COMPUTER NETWORKS LAB

ETCS-354

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6th Semester

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EXPERIMENT – 1

Aim: Introduction to Cisco Packet Tracer and to demonstrate Hybrid Topology.

Cisco Packet Tracer

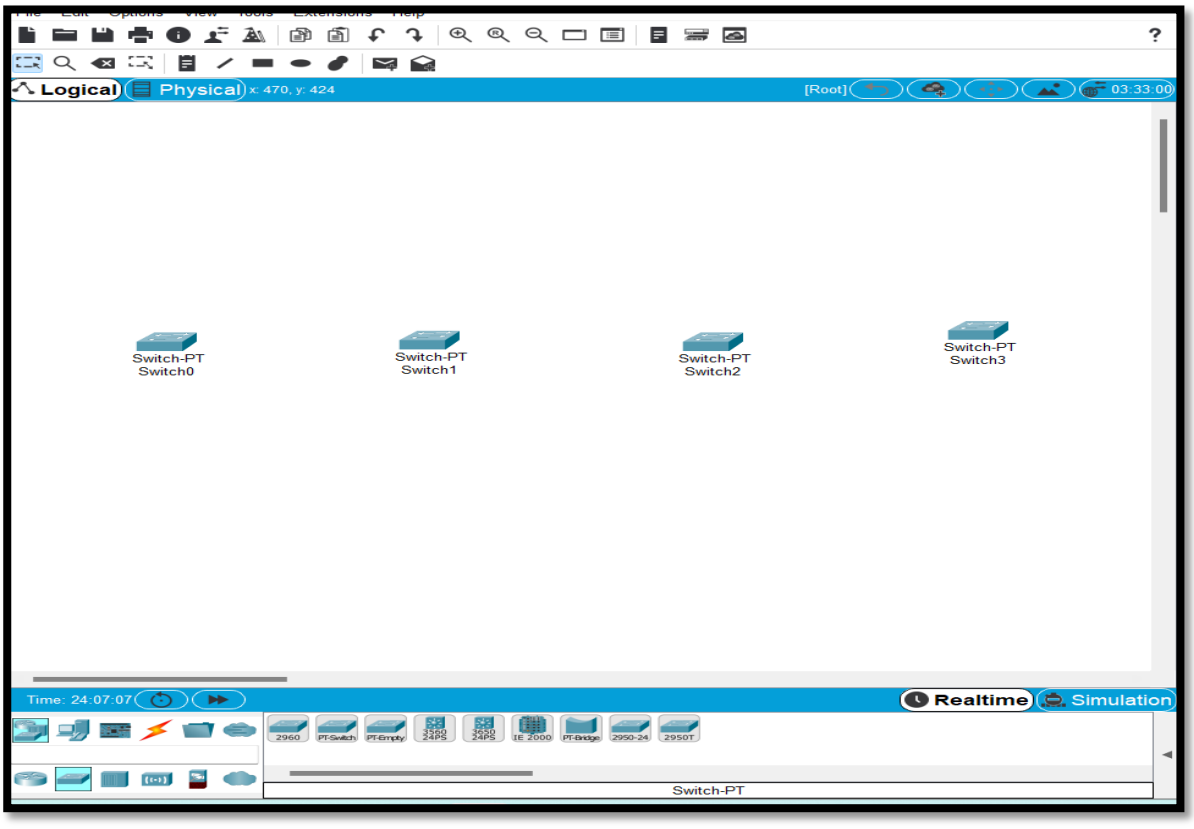
Cisco Packet Tracer is a network simulation tool developed by Cisco Systems. It allows users to create, configure, and troubleshoot virtual networks using a variety of network devices such as routers, switches, and servers.

With Packet Tracer, users can simulate network topologies, design and configure virtual networks, and test network protocols in a safe and controlled environment. The tool is widely used in networking courses and certification programs to teach students and professionals how to build and manage computer networks.

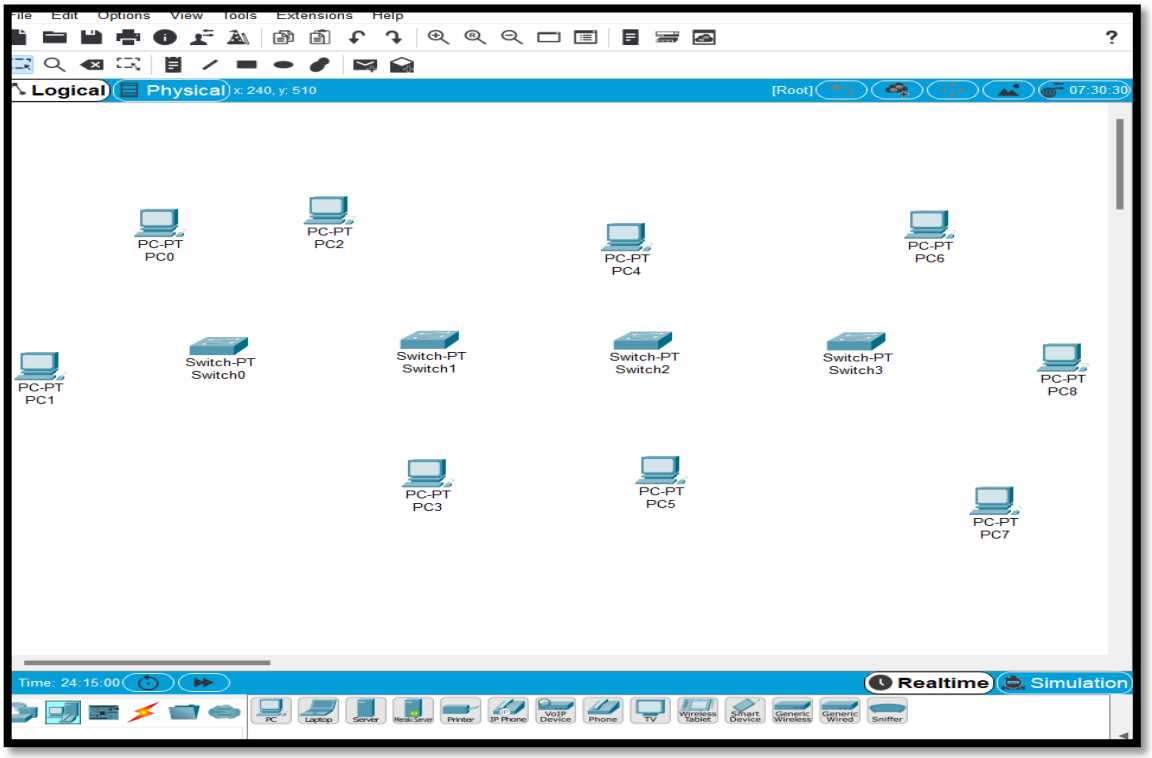
Packet Tracer is available for free to Cisco Networking Academy students, instructors, and alumni, as well as to self-learners and hobbyists who download it from the Cisco Networking Academy website. The tool is compatible with Windows and Linux operating systems, and it has a user-friendly interface that makes it easy to learn and use.

Steps:-

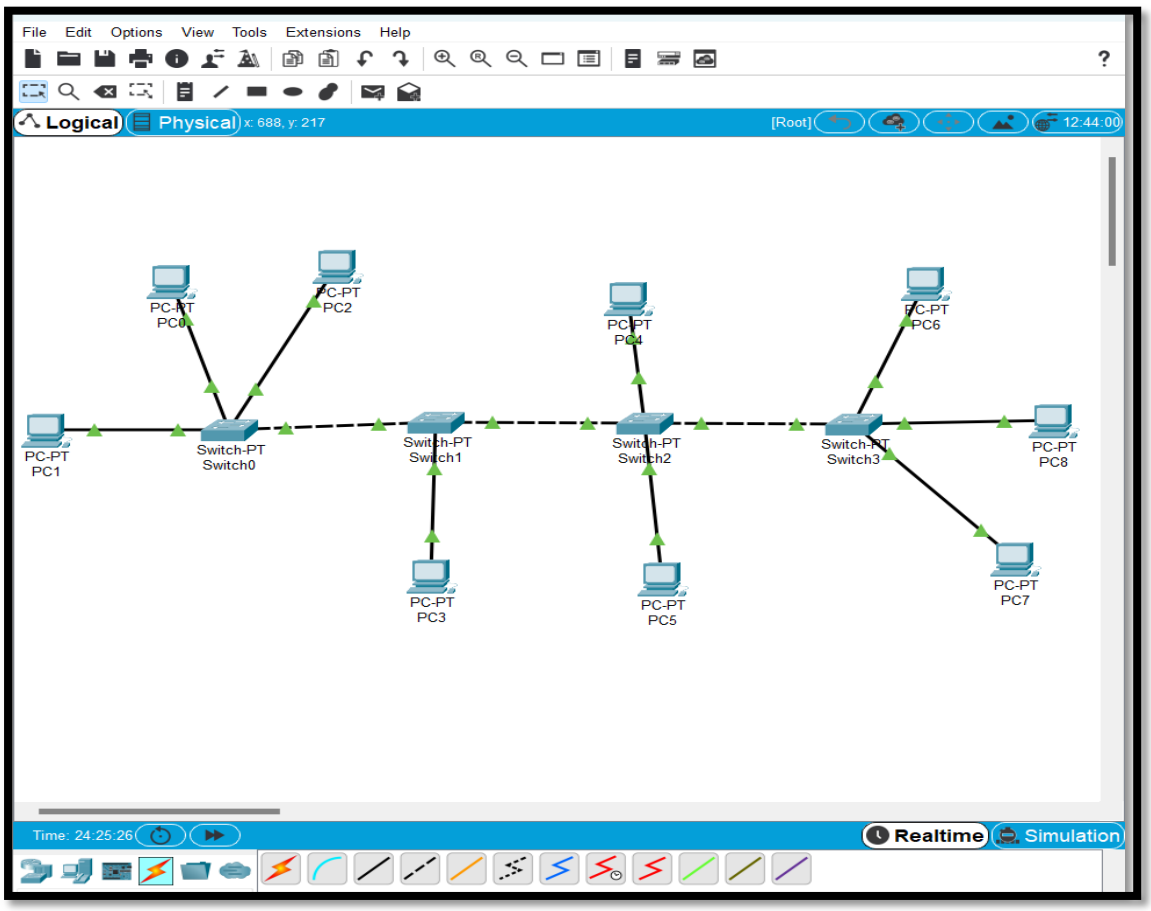
1) Pick 3-4 Switches from Network Devices using Drag and drop.



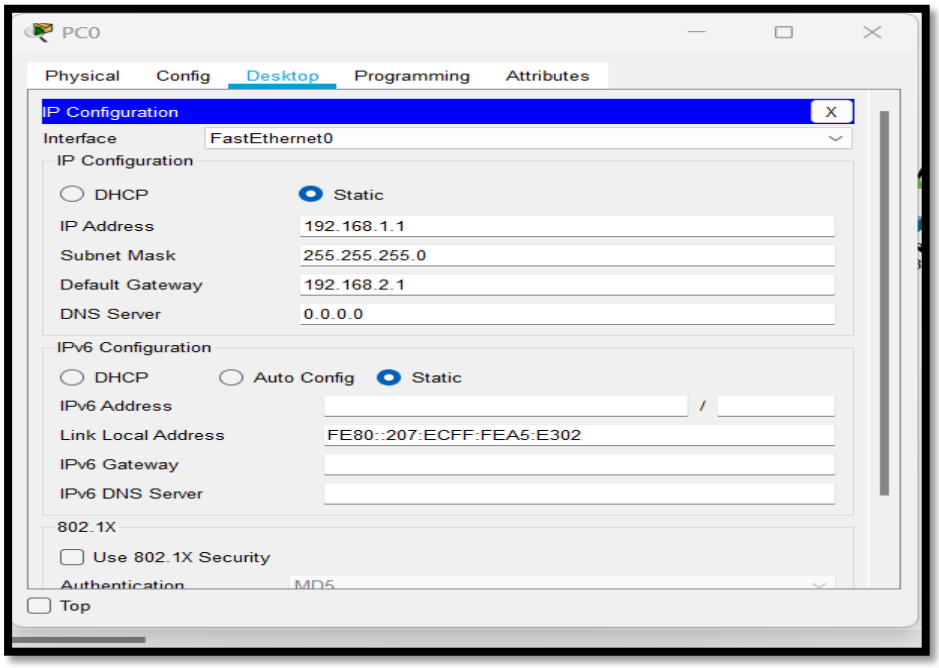
2) Pick 2-3 PCs from End-Devices using Drag and Drop.



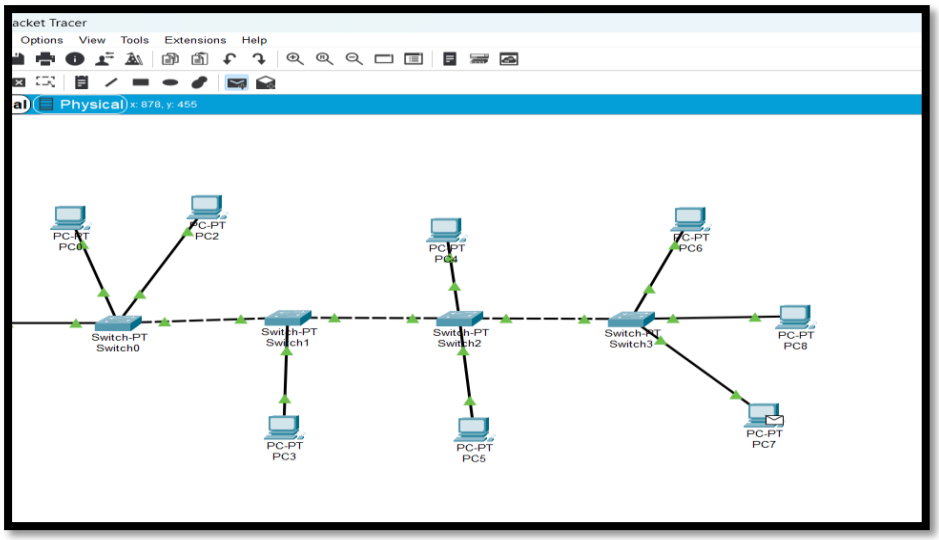
3) Now connect these Devices using Auto Connect from Connections. Drag the cursor on devices between which you have to make connection.



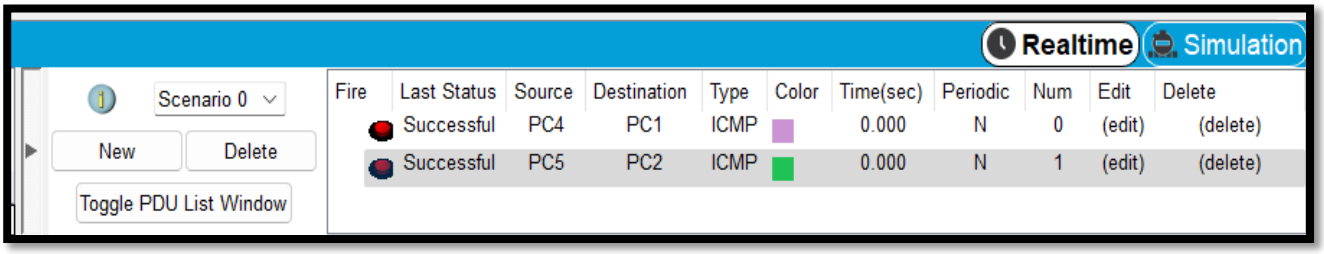
4) Set IP configuration for each PC in Desktop Option. Add IP address, Subnet mask and Default Gateway for each.



5) Pick simple PDU and choose two different PCs between which you have to transfer it .



RESULT : As you can see package is successfully transferred from 1 pc to another

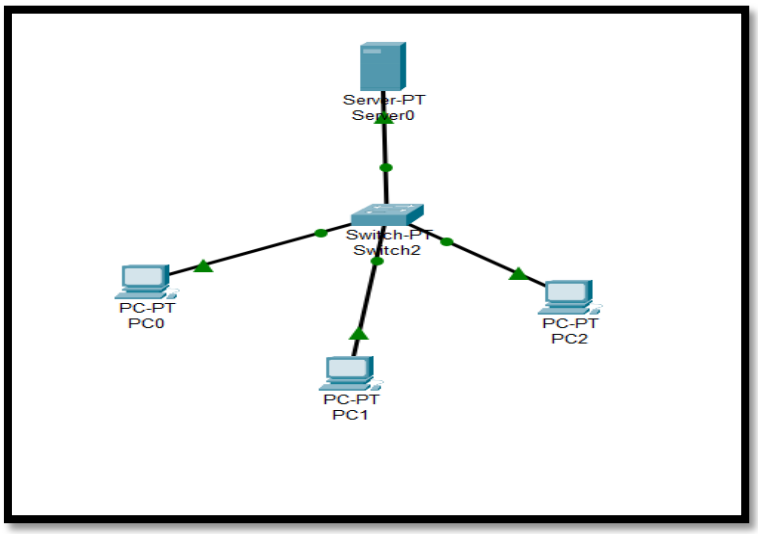


. EXPERIMENT – 2

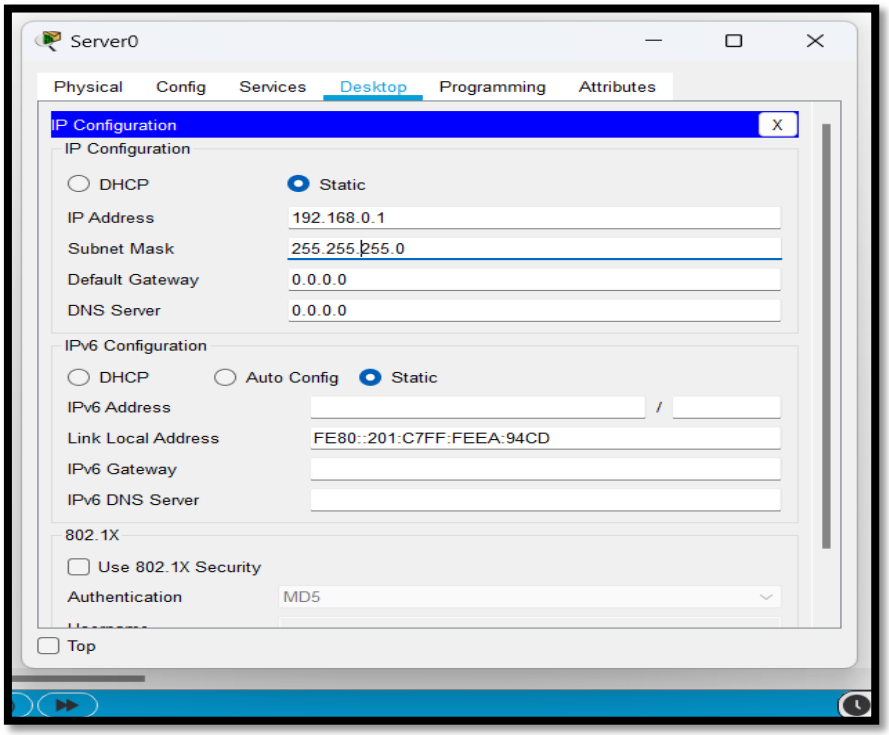
Aim: To Configure and Demonstrate DHCP server on Cisco Packet Tracer

Steps:-

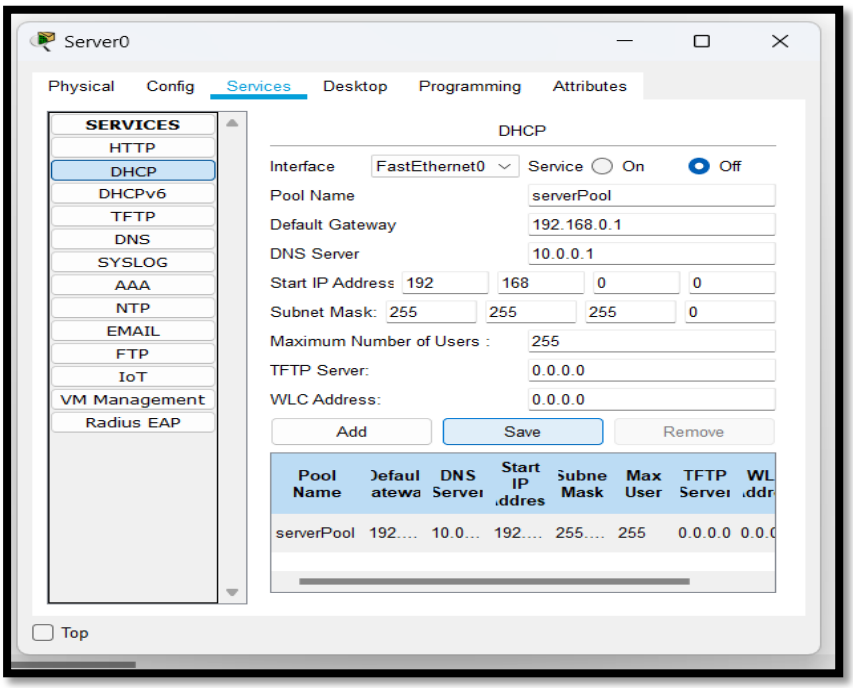
Step-1 : Add 1 server , 1 switch , and 3-4 PCs using Drag and Drop . Connect both switch to Server and PCs to switch using auto connect .



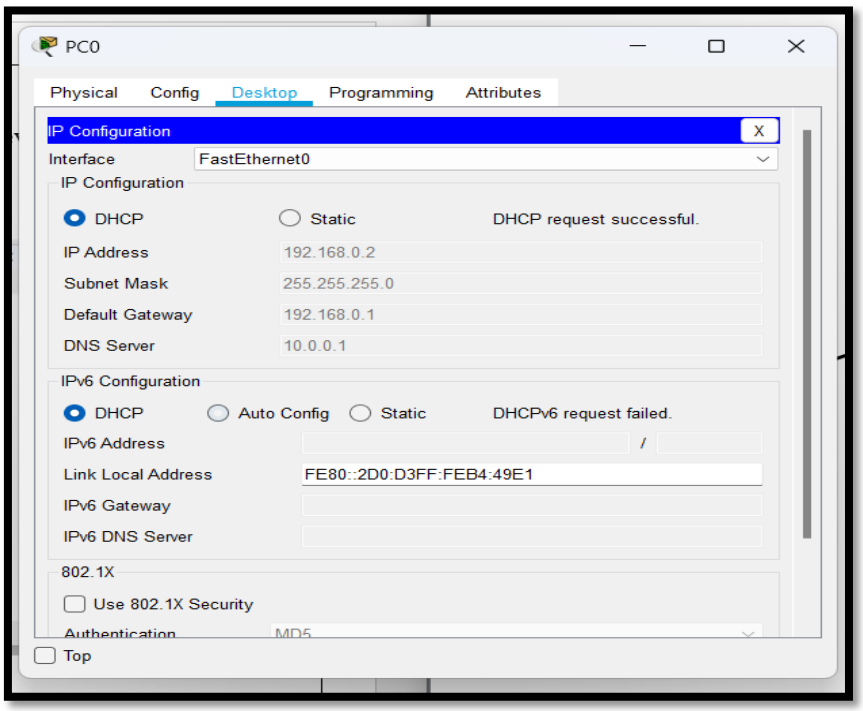
Step-2: Now in Server→Desktop setup IP config and enter static IP address and subnet mask .



Step-3: Now in Serer→ Services Go to DHCP add Default Gateway , DNS server and turn on service for DHCP

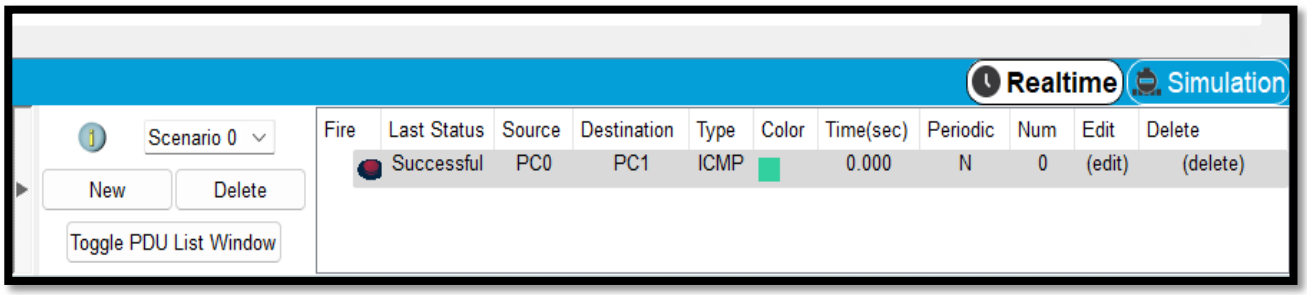


Step-4 : Now check on different PCs connected its desktop→ip config→DHCP, it will automatically request , will assign IP address and DHCP request successfully will be displayed .



Step-5: Try sending a simple PDU from pc to another .

Result :

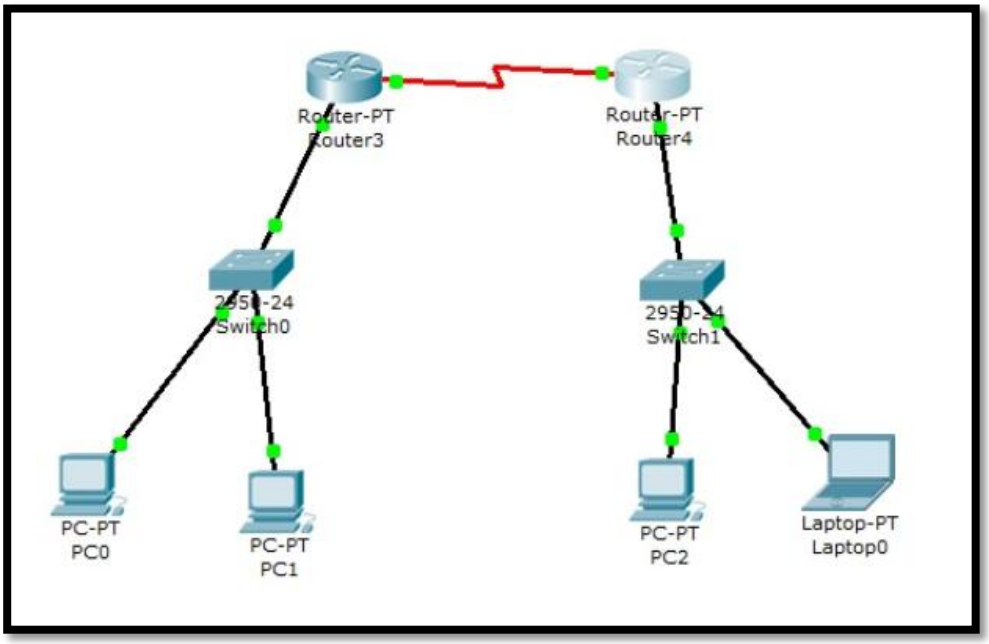

Realtime
Simulation
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Delete
Successful
PC0
PC1
ICMP
0.000
N
0
(edit)
(delete)

. EXPERIMENT – 3

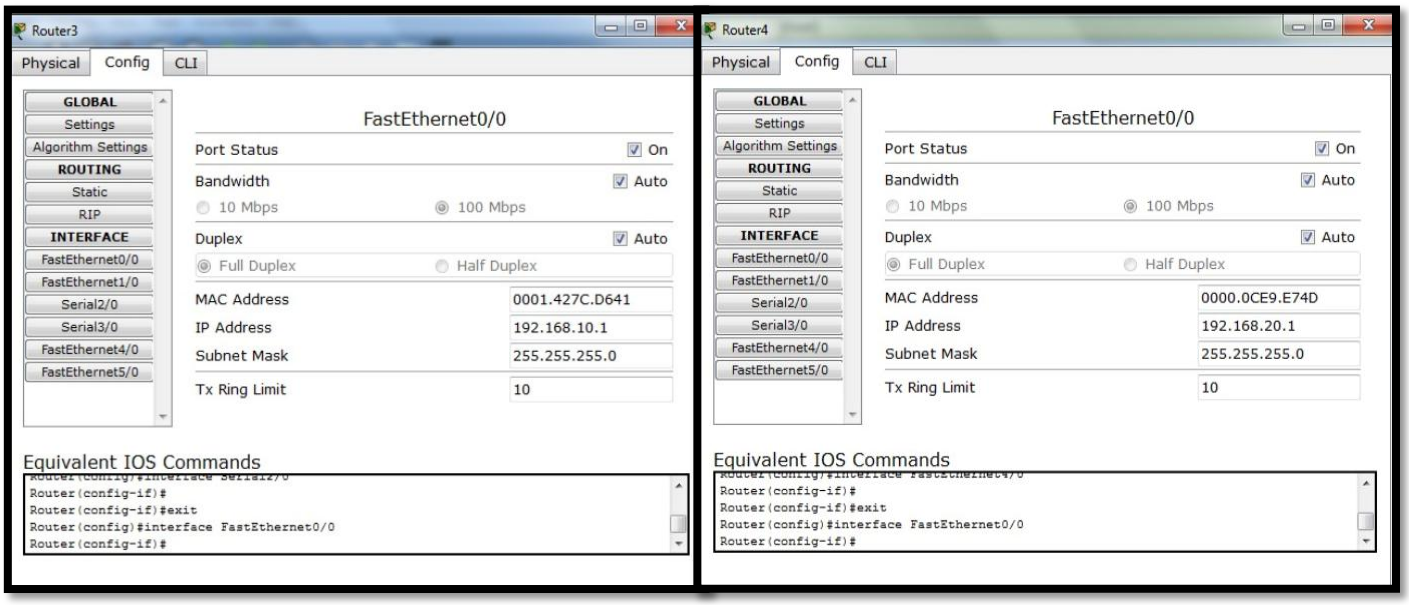
Aim: To configure and implement Static routing in Cisco packet tracer.

Steps:-

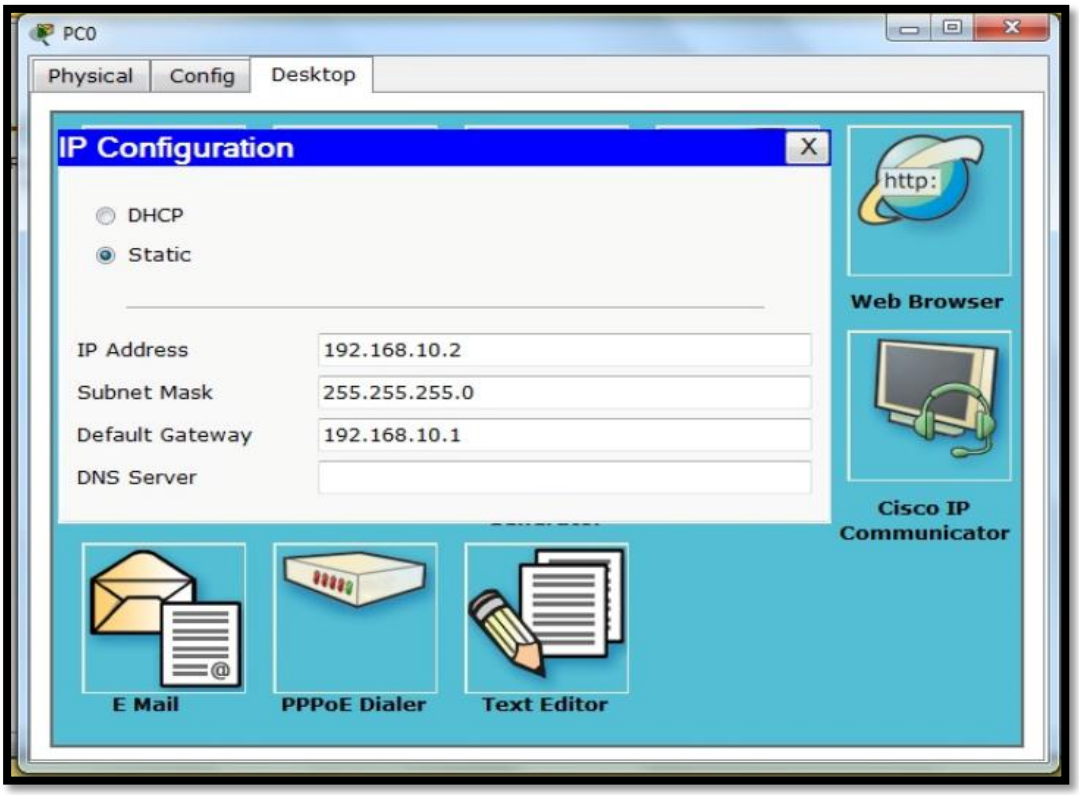
Step-1 : Create a network simulation in Cisco Packet Tracer with two routers connected using serial connect and 3-4 end devices (PCs or laptops) connected to the routers via switches.



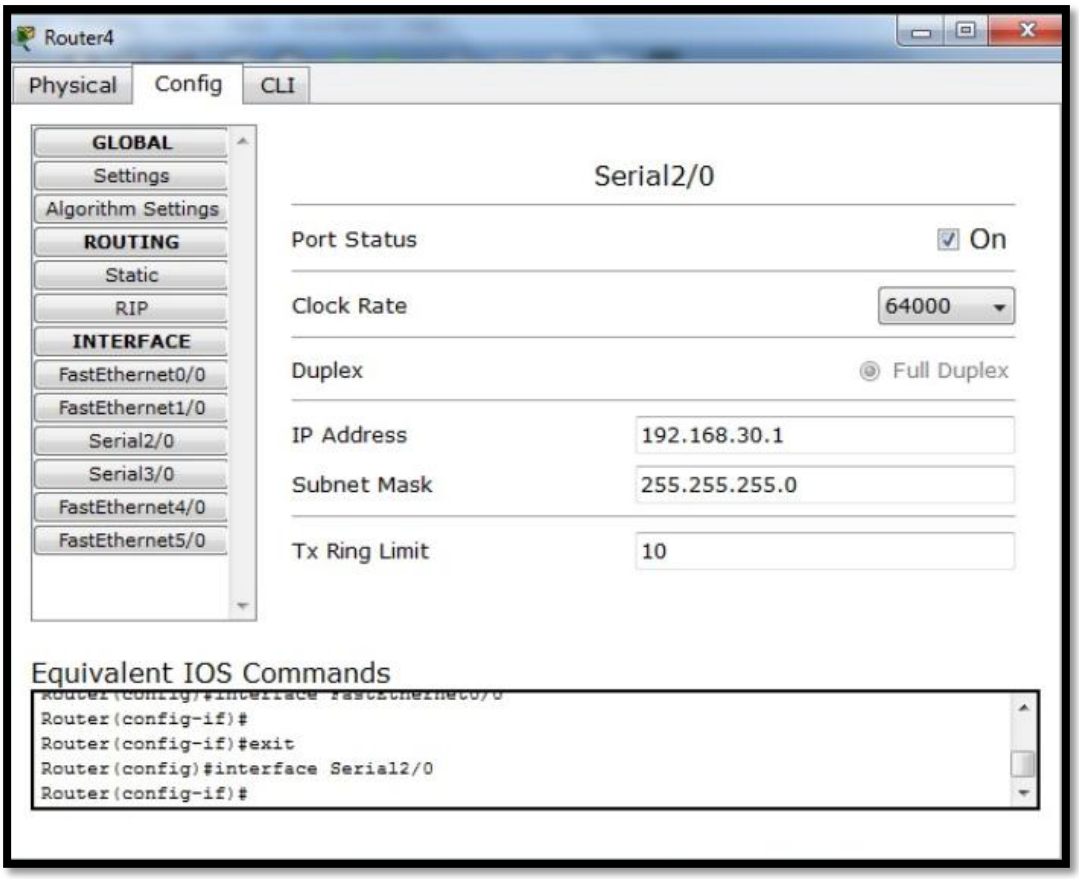
Step-2: Configure the FastEthernet connection on both routers by adding IP addresses and subnet masks, and mark the port status as on.



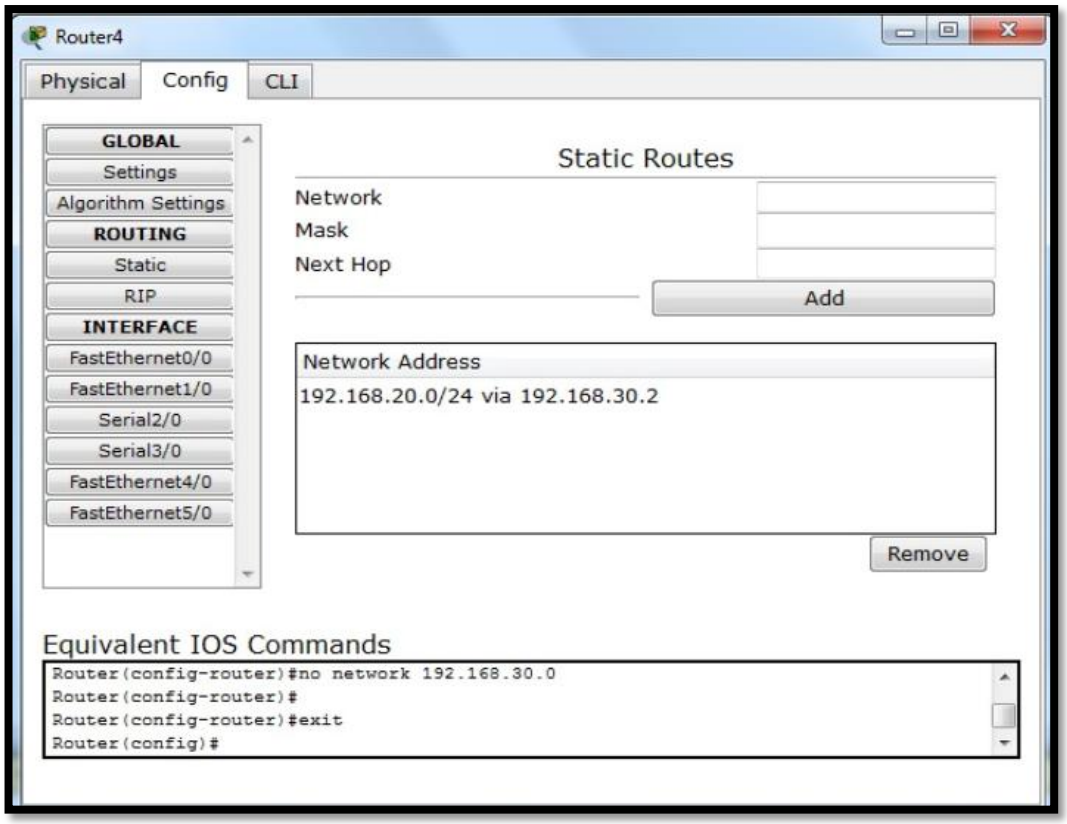
Step-3: To configure each PC or end device, go to the desktop and click on IP configuration to add the IP address, default gateway, and subnet mask.



Step-4 : Open the serial port configuration on the router and add the IP address and subnet mask, set the clock rate to 64000, and turn on the port status.

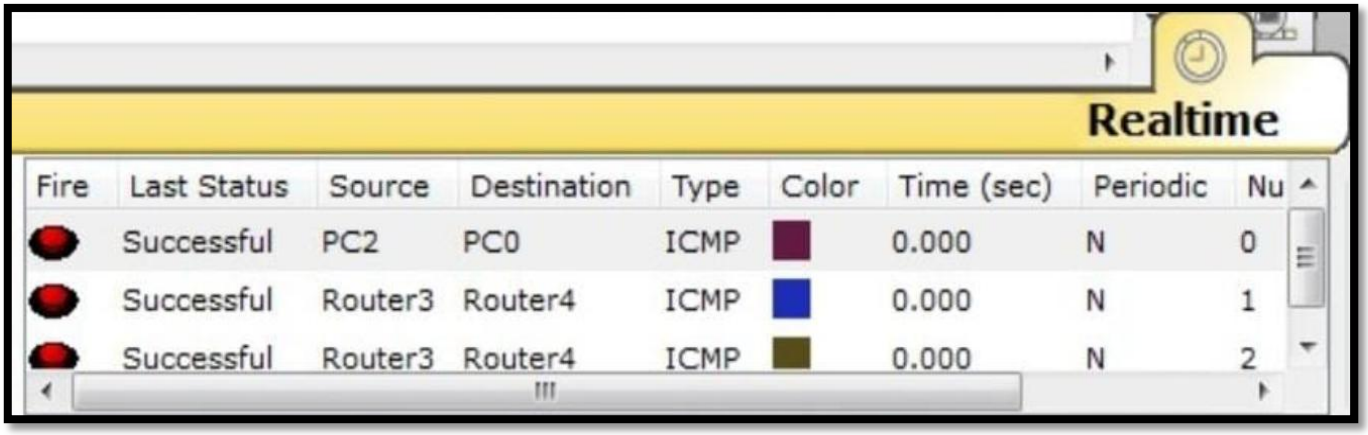


Step-5: To enable static routing, click on static in routing, then add the network IP address, mask, and next hop.



Step-6: To send a simple PDU from one PC to another, simply drag and drop the PDU from the source PC to the destination PC in the network simulation.

Result :

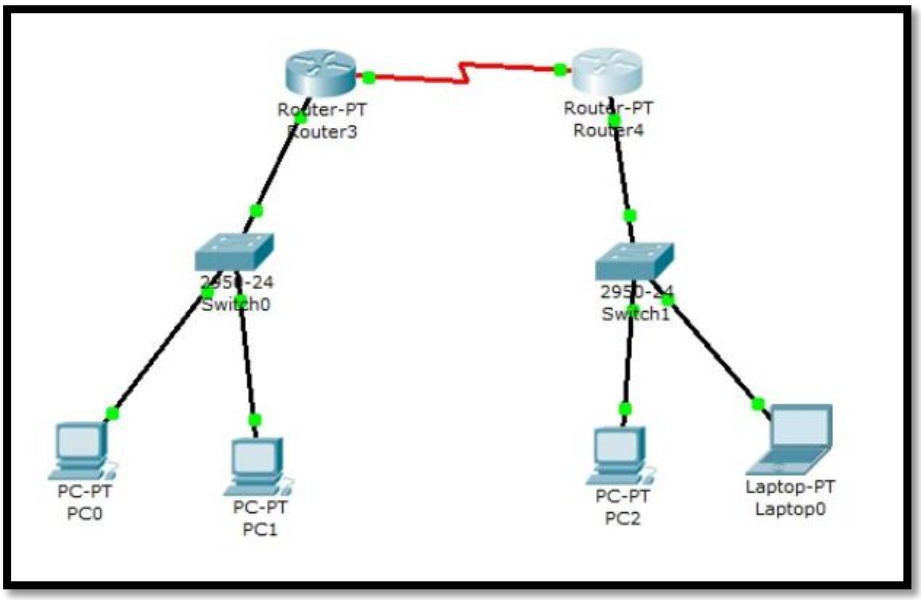


EXPERIMENT – 4

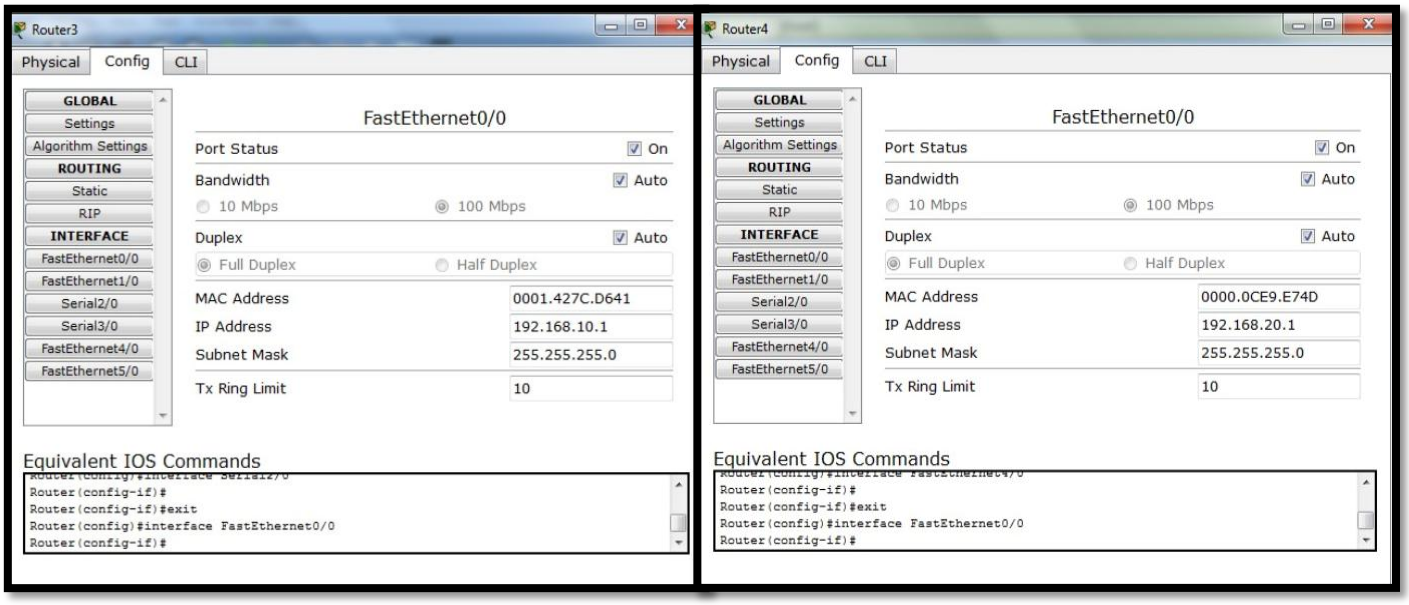
Aim: To configure and implement dynamic routing(RIP) in Cisco packet tracer

Steps:-

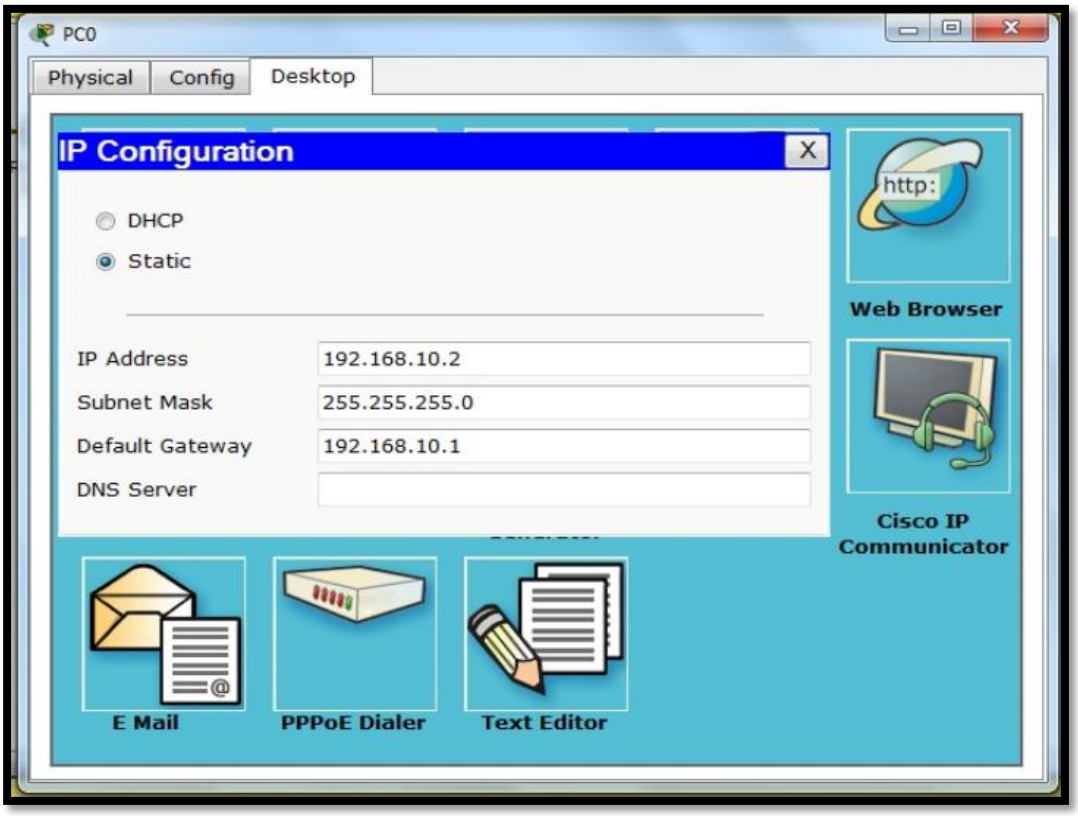
Step-1 : Create a network simulation in Cisco Packet Tracer with two routers connected using serial connect and 3-4 end devices (PCs or laptops) connected to the routers via switches.



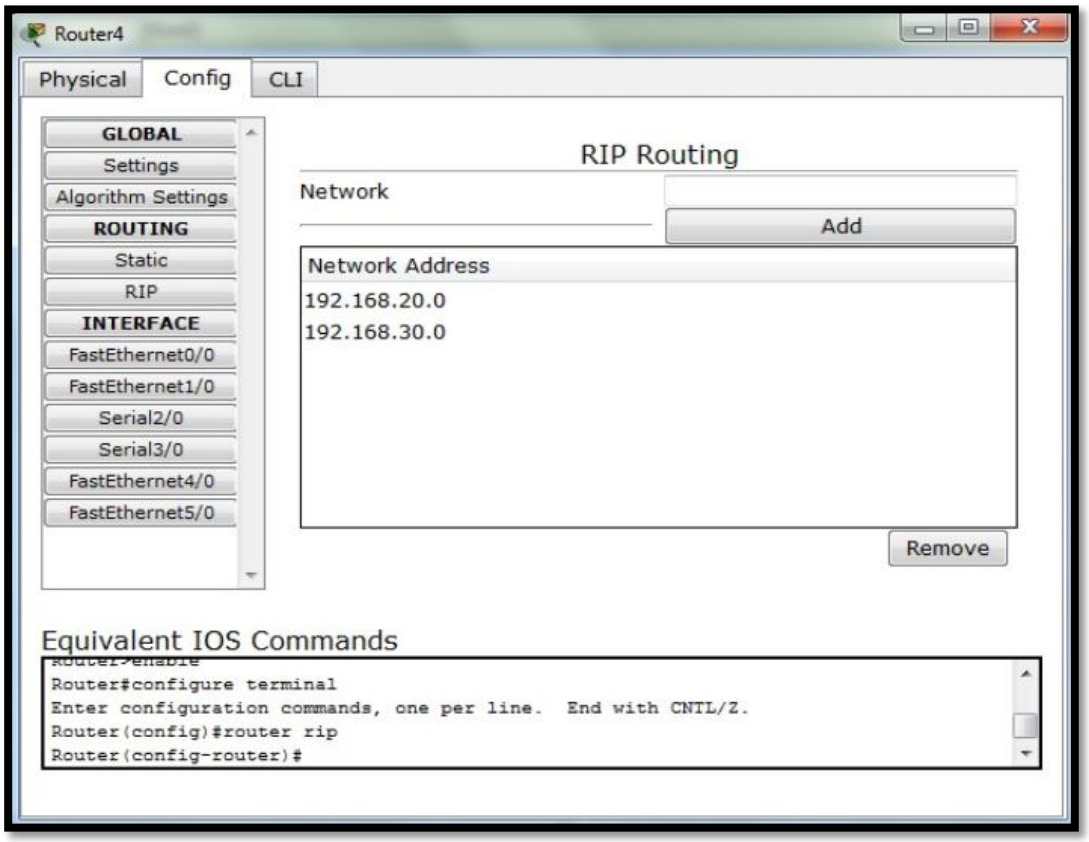
Step-2: Configure the FastEthernet connection on both routers by adding IP addresses and subnet masks, and mark the port status as on.



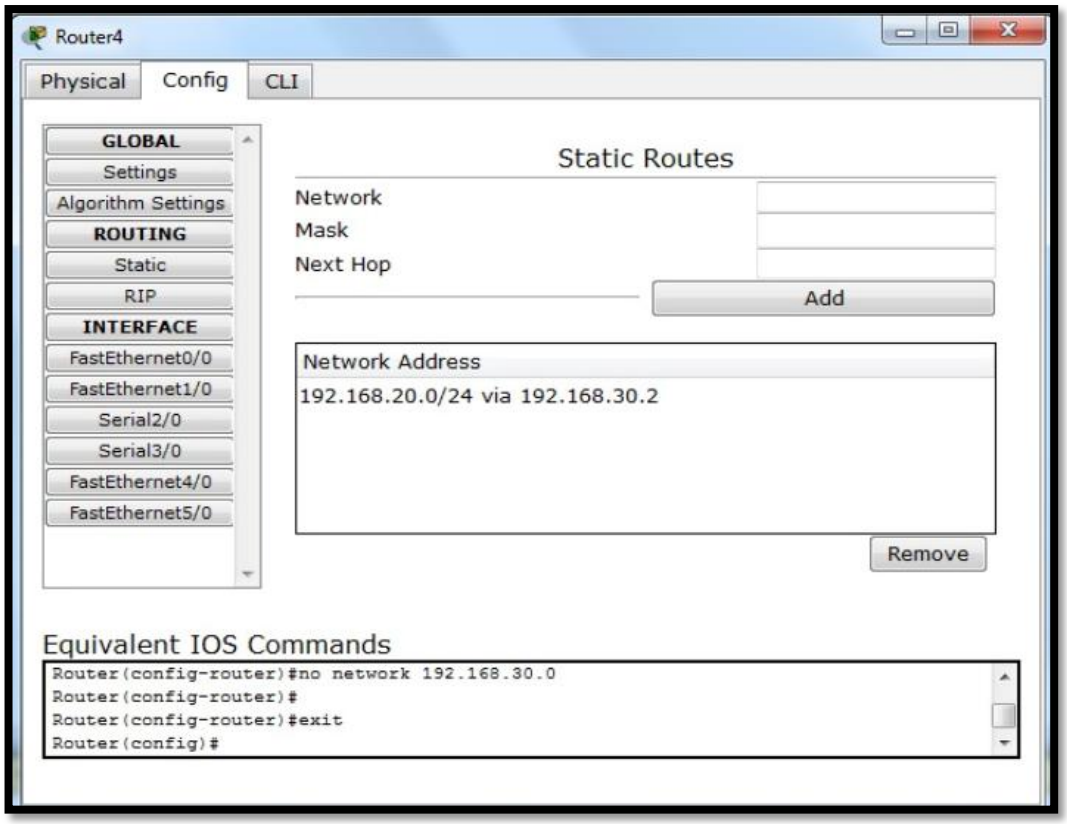
Step-3: To configure each PC or end device, go to the desktop and click on IP configuration to add the IP address, default gateway, and subnet mask.



Step-4 : To configure dynamic routing using RIP, click on RIP routing and add the network addresses of the next router and the network at which you want to transfer your package.

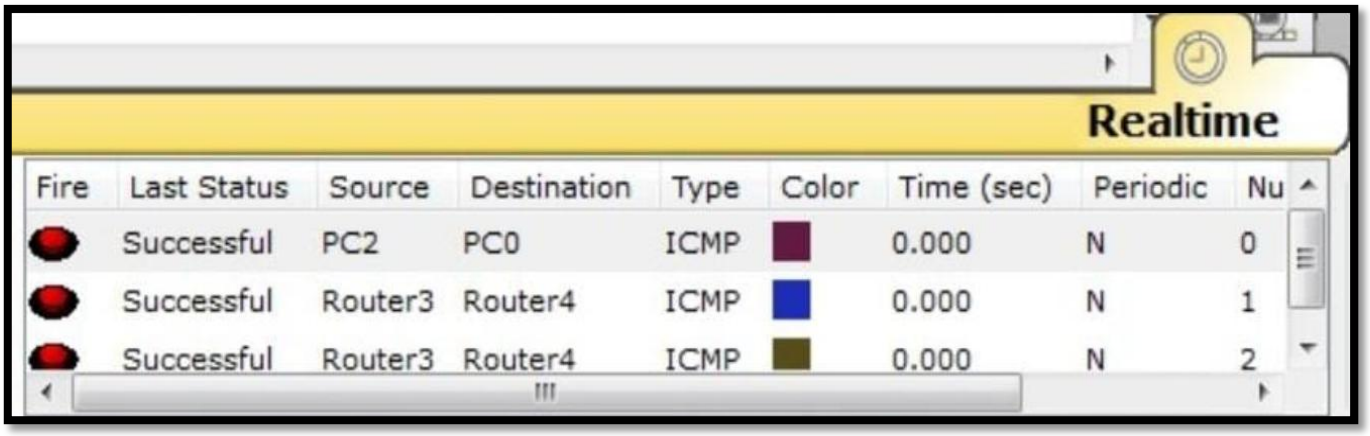


Step-5: To enable static routing, click on static in routing, then add the network IP address, mask, and next hop.



Step-6: To send a simple PDU from one PC to another, simply drag and drop the PDU from the source PC to the destination PC in the network simulation.

Result :

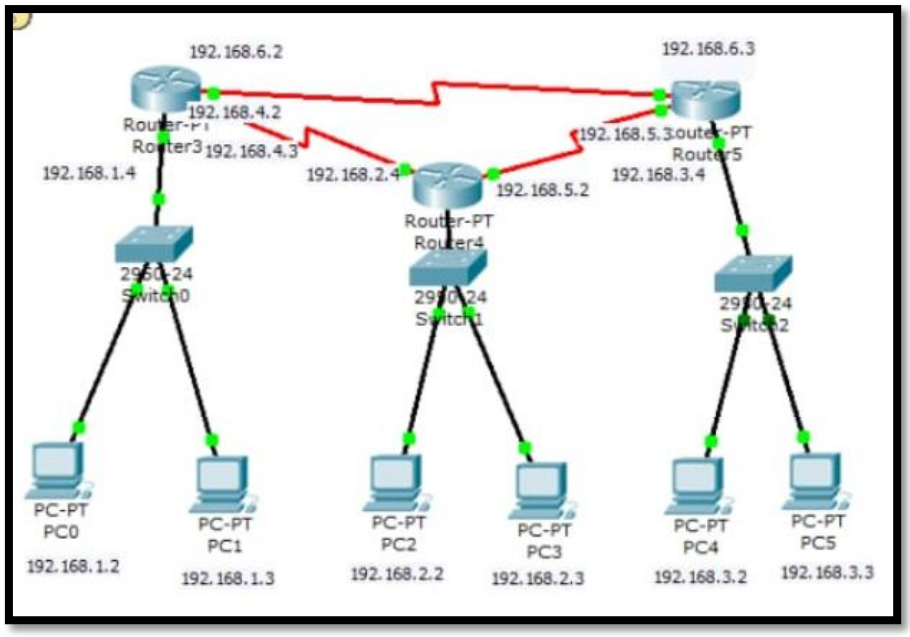


EXPERIMENT – 5

Aim: To configure and implement dynamic routing using three routers in Cisco packet tracer

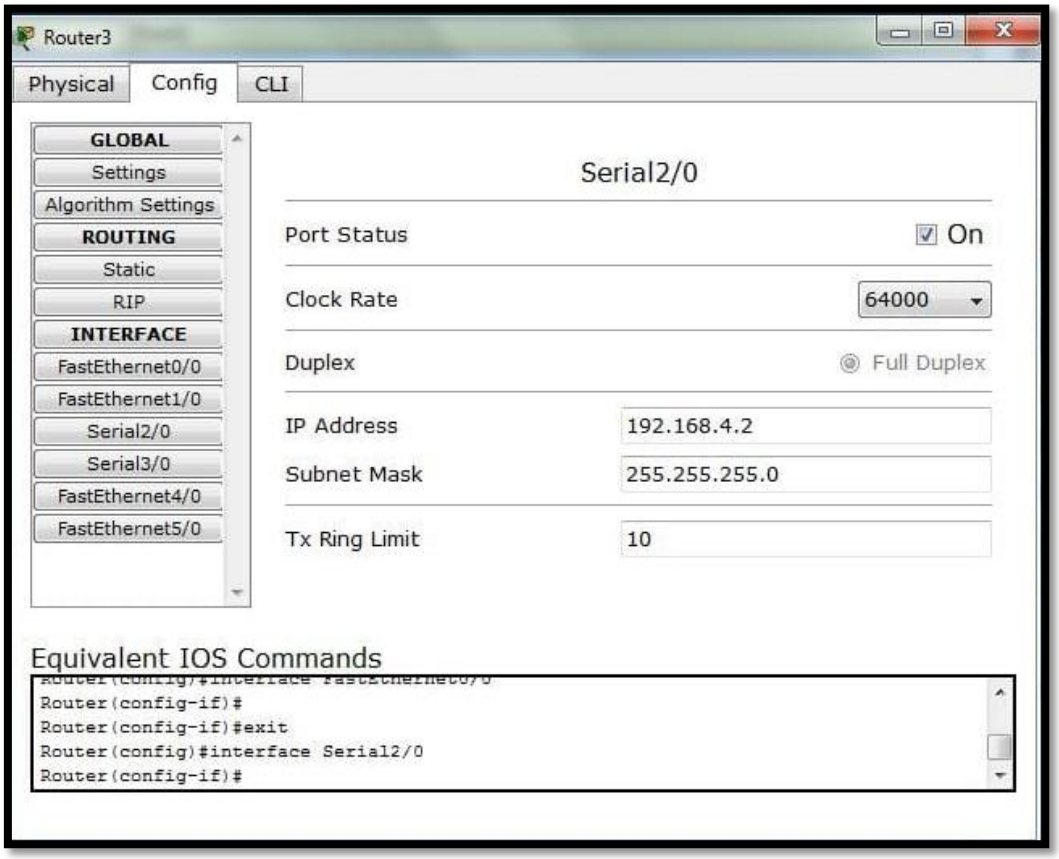
Steps:-

Step-1 : Create a network simulation in Cisco Packet Tracer by connecting 3 routers together in a loop, with PCs connected to each router, such that the first and third routers are directly connected as well as connected via the second router.

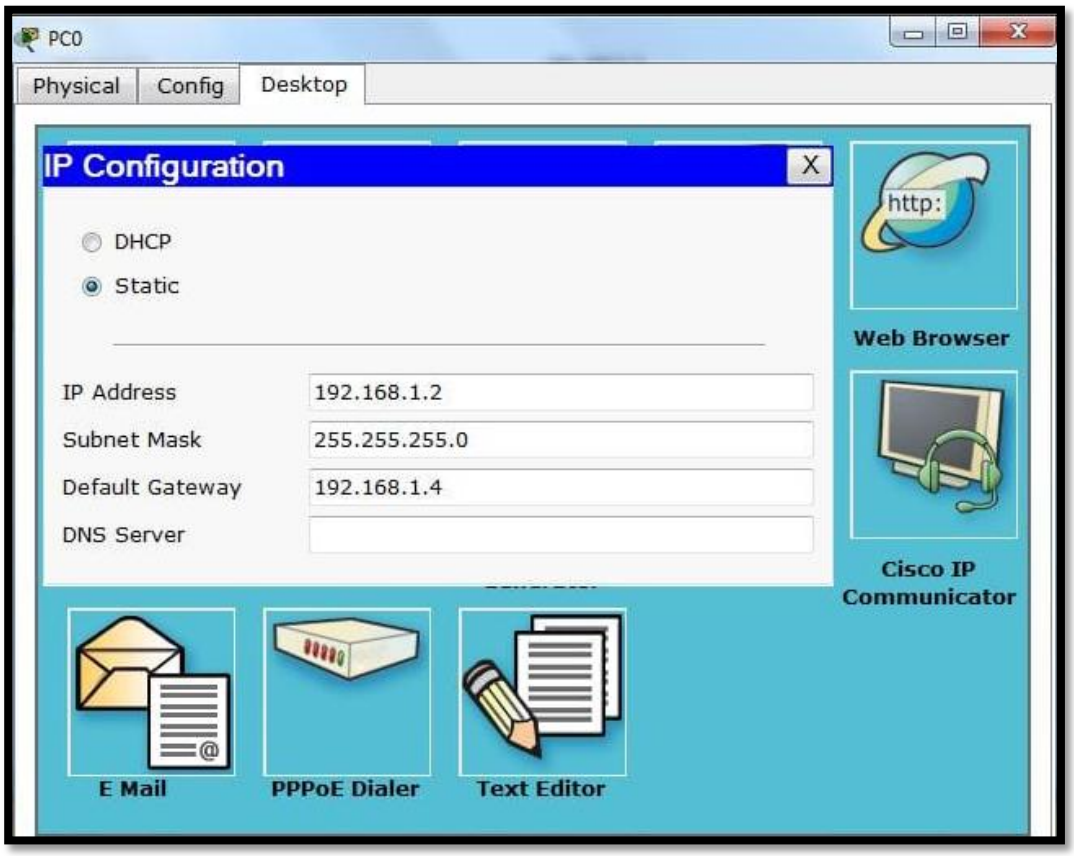


Step-2: Configure Fast Ethernet ports on each router by adding an IP address and subnet mask and enabling the ports.

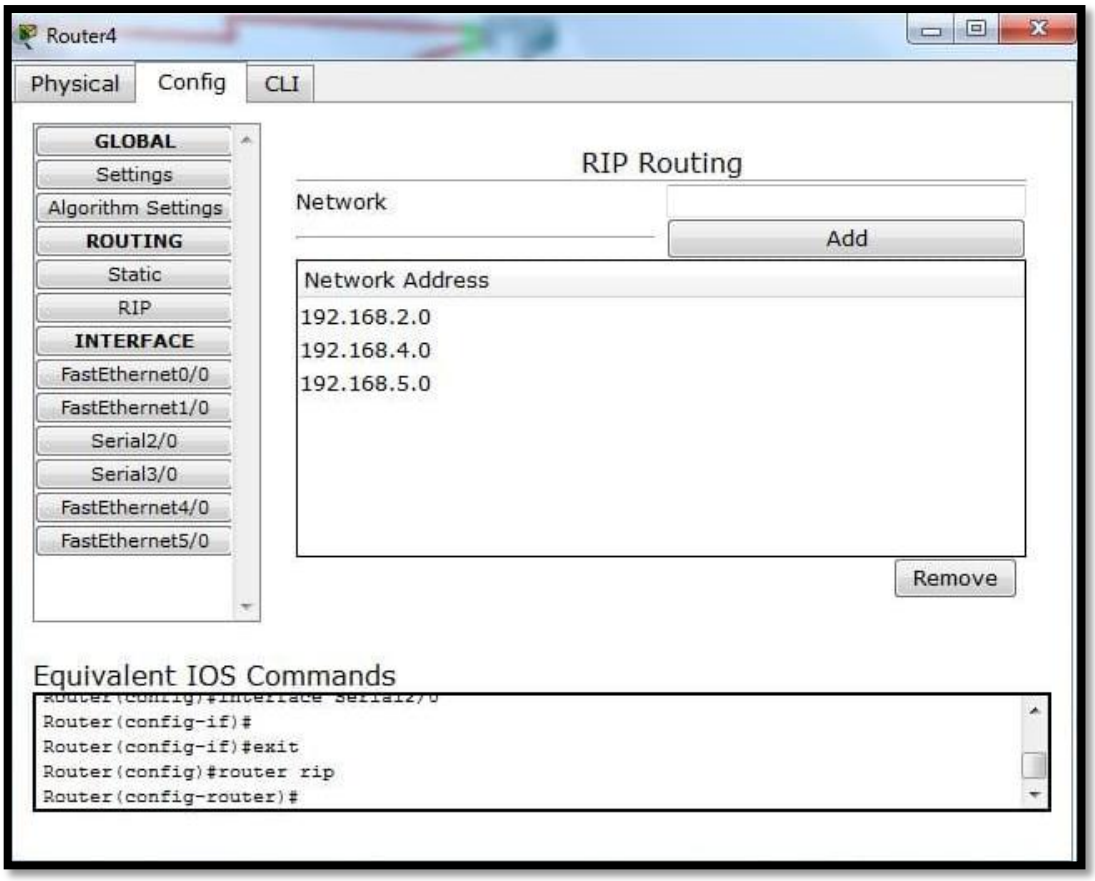
Step-3: Configure the serial port connections on each router by adding an IP address, subnet mask, assigning a clock rate, and enabling the ports.



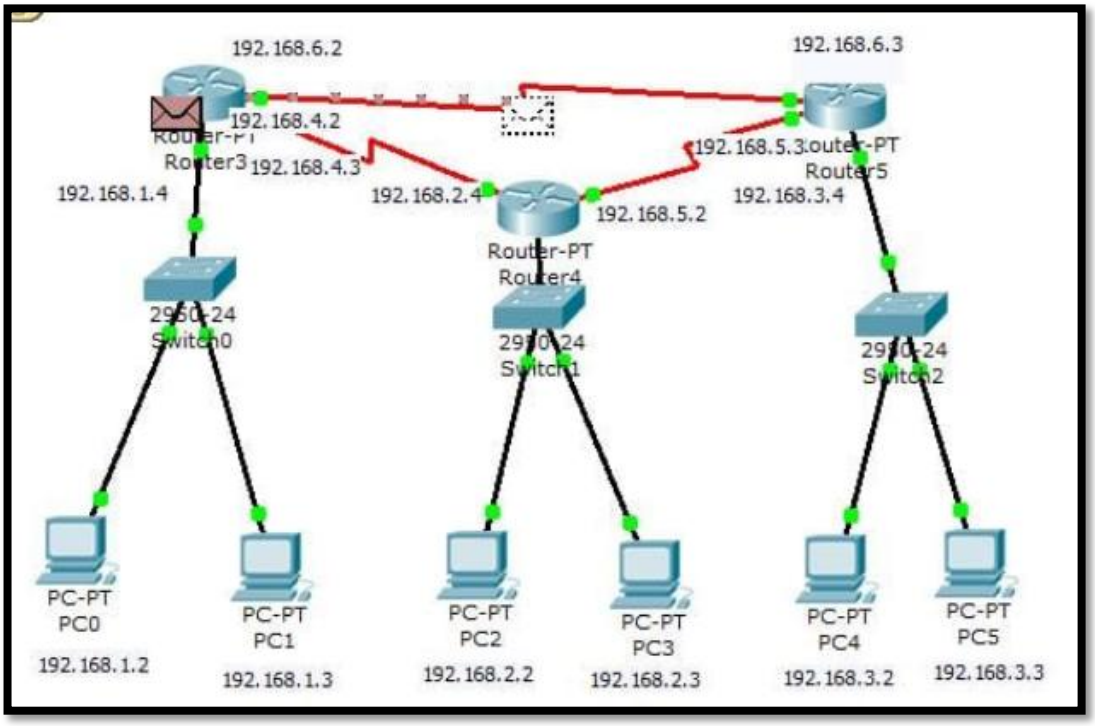
Step-4 : Configure IP address, subnet mask, and default gateway on each end device by going to their desktop IP configuration settings.



Step-5: Configure Routing Information Protocol (RIP) on each router by adding the network addresses of the connected routers and destination addresses where the packet needs to be forwarded.

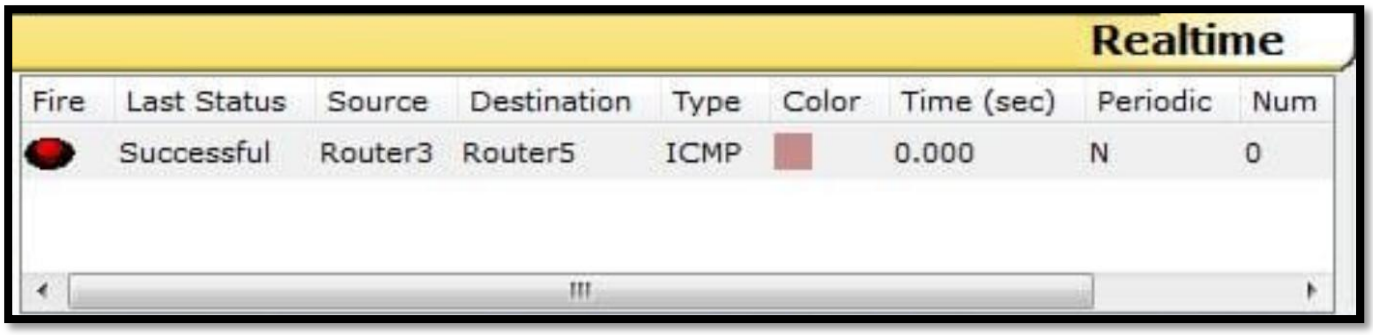


Step-6: When sending data from router 1 to router 3, the packet takes the shortest path instead of going through router 2 because of the configured RIP.



Result :

Packet was successfully transferred from router 1 to router 3 directly.

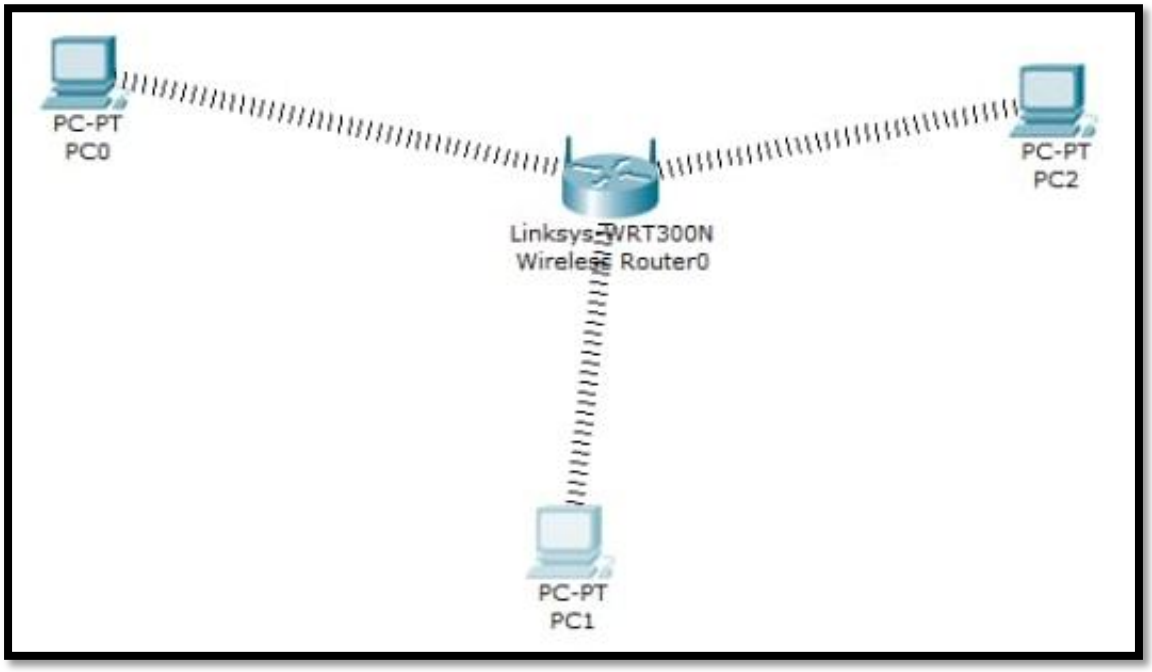


EXPERIMENT – 6

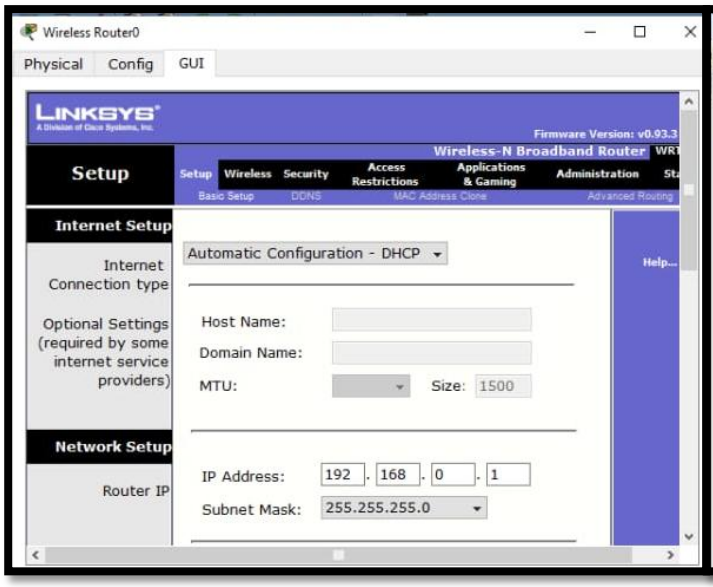
Aim: Configuring a wireless network using Cisco packet tracer

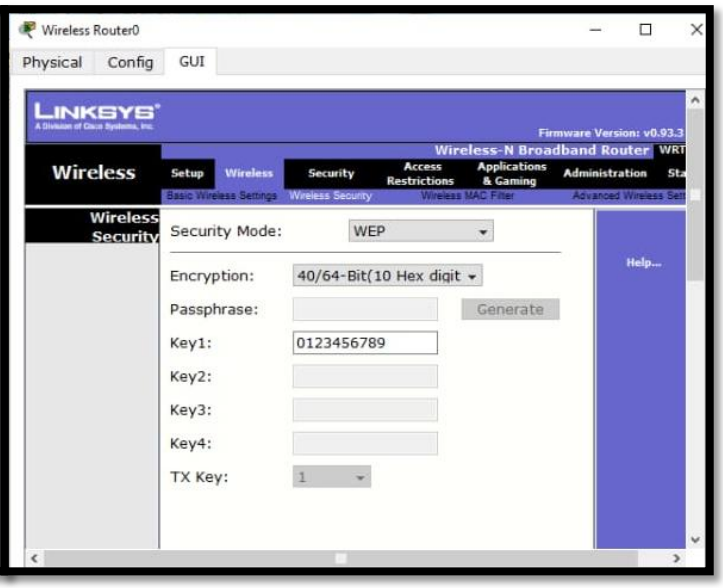
Steps:-

Step-1 : Pick a Linksys router from the components and connect two or three devices to be connected with it.

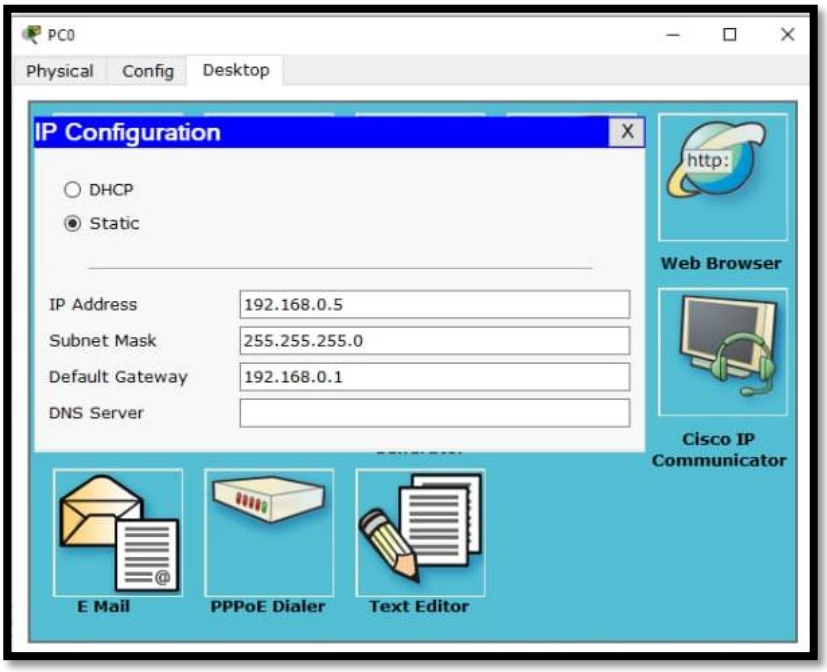


Step-2 : To configure the internet setup in the router, add the IP address, subnet mask, set up security for your router network, and establish a password key for your network.





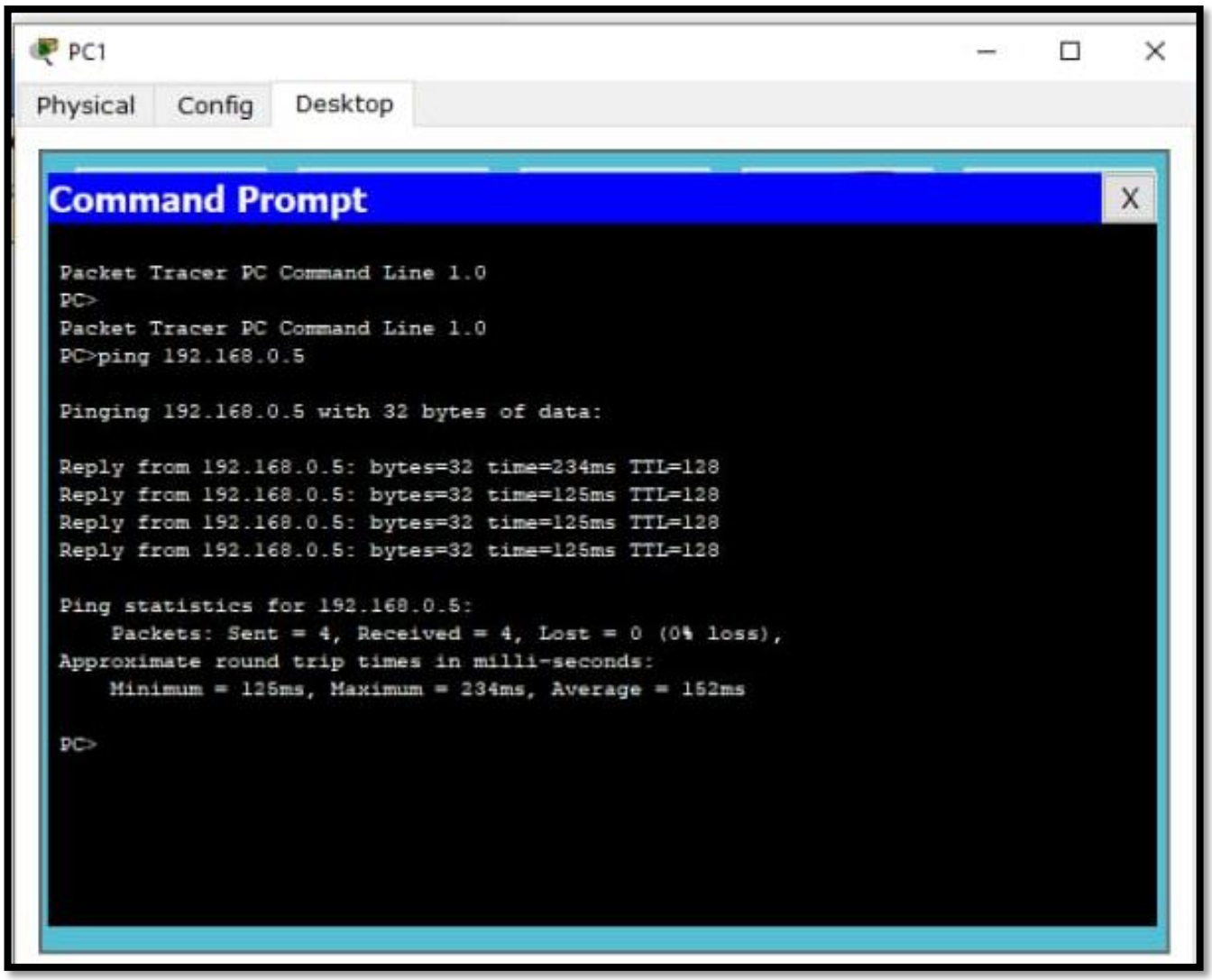
Step-3 : Set up the IP configuration as static in each PC, add the IP address, subnet mask, and default gateway.



Step-4 : Now, add the wireless network and its passphrase key to each PC or end device.

Result :

We will ping any device from any of the end devices to confirm that they are on the same wireless network.



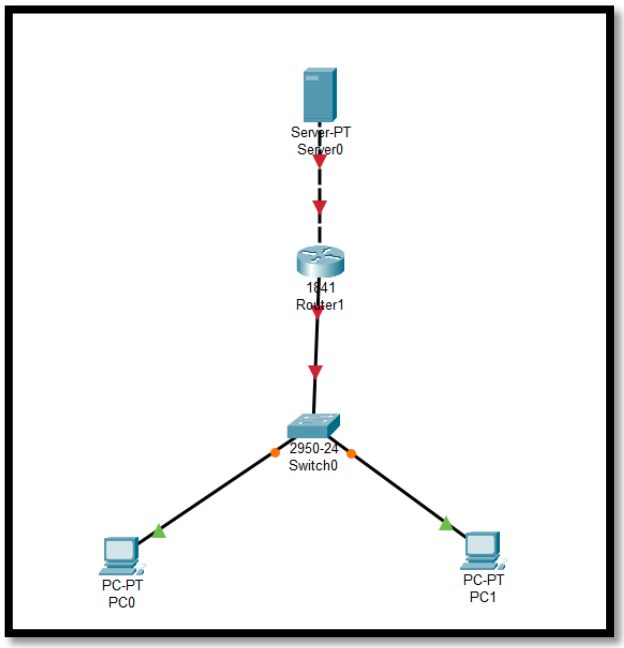
It is visible from the output, that devices are successfully connected on same wireless network.

EXPERIMENT – 7

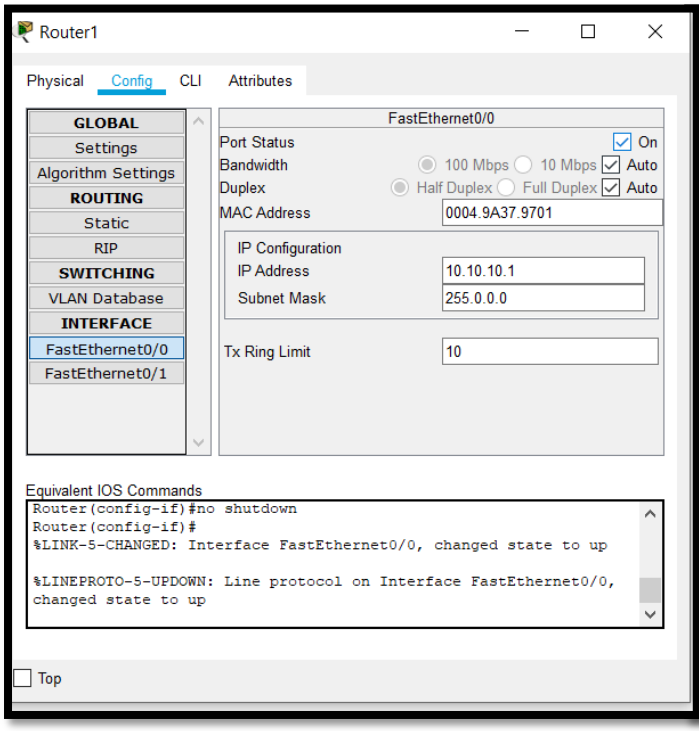
Aim: To configure and demonstrate FTP server on Cisco packet Tracer.

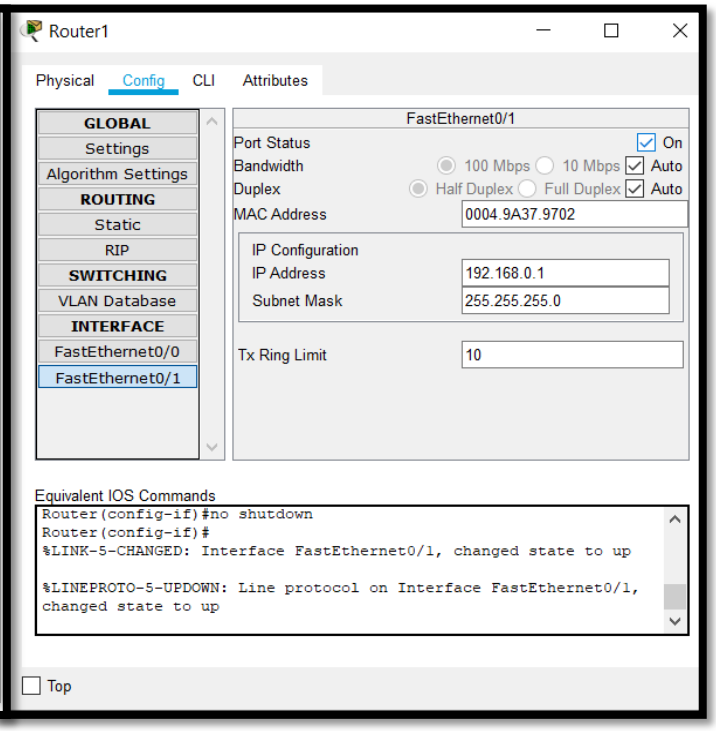
Steps:-

Step-1 : Connect and set up two end devices to a router, and subsequently connect that router to a server.

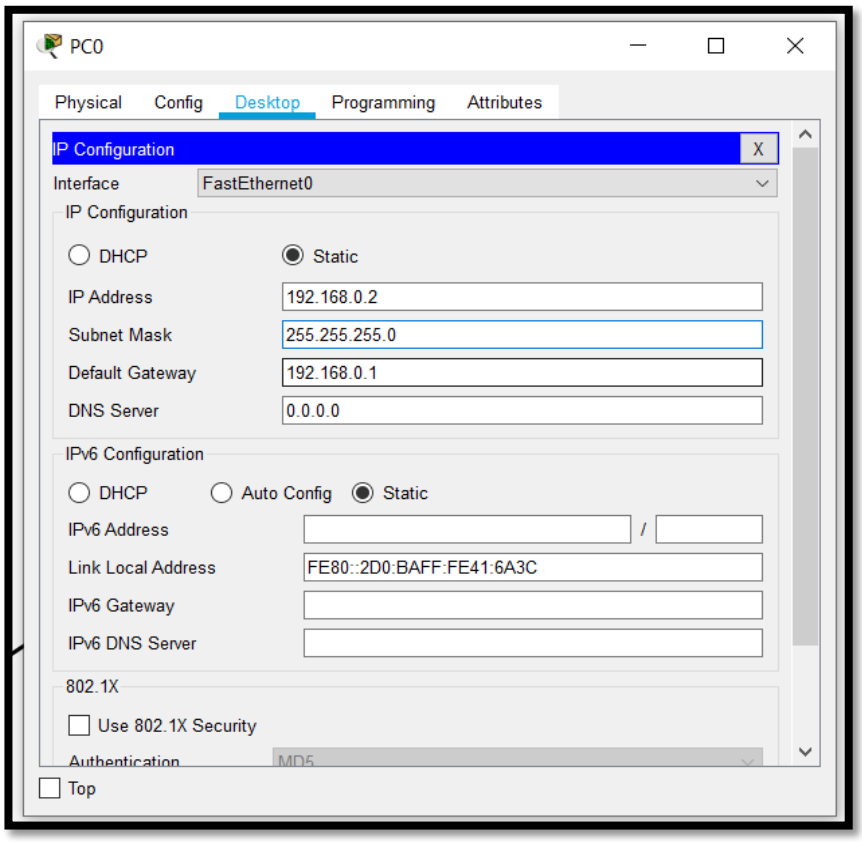


Step-2 : Configure the FastEthernet connection on both routers by adding IP addresses and subnet masks, and mark the port status as on.

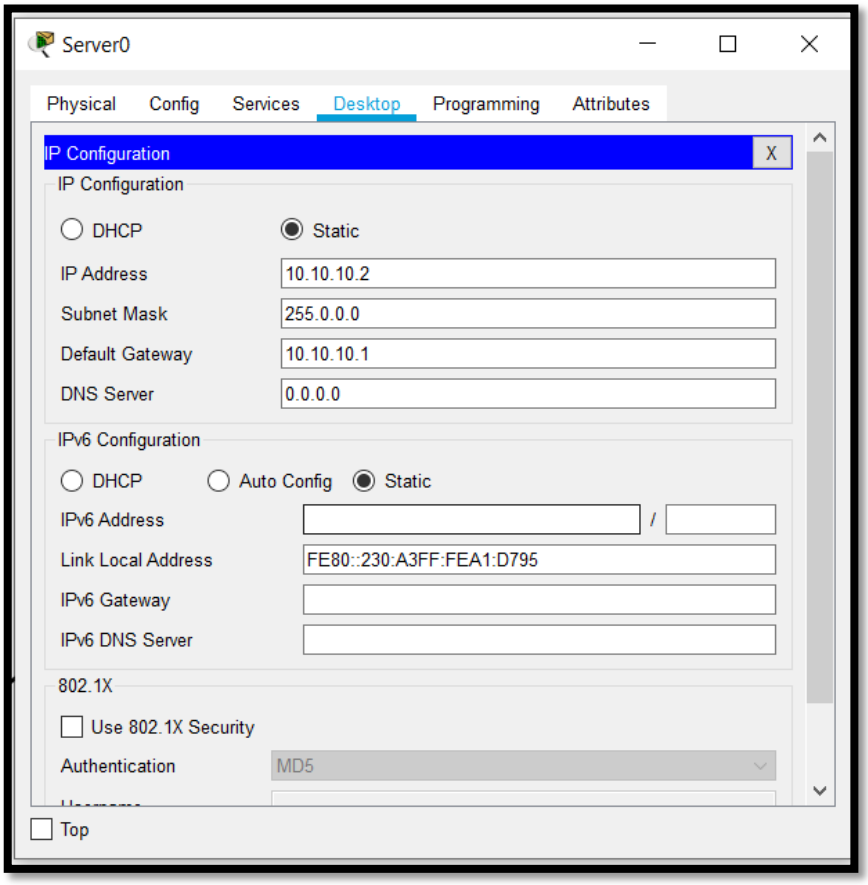




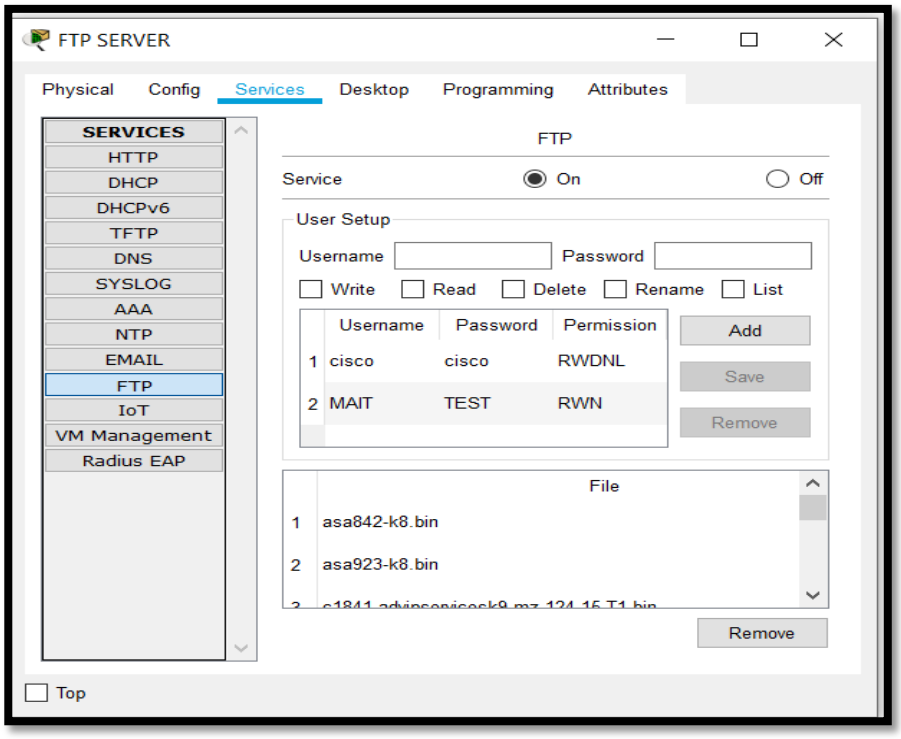
Step-3 : Set up and add static IP configuration in each **end device** by specifying the IP address, subnet mask, and default gateway.



Step-4 : Add the IP configuration in the **server** and desktop by specifying their respective IP address, subnet mask, and default gateway.



Step-5 : Now, in the server, go to services and enable the FTP server. Add a username and password, grant permissions for read and write access, and click on ‘ADD’.



Step-6 : Create a text file on one of the PCs, add some content, and save it.

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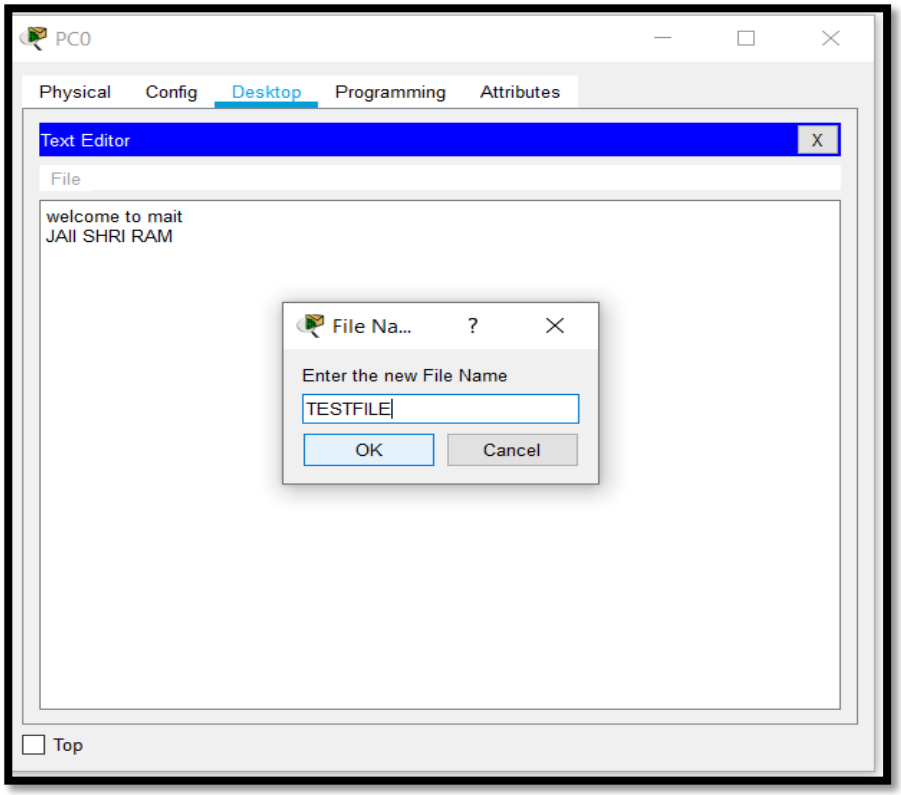
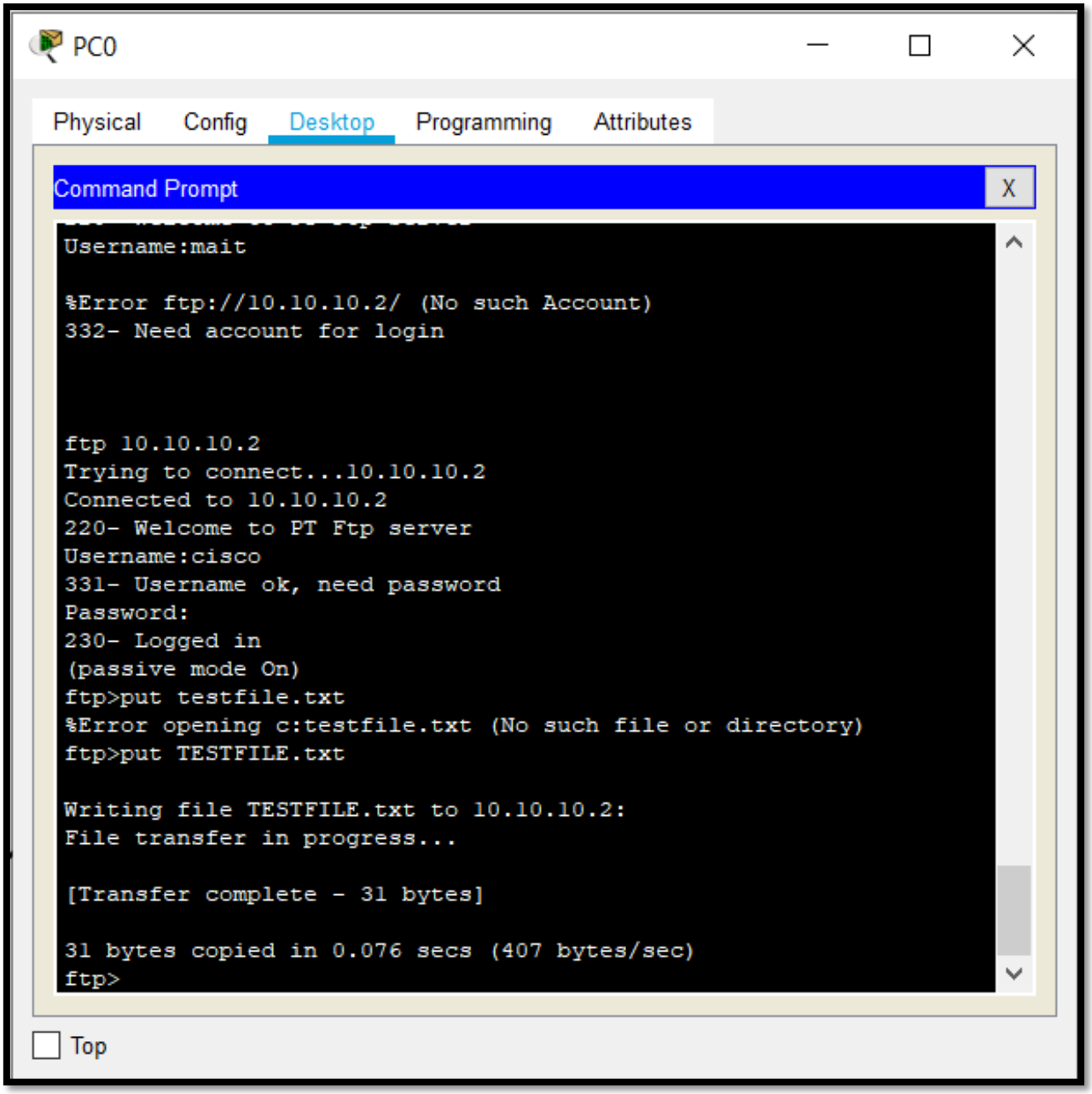


Step-7 : Open the command line on this PC and ping the server to confirm the connection between our end device and the server.

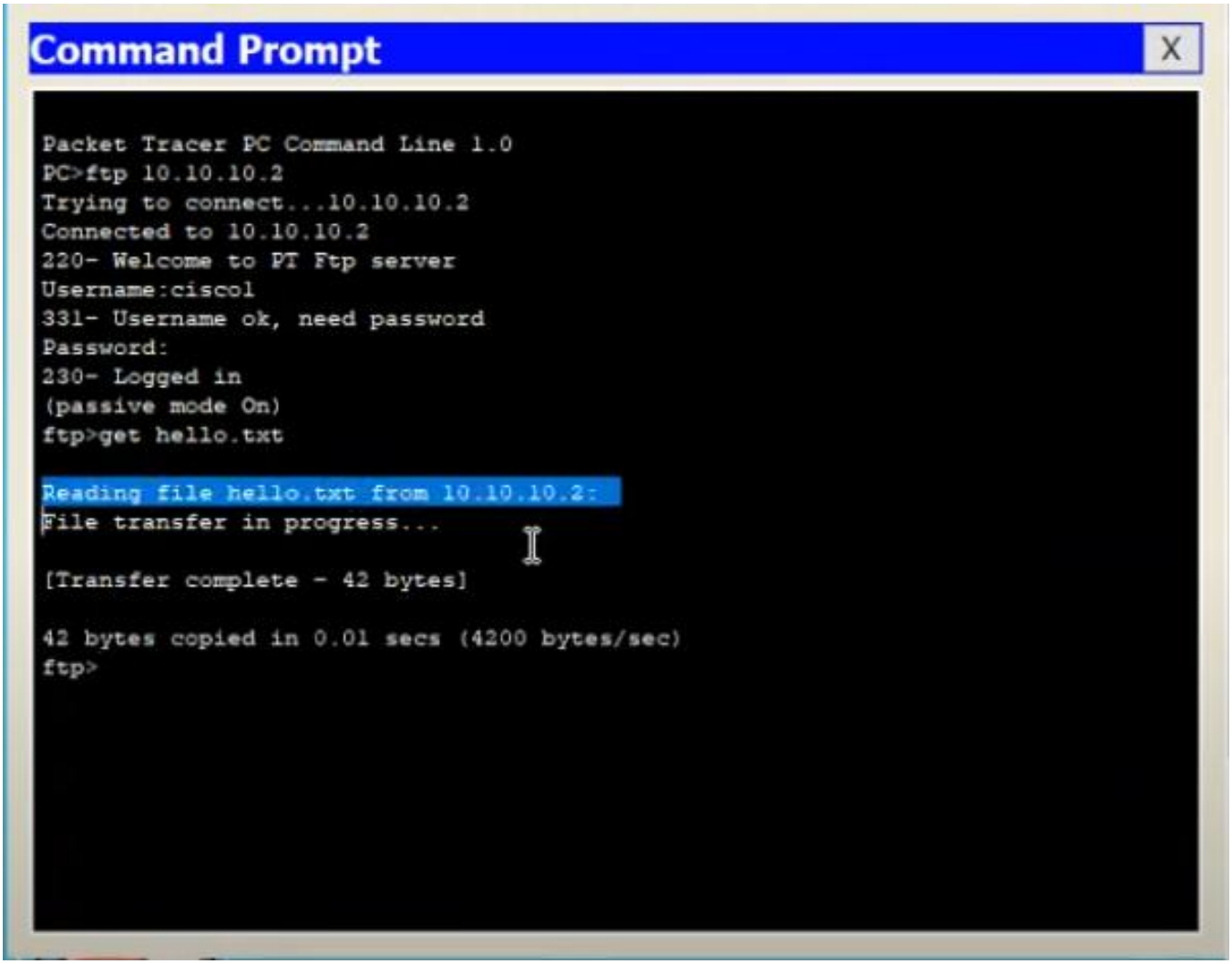
Step-8 : Now, type "ftp" and enter the username and password that you added to the server, followed by the "ftp <ip address of server>" command to establish an FTP connection with the server. Then, use the command "put <file-name>" to send and save this file to the server.



Step-9 : Now, on another PC, ping the server's IP address and establish an FTP connection with the server by typing "ftp" and adding the username and password. Afterward, on this PC, type "get <file-name>" and press enter to receive the file that you sent from the first PC..

Result :

FTP server has been setup and configured.Requested file is succesfully downloaded from the server

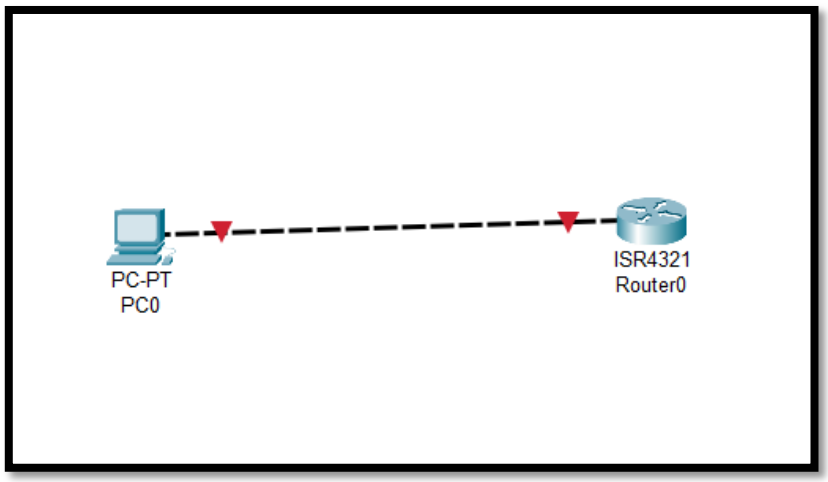


EXPERIMENT – 8

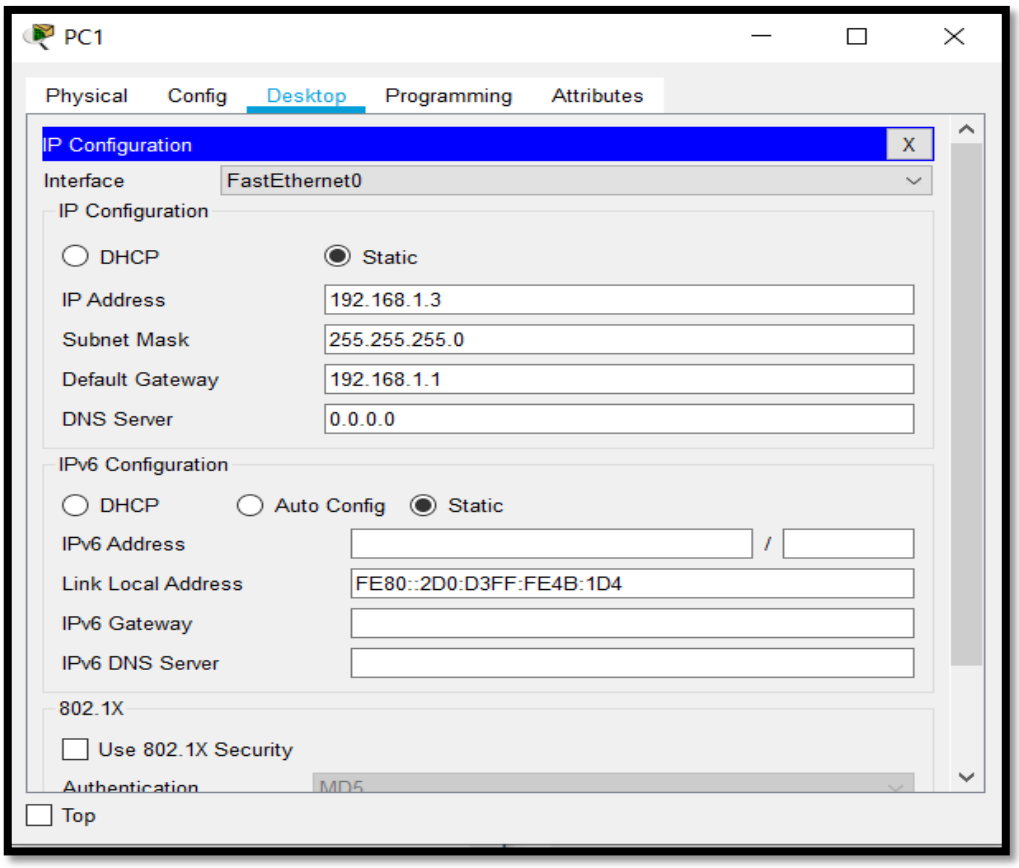
Aim: To configure Telnet configuration in Cisco packet tracer

Steps:-

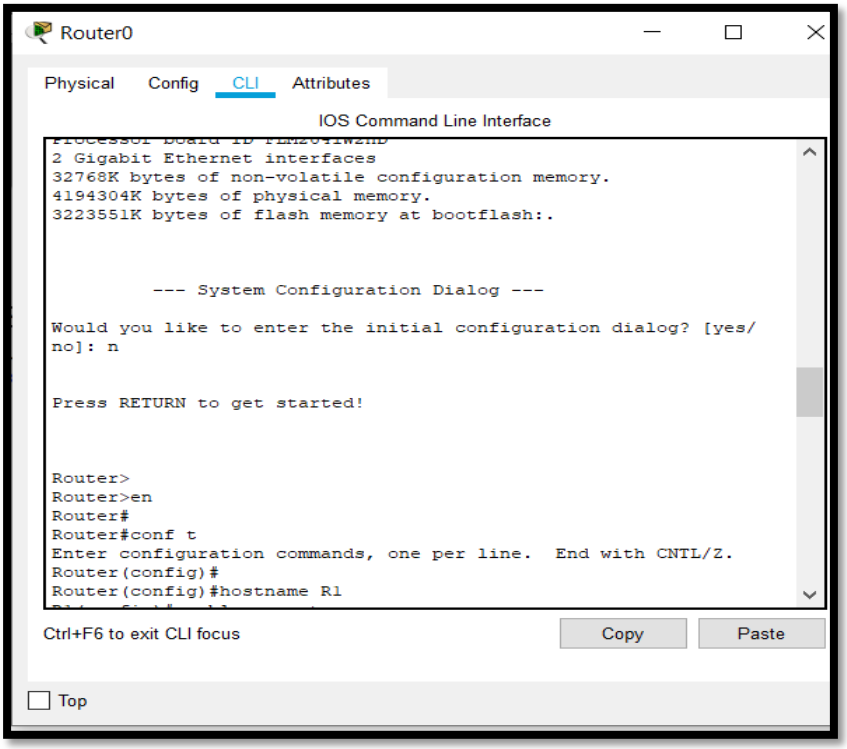
Step-1 : Take a router and an end device . Connect them using automatically choose connection type.



Step-2 : Add the IP configuration of the PC, including its IP address, default gateway, and subnet mask.

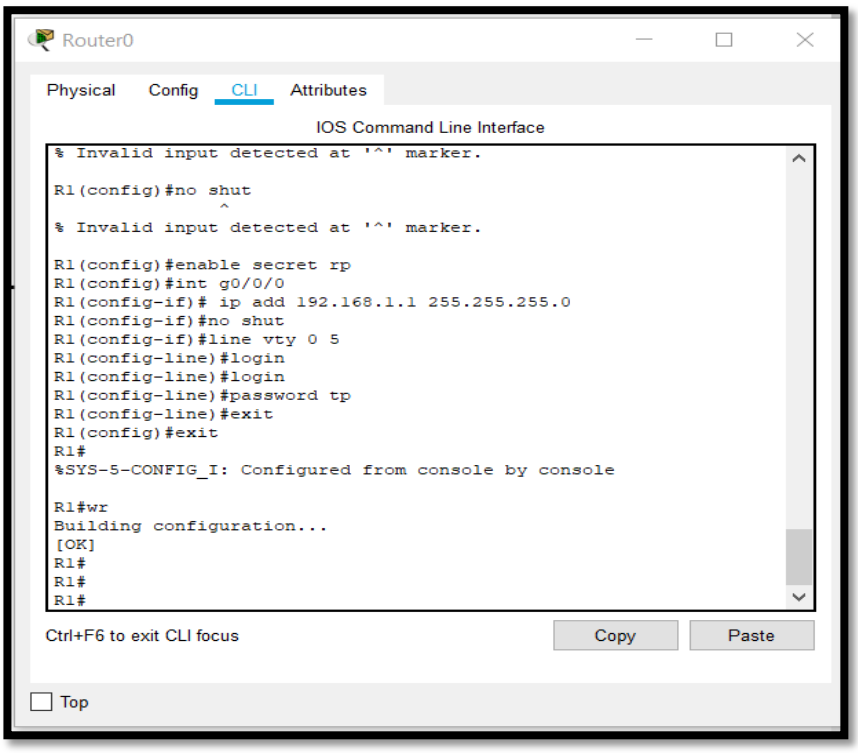


Step-3 : Double-click IS4321 Router0 to open the CLI prompt and type No to skip the initial configuration and press Enter.

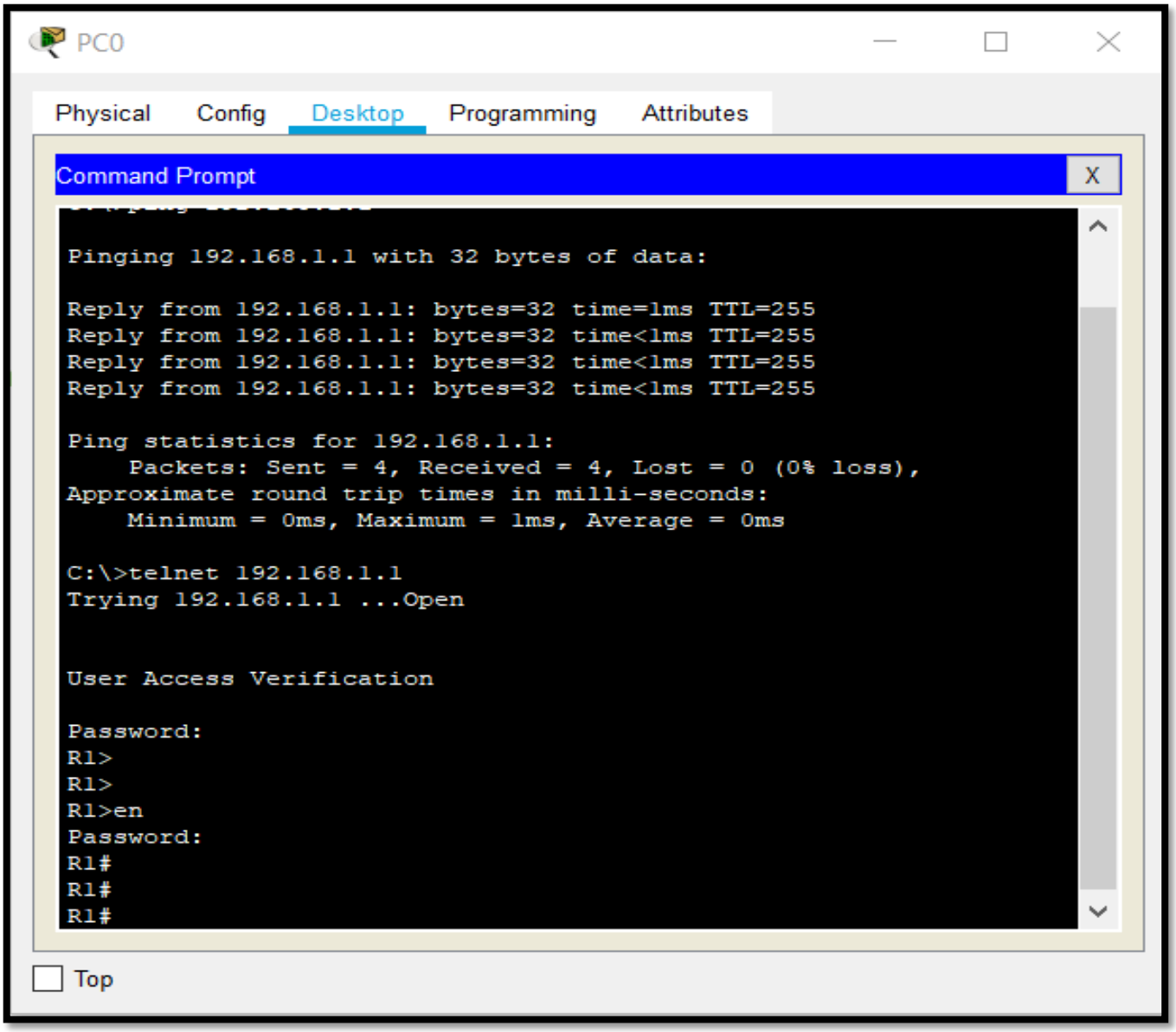


Step-4 : Set privileged mode password to Cisco and enable telnet lines on router, by executing the following commands in order.

```
Router(config)#enable password cisco
Router(config)#line vty 0 15
Router(config-line)#password cisco
Router(config-line)#login
```



Step-5 : Test telnet connection via your PC. Now, on the PC, navigate to the command prompt located on the desktop. From there, ping the IP address of the router to verify if the connection has been established. Afterward, type 'telnet <IP address>' to establish a telnet connection. Next, enter the password that you set up during the router configuration process. Once you have entered the user mode successfully, type 'en' to switch to privilege mode. Enter the privilege mode password, and you will then have access to the privilege mode.



Result :

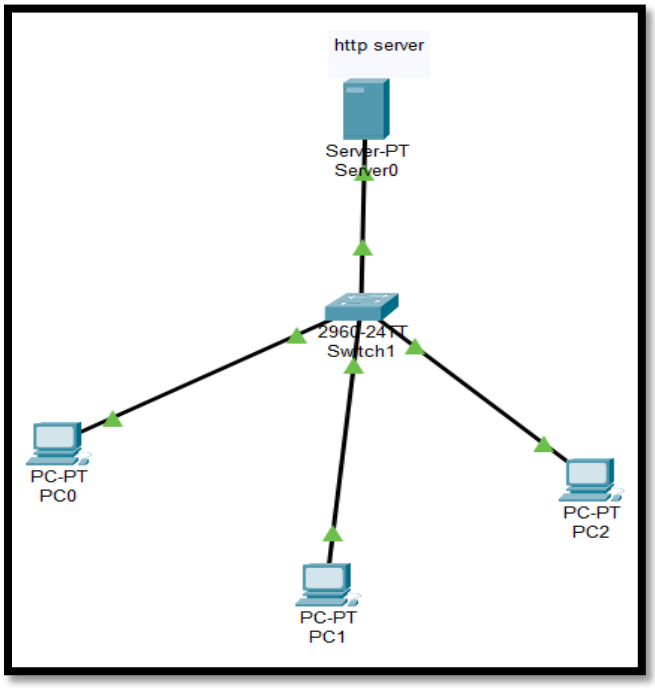
Hence, the Telnet protocol has been set up between the router and a computer.

EXPERIMENT – 9

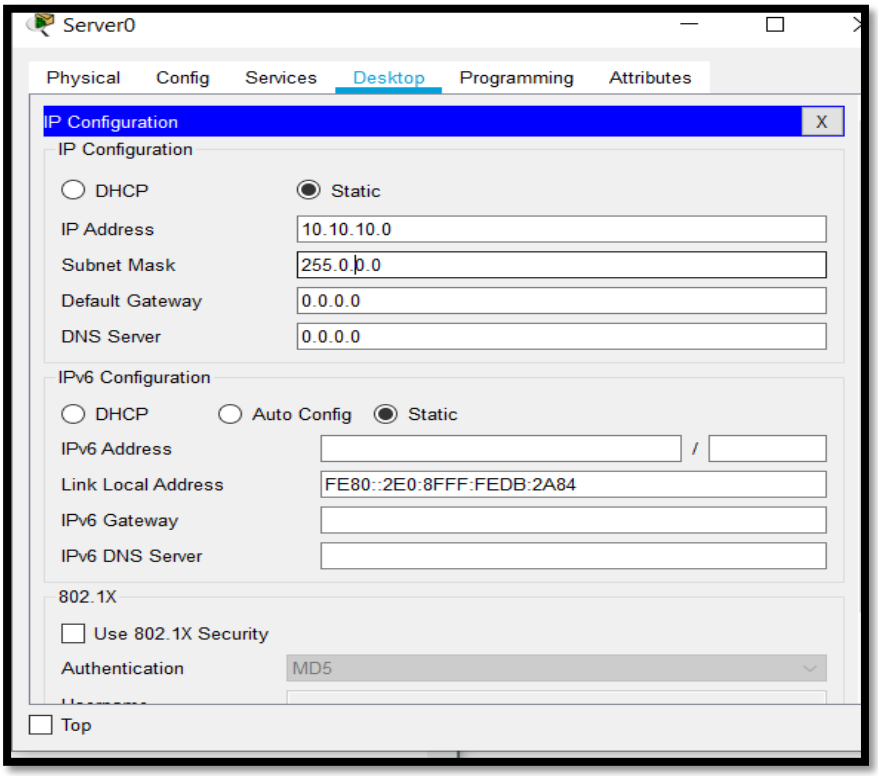
Aim: To configure and implement HTTP protocol in Cisco packet tracer

Steps:-

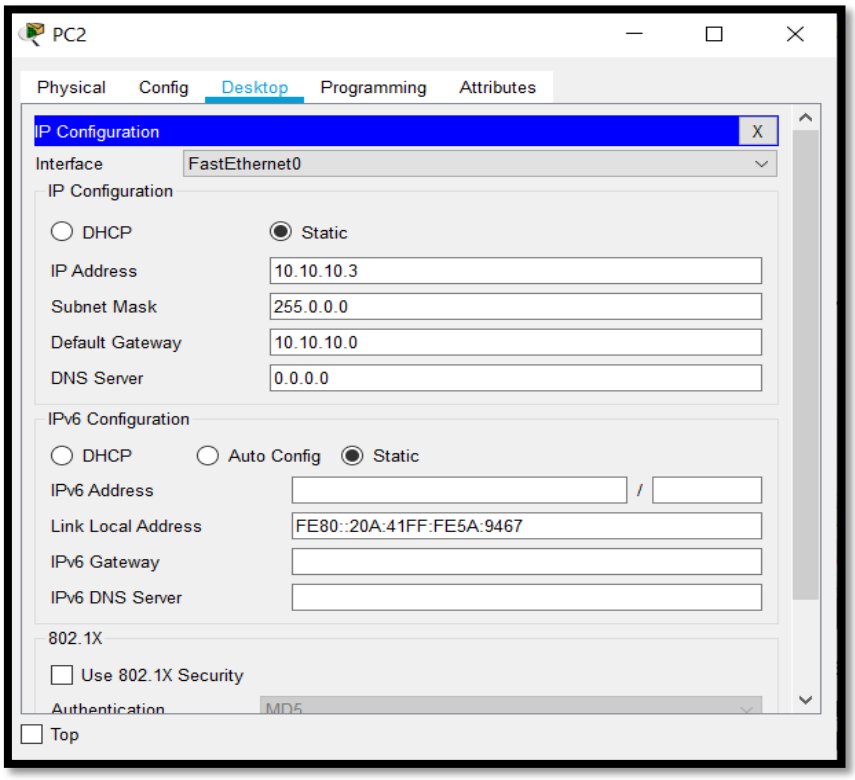
Step-1 : We will be using a few PCs, one web server, and one switch to connect all the devices. Please ensure that all devices are connected using straight-through cables since they are required for connecting different devices. Assign IP addresses to each end device (server and PCs) within a single network (192.168.1.0) with a subnet mask of 255.255.255.0. The specific IP addresses can vary based on your preference.



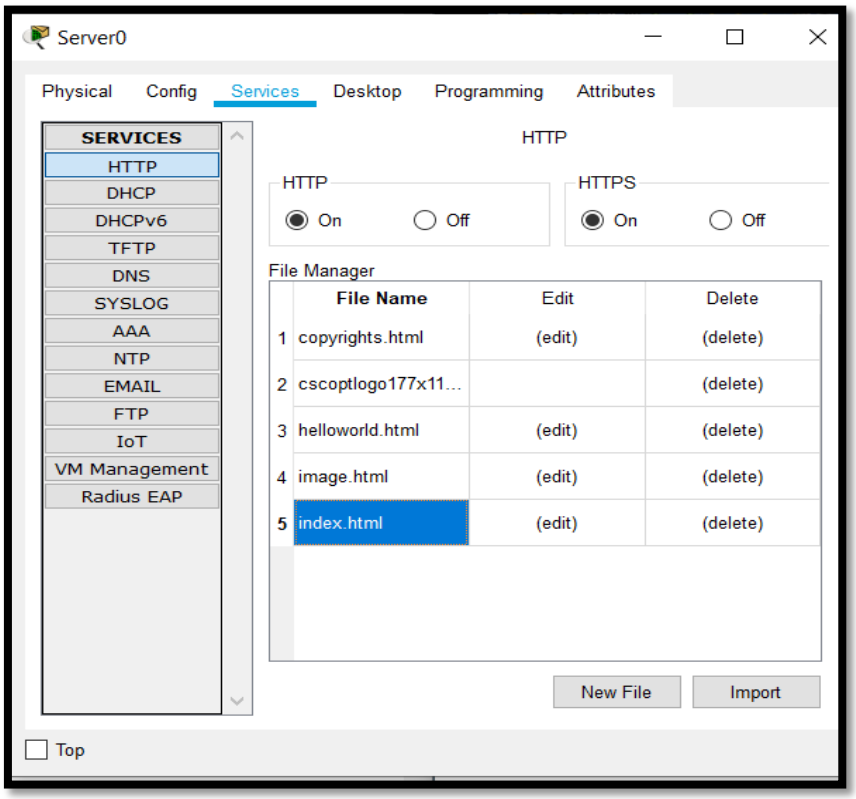
Step-2 : Add and set up the IP configuration of the server by adding the IP address and subnet mask in the desktop.



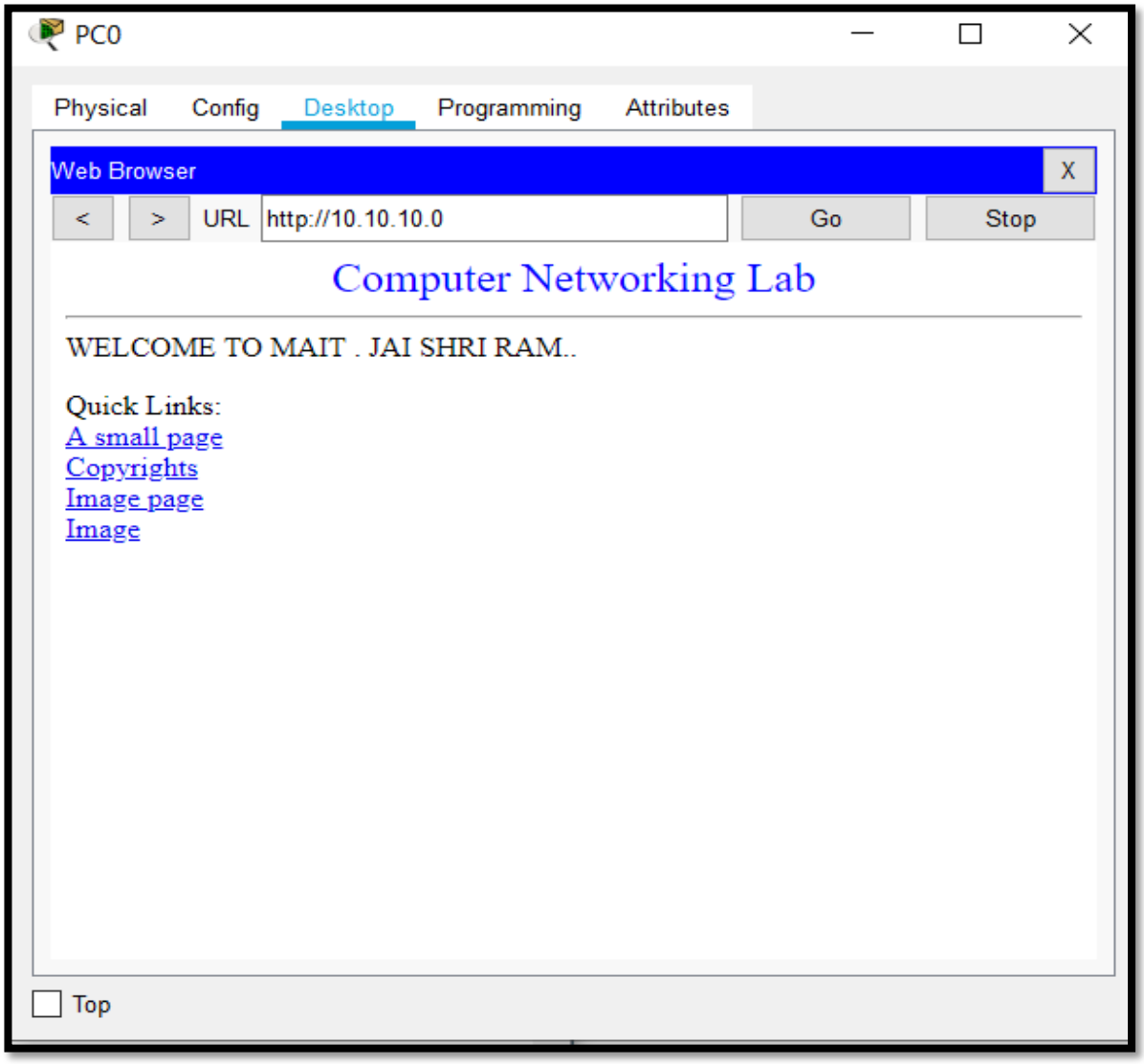
Step-3 : Add the static IP configuration of each PC in the desktop. Include the IP address, subnet mask, and default gateway for each PC.



Step-4 : Now, navigate to the server, go to Services, and enable the HTTP service while disabling the TFTP service. If desired, you can modify the index.html file according to your preferences and save the changes.



Step-5 : Select any PC that is connected to the server, then navigate to the desktop and open a web browser. Type the IP address of the server into the web browser's address bar.



Result :

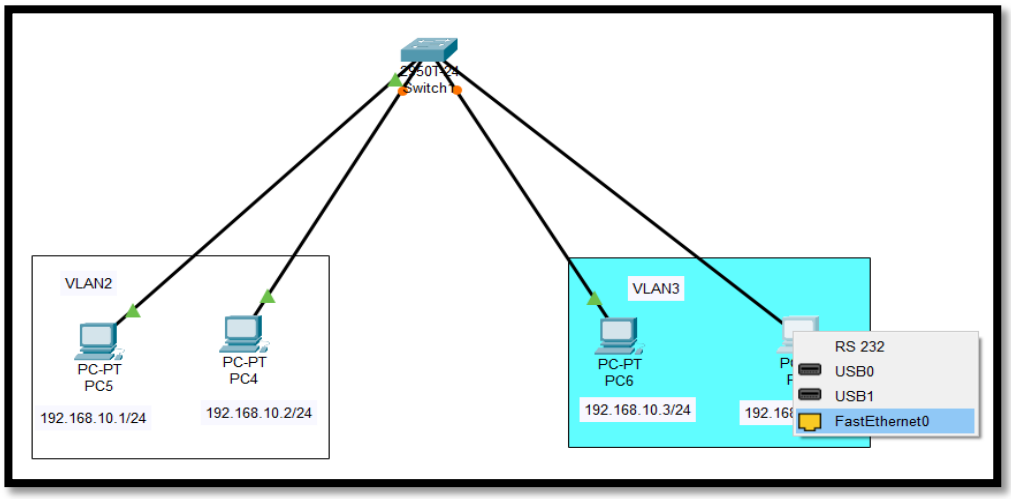
After entering the server's IP address, we are able to see the web page that was created on the server displayed on the client PC. Therefore, confirming the establishment of the HTTP protocol.

EXPERIMENT – 10

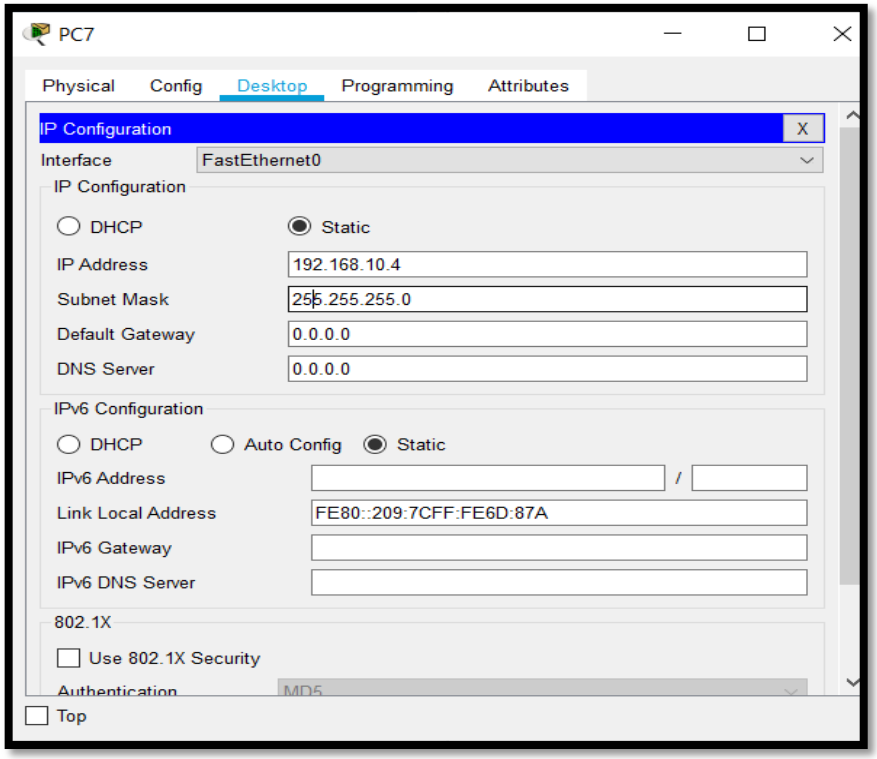
Aim: To configure and implement VLAN (Virtual Local Area Network) in Cisco packet tracer

Steps:-

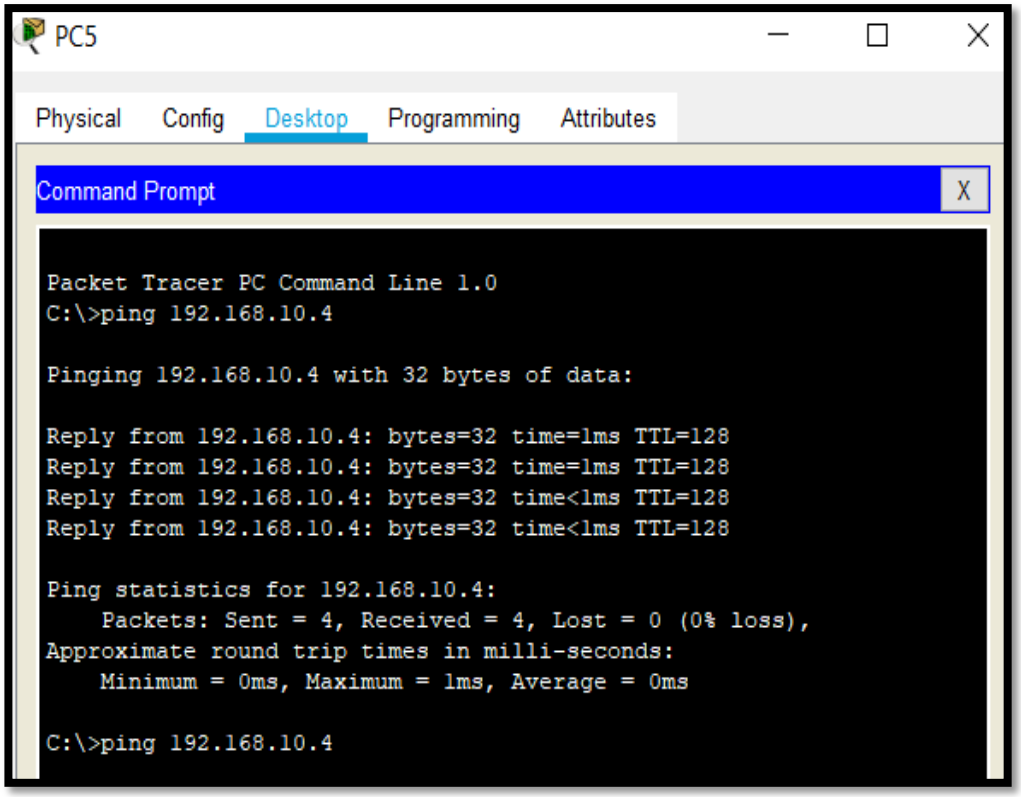
Step-1 : Add a switch and connect it to 3-4 end devices using Fast Ethernet. Arrange the end devices in such a way that some are grouped together while others are placed in a separate group.



Step-2 : Set IP configuration for each PC in Desktop Option. Add IP address, Subnet mask and Default Gateway for each.

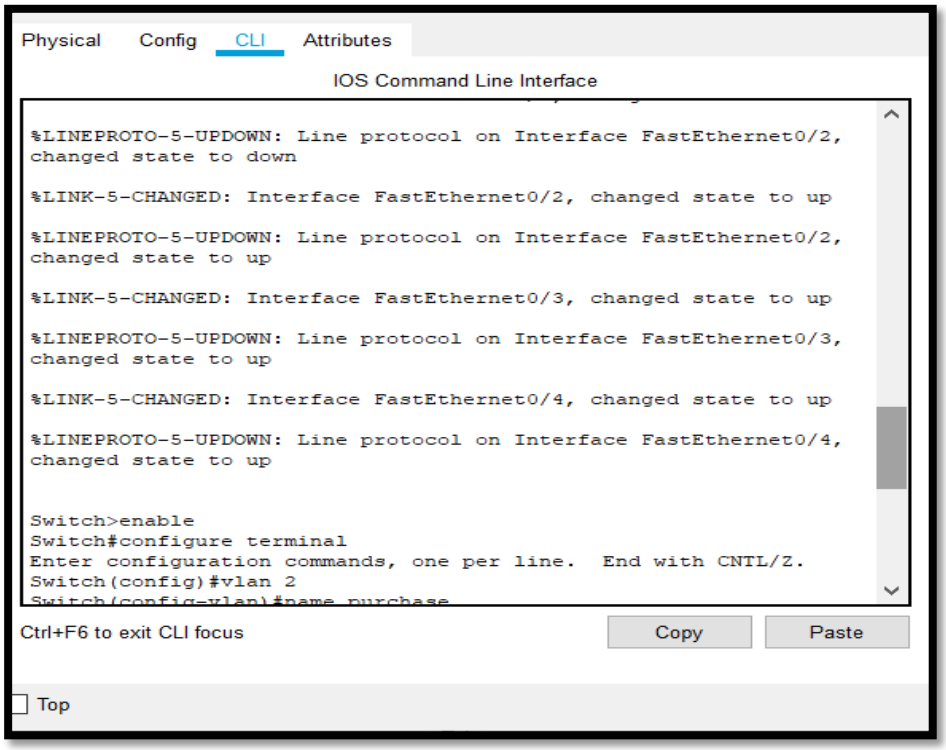


Step-3 : Attempt to ping one device from another by typing 'ping <IP address of the device>'.

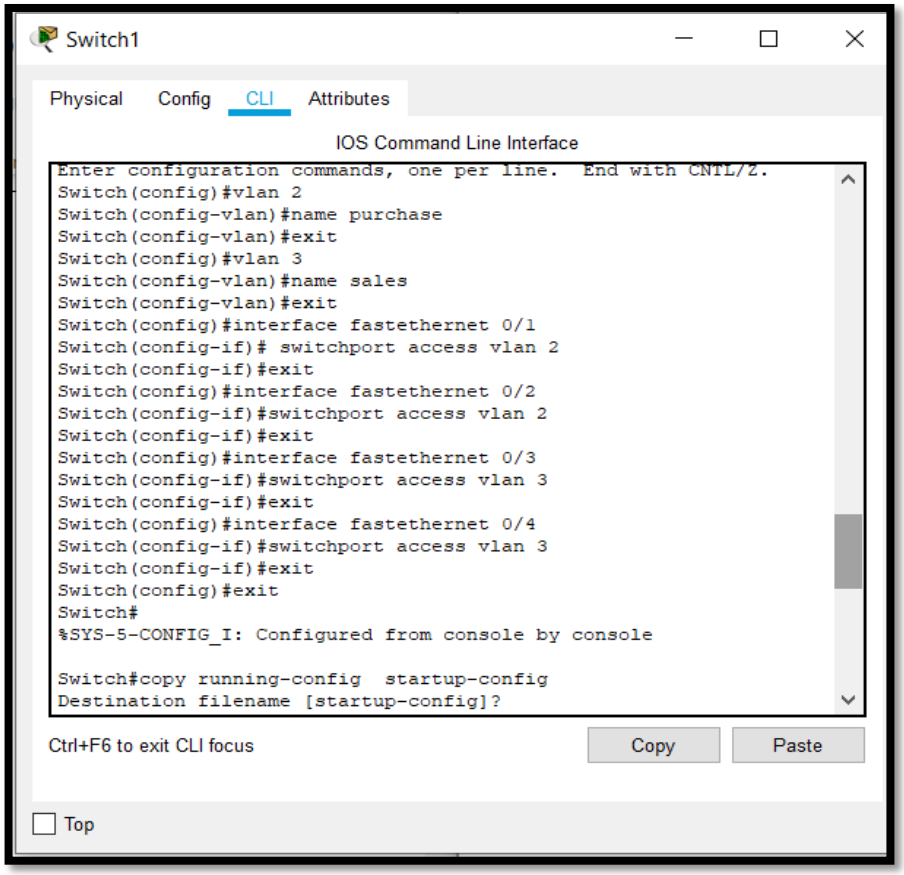


As you can see the these devices are connected to each other and can successfully send a package to each other .

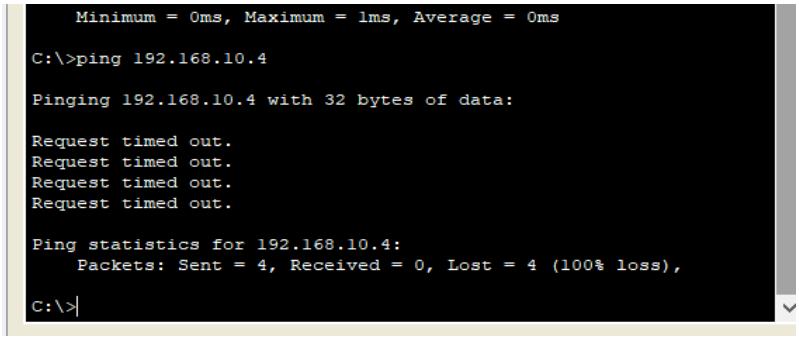
Step-4 : Navigate to the switch's CLI (Command Line Interface), type 'enable' and press Enter. After that, type 'configure terminal' and press Enter to enter the configuration mode.



Step-5 : Now, we need to virtually divide our end devices into two or more LAN connections. Let's consider VLAN 2 and VLAN 3 for this purpose. To accomplish this, type 'vlan 2' and provide a name for the LAN. Next, add all the desired Fast Ethernet interfaces to this LAN by typing 'interface fastethernet 0/port-number' and then 'switchport access VLAN <LAN number>'. Repeat these steps for all the end devices. Once done, type 'exit' and press Enter.



Step-6 : Now, attempt to send packets or ping a device from one virtual LAN to another. For example, try pinging from Device 1 to Device 4.



Result :

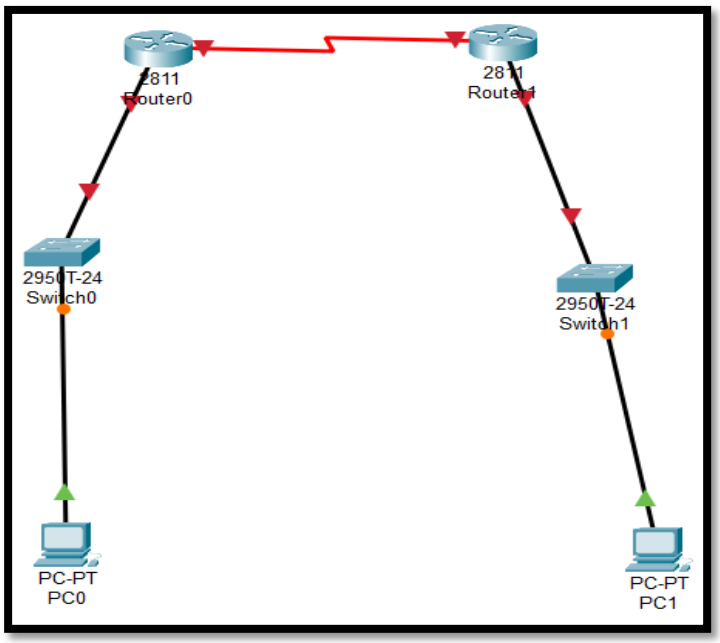
As you can see, the attempt to send a packet has failed, indicating that we have successfully achieved logical separation of these devices using VLANs. Some devices are connected to VLAN 2, while others are in VLAN 3. Despite being connected to the same switch, they are unable to ping devices in a different LAN.

EXPERIMENT – 11

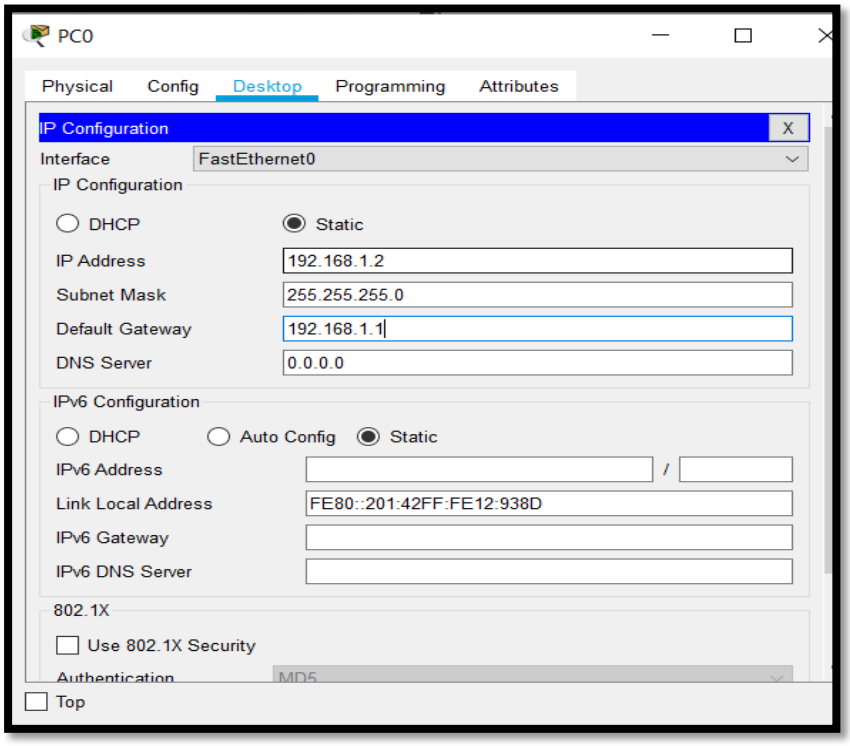
Aim: To configure and demonstrate EIGRP routing protocol in cisco packet tracer .

Steps:-

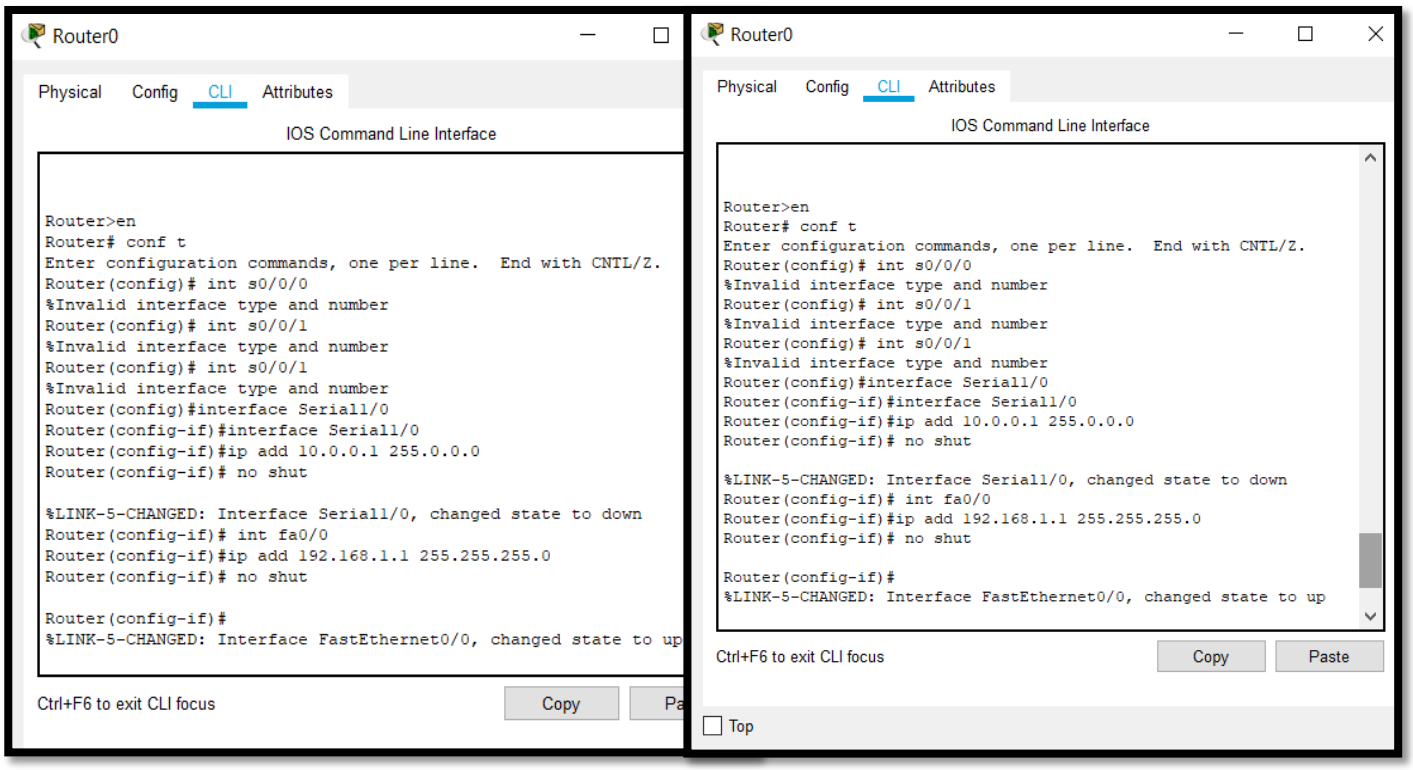
Step-1 : Connect two routers using serial ports. Then, connect 1-2 end devices to each router using a switch.



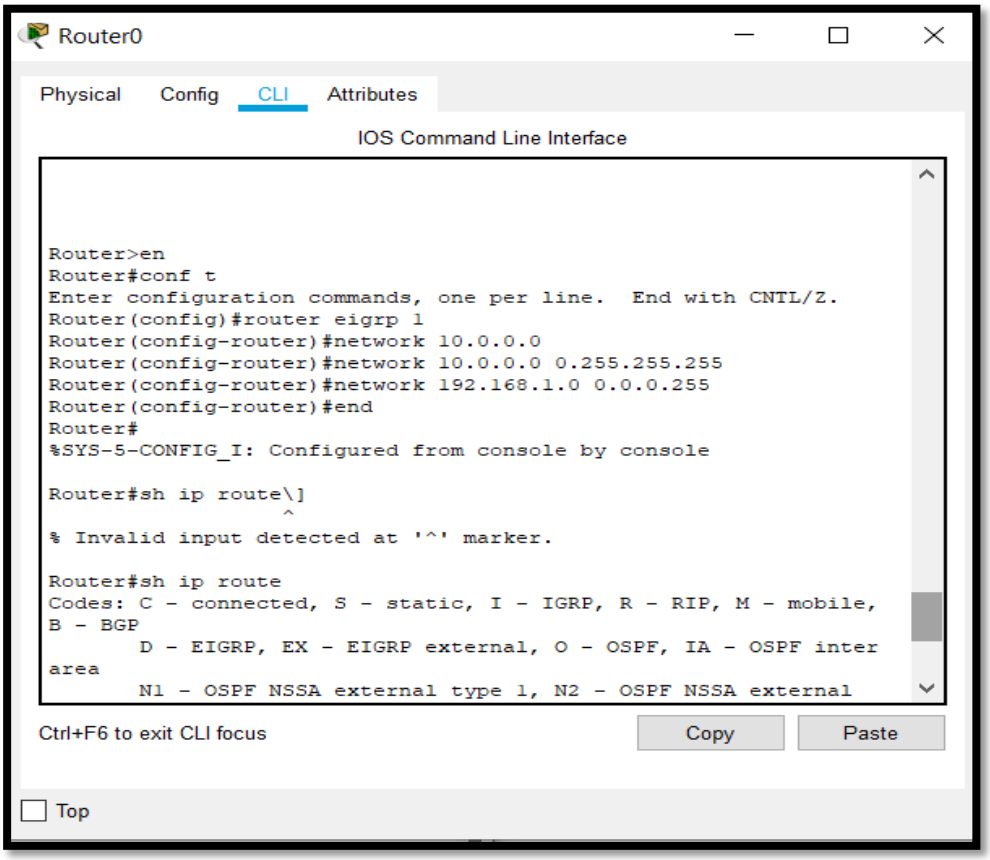
Step-2 : Set IP configuration for each PC in Desktop Option. Add IP address, Subnet mask and Default Gateway for each.



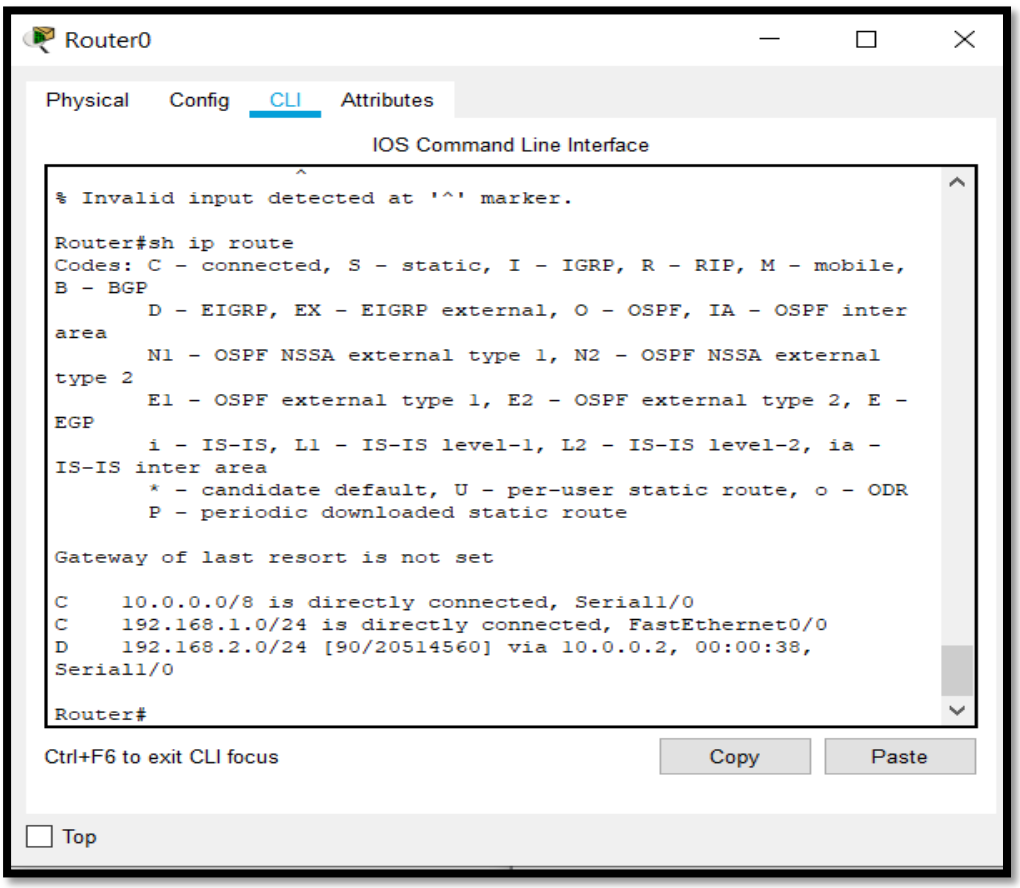
Step-3 : Navigate to the router's CLI, type 'en' followed by 'conf t' and press Enter to enter the configuration mode. Then, type 'interface serial1/0' to set up the serial port, assign an IP address and subnet mask, and finally, type 'no shut' to enable the interface. Set up the Fast Ethernet port on the router by typing 'int fa0/0', followed by adding the IP address and subnet mask. Then, type 'no shut' and press Enter to enable the interface. Perform these steps on both routers.



Step-4 : Now, once again, navigate to the router's CLI. Enter the configuration mode by typing 'conf t' and pressing Enter. Then, type 'router eigrp <router-number>' and press Enter. Add the IP addresses and subnet masks of the networks you wish to connect via EIGRP. Repeat the same steps for the other router and type 'end' to exit the router.

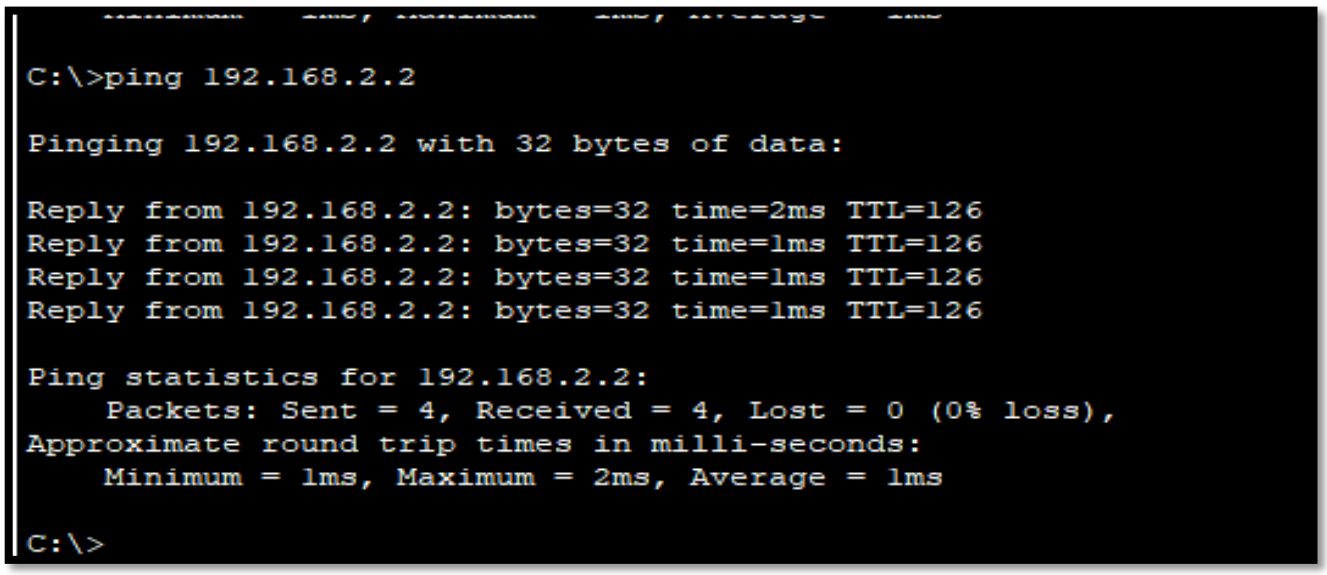


Step-5 : Navigate to Router 1 and type 'sh ip router'. You will observe the label 'D' indicating a successful EIGRP connection, confirming that it is connected via EIGRP.



Result :

After navigating to one of the end devices, attempt to ping another device. You will observe that the packets are successfully transferred, indicating a successful EIGRP protocol connection.

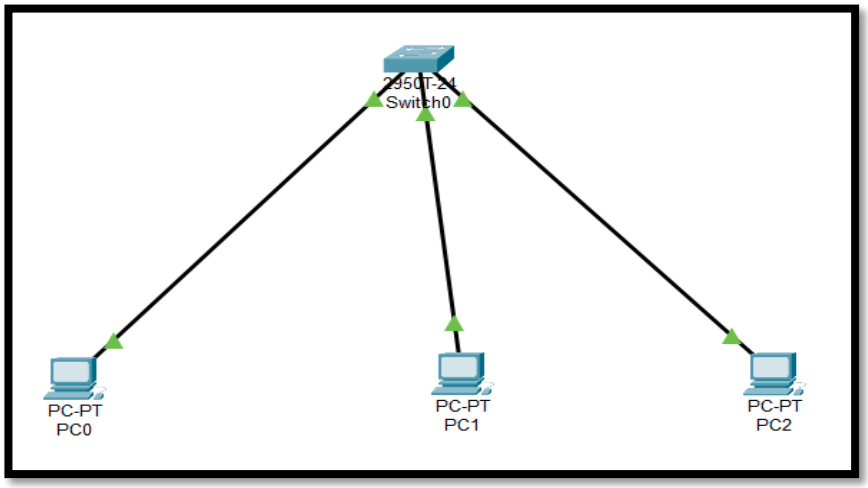


EXPERIMENT – 12

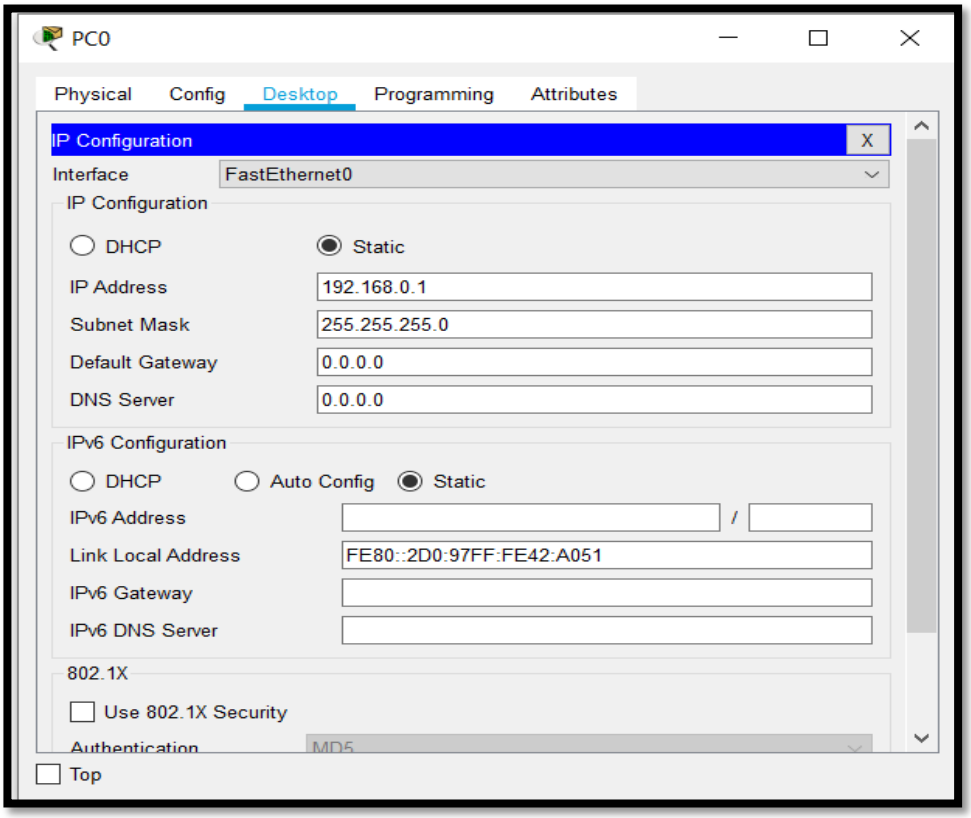
Aim: to configure and demonstrate the Address Resolution Protocol (ARP) on Cisco Packet Tracer.

Steps:-

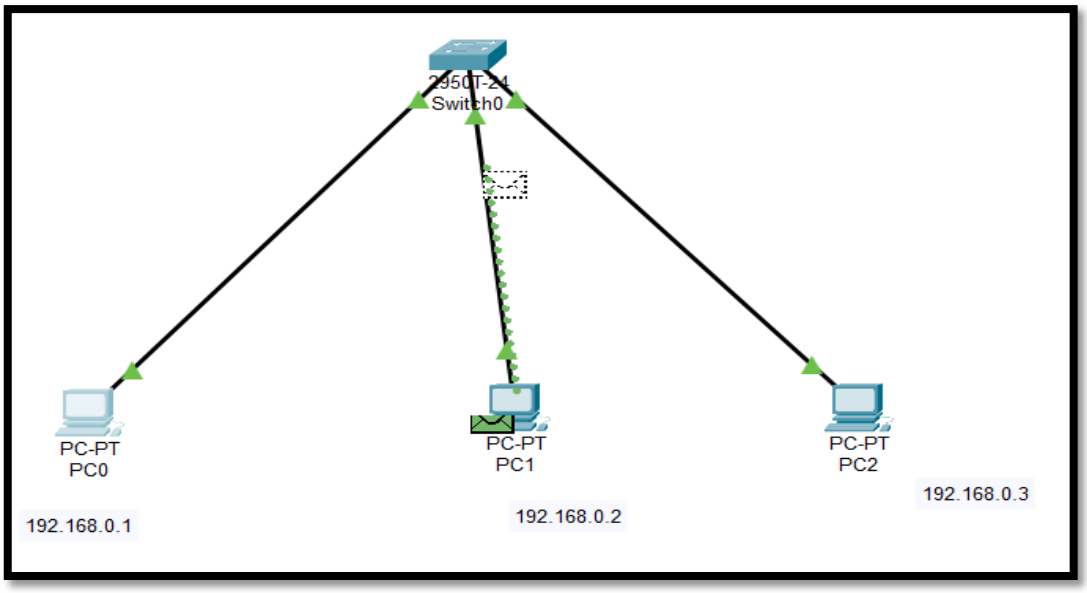
Step-1 : Select a 2950T switch and connect 2-3 end devices to it.



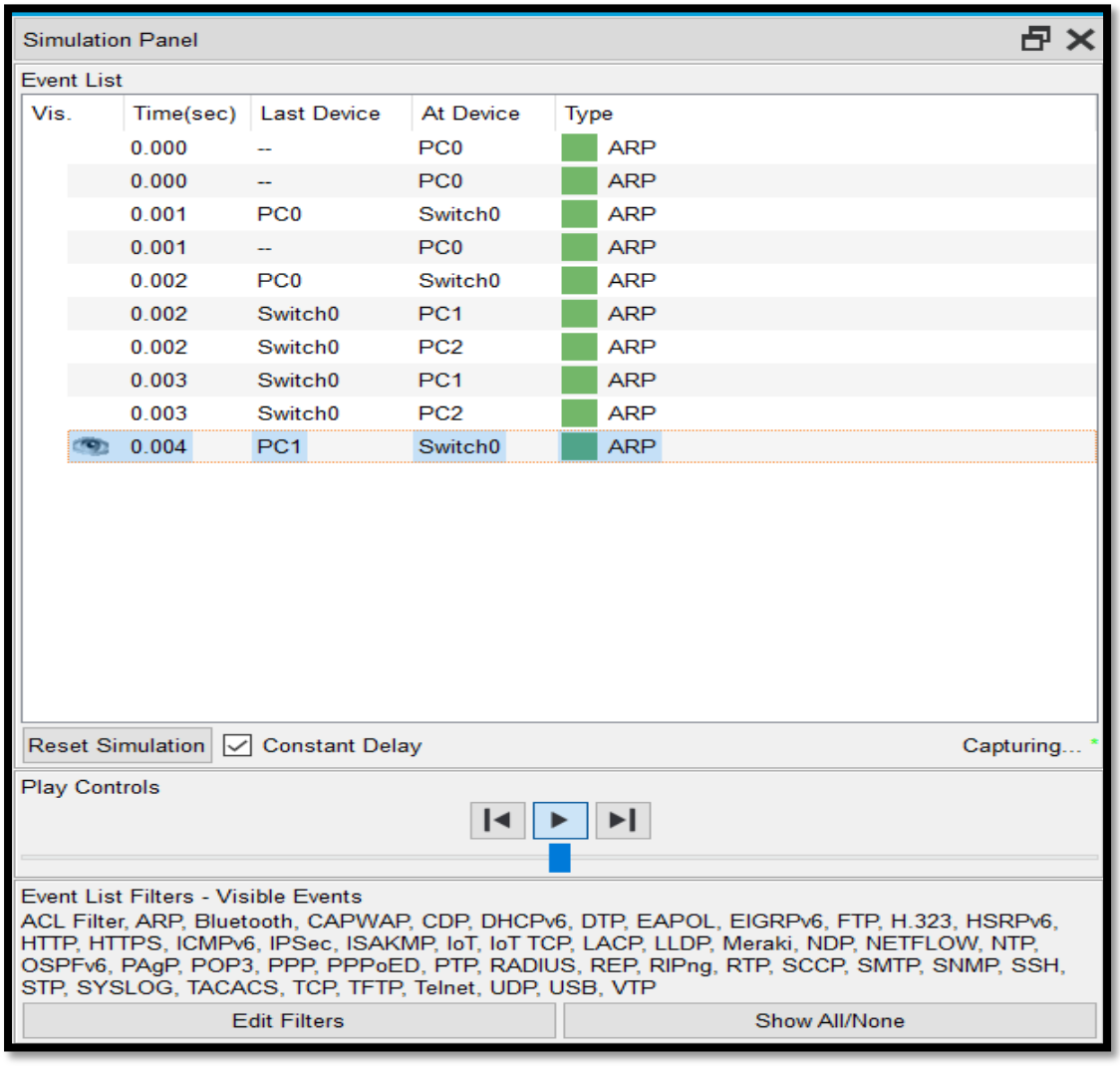
Step-2 : Set IP configuration for each PC in Desktop Option. Add IP address, Subnet mask and Default Gateway for each.



Step-3 : Now, open the simulation mode and attempt to ping another device from one of the devices.

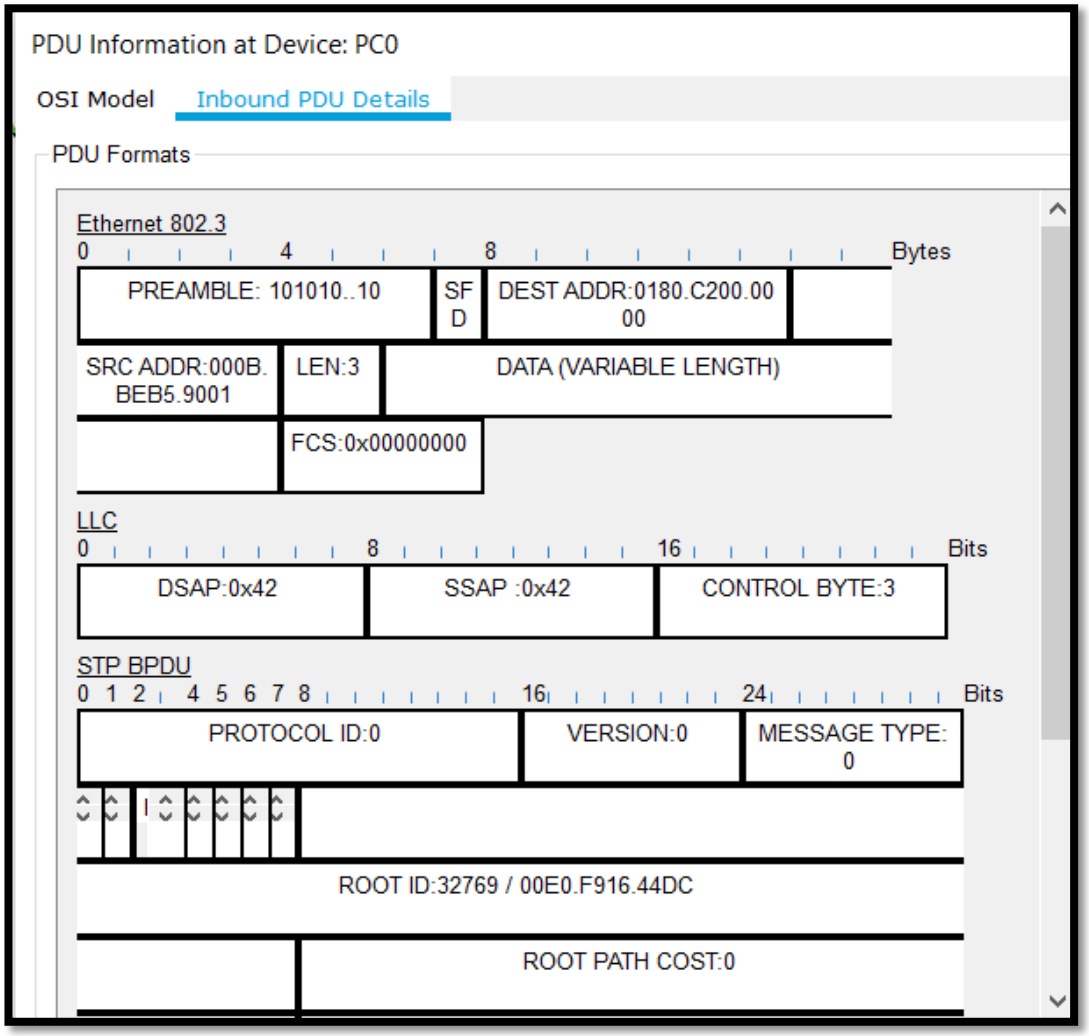


Step-4 : In the simulation mode, enable the ARP option in the filter and click on the events displayed in the simulation panel.



Result :

Here, we can observe the source MAC address and destination MAC address of both the source and destination devices.



EXPERIMENT – 13

Aim: Write a program in NS3 to connect 2 nodes,

Source Code:-

```
#include "ns3/core-module.h"
#include "ns3/network-module.h"
#include "ns3/internet-module.h"
#include "ns3/point-to-point-module.h"
#include "ns3/applications-module.h"
using namespace ns3;
NS_LOG_COMPONENT_DEFINE ("FirstScriptExample");
int
main (int argc, char *argv[])
{
    Time::SetResolution (Time::NS);
    LogComponentEnable("UdpEchoClientApplication",
    LOG_LEVEL_INFO);
    LogComponentEnable("UdpEchoServerApplication",
    LOG_LEVEL_INFO);
    NodeContainer nodes;
    nodes.Create (2);
    PointToPointHelper pointToPoint;
    pointToPoint.SetDeviceAttribute ("DataRate", StringValue ("10Mbps"));
    pointToPoint.SetChannelAttribute ("Delay", StringValue ("2ms"));
    NetDeviceContainer devices;
    devices = pointToPoint.Install (nodes);
    InternetStackHelper stack;
    stack.Install (nodes);
```

```
Ipv4AddressHelper address;
address.SetBase ("10.1.1.0", "255.255.255.0");
Ipv4InterfaceContainer interfaces = address.Assign (devices);
UdpEchoServerHelper echoServer (9);
ApplicationContainer serverApps = echoServer.Install (nodes.Get (1));
serverApps.Start (Seconds (1.0));
serverApps.Stop (Seconds (10.0));
UdpEchoClientHelper echoClient (interfaces.GetAddress (1), 9);
echoClient.SetAttribute ("MaxPackets", UintegerValue (1));
echoClient.SetAttribute ("Interval", TimeValue (Seconds (1.0)));
echoClient.SetAttribute ("PacketSize", UintegerValue (1024));
ApplicationContainer clientApps = echoClient.Install (nodes.Get (0));
clientApps.Start (Seconds (2.0));
clientApps.Stop (Seconds (10.0));
Simulator::Run ();
Simulator::Destroy ();
return 0;
}
```

Output:-

```
devang@devang: ~/ns3/ns-allinone-3.29/ns-3.29
devang@devang:~/ns3/ns-allinone-3.29/ns-3.29$ sudo ./waf --run devang2
sudo: unable to resolve host devang: Connection timed out
[sudo] password for devang:
Waf: Entering directory `/home/devang/ns3/ns-allinone-3.29/ns-3.29/build'
[2672/2729] Compiling scratch/devang2.cc
[2673/2729] Compiling scratch/subdir/scratch-simulator-subdir.cc
[2674/2729] Compiling scratch/scratch-simulator.cc
[2675/2729] Compiling scratch/devang1.cc
[2686/2729] Linking build/scratch/scratch-simulator
[2687/2729] Linking build/scratch/subdir/subdir
[2688/2729] Linking build/scratch/devang1
[2689/2729] Linking build/scratch/devang2
Waf: Leaving directory `/home/devang/ns3/ns-allinone-3.29/ns-3.29/build'
Build commands will be stored in build/compile_commands.json
'build' finished successfully (50.127s)
At time 2s client sent 1024 bytes to 10.1.1.2 port 9
At time 2.00284s server received 1024 bytes from 10.1.1.1 port 49153
At time 2.00284s server sent 1024 bytes to 10.1.1.1 port 49153
At time 2.00569s client received 1024 bytes from 10.1.1.2 port 9
```

EXPERIMENT – 14

Aim: Using Free Open Source Software tools ns3, design and implement a bus topology using CSMA.

Source Code:-

```
#include "ns3/core-module.h"
#include "ns3/network-module.h"
#include "ns3/csma-module.h"
#include "ns3/internet-module.h"
#include "ns3/point-to-point-module.h"
#include "ns3/applications-module.h"
#include "ns3/ipv4-global-routing-helper.h"
 using namespace ns3;
NS_LOG_COMPONENT_DEFINE ("BusTopology");
int
main (int argc, char *argv[])
{
 bool verbose = true;
 uint32_t nCsma = 3;
 CommandLine cmd;
cmd.AddValue ("nCsma", "Number of \"extra\" CSMA nodes/devices",
nCsma); cmd.AddValue ("verbose", "Tell echo applications to log if true",
verbose);
cmd.Parse (argc,argv);
 if (verbose)
{
LogComponentEnable ("UdpEchoClientApplication", LOG_LEVEL_INFO);
LogComponentEnable ("UdpEchoServerApplication", LOG_LEVEL_INFO);
```

```
}
  nCsma = nCsma == 0 ? 1 : nCsma;
  NodeContainer p2pNodes;
  p2pNodes.Create (2);
  NodeContainer csmaNodes;
  csmaNodes.Add (p2pNodes.Get (1));
  csmaNodes.Create (nCsma);
  PointToPointHelper pointToPoint;
  pointToPoint.SetDeviceAttribute ("DataRate", StringValue ("5Mbps")
  pointToPoint.SetChannelAttribute ("Delay", StringValue ("2ms"));
  NetDeviceContainer p2pDevices;
  p2pDevices = pointToPoint.Install (p2pNodes);
  CsmaHelper csma;
  csma.SetChannelAttribute ("DataRate", StringValue ("100Mbps"));
  csma.SetChannelAttribute ("Delay", TimeValue (NanoSeconds (6560)));
  NetDeviceContainer csmaDevices;
  csmaDevices = csma.Install (csmaNodes);
  InternetStackHelper stack;
  stack.Install (p2pNodes.Get (0));
  stack.Install (csmaNodes);
  Ipv4AddressHelper address;
  address.SetBase ("10.1.1.0", "255.255.255.0");
  Ipv4InterfaceContainer p2pInterfaces;
  p2pInterfaces = address.Assign (p2pDevices);
  address.SetBase ("10.1.2.0", "255.255.255.0");
  Ipv4InterfaceContainer csmaInterfaces;
  csmaInterfaces = address.Assign (csmaDevices);
  UdpEchoServerHelper echoServer (9);
```

```
  ApplicationContainer serverApps = echoServer.Install (csmaNodes.Get
(nCsma));   serverApps.Start (Seconds (1.0));
  serverApps.Stop (Seconds (10.0));
  UdpEchoClientHelper echoClient (csmaInterfaces.GetAddress (nCsma), 9);
echoClient.SetAttribute ("MaxPackets", UintegerValue (1));
  echoClient.SetAttribute ("Interval", TimeValue (Seconds (1.0)));
  echoClient.SetAttribute ("PacketSize", UintegerValue (1024));
  ApplicationContainer clientApps = echoClient.Install (p2pNodes.Get (0));
clientApps.Start (Seconds (2.0));
  clientApps.Stop (Seconds (10.0));
  Ipv4GlobalRoutingHelper::PopulateRoutingTables ();
  pointToPoint.EnablePcapAll ("second");
  csma.EnablePcap ("second", csmaDevices.Get (1), true);
  Simulator::Run ();
  Simulator::Destroy ();
  return 0;
}
```

Output:-