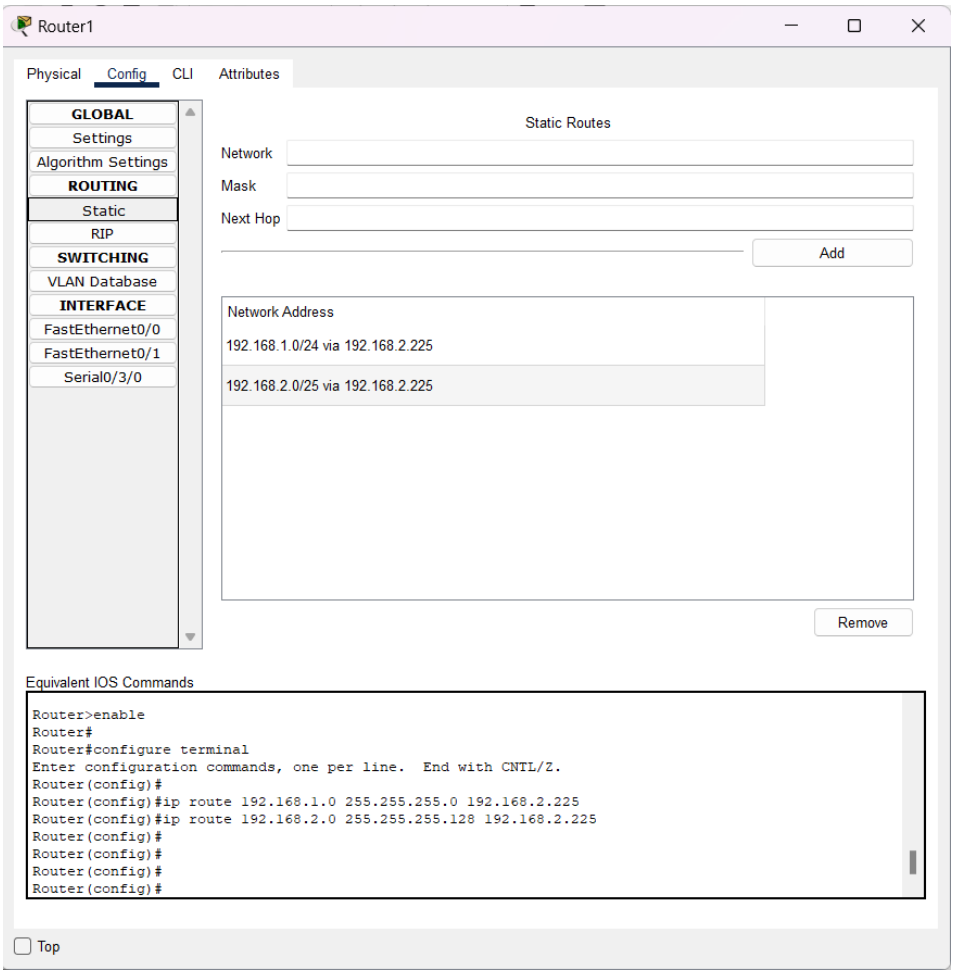


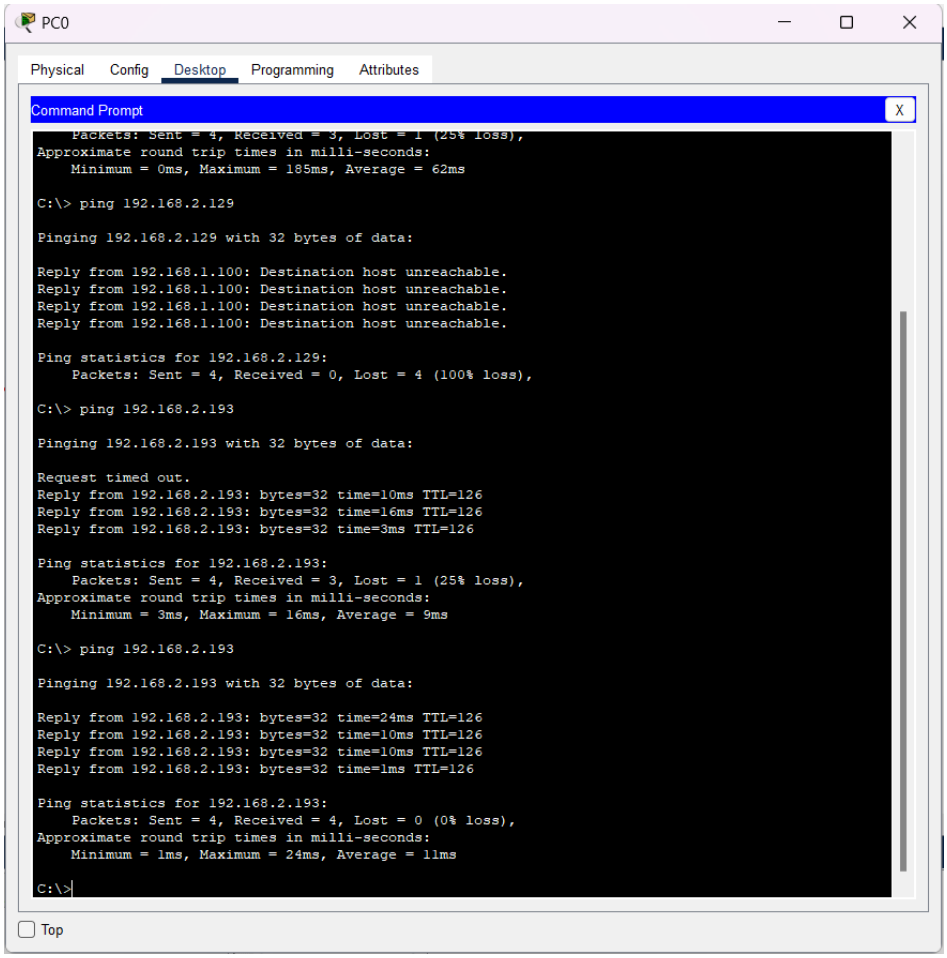



Cisco Packet Tracer
File Edit Options View Tools Extensions Window Help
Logical Physical
PC-PT PC0
PC-PT PC1
2960-24TT Switch 0
2811 Router0
2811 Router1
2960-24TT Switch 2
PC-PT PC4
PC-PT PC5
PC-PT PC2
2960-24TT Switch 1
PC-PT PC3
2960-24TT Switch 3
PC-PT PC6
PC-PT PC7
Simulation Panel
Event List
Reset Simulation
Constant Delay
Play Controls
Edit Filters
Show All/None
Event List
Realtime
Simulation
Serial DCE
Toggle PDU List Window
Search
ENG IN
21:08
07-11-2024


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Cisco Packet Tracer PC Command Line 1.0
C:\> ping 192.168.2.2
Pinging 192.168.2.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.2: bytes=32 time=185ms TTL=127
Reply from 192.168.2.2: bytes=32 time=1ms TTL=127
Reply from 192.168.2.2: bytes=32 time<1ms TTL=127
Ping statistics for 192.168.2.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 185ms, Average = 62ms
C:\>
Top


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/3/0
Static Routes
Network
Mask
Next Hop
Add
Network Address
192.168.2.128/26 via 192.168.2.226
192.168.2.192/27 via 192.168.2.226
Remove
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/3/0, changed state to up
Router(config-if)#
Router(config-if)#exit
Router(config)#
Router(config)#ip route 192.168.2.128 255.255.255.192 192.168.2.226
Router(config)#ip route 192.168.2.192 255.255.255.224 192.168.2.226
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Top


Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/3/0
Static Routes
Network
Mask
Next Hop
Add
Network Address
192.168.1.0/24 via 192.168.2.225
192.168.2.0/25 via 192.168.2.225
Remove
Equivalent IOS Commands
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#ip route 192.168.1.0 255.255.255.0 192.168.2.225
Router(config)#ip route 192.168.2.0 255.255.255.128 192.168.2.225
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Top



RESULT: -

Implementation of SUBNETTING in CISCO PACKET TRACER simulator have been done successfully

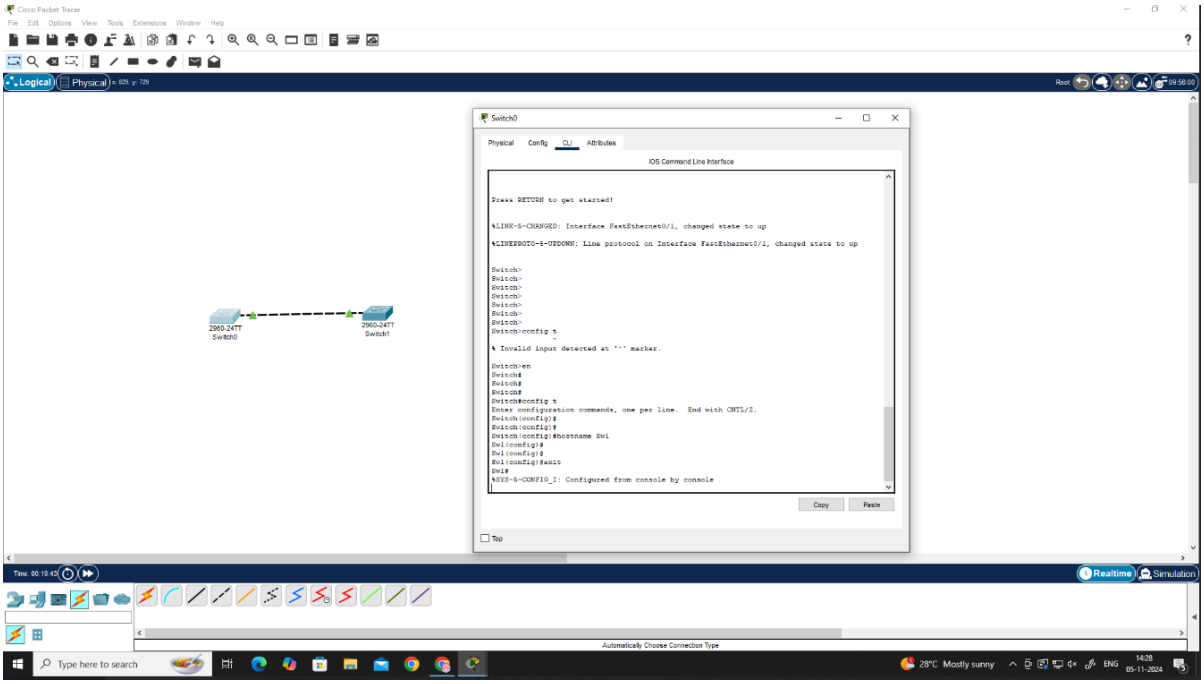
EXPERIMENT – 8

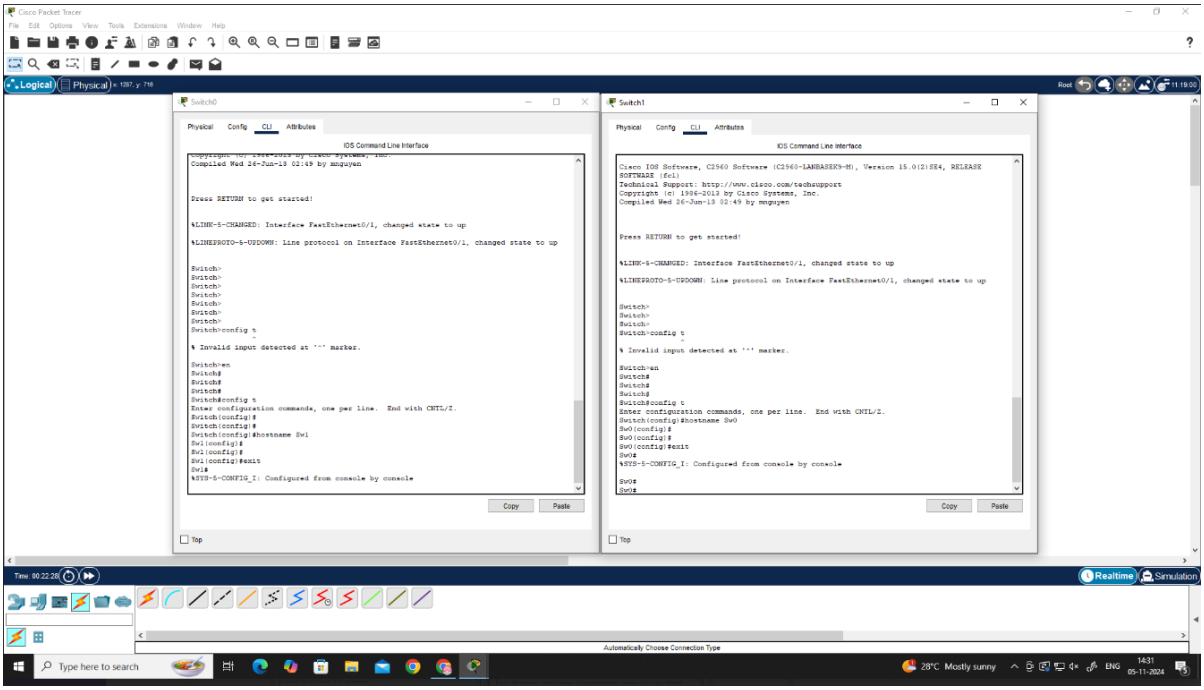
AIM: - a) Simulate Virtual LAN configuration using CISCO Packet Tracer Simulation.

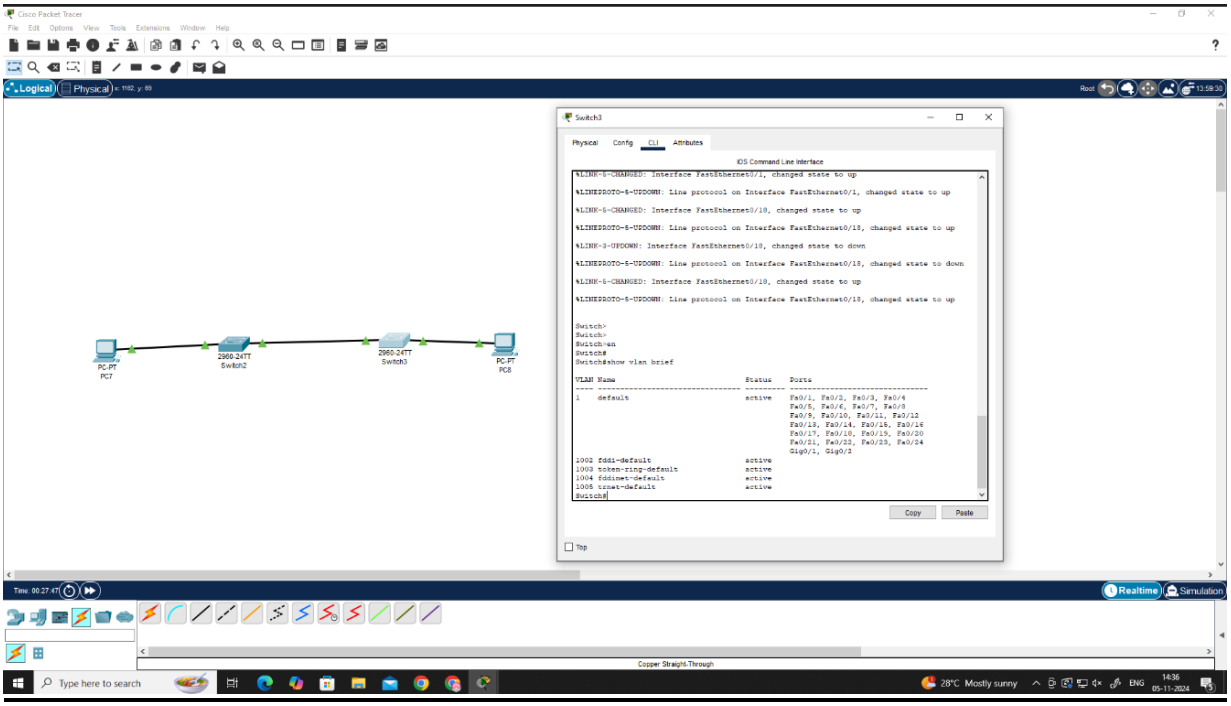
Steps:

Step 1: Build the network as shown in the topology.
Step 2: Configure basic settings for each switch.
Step 3: Configure PC hosts.
Step 4: Test connectivity.

OUTPUT: -







RESULT: -

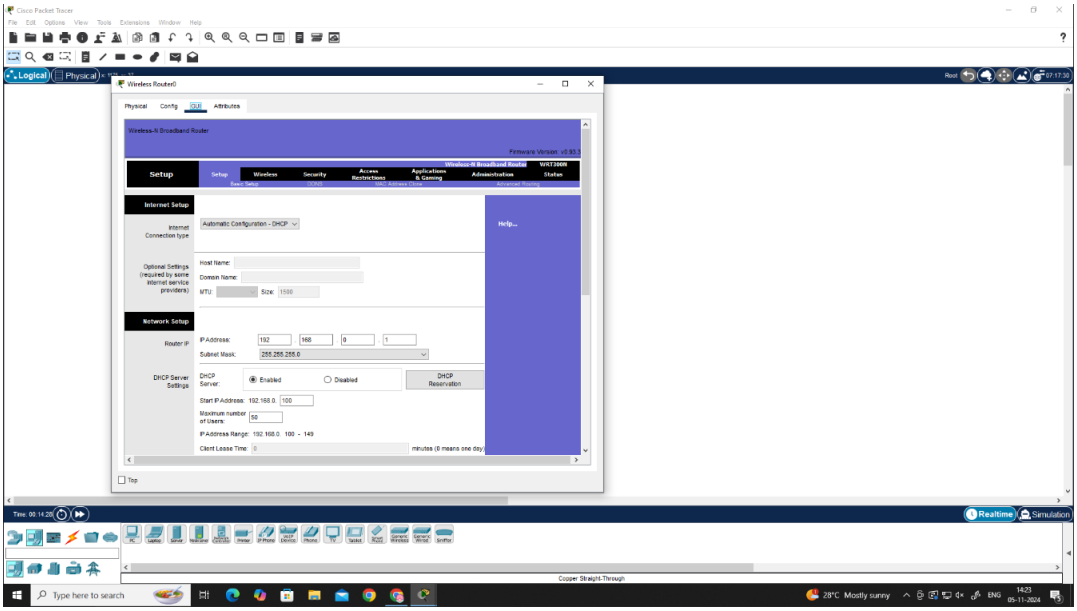
Simulation of virtual LAN configuration have been done successfully.

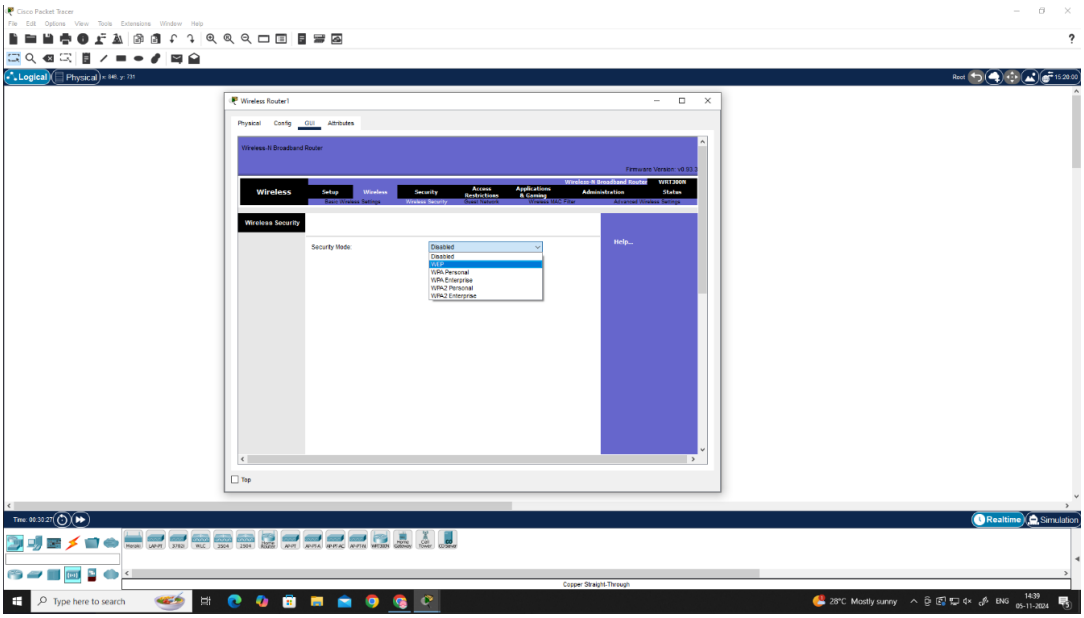
AIM: - b) Configuration of Wireless LAN using CISCO Packet Tracer.

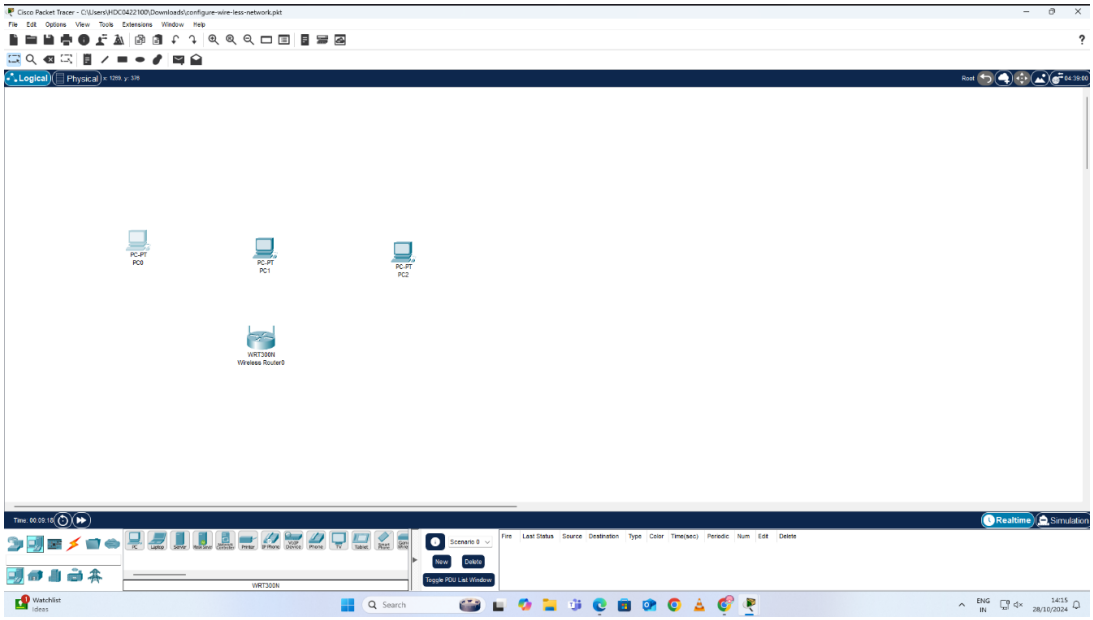
Steps:

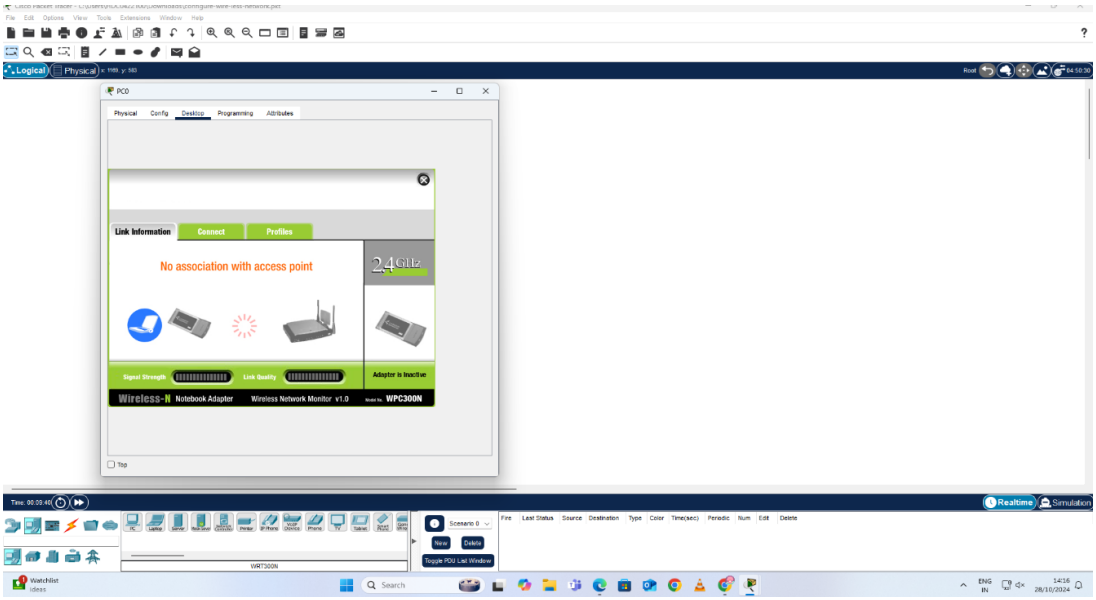
- Configure Static IP on PC and Wireless Router
- Set SSID to MotherNetwork
- Set IP address of router to 192.168.0.1, PC0 to 192.168.0.2, PC1 to 192.168.0.3 and PC2 to 192.168.0.4.
- Secure your network by configuring WAP key on Router
- Connect PC by using WAP key

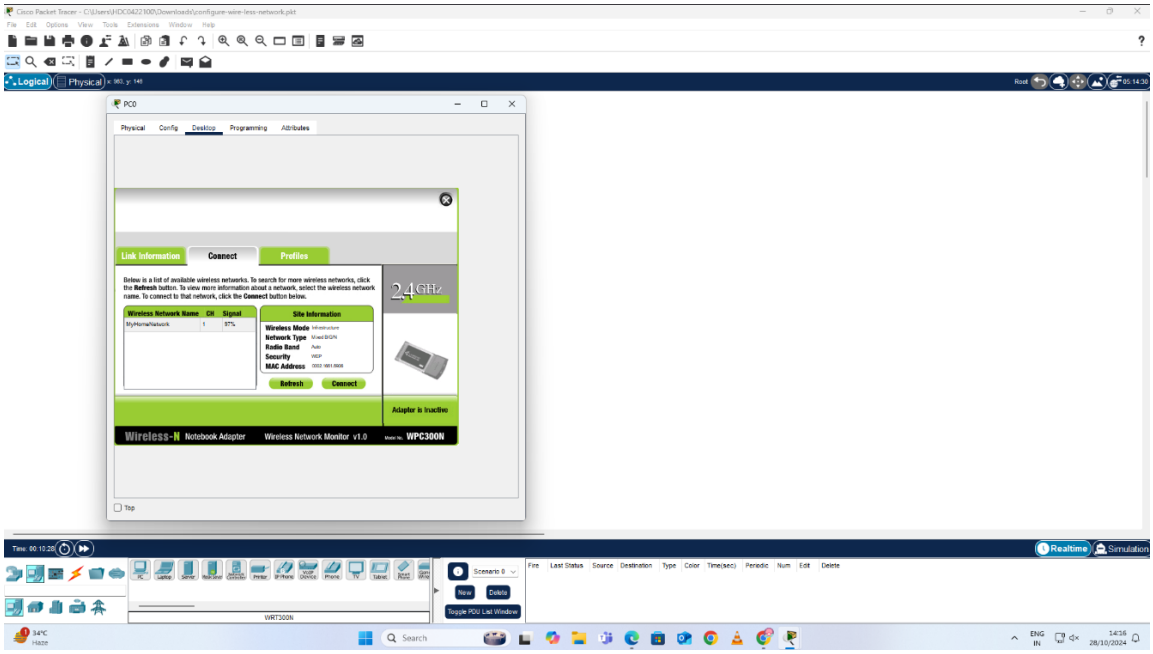
OUTPUT: -

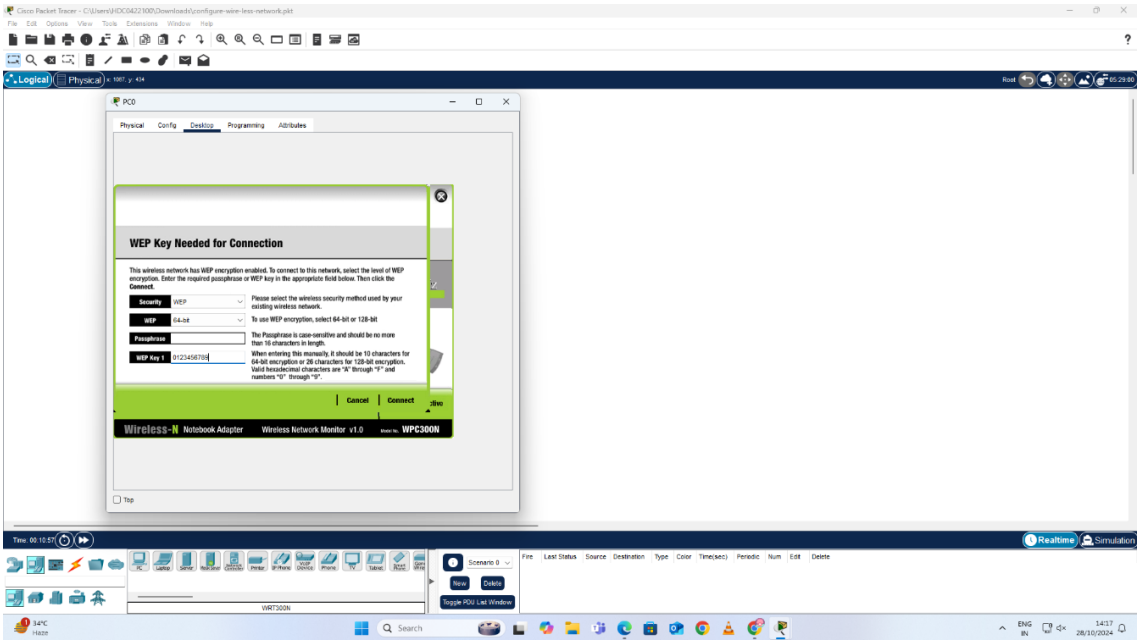


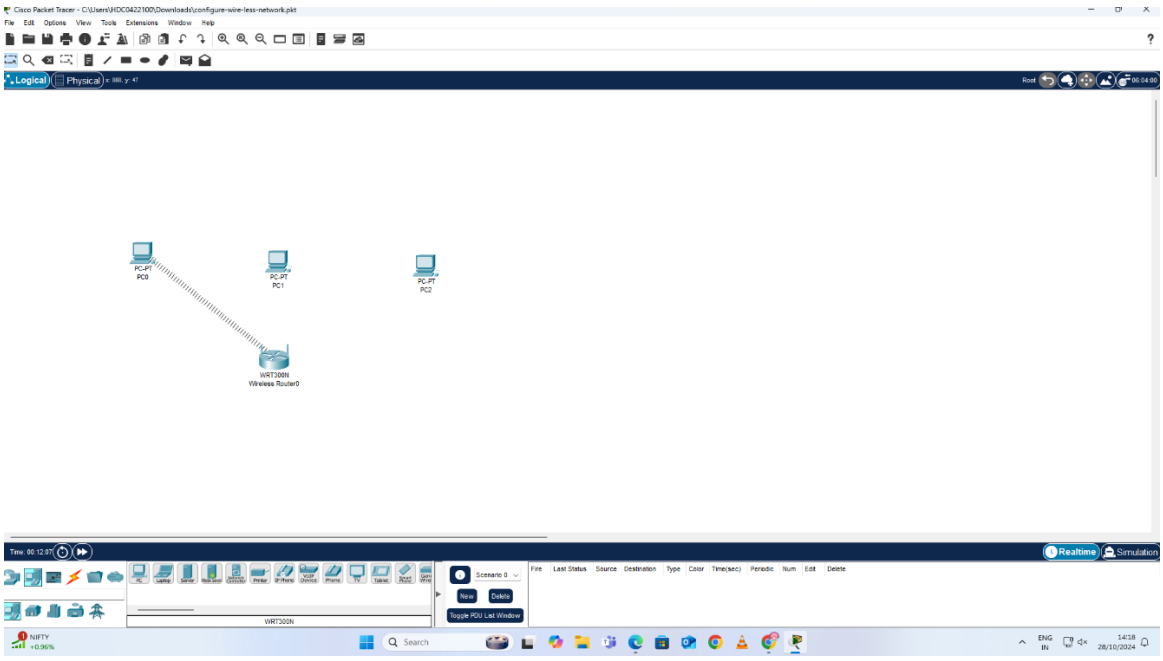


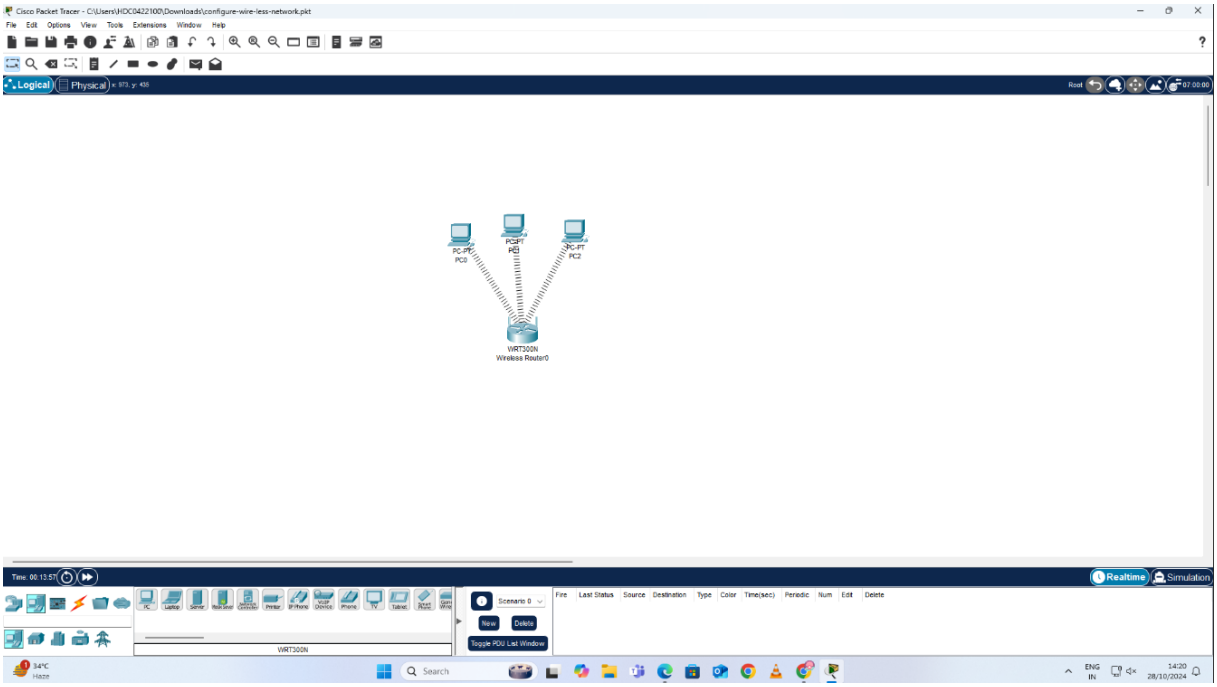

PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
WRT300N
Wireless Router0


PC0
Physical
Config
Desktop
Programming
Attributes
Link Information
Connect
Profiles
No association with access point
2.4GHz
Signal Strength
Link Quality
Adapter is Inactive
Wireless-N Notebook Adapter
Wireless Network Monitor v1.0
WPC300N
Top


PC0
Physical
Config
Desktop
Programming
Attributes
Link Information
Connect
Profiles
Below is a list of available wireless networks. To search for more wireless networks, click the Refresh button. To view more information about a network, select the wireless network name. To connect to that network, click the Connect button below.
Wireless Network Name
CH
Signal
MyHomeNetwork
1
97%
Site Information
Wireless Mode
Network Type
Radio Band
Security
MAC Address
Refresh
Connect
2.4GHz
Adapter is Inactive
Wireless-N Notebook Adapter
Wireless Network Monitor v1.0
WPC300N
Top


PC0
Physical
Config
Desktop
Programming
Attributes
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
Please select the wireless security method used by your existing wireless network.
WEP
64-bit
To use WEP encryption, select 64-bit or 128-bit.
Passphrase
The Passphrase is case-sensitive and should be no more than 16 characters in length.
WEP Key 1
0123456789
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
Wireless-N Notebook Adapter
Wireless Network Monitor v1.0
WPC300N
Top
Logical
Physical
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
WRT300N


PC-PT
PC0
PC-PT
PC1
PC-PT
PC2
WRT300N
Wireless Router0
Logical
Physical
Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
WRT300N



RESULT: -

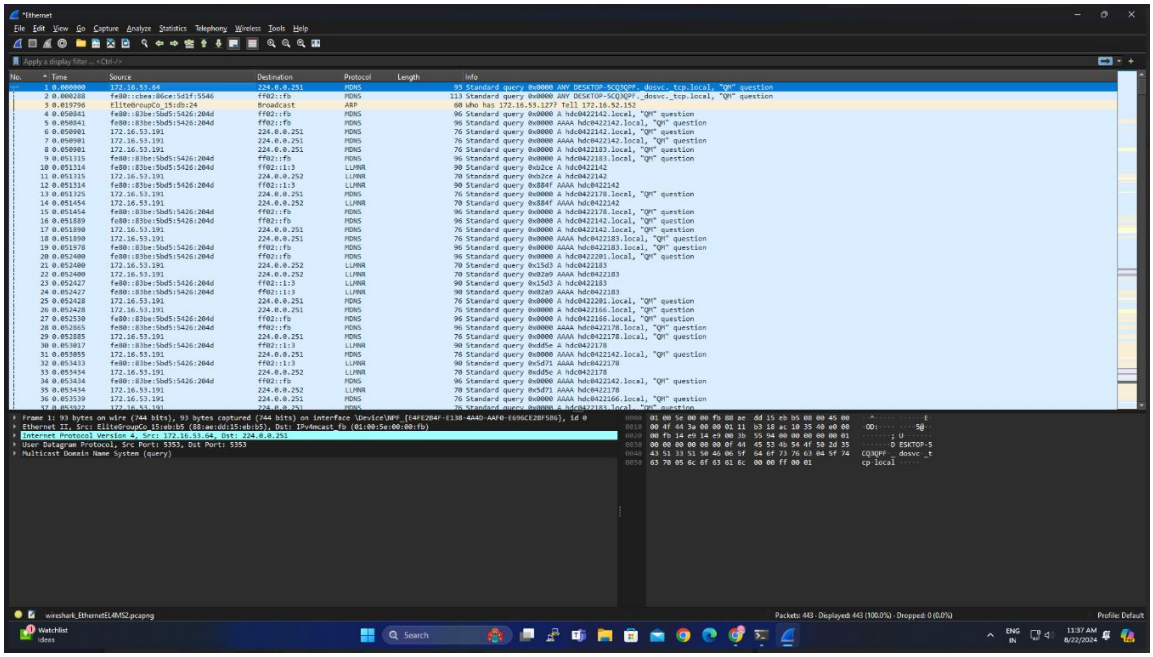
Configuration of Wireless LAN using CISCO Packet Tracer have been done successfully and verified.

EXPERIMENT – 5

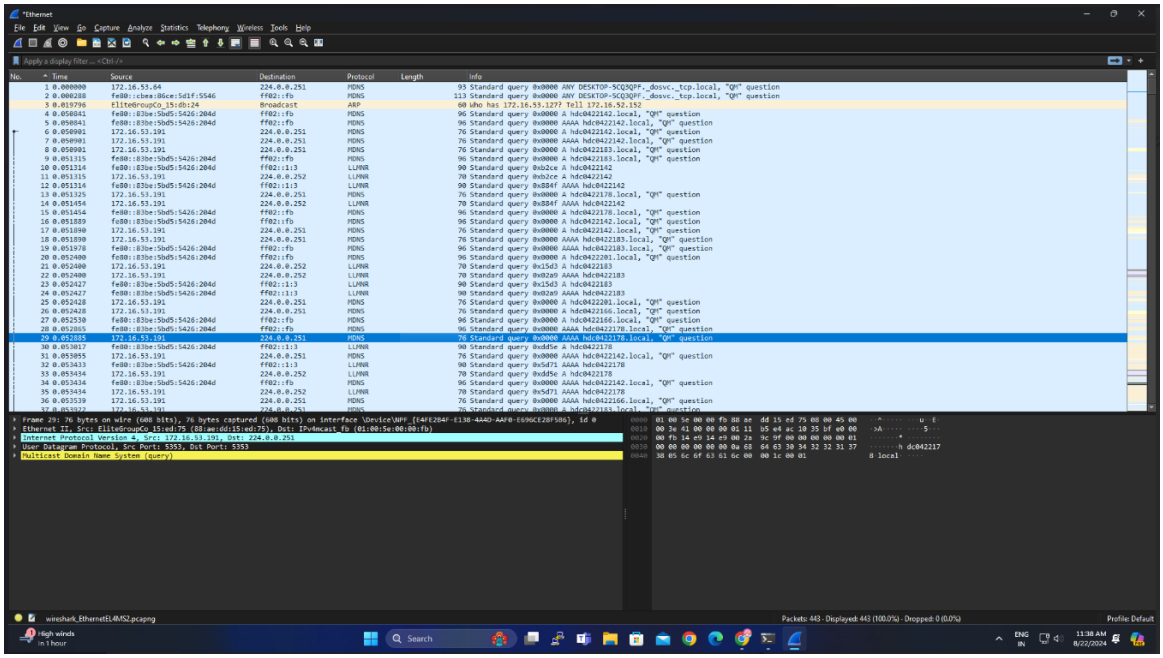
AIM: - Experiments on Packet capture tool: Wireshark

CAPTURING AND ANALYSING PACKETS USING WIRESHARK TOOL:

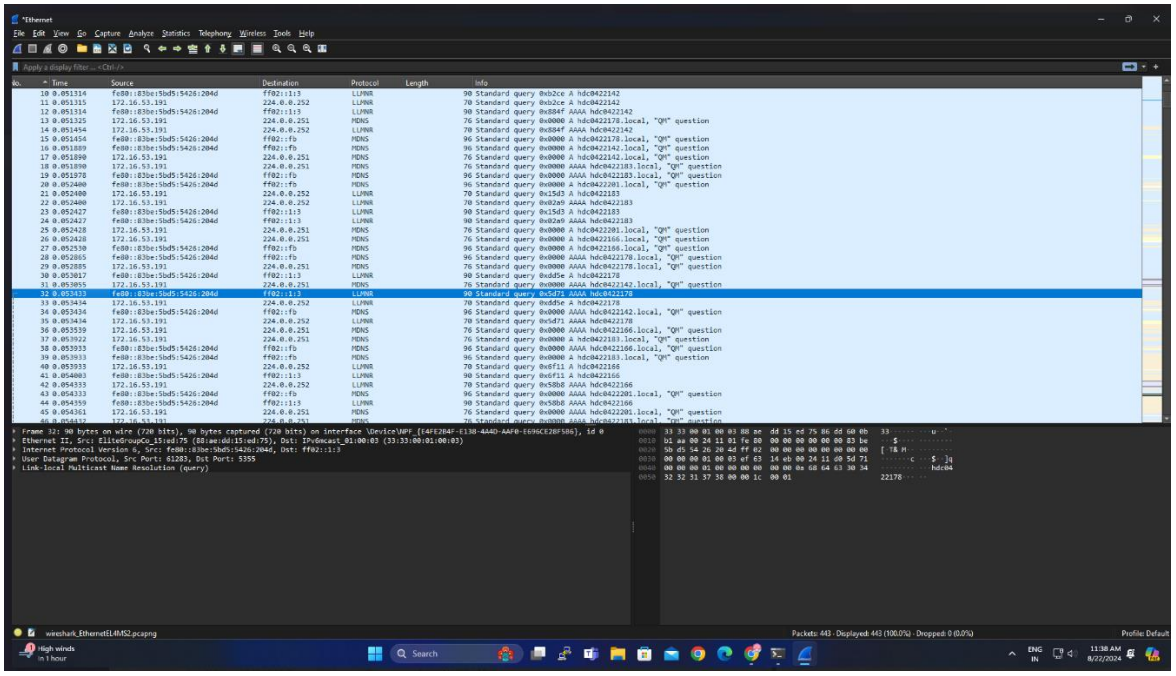
Packet 1:



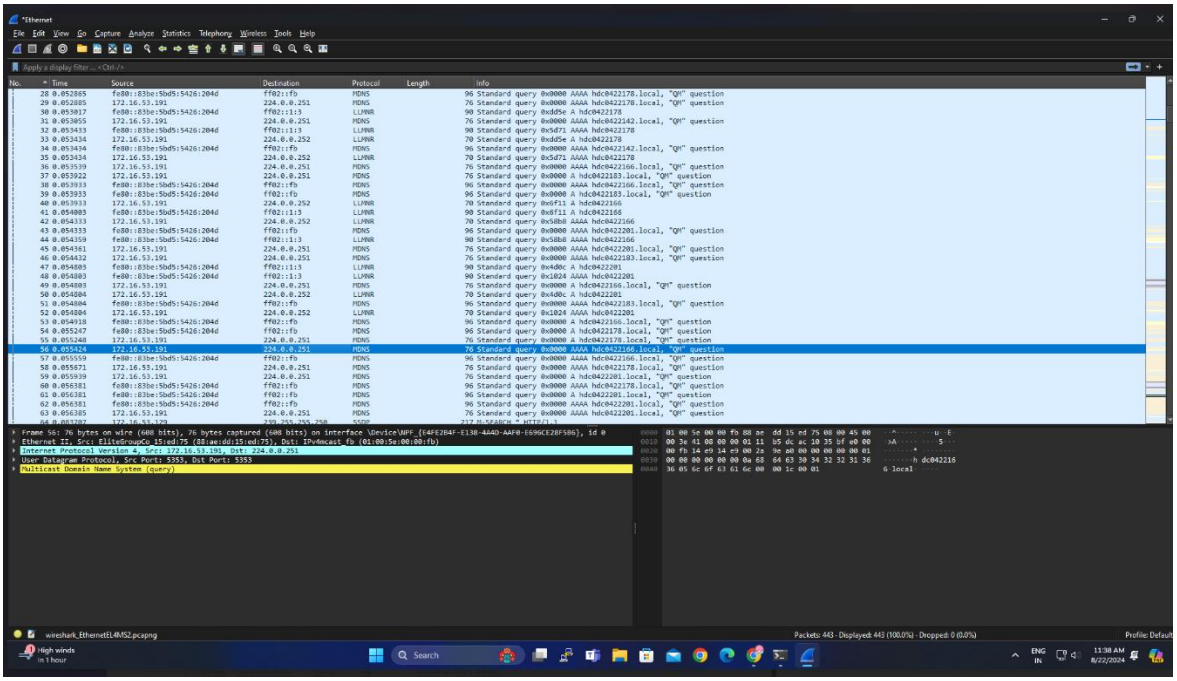
Packet 2:



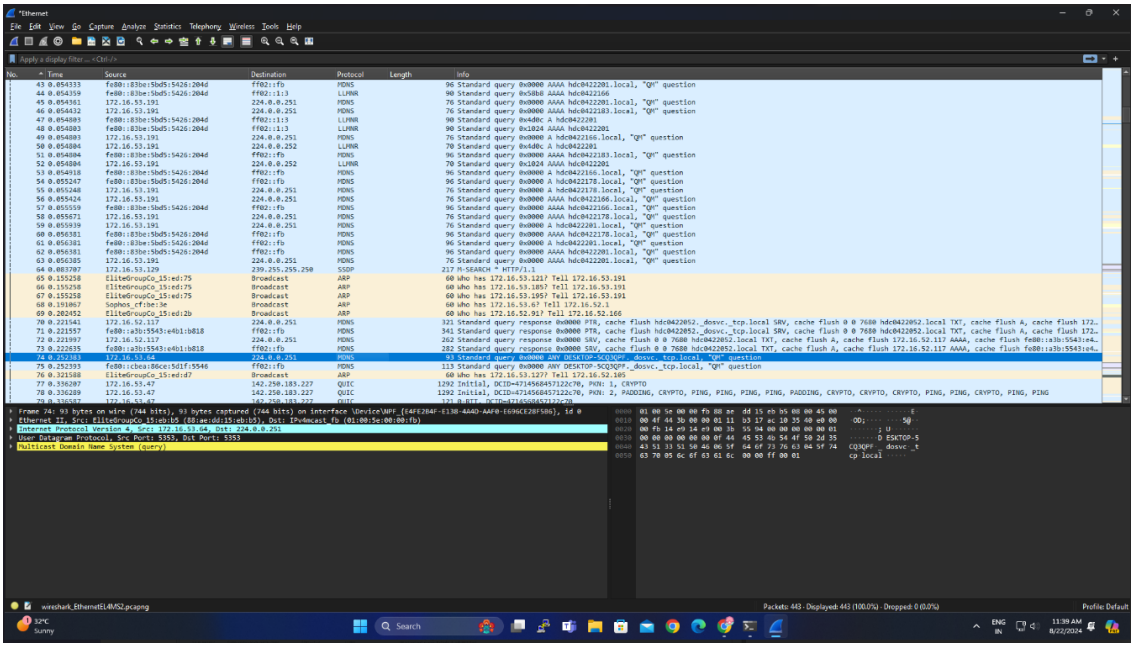
Packet 3:



Packet 4:



Packet 5:



RESULT: -

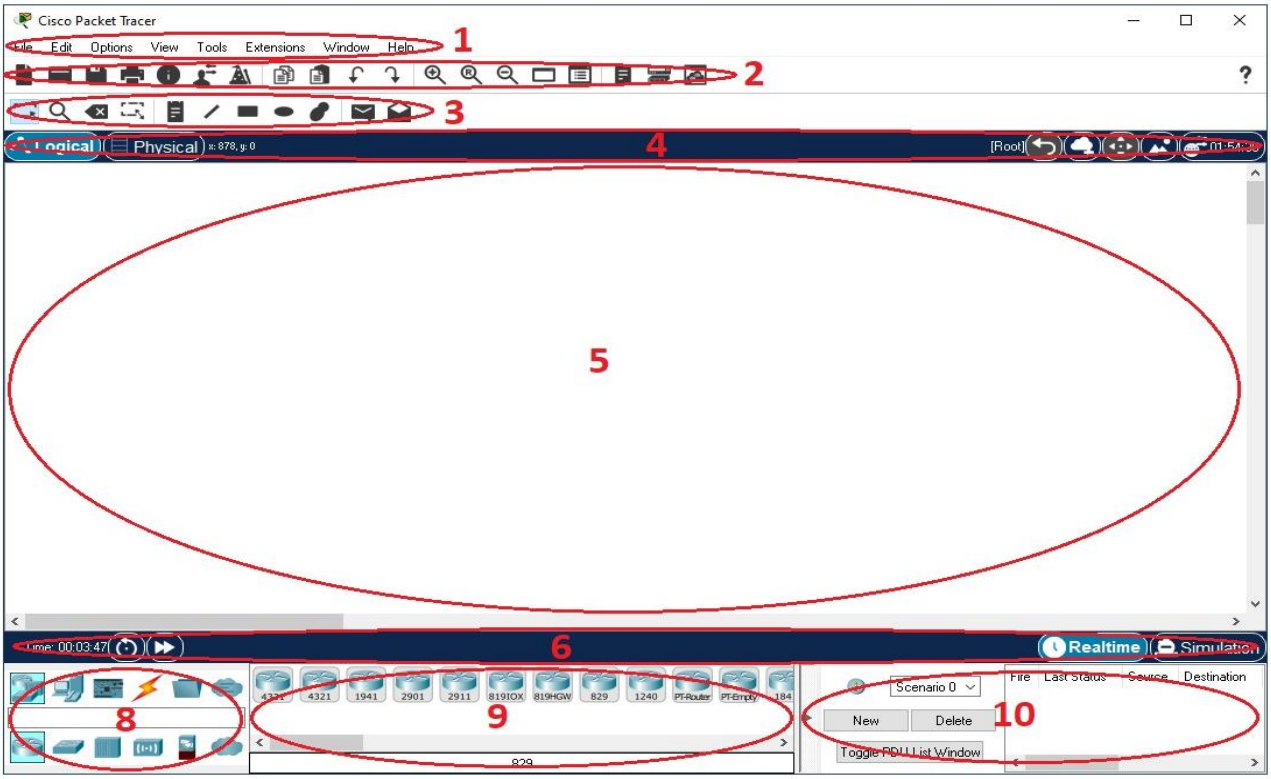
Capturing and analysing the packets have been done successfully using Wireshark.

EXPERIMENT – 3

AIM: - To study the Packet tracer tool Installation and User Interface Overview

To understand environment of CISCO PACKET TRACER to design simple network.

USER INTERFACE OVERVIEW:



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

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. 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.

4. Logical/Physical workspace tabs – These tabs allow you to toggle between the Logical and Physical work areas.

5. Workspace – This is the area where topologies are created and simulations are displayed.

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:

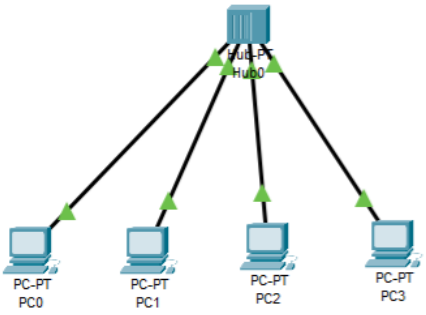
8. **Device-type selection box** – This area contains device categories

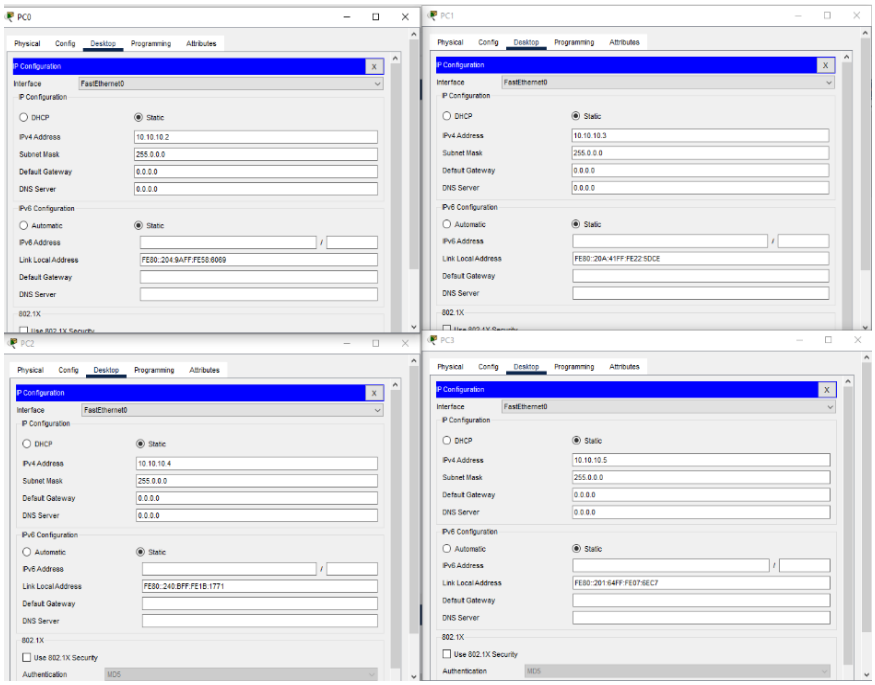
9. **Device-specific selection box** – When a device category is selected, this selection box displays the different device models within that category

10. User-created packet box – Users can create highly-customized packets to test them topology from this area, and the results are displayed as a list.

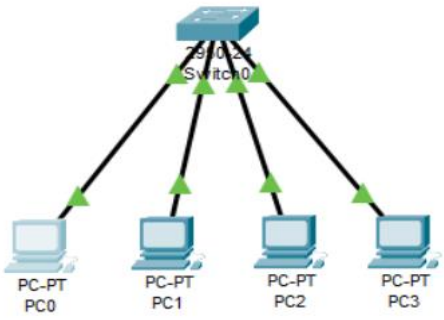
Analyse the behaviour of network devices using CISCO PACKET TRACER simulator.

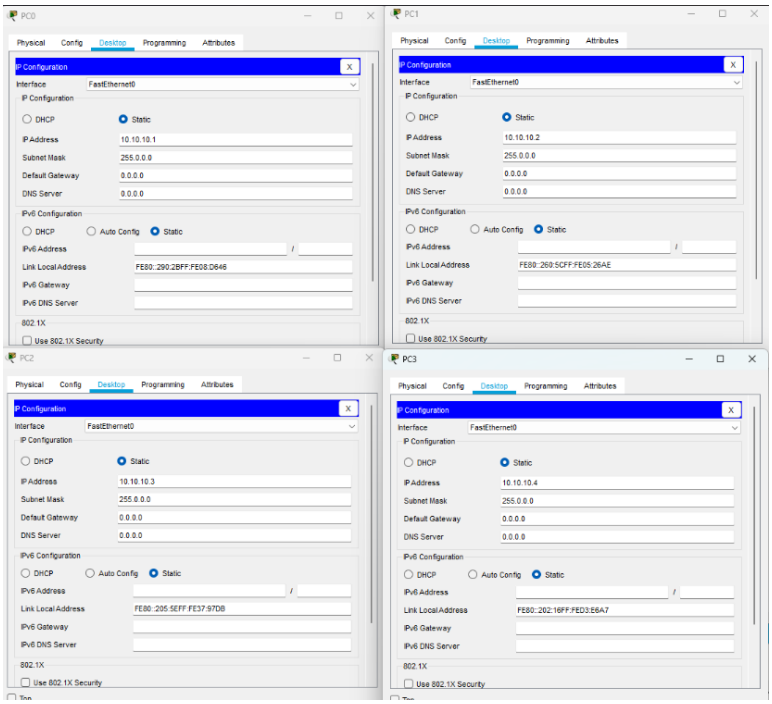
a. 4 Generic PCs and One HUB:





b. 4 Generic PCs and One Switch:



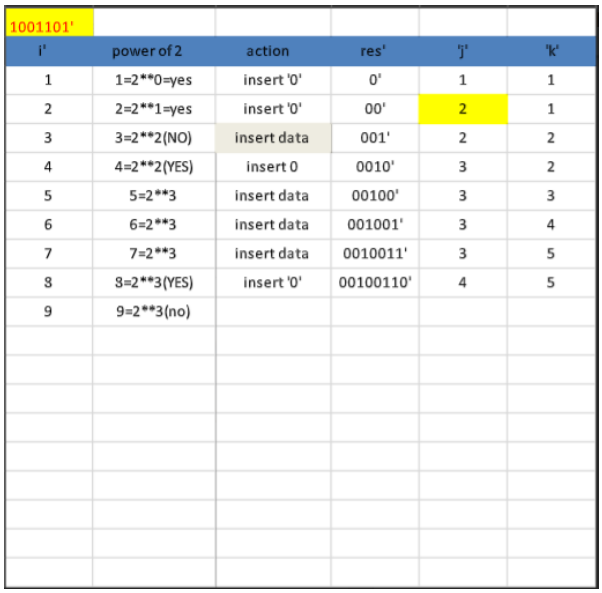


<u>RESULT:</u> -

Cisco packet have been installed successfully and the interface is studied.

EXPERIMENT – 6

AIM: - Write a program to implement error detection and correction using HAMMING code concept. Make a test run to input data stream and verify error correction feature.



1001101'					
i'	power of 2	action	res'	'j'	'k'
1	1=2**0=yes	insert '0'	0'	1	1
2	2=2**1=yes	insert '0'	00'	2	1
3	3=2**2(NO)	insert data	001'	2	2
4	4=2**2(YES)	insert 0	0010'	3	2
5	5=2**3	insert data	00100'	3	3
6	6=2**3	insert data	001001'	3	4
7	7=2**3	insert data	0010011'	3	5
8	8=2**3(YES)	insert '0'	00100110'	4	5
9	9=2**3(no)				

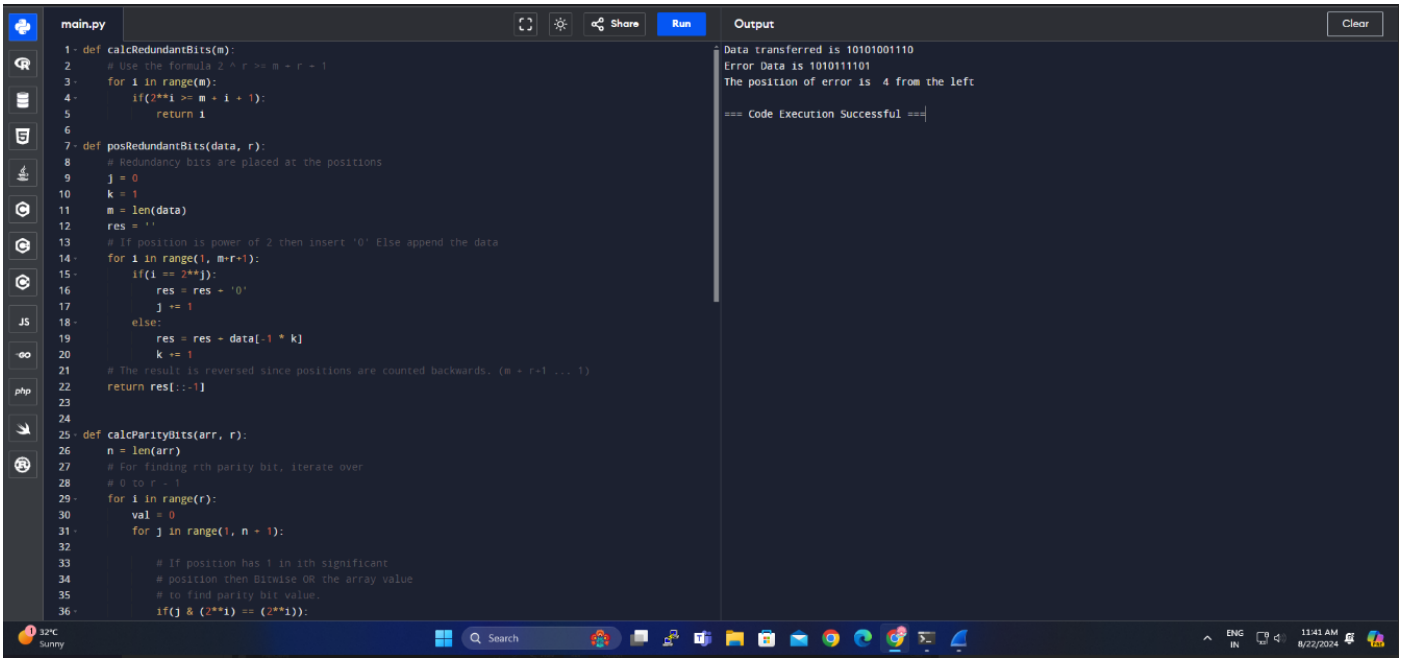
CODE: -

```
def calcRedundantBits(m):
    # Use the formula 2 ^ r >= m + r + 1
    for i in range(m):
        if(2**i >= m + i + 1):
            return i

def posRedundantBits(data, r):
    # Redundancy bits are placed at the positions
    j = 0
    k = 1
    m = len(data)
    res = ''
    # If position is power of 2 then insert '0' Else append the data
    for i in range(1, m+r+1):
        if(i == 2**j):
            res = res + '0'
            j += 1
        else:
            res = res + data[-1 * k]
            k += 1
    # The result is reversed since positions are counted backwards. (m + r+1
... 1)
    return res[::-1]


def calcParityBits(arr, r):
    n = len(arr)
    # For finding rth parity bit, iterate over
```

```
    # 0 to r - 1
    for i in range(r):
        val = 0
        for j in range(1, n + 1):

            # If position has 1 in ith significant
            # position then Bitwise OR the array value
            # to find parity bit value.
            if(j & (2**i) == (2**i)):
                val = val ^ int(arr[-1 * j])
                # -1 * j is given since array is reversed

        # String Concatenation
        # (0 to n - 2^r) + parity bit + (n - 2^r + 1 to n)
        arr = arr[:n-(2**i)] + str(val) + arr[n-(2**i)+1:]
    return arr

def detectError(arr, nr):
    n = len(arr)
    res = 0

    # Calculate parity bits again
    for i in range(nr):
        val = 0
        for j in range(1, n + 1):
            if(j & (2**i) == (2**i)):
                val = val ^ int(arr[-1 * j])

        # Create a binary no by appending
        # parity bits together.

        res = res + val*(10**i)

    # Convert binary to decimal
    return int(str(res), 2)


# Enter the data to be transmitted
data = '1011001'

# Calculate the no of Redundant Bits Required
m = len(data)
r = calcRedundantBits(m)

# Determine the positions of Redundant Bits
arr = posRedundantBits(data, r)

# Determine the parity bits
arr = calcParityBits(arr, r)
```

```
# Data to be transferred
print("Data transferred is " + arr)

# Stimulate error in transmission by changing
# a bit value.
# 10101001110 -> 11101001110, error in 10th position.

arr = '10101001110'
print("Error Data is " + arr)
correction = detectError(arr, r)
if(correction==0):
    print("There is no error in the received message.")
else:
    print("The position of error is ",len(arr)-correction+1,"from the left")
```

OUTPUT: -



RESULT: -

The code for HAMMING CODE have been executed successfully and the output is verified.

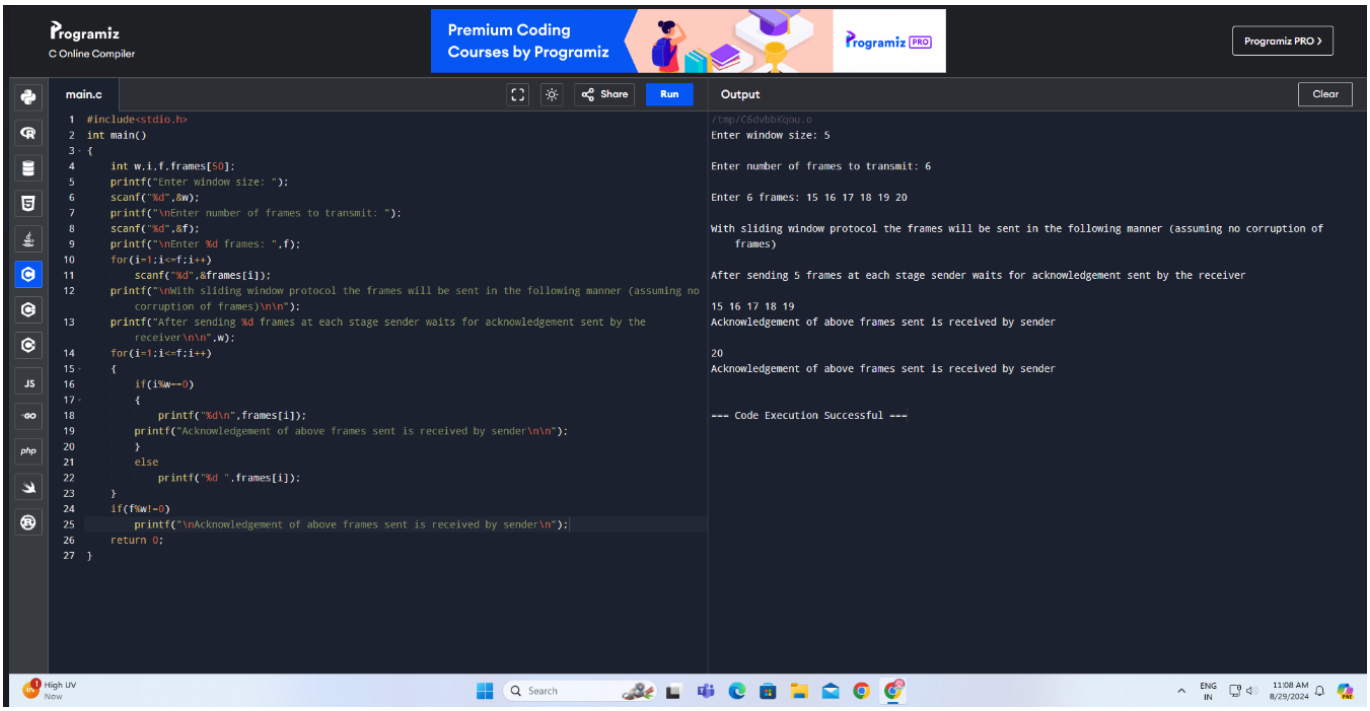
EXPERIMENT – 7

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

CODE: -

```
# include <stdio.h>
int main()
{
	int w,i,f,frames[50];
	printf("Enter window size");
	scanf("%d", &w);
	printf("\n Enter %d frames:", f);
	scanf("%d", &f);
	printf("\n Enter %d frames:", f);

	for (i=1; i<=f; i++)
		scanf("%d", &frames[i]);
		printf("\n With sliding window protocol the frames will be sent
in the following manner (assuming no corruption of frames)\n\n)");
		printf("After sending %d frames at each frames at each stage
sender waits for acknowledement sent by the receiver \n\n", w);

	for(i=1; i<=f;i++)

	{
		if(i%w==0)
		{
			printf("%d\n", frames[i]);
		}
		else
			printf("%d\n", frames[i]);
	}
	if (f%w!=0)
	printf("\n Acknowledgement of above frames sent is received by sender
\n");
	return 0;
}
```

OUTPUT: -



RESULT: -

The code for SLIDING WINDOW have been executed successfully and the output is verified.

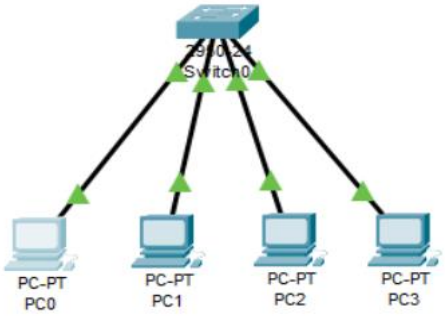
EXPERIMENT – 4

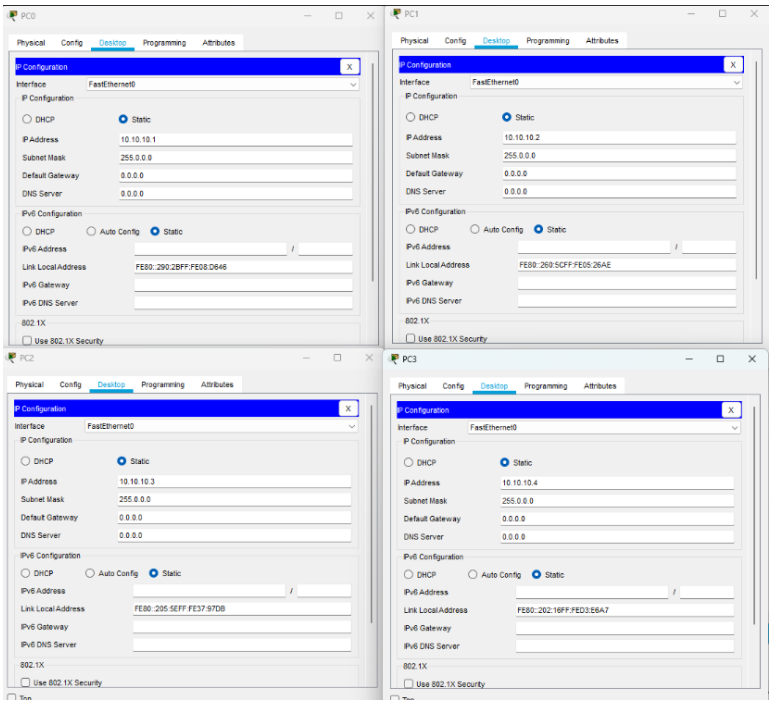
AIM: - Setup and configure a LAN (Local area network) using a Switch and Ethernet cables in your lab.

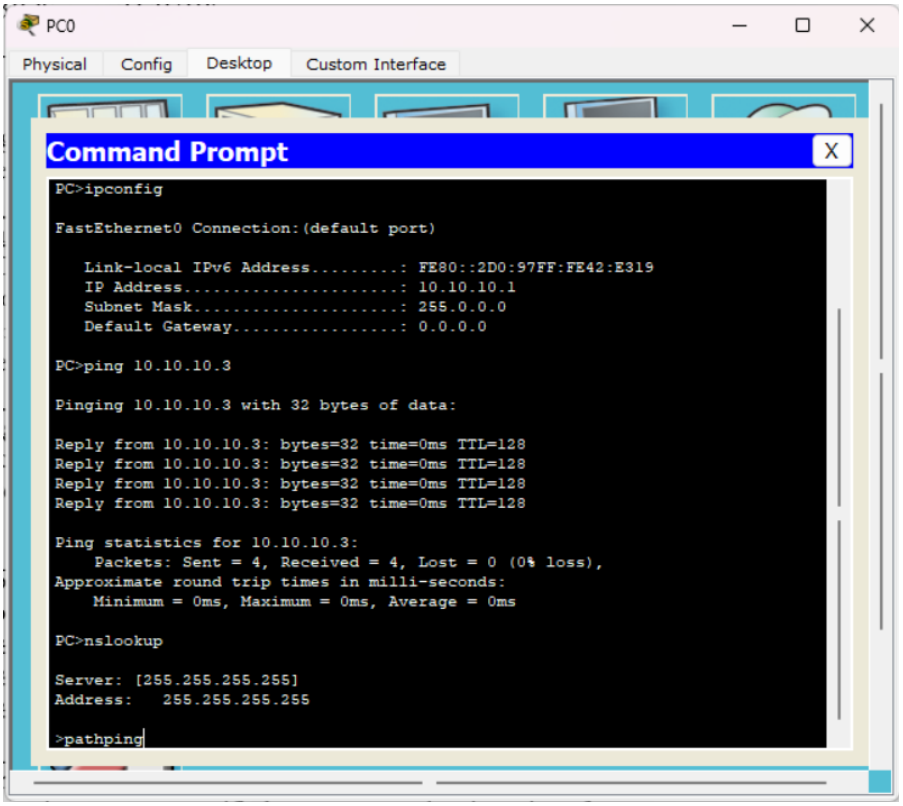
How to set up a LAN:

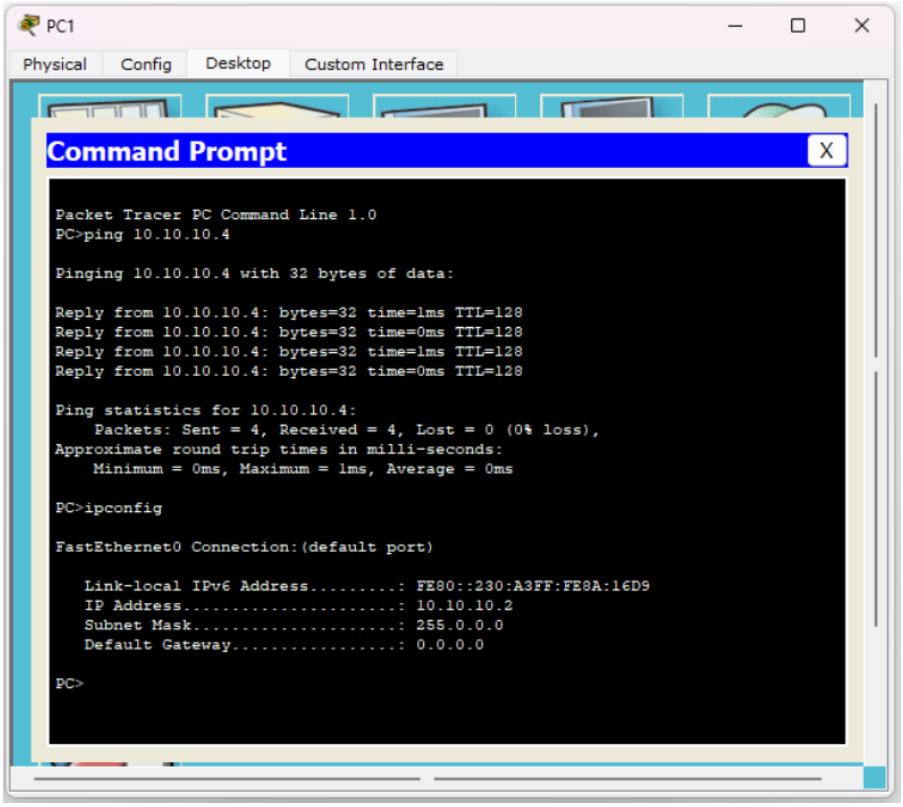
- **Plan and Design Network Topology:** Decide on network layout and equipment location.
- **Gather Equipment:** Use 4 computers, an 8/16/24-port switch, and 4 Ethernet cables.
- **Connect Devices to Switch:** Plug Ethernet cables from each computer into the switch.
- **Assign IP Addresses:**
  Log in as Administrator on each PC.
  Go to **Network and Internet Connections > Local Area Connection/Ethernet**.
  Select **Properties > TCP/IPv4 > Use the following IP address**, then assign:
  - PC1: 10.1.1.1, Subnet Mask: 255.0.0.0
  - PC2: 10.1.1.2, Subnet Mask: 255.0.0.0
  - PC3: 10.1.1.3, Subnet Mask: 255.0.0.0
  - PC4: 10.1.1.4, Subnet Mask: 255.0.0.0
- **Configure the Switch:** Connect a computer to the switch and log in to its web interface. Set the switch's IP address to 10.1.1.5, Subnet Mask: 255.0.0.0.
- **Verify Connectivity:** Use the **ping** command to test connection between devices.
- **Share Folder:** Select a folder, go to **Properties > Sharing tab**, and share it with everyone on the LAN.
- **Access Shared Folder:** Try accessing the shared folder from other network computers.

OUTPUT: -









RESULT: -

LAN Configuration using Switch has been done and studied successfully.

EXPERIMENT – 1

AIM: - Study of various Network commands used in Linux and Windows

BASIC NETWORKING COMMANDS: -

Windows:

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.

---

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

---

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

---

nbtstat –a: This command helps solve problems with NetBIOS name resolution. (Nbt stands for NetBIOS over TCP/IP)

---

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

---

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

---

pathping: Pathping is unique to Window's, and is basically a combination of the Ping and Tracert commands. Pathping traces the route to the destination address then launches a 25 second test of each router along the way, gathering statistics on the rate of data loss along eachhop.

---

ping: (Packet INternet Groper) command is the best way to test connectivity between two nodes. Ping use 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
Route: route command is used to show/manipulate the IP routing table. It is primarily used to setup static routes to specific host or networks via an interface.

OUTPUT: -

```
Microsoft Windows [Version 10.0.22631.4317]
(c) Microsoft Corporation. All rights reserved.

C:\Users\hp>arp -a

Interface: 192.168.0.100 --- 0x5
  Internet Address      Physical Address      Type
  192.168.0.1           b0-95-75-d0-c1-19     dynamic
  192.168.0.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

C:\Users\hp>hostname
DESKTOP-FODB1M0

C:\Users\hp>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
```

```
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   IPv6 Address. . . . . . . . . . . : 2406:7400:bb:9a01:68d5:b10:8367:e13e
   Temporary IPv6 Address. . . . . . : 2406:7400:bb:9a01:9462:fa5e:ebe4:3130
   Link-local IPv6 Address . . . . . : fe80::697a:d049:6a46:ed14%5
   IPv4 Address. . . . . . . . . . . : 192.168.0.100
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::b295:75ff:fed0:c119%5
                                       192.168.0.1

Ethernet adapter Bluetooth Network Connection:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

C:\Users\hp>pathping

Usage: pathping [-g host-list] [-h maximum_hops] [-i address] [-n]
                [-p period] [-q num_queries] [-w timeout]
                [-4] [-6] target_name

Options:
    -g host-list     Loose source route along host-list.
    -h maximum_hops  Maximum number of hops to search for target.
    -i address       Use the specified source address.
    -n               Do not resolve addresses to hostnames.
    -p period        Wait period milliseconds between pings.
    -q num_queries   Number of queries per hop.
    -w timeout       Wait timeout milliseconds for each reply.
    -4               Force using IPv4.
    -6               Force using IPv6.

C:\Users\hp>
```

Linux:

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.

---

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.

---

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

---

tcpdump: The tcpdump command is designed for capturing and displaying packets.

---

ping: verifies IP-level connectivity to another TCP/IP computer by sending Internet Control Message Protocol (ICMP) Echo Request messages. The receipt of corresponding Echo Reply messages is displayed, along with round-trip times. Ping is the primary TCP/IP command used to troubleshoot connectivity, reachability, and name resolution.

OUTPUT: -

RESULT: -

The commands for Linux and Windows has been executed successfully and the output is verified.

Experiment No 2

Aim: Study of different types of Network cables.

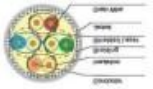
Different type of cables used in networking are:

1. Unshielded Twisted Pair (UTP) Cable

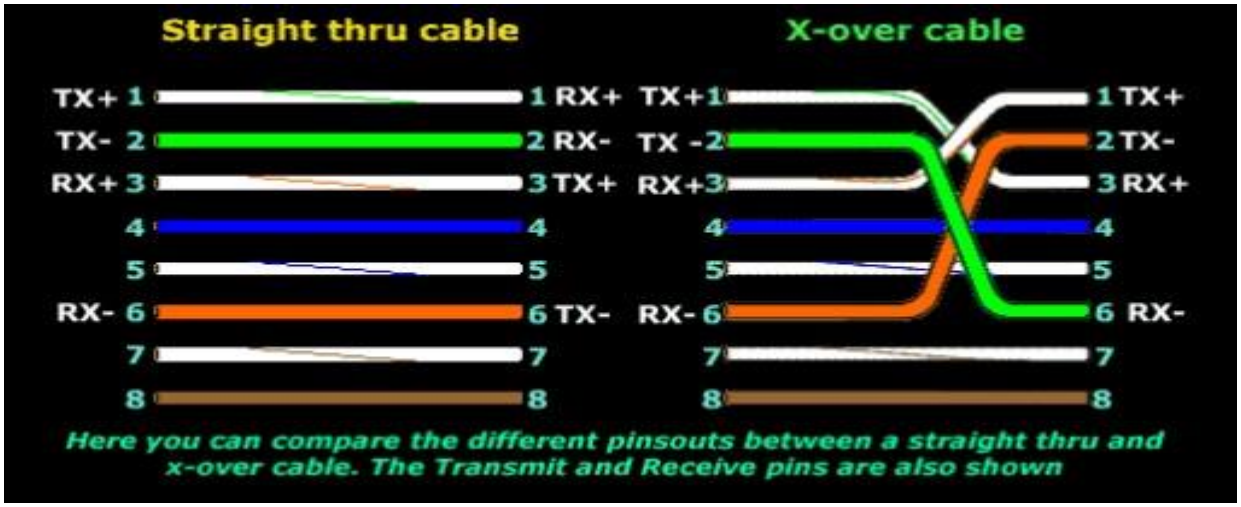
2. Shielded Twisted Pair (STP) Cable

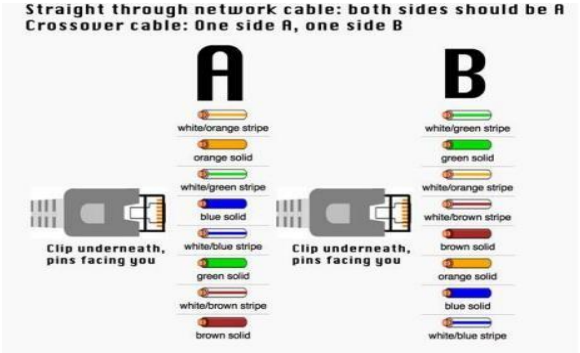
3. Coaxial Cable

4. Fiber Optic Cable

Cable type	Category	Maximum Data Transmission	Advantages/ Disadvantages	Application/Use	Image
UTP	Category 3	10 bps	**Advantages** • Cheaper in cost • Easy to install as they have a smaller overall diameter. **Disadvantages** • More prone to (EMI) Electromagnetic interference and noise	10Base-T Ethernet	
	Category 5	Up to 100 Mbps		Fast Ethernet, Gigabit Ethernet	
	Category 5e	1Gbps		Fast Ethernet, Gigabit Ethernet	
STP	Category6,6a	10Gbps	**Advantages** • Shielded. • Faster than UTP. • Less susceptible to noise and interference **Disadvantages** • Expensive • Greater installation effort	Gigabit Ethernet, 10G Ethernet (55m) Widely used in data centres	
SSTP	Category 7	10Gbps		Gigabit Ethernet, 10G Ethernet (100m)	 

Coaxial cable	RG-6 RG-59 RG-11	10-100Mbps	• High bandwidth • Immune to interference • Low loss bandwidth • Versatile • **Disadvantages** • Limited distance • Cost • Size is bulky	Speed of signal is 500m Television network High speed internet connections	
fibre optics cable	Single mode Multi mode	100Gbps	**Advantages** • High speed • High bandwidth • High security • Long distance **Disadvantages** • Expensive • Requires skilled installers	• Maximum distance of fibre optics cable is around 100meters	





Step 1: To start construction of the device, begin by threading shields onto thecable.

_crimping tool has a round area to complete this task.

Step 3: After, you will need to untangle the wires; there should be four “twisted pairs.”

Referencing back to the sheet, arrange them from top to bottom. One end shouldbe in

arrangement A and the other in B.

Step 4: Once the order is correct, bunch them together in a line, and if there areany that

stick out farther than others, snip them back to create an even level. The difficultaspect

is placing these into the RJ45 plug without messing up the order. To do so, hold theplug

with the clip side facing away from you and have the gold pins facing toward you,as

shown.

Step 5: Next, push the cable right in. The notch at the end of the plug needs to bejust

over the cable shielding, and if it isn’t, that means that you stripped off too

muchshielding. Simply snip the cables back a little more.

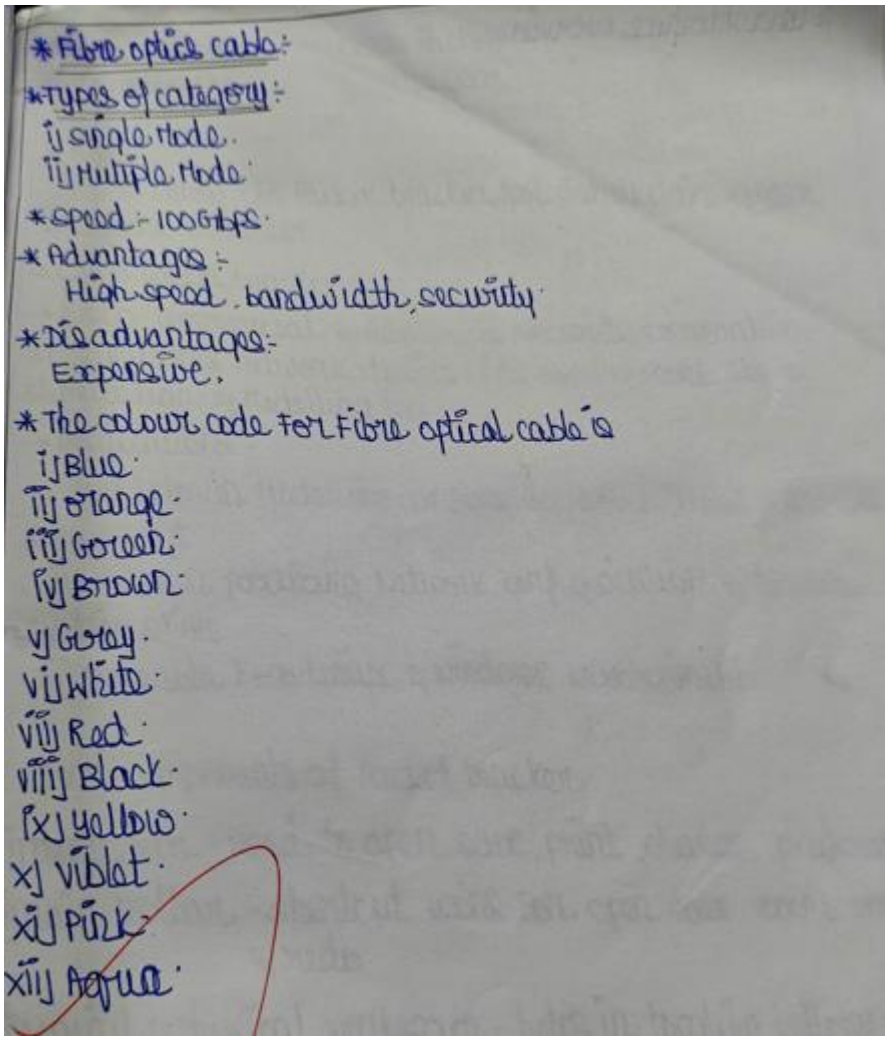
Step 6: After the wires are securely sitting inside the plug, insert it into the crimping tool

and push down. It should be shaped correctly, but pushing too hard can crack thefragile plastic plug.

Step 7: Lastly, repeat for the other end using diagram B (to make a crossover cables)/

using diagram A (to make a straight through cable)

To test it, plug it in and attempt to connect two devices directly.



Result :

The Study of different types of Network cables has been successfully executed.