# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

**"JnanaSangama", Belgaum -590014, Karnataka.**

**LAB REPORT**

**on**

# COMPUTER NETWORKS

***Submitted by***

**KUSHAL C (1BM20CS077)**

***in partial fulfillment for the award of the degree of***
**BACHELOR OF ENGINEERING**

***in***
**COMPUTER SCIENCE AND ENGINEERING**

**B.M.S. COLLEGE OF ENGINEERING**
**(Autonomous Institution under VTU)**
**BENGALURU-560019**

**October-2022 to Feb-2023**

# B. M. S. College of Engineering,

**Bull Temple Road, Bangalore 560019**

(Affiliated To Visvesvaraya Technological University, Belgaum)

## Department of Computer Science and Engineering

## CERTIFICATE

This is to certify that the Lab work entitled "**COMPUTER NETWORKS**" carried out by **KUSHAL C (1BM20CS077),** who is a bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a **COMPUTER NETWORKS - (20CS5PCCON)** work prescribed for the said degree.

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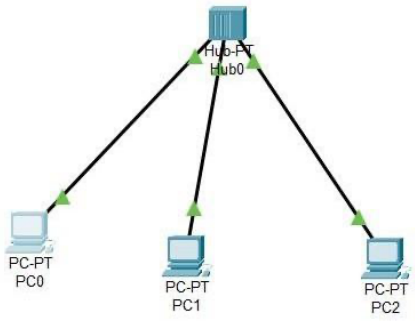
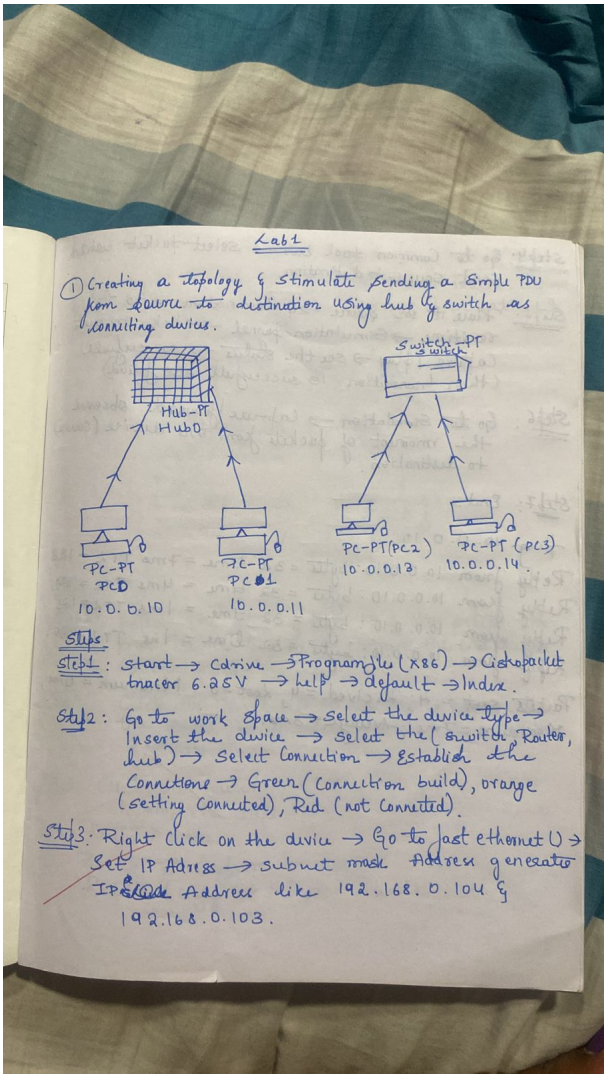
# Index

# Cycle-1 Experiment No 1 Aim of the program

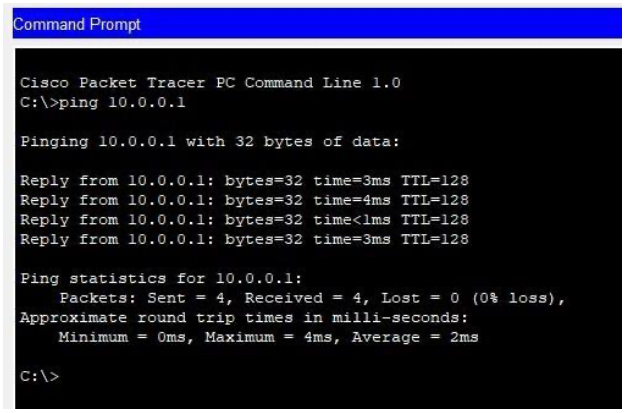
Creating a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices.

## Hub Topology

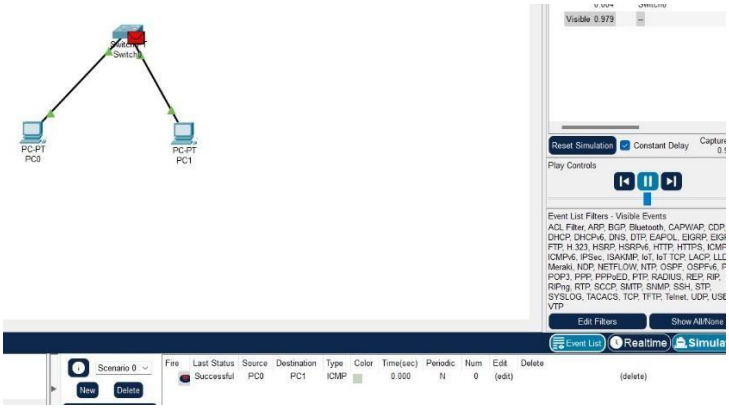


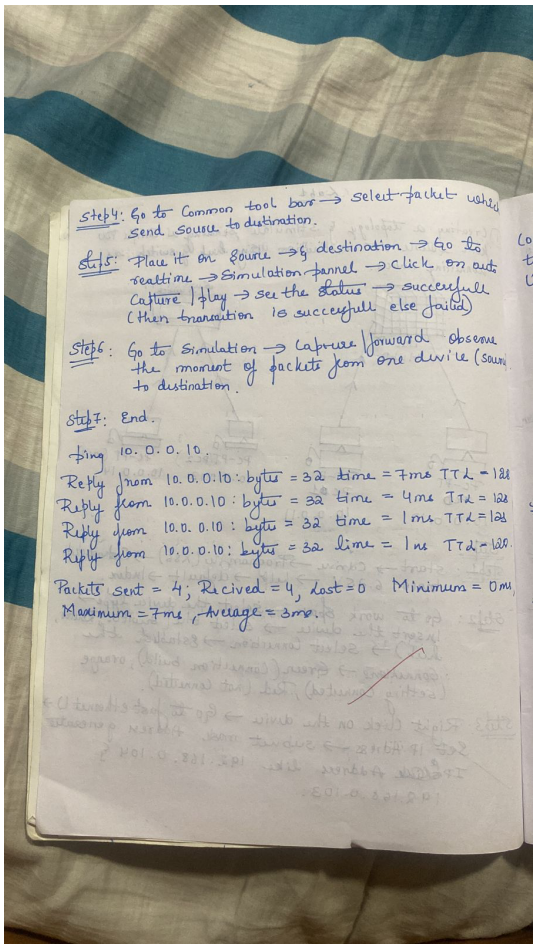
# Output



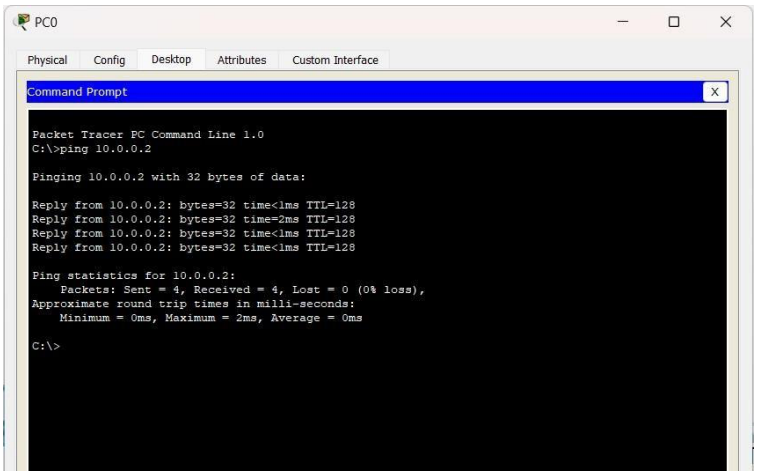

# Switch Topology



# Procedure



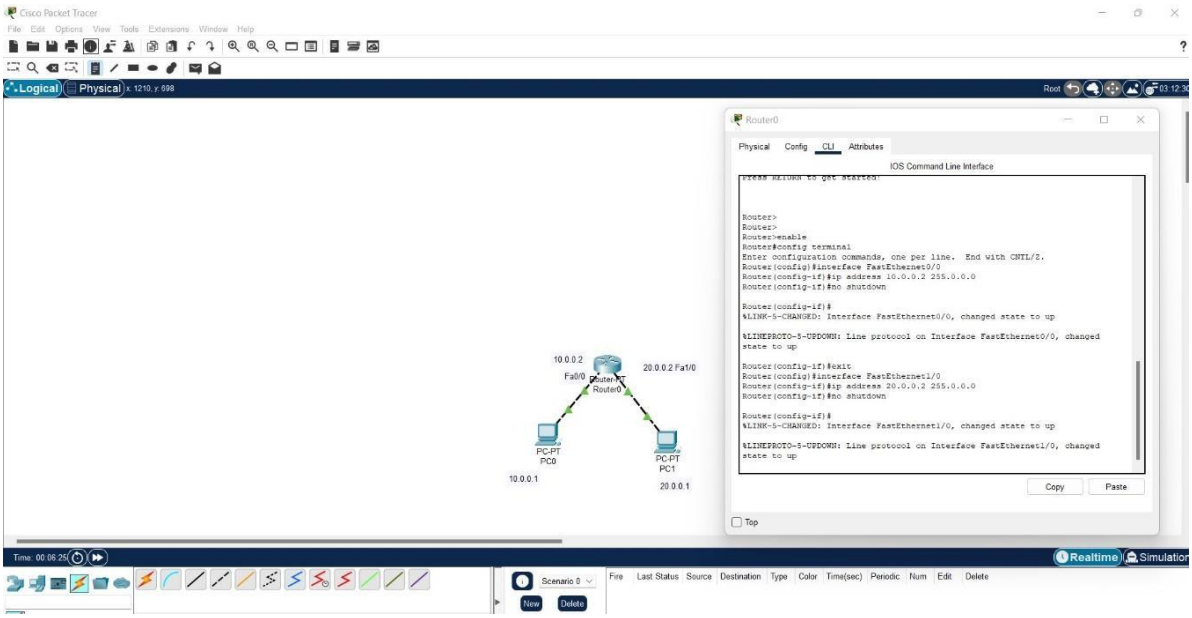

# Output



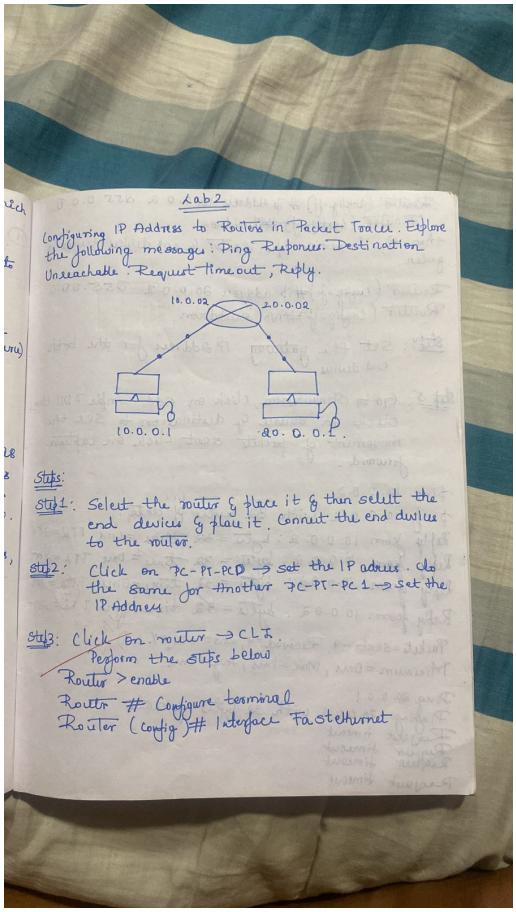
# Experiment No 2 Aim of the program

Configuring IP address to Routers in Packet Tracer. Exploring the following messages: Ping Responses, Destination unreachable, Request timed out, Reply.

## Topology



# Procedure



Lab 2

Configuring IP Address to Routers in Packet Tracer. Explore the following messages: Ping Responses. Destination Unreachable. Request Timeout, Reply.



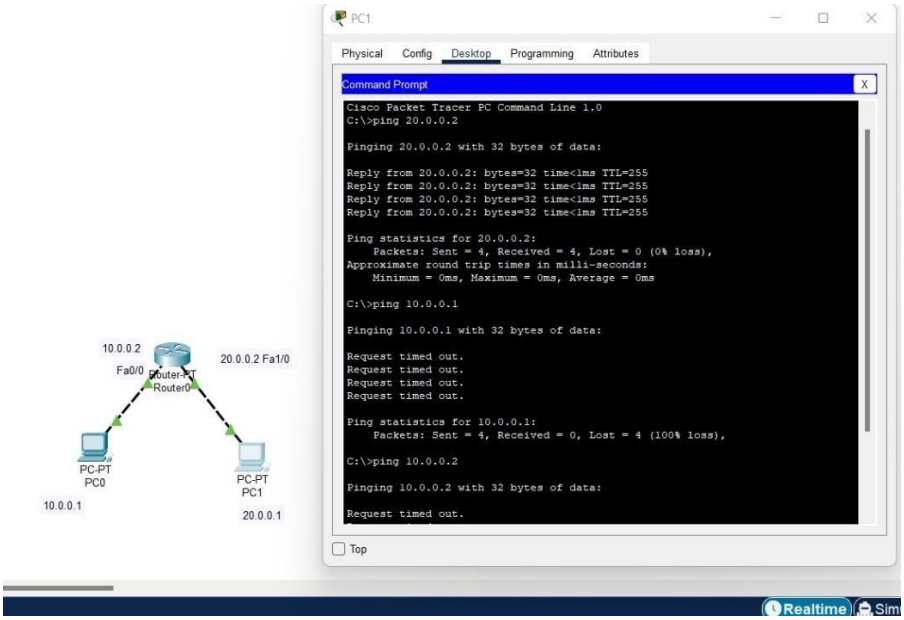

Steps:

Step 1: Select the router & place it & then select the end devices & place it. Connect the end devices to the router.

Step 2: Click on PC-PT-PC0 → set the IP address. Do the same for another PC-PT-PC1 → set the IP Address

Step 3: Click on router → CLI.
Perform the steps below
Router > enable
Router # Configure terminal
Router (config)# interface FastEthernet

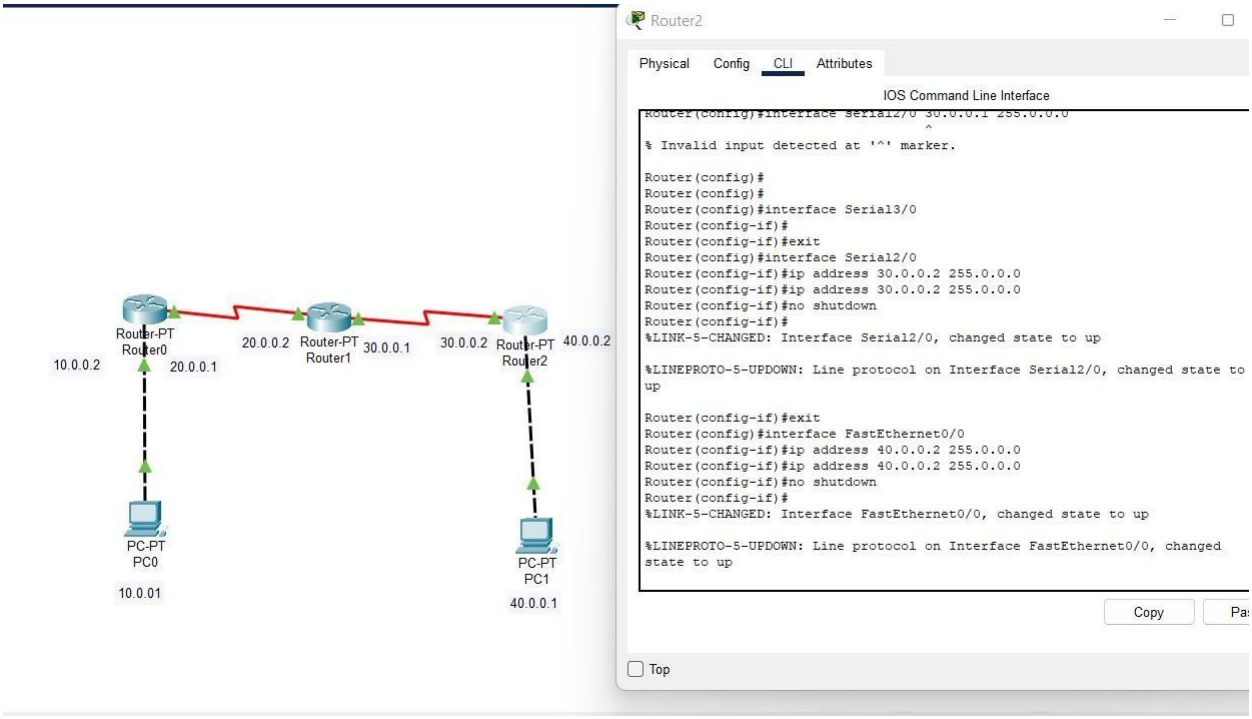
# Output


PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.2
Pinging 20.0.0.2 with 32 bytes of data:
Reply from 20.0.0.2: bytes=32 time<1ms TTL=255
Reply from 20.0.0.2: bytes=32 time<1ms TTL=255
Reply from 20.0.0.2: bytes=32 time<1ms TTL=255
Reply from 20.0.0.2: bytes=32 time<1ms TTL=255
Ping statistics for 20.0.0.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 10.0.0.1
Pinging 10.0.0.1 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 10.0.0.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 10.0.0.2
Pinging 10.0.0.2 with 32 bytes of data:
Request timed out.
Top
10.0.0.2
Fa0/0
Router-PT
Router0
20.0.0.2 Fa1/0
PC-PT
PC0
10.0.0.1
PC-PT
PC1
20.0.0.1
Realtime

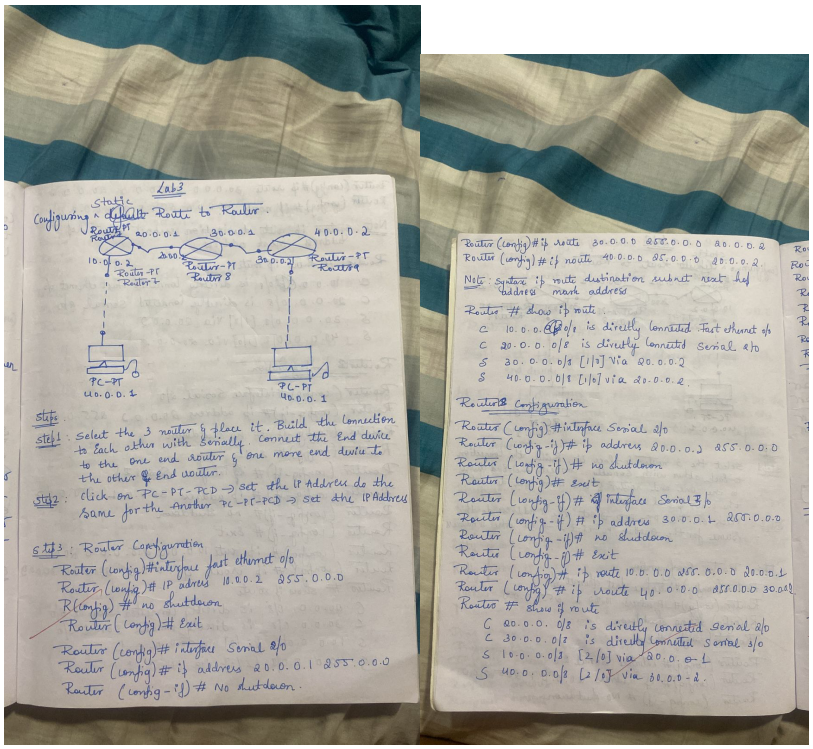
# Experiment No 3 Aim of the program

Configuring default route to the Router

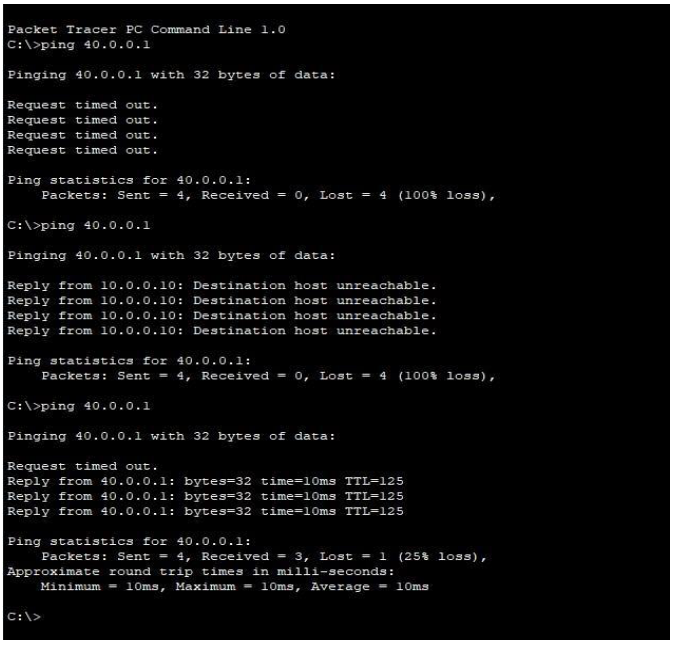
## Topology




## Procedure



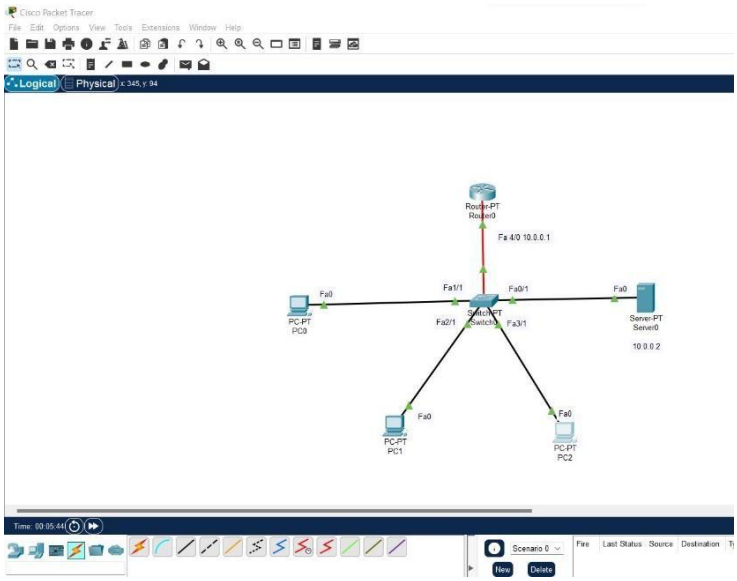
# Output


Packet Tracer PC Command Line 1.0
C:\>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Reply from 10.0.0.10: Destination host unreachable.
Reply from 10.0.0.10: Destination host unreachable.
Reply from 10.0.0.10: Destination host unreachable.
Reply from 10.0.0.10: Destination host unreachable.
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.1: bytes=32 time=10ms TTL=125
Reply from 40.0.0.1: bytes=32 time=10ms TTL=125
Reply from 40.0.0.1: bytes=32 time=10ms TTL=125
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 10ms, Average = 10ms
C:\>

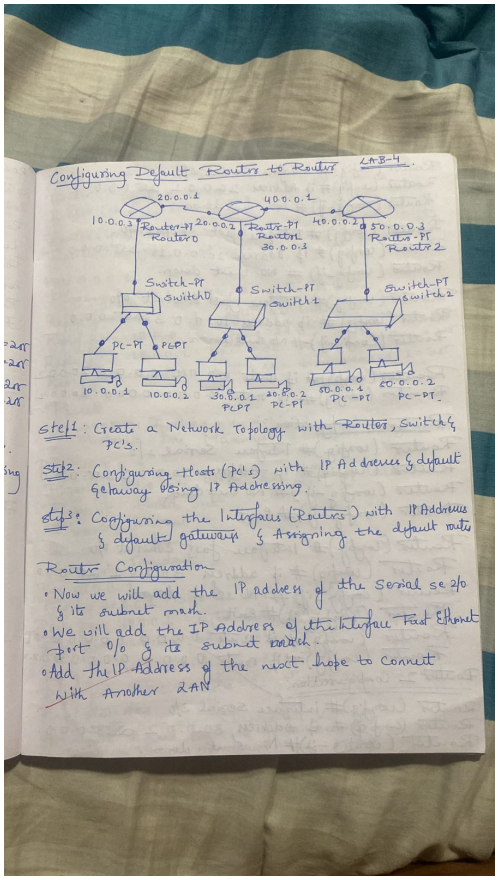
# Experiment No 4 Aim of the program

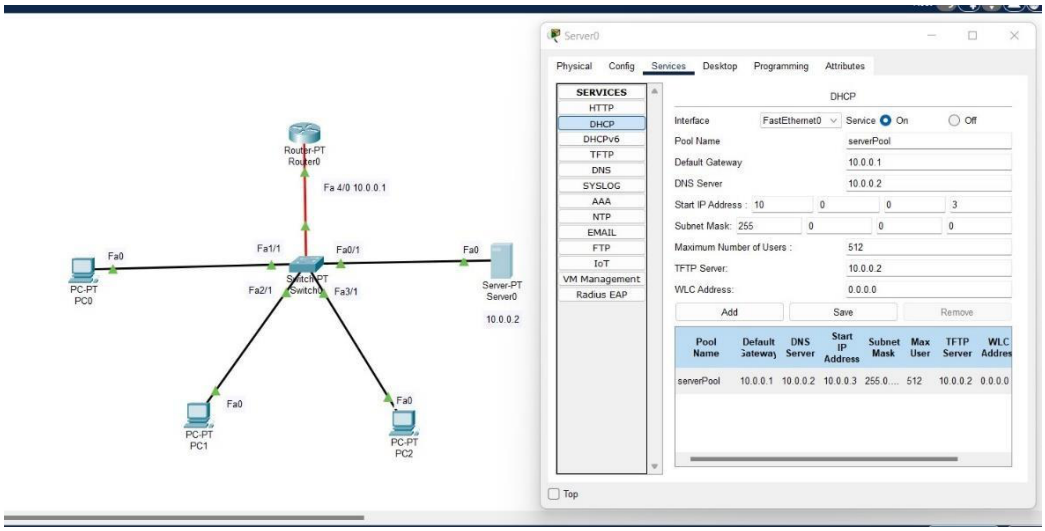
Configuring DHCP within a LAN in a packet Tracer

## Topology

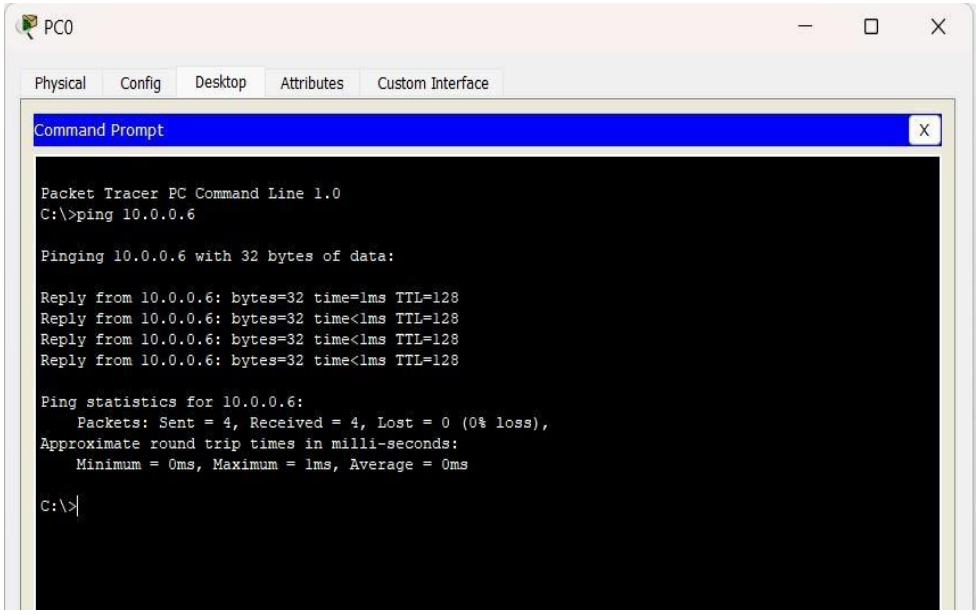



## Procedure




Router-PT
Router0
Fa 4/0 10.0.0.1
Fa0
PC-PT
PC0
Fa1/1
Fa0/1
Fa0
Fa2/1
Switch-PT
Switch
Fa3/1
Server-PT
Server0
10.0.0.2
Fa0
PC-PT
PC1
Fa0
PC-PT
PC2
Server0
Physical
Config
Services
Desktop
Programming
Attributes
SERVICES
HTTP
DHCP
DHCPv6
TFTP
DNS
SYSLOG
AAA
NTP
EMAIL
FTP
IoT
VM Management
Radius EAP
DHCP
Interface
FastEthernet0
Service
On
Off
Pool Name
serverPool
Default Gateway
10.0.0.1
DNS Server
10.0.0.2
Start IP Address :
10
0
0
3
Subnet Mask:
255
0
0
0
Maximum Number of Users :
512
TFTP Server:
10.0.0.2
WLC Address:
0.0.0.0
Add
Save
Remove
Pool Name
Default Gateway
DNS Server
Start IP Address
Subnet Mask
Max User
TFTP Server
WLC Addres
serverPool
10.0.0.1
10.0.0.2
10.0.0.3
255.0....
512
10.0.0.2
0.0.0.0
Top

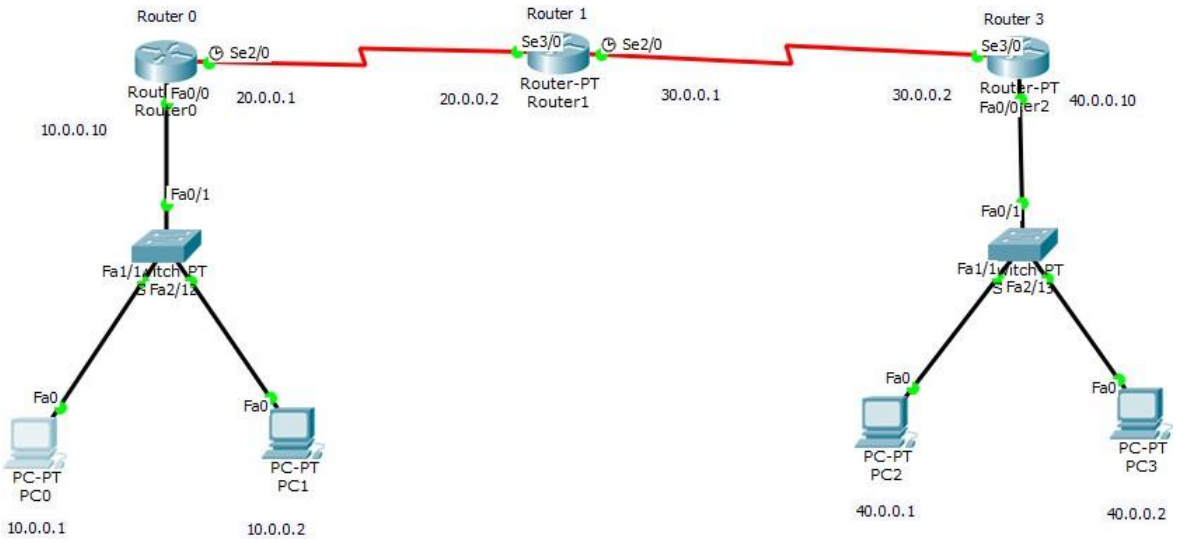
# Output


PC0
Physical
Config
Desktop
Attributes
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.6
Pinging 10.0.0.6 with 32 bytes of data:
Reply from 10.0.0.6: bytes=32 time=1ms TTL=128
Reply from 10.0.0.6: bytes=32 time<1ms TTL=128
Reply from 10.0.0.6: bytes=32 time<1ms TTL=128
Reply from 10.0.0.6: bytes=32 time<1ms TTL=128
Ping statistics for 10.0.0.6:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>

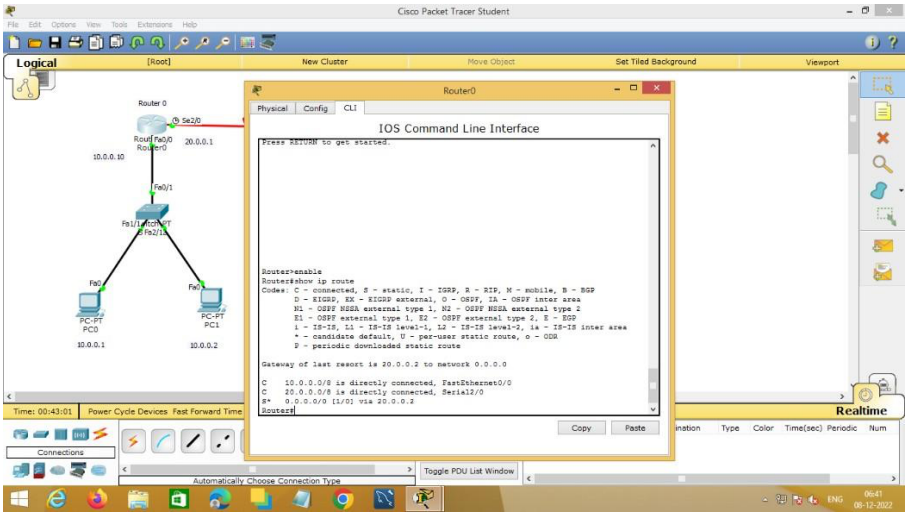
# Experiment No 5 Aim of the program

Configuring default router to router

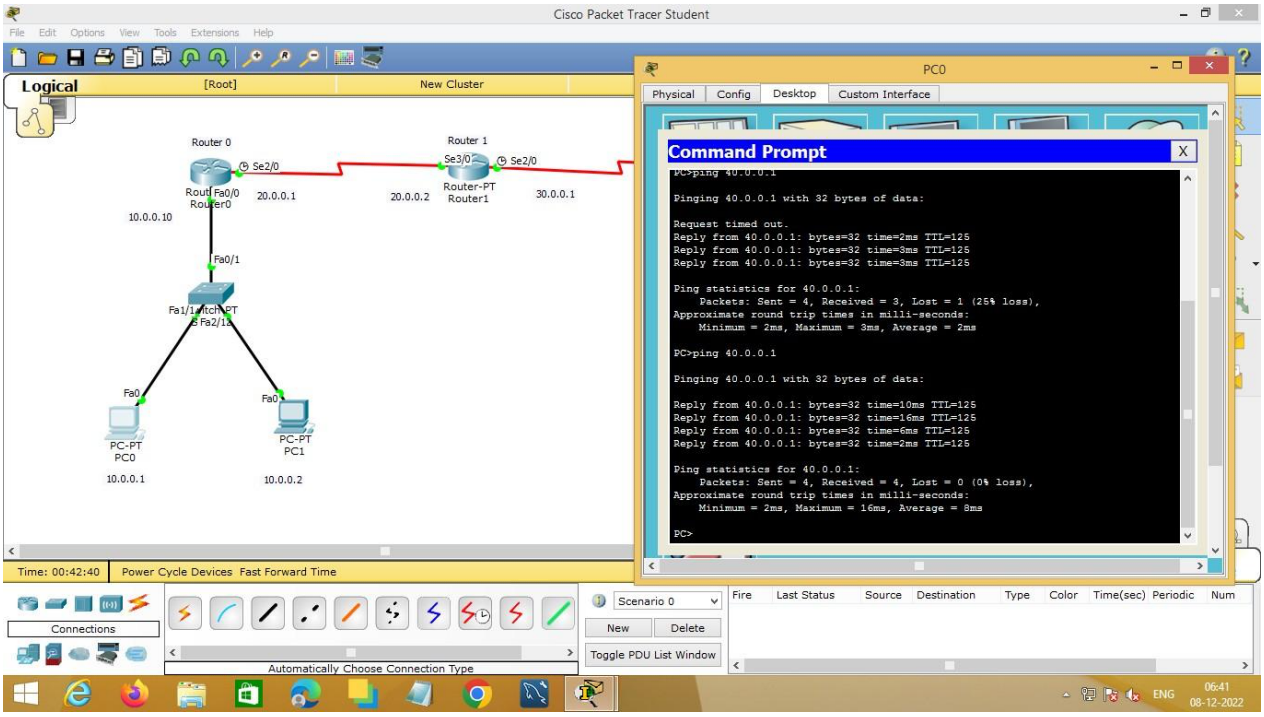
## Topology




## Procedure



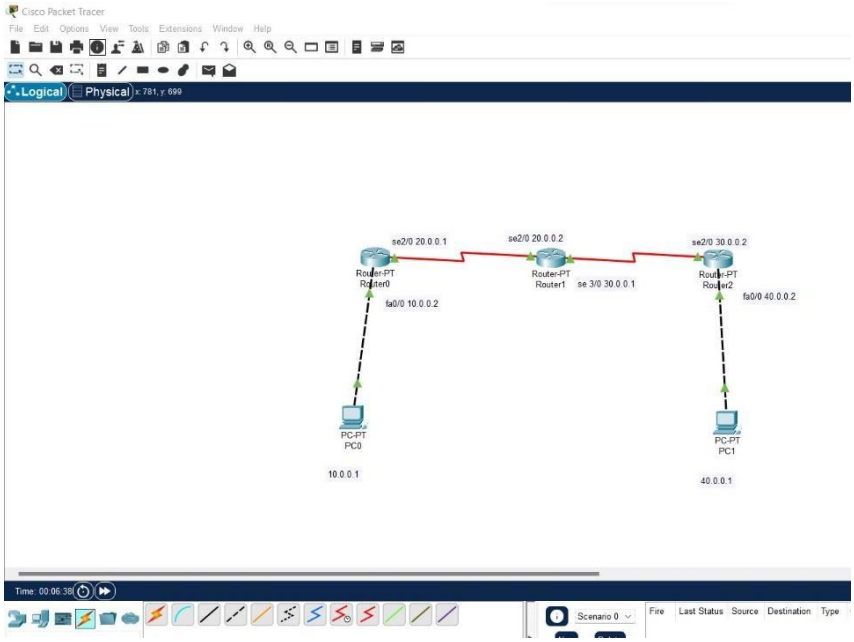
# Output

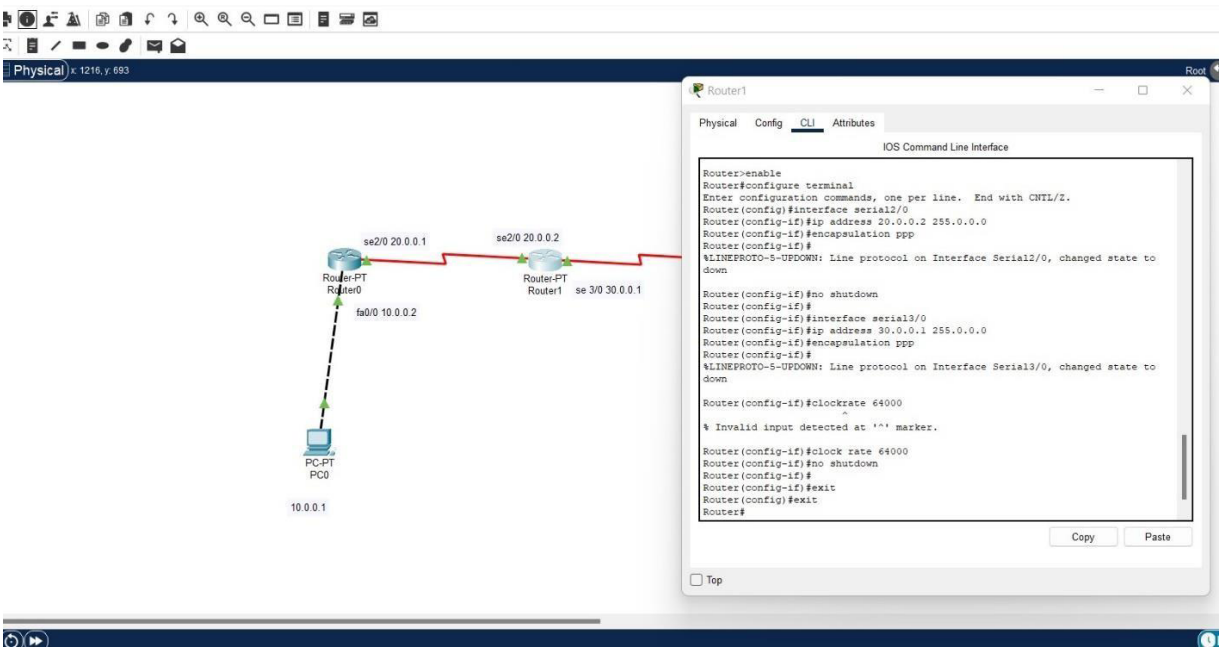

Cisco Packet Tracer Student
Logical
[Root]
New Cluster
Router 0
Router 1
Se2/0
Se3/0
Se2/0
Fa0/0
Router0
Router-PT
Router1
20.0.0.1
20.0.0.2
30.0.0.1
10.0.0.10
Fa0/1
Fa1/1
Fa2/1
Fa0
Fa0
PC-PT
PC0
PC-PT
PC1
10.0.0.1
10.0.0.2
Time: 00:42:40
Power Cycle Devices
Fast Forward Time
Connections
Automatically Choose Connection Type
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
PC>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=3ms TTL=125
Reply from 40.0.0.1: bytes=32 time=3ms TTL=125
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 3ms, Average = 2ms
PC>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Reply from 40.0.0.1: bytes=32 time=10ms TTL=125
Reply from 40.0.0.1: bytes=32 time=16ms TTL=125
Reply from 40.0.0.1: bytes=32 time=6ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 16ms, Average = 8ms
PC>
ENG
06:41
08-12-2022

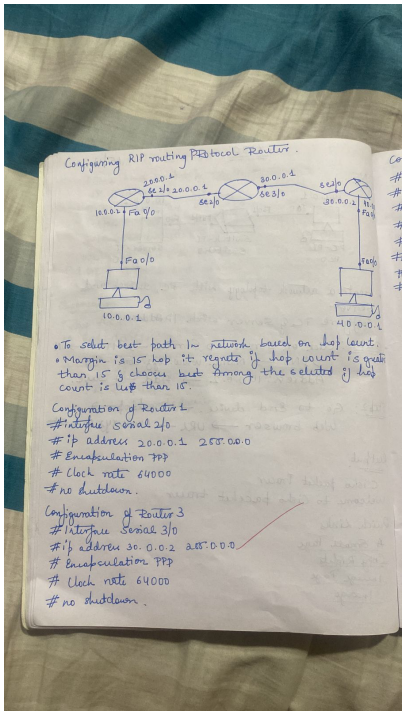
# Experiment No 6 Aim of the program

Configuring RIP Routing Protocol in Routers

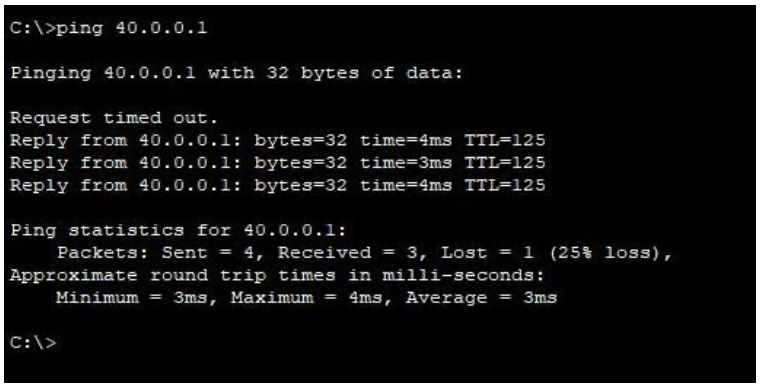
## Topology




Physical
x: 1216, y: 693
Root
se2/0 20.0.0.1
se2/0 20.0.0.2
Router-PT
Router0
Router-PT
Router1
se 3/0 30.0.0.1
fa0/0 10.0.0.2
PC-PT
PC0
10.0.0.1
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 serial2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#interface serial3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to down
Router(config-if)#clockrate 64000
% Invalid input detected at '^' marker.
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#
Router(config-if)#exit
Router(config)#exit
Router#
Copy
Paste
Top


Configuring RIP routing Protocol Routing.
Fa0/0
10.0.0.1
40.0.0.1
• To select best path in network based on hop count.
• Margin is 15 hop it regrets if hop count is greater than 15 & choose best among the selected if hop count is less than 15.
Configuration of Router 1
#interface Serial 2/0
#ip address 20.0.0.1 255.0.0.0
#Encapsulation PPP
#Clock rate 64000
#no shutdown.
Configuration of Router 3
#interface Serial 3/0
#ip address 30.0.0.2 255.0.0.0
#Encapsulation PPP
#Clock rate 64000
#no shutdown.

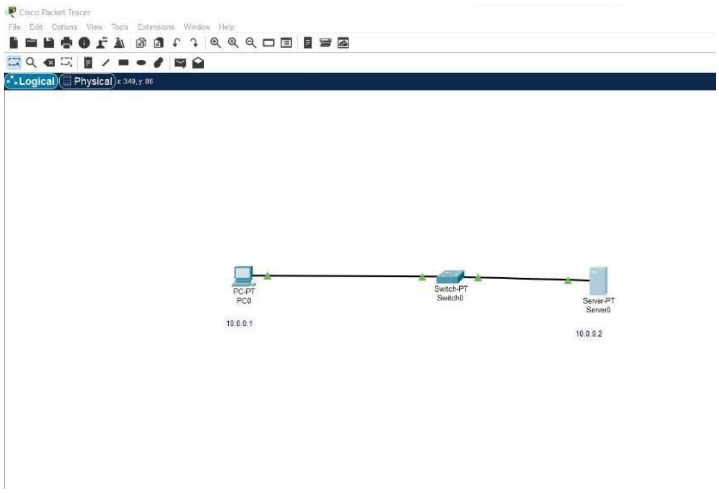
## Output


C:\>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Reply from 40.0.0.1: bytes=32 time=3ms TTL=125
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 3ms, Maximum = 4ms, Average = 3ms
C:\>

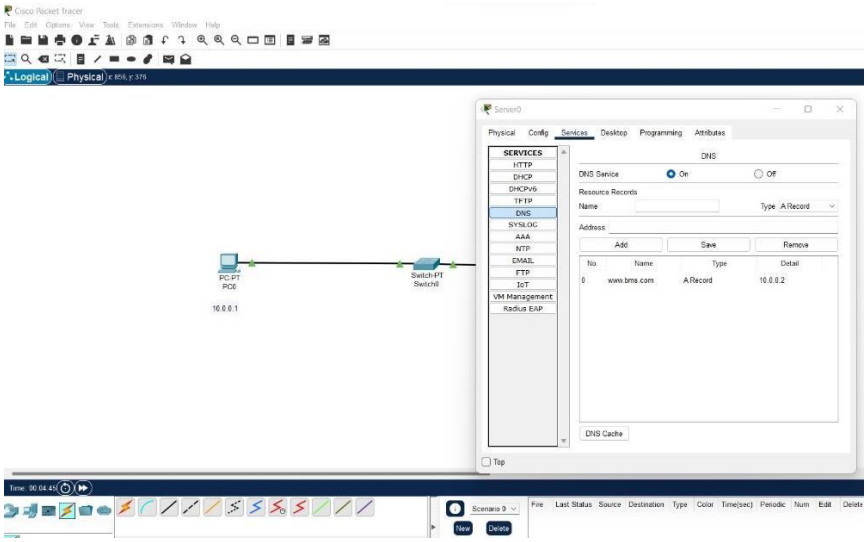
# Experiment No 7 Aim of the program

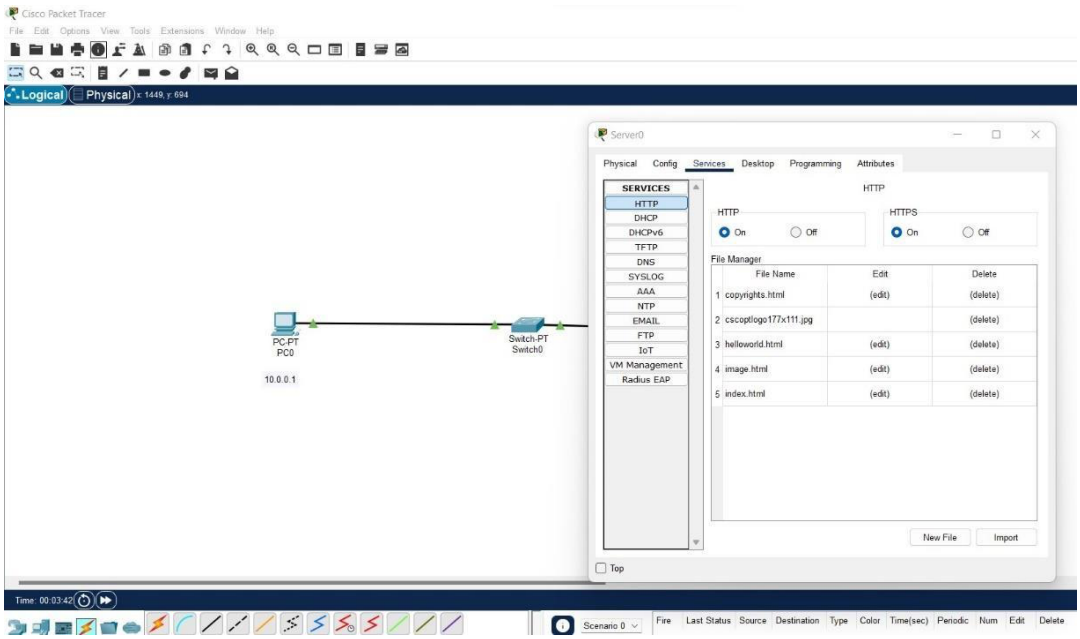
Demonstration of WEB server and DNS using Packet Tracer

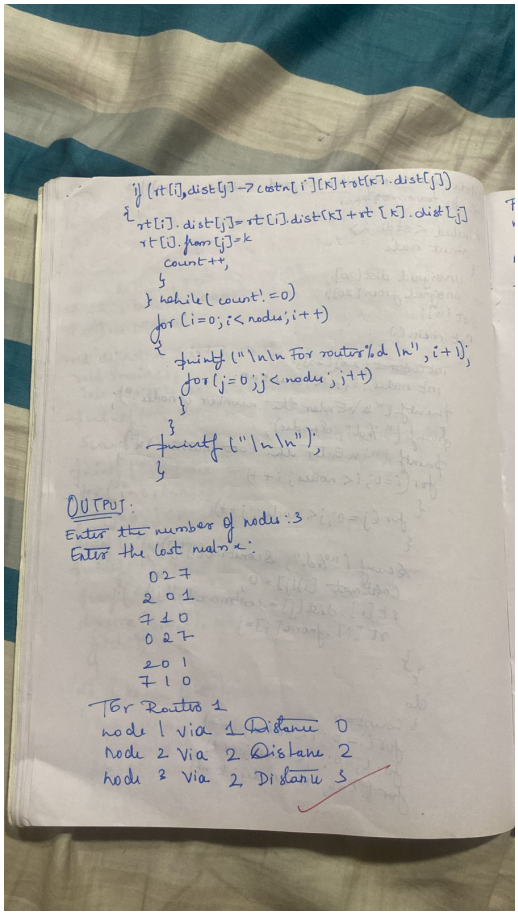
## Topology




## Procedure





```
if (rt[i].dist[j] > cost[i][k] + rt[k].dist[j])
{
rt[i].dist[j] = rt[i].dist[k] + rt[k].dist[j]
rt[i].from[j] = k
    count++;
}
} while (count != 0)
for (i=0; i<nodes; i++)
{
    printf ("\n\n For router %d \n", i+1);
    for (j=0; j<nodes; j++)
    }
}
printf ("\n\n");
}
```

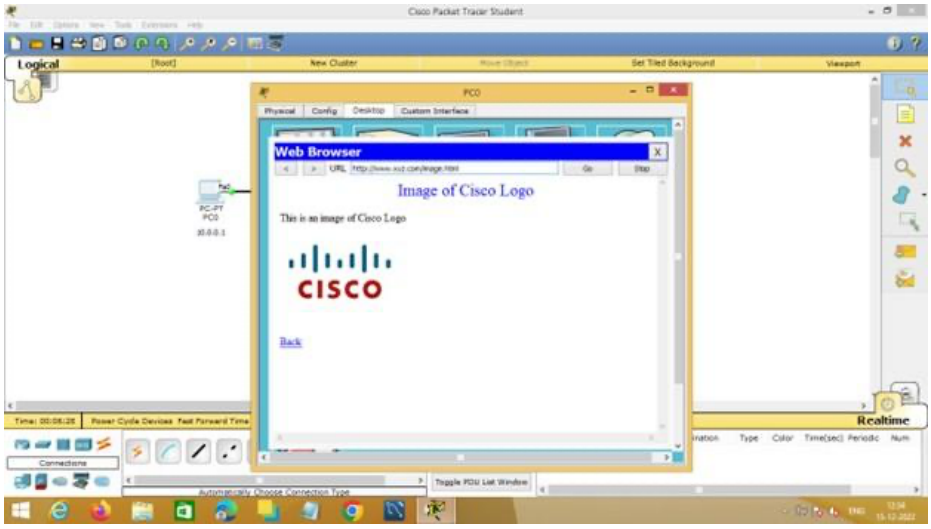
OUTPUT:

Enter the number of nodes: 3
Enter the cost matrix:

0 2 7
2 0 1
7 1 0
0 2 7
2 0 1
7 1 0

For Router 1
node 1 via 1 Distance 0
node 2 via 2 Distance 2
node 3 via 2 Distance 3

## Output


Cisco Packet Tracer Student
Logical
PC0
Physical
Config
Desktop
Custom Interface
Web Browser
Image of Cisco Logo
This is an image of Cisco Logo
CISCO
Back
Realtime

# Cycle-2 Experiment No 1 Aim of the Experiment

Write a program for error detecting code using CRC-CCITT (16-bits).

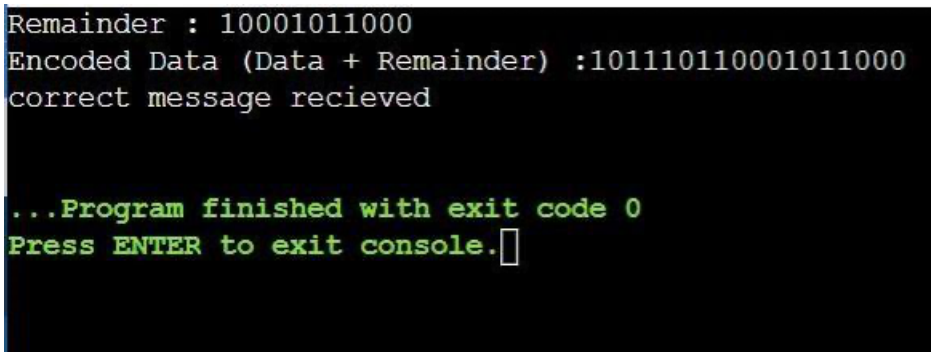
## Code

```
#include<bits/stdc++.h> using
namespace std; void receiver(string
data, string key);

string xor1(string a, string b)
{

        string result = "";

        int n = b.length();

        for(int i = 1; i < n; i++)
        {
                if (a[i] == b[i])
                        result += "0";
else
                        result += "1";
        }
        return result;
}

string mod2div(string dividend, string divisor)
{
        int pick = divisor.length();
```

```
        string tmp = dividend.substr(0, pick);

        int n = dividend.length();

         while (pick < n)
        {
                if (tmp[0] == '1')                              tmp =
xor1(divisor, tmp) + dividend[pick];
                else
                        tmp = xor1(std::string(pick, '0'), tmp) +
                                dividend[pick];

                 pick += 1;
        }
        if (tmp[0] == '1')
tmp = xor1(divisor, tmp);
        else
                 tmp = xor1(std::string(pick, '0'), tmp);

        return tmp;
}

void encodeData(string data, string key)
{
         int l_key = key.length();

            string appended_data = (data +std::string(l_key - 1, '0'));

         string remainder = mod2div(appended_data, key);
```

```
        string codeword = data + remainder;
cout << "Remainder : "
                << remainder << "\n";
           cout << "Encoded Data (Data + Remainder) :"
                << codeword << "\n";
         receiver(codeword, key);
}
void receiver(string data, string key)
{       string currxor = mod2div(data.substr(0, key.size()), key);
int curr = key.size();      while (curr != data.size())
        {
                 if (currxor.size() != key.size())
                {
                        currxor.push_back(data[curr++]);
                }
                else
                {
                        currxor = mod2div(currxor, key);
                }
        }
          if (currxor.size() == key.size())
        {
                 currxor = mod2div(currxor, key);
        }
        if (currxor.find('1') != string::npos)
        {       cout << "there is some error in data" << endl;
        }
        else
```

```
        {
                cout << "correct message recieved" << endl;
        }
} int
main()
{

        string data = "1011101";
string key = "100010000001";

         encodeData(data, key);

        return 0;
}
```



# Experiment No 2 Aim of the Experiment

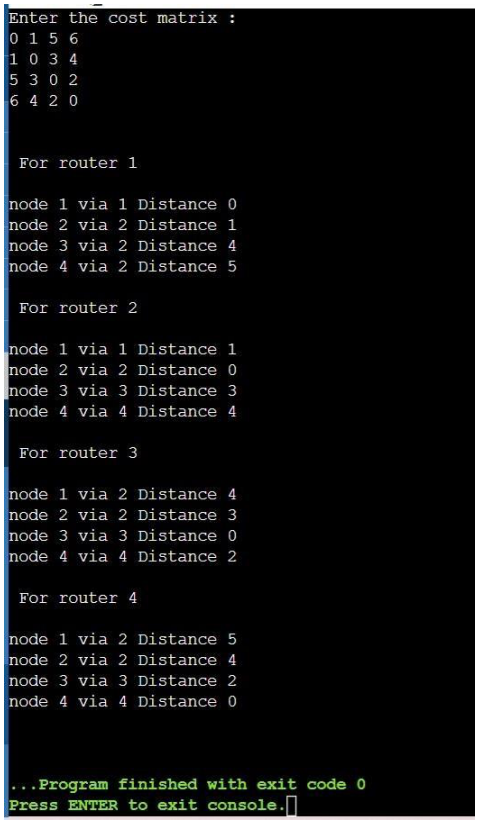
Write a program for distance vector algorithm to find suitable path for transmission.

## Code

```
#include<stdio.h>
                    struct node
                    {
                        unsigned dist[20];
                        unsigned from[20];
                    }rt[10];
                    int main()
                    {
                        int costmat[20][20];
                        int nodes,i,j,k,count=0;
                        printf("\nEnter the number of nodes : ");
                        scanf("%d",&nodes);//Enter the nodes
                        printf("\nEnter the cost matrix :\n");
                        for(i=0;i<nodes;i++)
                        {
                            for(j=0;j<nodes;j++)
                            {
                                scanf("%d",&costmat[i][j]);
                                costmat[i][i]=0;
                                rt[i].dist[j]=costmat[i][j];//initialise the distance equal
                    to cost matrix
                                rt[i].from[j]=j;
                            }
                        }
                            do
                            {
                                count=0;
                                for(i=0;i<nodes;i++)//We choose arbitary vertex k and we
                            calculate the direct distance from the node i to k using the cost
                            matrix
                                //and add the distance from k to node j
                                for(j=0;j<nodes;j++)
                                for(k=0;k<nodes;k++)
                                    if(rt[i].dist[j]>costmat[i][k]+rt[k].dist[j])
                                    {//We calculate the minimum distance
                                        rt[i].dist[j]=rt[i].dist[k]+rt[k].dist[j];
```

```
                        rt[i].from[j]=k;
                        count++;
                    }
            }while(count!=0);
            for(i=0;i<nodes;i++)
            {
                printf("\n\n For router %d\n",i+1);
                for(j=0;j<nodes;j++)
                {
                    printf("\t\nnode %d via %d Distance %d
",j+1,rt[i].from[j]+1,rt[i].dist[j]);
                }
            }
        printf("\n\n");
        getch();
}
```

# Output



## Experiment No 3 Aim of the Experiment

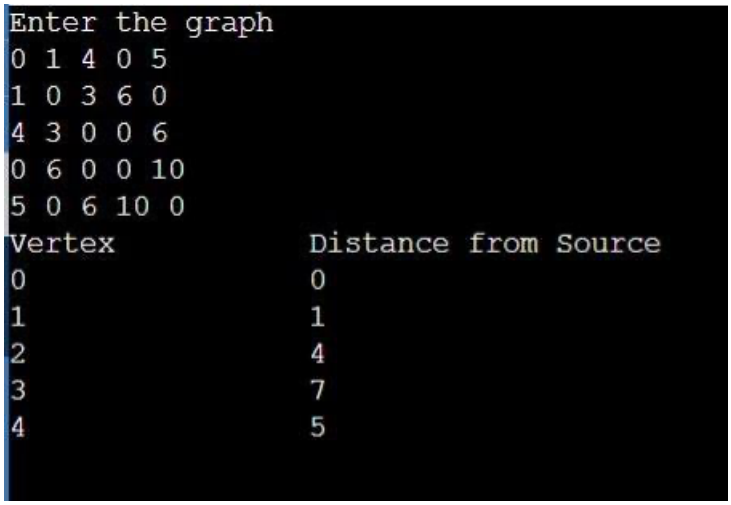
Implement Dijkstra's algorithm to compute the shortest path for a given topology.

## Code

```
#include<bits/stdc++.h>
                            #include <limits.h>
                            #include <stdio.h>
                             using namespace std;

                            #define V 5


                            int minDistance(int dist[], bool Test[])
                            {

                                int min = INT_MAX, min_index;

                                for (int v = 0; v < V; v++)
                                    if ( Test[v] == false && dist[v] <= min)
                                        min = dist[v], min_index = v;

                                return min_index;
                            }


                            void printSolution(int dist[])
                            {
                                printf("Vertex \t\t Distance from Source\n");
                                for (int i = 0; i < V; i++)
                                    printf("%d \t\t %d\n", i, dist[i]);
                            }


                            void dijkstra(int graph[V][V], int src)
                            {
                                int dist[V];
                                bool Test[V];
                                for (int i = 0; i < V; i++)
                                    dist[i] = INT_MAX, Test[i] = false;
```

```
    dist[src] = 0;


    for (int count = 0; count < V - 1; count++) {

        int u = minDistance(dist, Test);


        Test[u] = true;


        for (int v = 0; v < V; v++)


            if (!Test[v] && graph[u][v] && dist[u] != INT_MAX
                && dist[u] + graph[u][v] < dist[v])
                dist[v] = dist[u] + graph[u][v];
    }


    printSolution(dist);
}


int main()
{

    int graph[V][V] ;
    cout<<"Enter the graph "<<endl;
    for(int i = 0; i<V; i++)
    {
        for(int j = 0; j<V; j++)
            cin>>graph[i][j];
    }

    dijkstra(graph, 0);

    return 0;
}
```

## Output


Enter the graph
0 1 4 0 5
1 0 3 6 0
4 3 0 0 6
0 6 0 0 10
5 0 6 10 0
Vertex Distance from Source
0 0
1 1
2 4
3 7
4 5

## Experiment No 4 Aim of the Experiment

Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

### Code

Server:

```
from socket import * serverName = '' serverPort =
12530 serverSocket = socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1) print("The server is ready to
receive") while 1:
   connectionSocket, addr = serverSocket.accept()
sentence = connectionSocket.recv(1024).decode()    try:
      file = open(sentence,"r")       l =
file.read(1024)
connectionSocket.send(l.encode())
file.close()    except Exception as e:
      message = "No such file exist"
connectionSocket.send(message.encode())    connectionSocket.close()
```

Client:

```
from socket import *
serverName = '192.168.1.104'
serverPort = 12530
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName,serverPort))
sentence = input("Enter file name")
clientSocket.send(sentence.encode()) filecontents =
clientSocket.recv(1024).decode() print ('From Server:',
filecontents) clientSocket.close()
```

## Experiment No 5 Aim of the Experiment

Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

### Code

Server:

```
from socket import * serverPort
= 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort)) print("The
server is ready to receive") while 1:
    sentence,clientAddress = serverSocket.recvfrom(2048)

    file=open(sentence,"r")     l=file.read(2048)

    serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
print("sent back to client",l)     file.close() Client:
from socket import * serverName = "127.0.0.1"
serverPort = 12000 clientSocket = socket(AF_INET,
SOCK_DGRAM)

sentence = input("Enter file name") clientSocket.sendto(bytes(sentence,"utf-8"),(serverName,
serverPort)) filecontents,serverAddress = clientSocket.recvfrom(2048) print ('From Server:',
filecontents)

clientSocket.close()
```