VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB REPORT
on

COMPUTER NETWORKS

Submitted by

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in partial fulfilment 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)

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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 **VIRAJ C(1BM20CS221),** who is a bonafide student of **B. M. S. College of Engineering.** It is in partial fulfilment 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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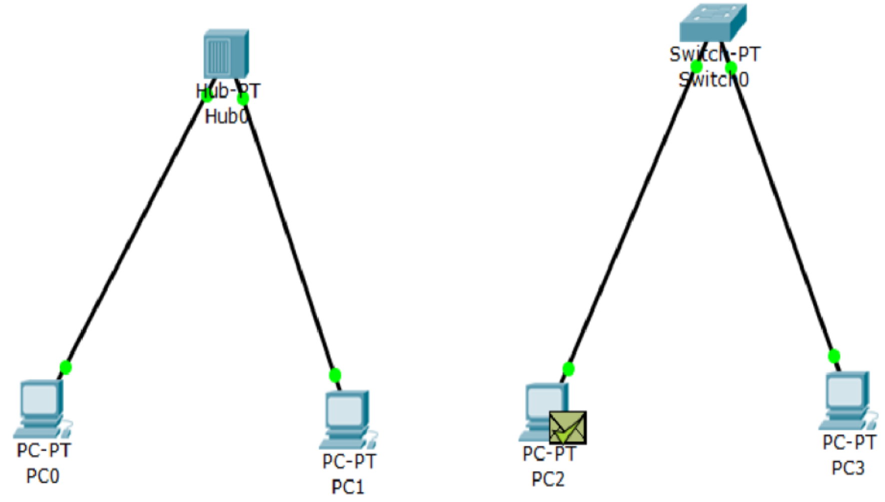
Experiment 1

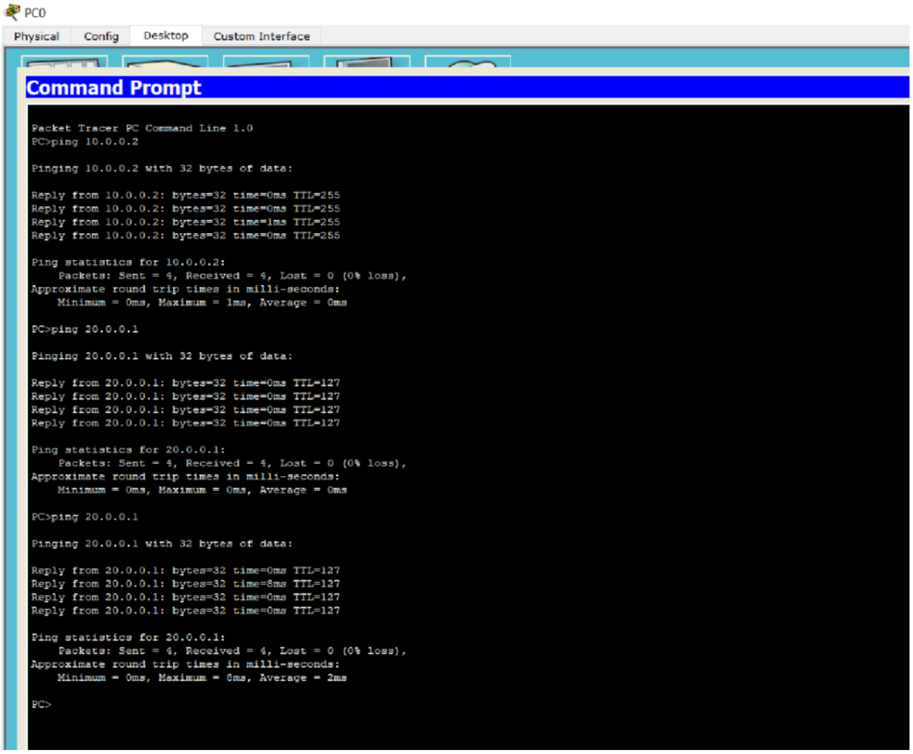
Aim of the program

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

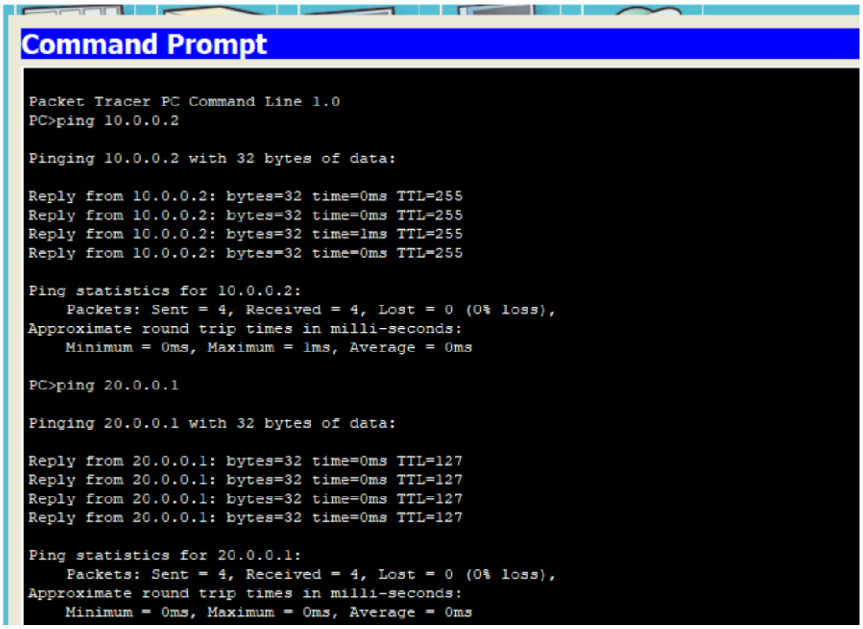
Topology



Output:



```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=1ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=8ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 8ms, Average = 2ms

PC>
```



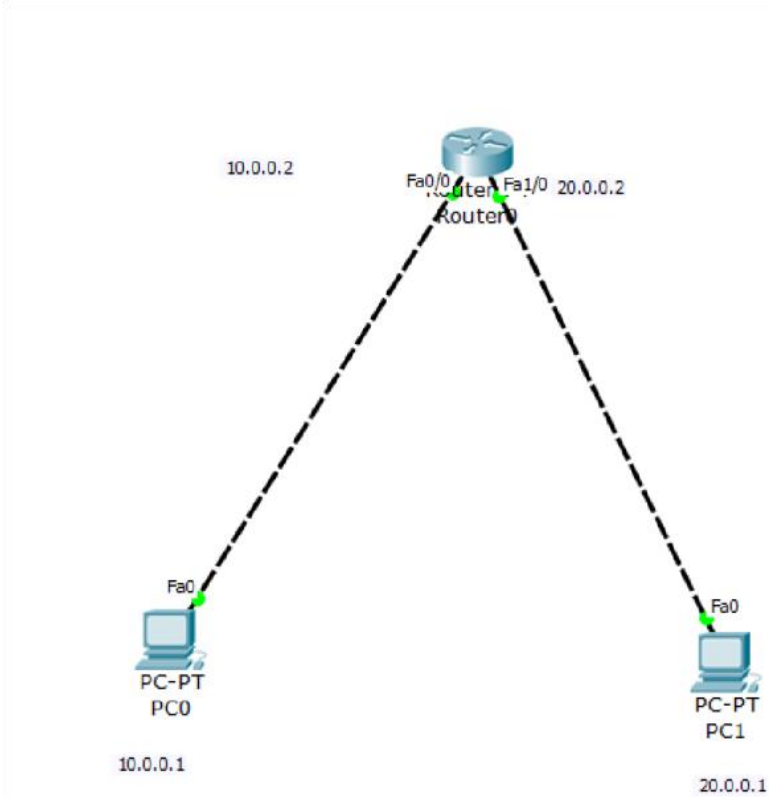
```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=1ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Experiment 2

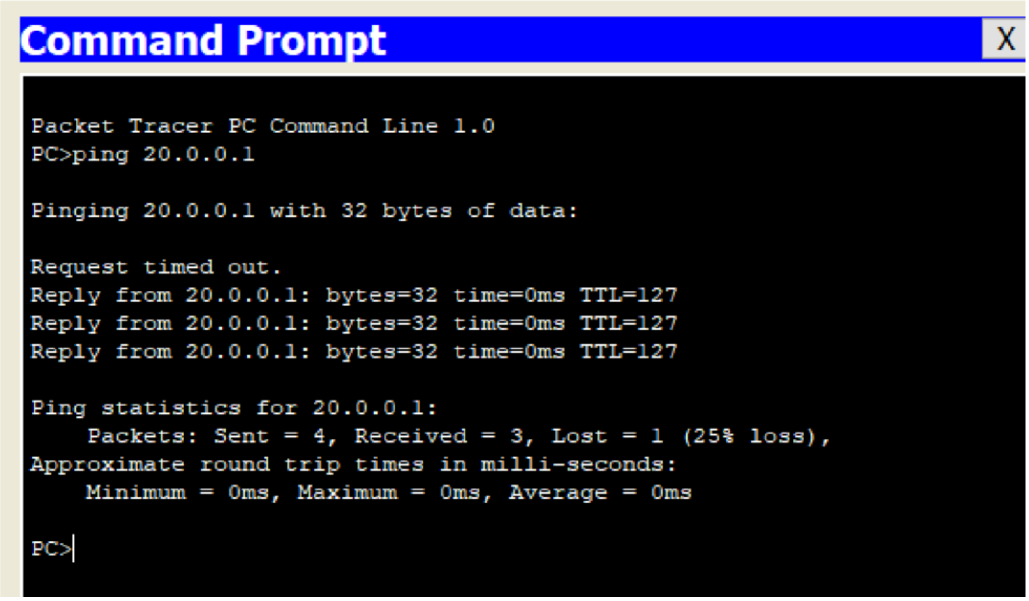
Aim of the program

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

Topology



Output:



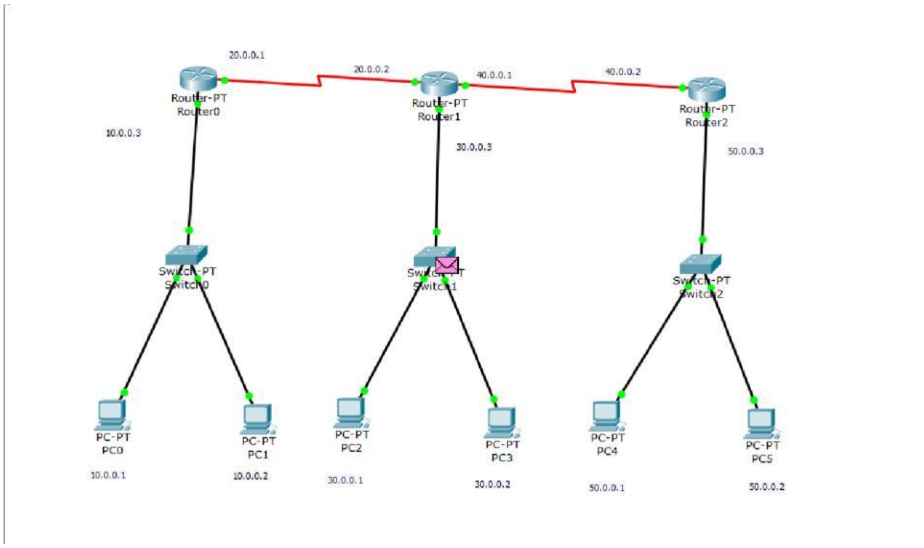
```
Packet Tracer PC Command Line 1.0
PC>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>
```

Experiment 3

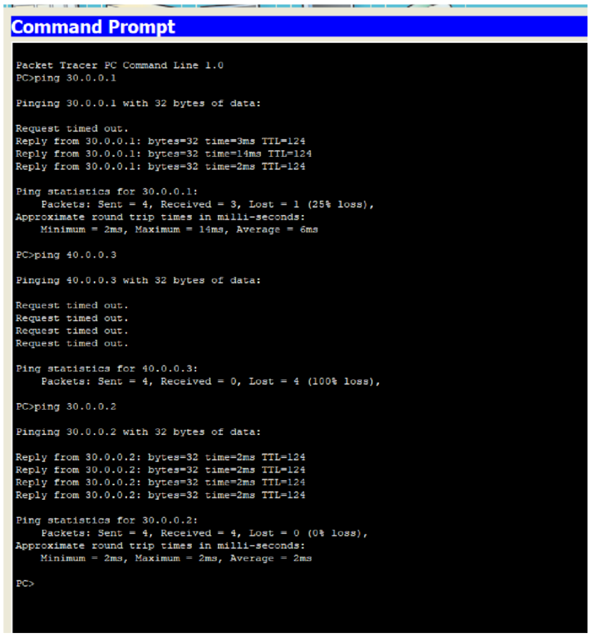
Aim of the program

Configuring default route to the Router

Topology



OUTPUT:



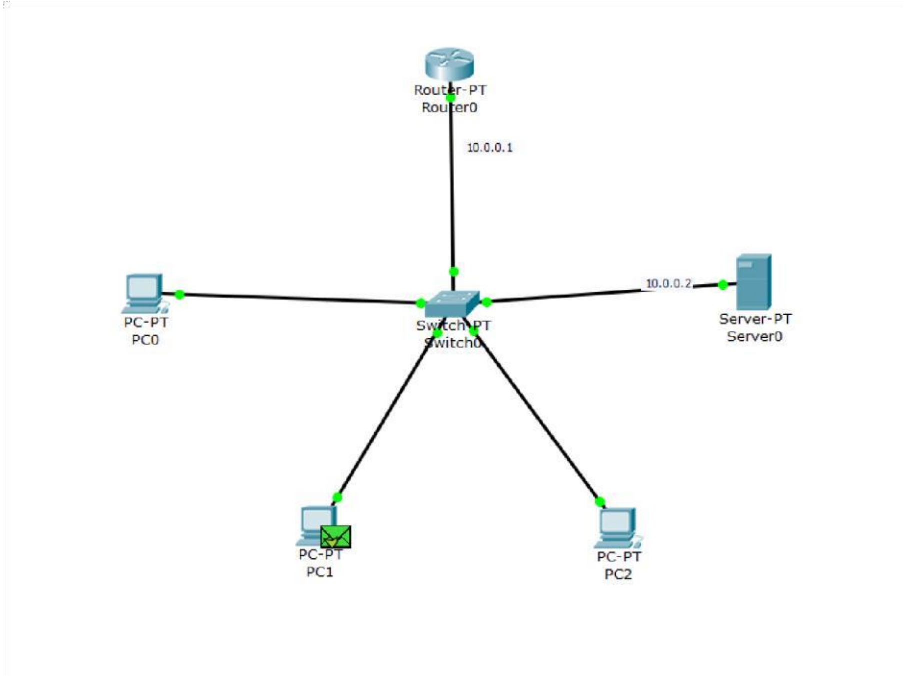
```
Packet Tracer PC Command Line 1.0
PC>ping 30.0.0.1

Pinging 30.0.0.1 with 32 bytes of data:

Request timed out.
Reply from 30.0.0.1: bytes=32 time=3ms TTL=124
Reply from 30.0.0.1: bytes=32 time=14ms TTL=124
Reply from 30.0.0.1: bytes=32 time=2ms TTL=124

Ping statistics for 30.0.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 14ms, Average = 6ms

PC>ping 40.0.0.3

Pinging 40.0.0.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 40.0.0.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

PC>ping 30.0.0.2

Pinging 30.0.0.2 with 32 bytes of data:

Reply from 30.0.0.2: bytes=32 time=2ms TTL=124
Reply from 30.0.0.2: bytes=32 time=2ms TTL=124
Reply from 30.0.0.2: bytes=32 time=2ms TTL=124
Reply from 30.0.0.2: bytes=32 time=2ms TTL=124

Ping statistics for 30.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 2ms, Average = 2ms

PC>
```

Experiment 4

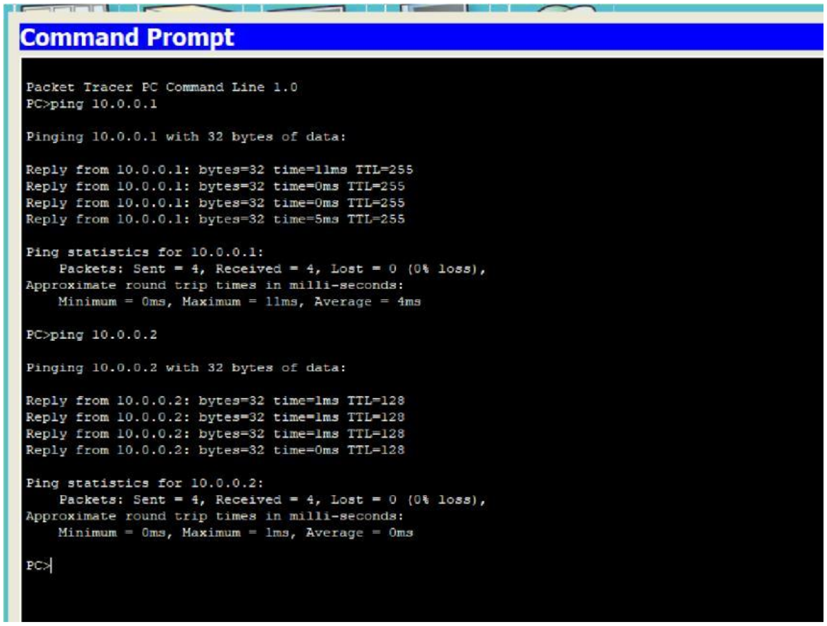
Aim of the program

Configuring DHCP within a LAN in a packet Tracer

Topology



Output



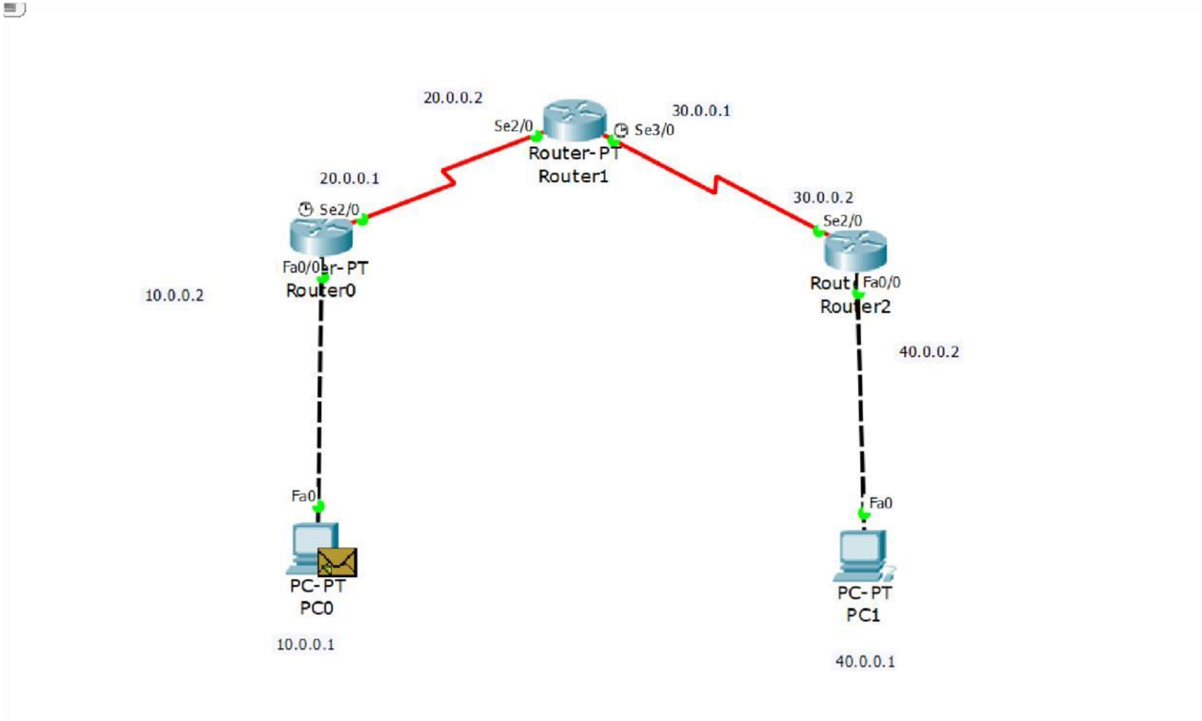
```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=11ms TTL=255
Reply from 10.0.0.1: bytes=32 time=0ms TTL=255
Reply from 10.0.0.1: bytes=32 time=0ms TTL=255
Reply from 10.0.0.1: bytes=32 time=5ms TTL=255

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 11ms, Average = 4ms

PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>
```

Experiment 5

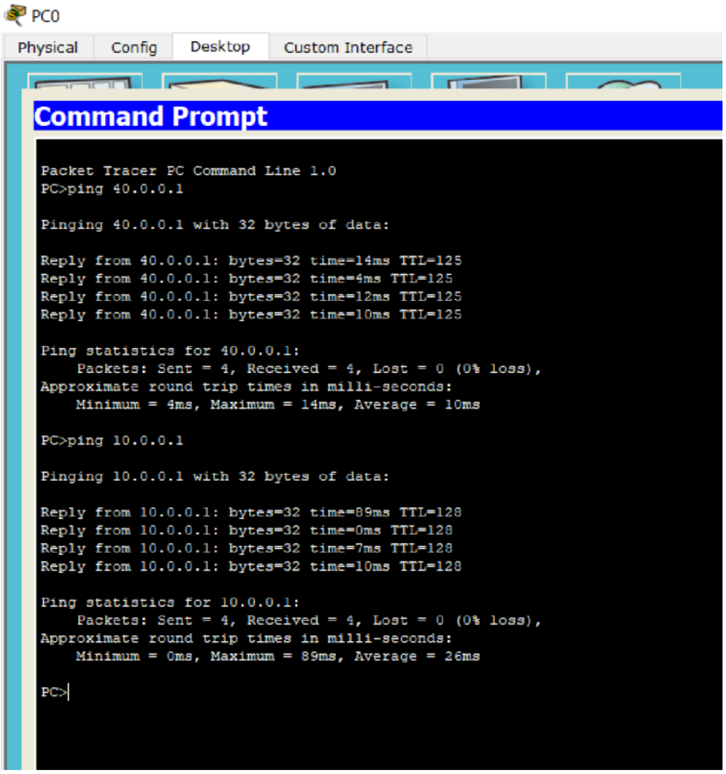
Aim of the program

Configuring RIP Routing Protocol in Routers

Topology



Output



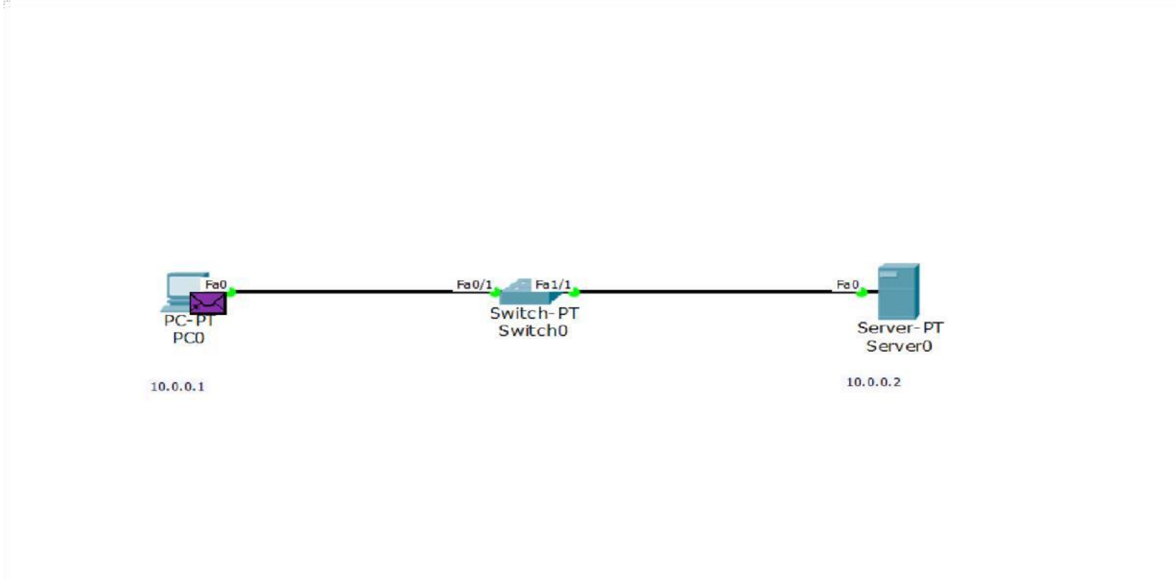
```
Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 40.0.0.1: bytes=32 time=14ms TTL=125
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Reply from 40.0.0.1: bytes=32 time=12ms 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 = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 14ms, Average = 10ms

PC>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=89ms TTL=128
Reply from 10.0.0.1: bytes=32 time=0ms TTL=128
Reply from 10.0.0.1: bytes=32 time=7ms TTL=128
Reply from 10.0.0.1: bytes=32 time=10ms TTL=128

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 89ms, Average = 26ms

PC>
```

Experiment 6

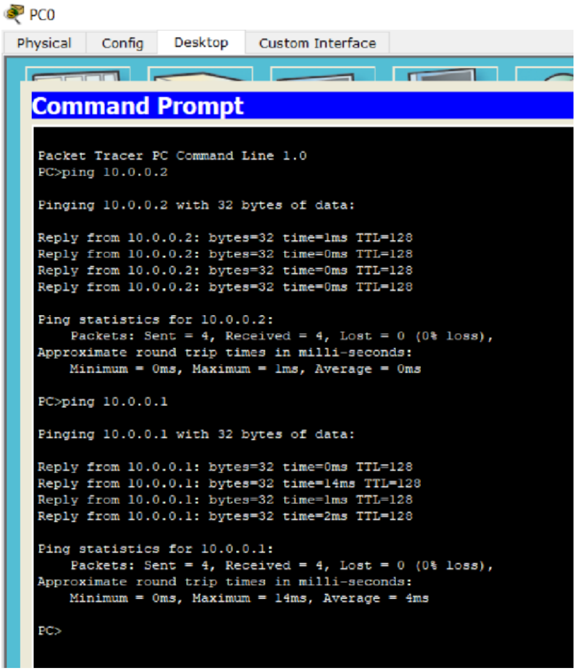
Aim of the program

Demonstration of WEB server and DNS using Packet Tracer

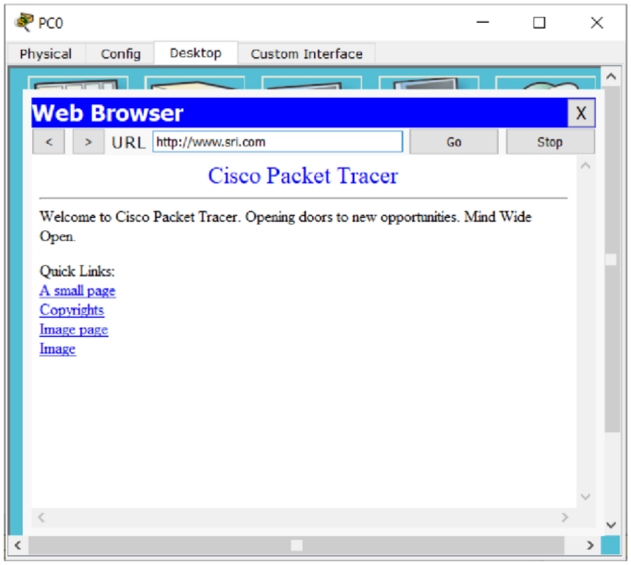
Topology



Output



```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=0ms TTL=128
Reply from 10.0.0.1: bytes=32 time=14ms TTL=128
Reply from 10.0.0.1: bytes=32 time=1ms TTL=128
Reply from 10.0.0.1: bytes=32 time=2ms TTL=128

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 14ms, Average = 4ms

PC>
```



URL http://www.sri.com

Cisco Packet Tracer

Welcome to Cisco Packet Tracer. Opening doors to new opportunities. Mind Wide Open.

Quick Links:
A small page
Copyrights
Image page
Image

Cycle-2

Experiment 1

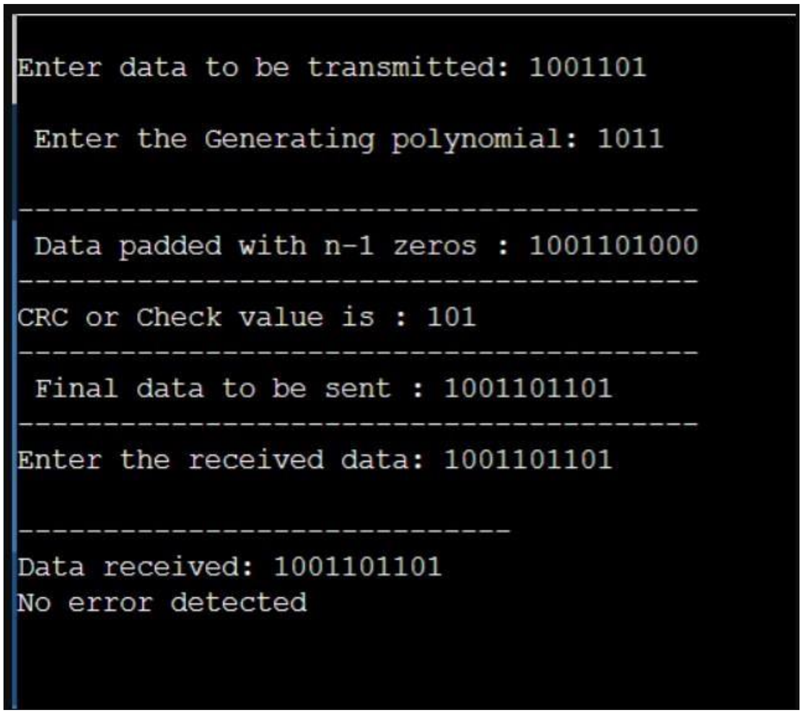
Aim of the Experiment

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

```
#include<stdio.h>
#include<string.h> #define
N strlen(gen_poly) char
data[28]; char
check_value[28]; char
gen_poly[10]; int
data_length,i,j;
void XOR(){
    for(j = 1;j < N; j++) check_value[j] = (( check_value[j] ==
    gen_poly[j])?'0':'1');
} void receiver(){ printf("Enter the received data:
"); scanf("%s", data); printf("\n----------------------
-------\n"); printf("Data received: %s", data);
crc(); for(i=0;(i<N-1) &&
(check_value[i]!='1');i++); if(i<N-1)
printf("\nError detected\n\n"); else printf("\nNo
error detected\n\n");}

void crc(){
    for(i=0;i<N;i++)
    check_value[i]=data[i];
    do{
    if(check_value[0]=='1')
            XOR();
```

```
        for(j=0;j<N-1;j++)
        check_value[j]=check_value[j+1];
        check_value[j]=data[i++];
    }while(i<=data_length+N-1);
}
int main()
{
    printf("\nEnter data to be transmitted: ");
    scanf("%s",data); printf("\n Enter the Generating
    polynomial: "); scanf("%s",gen_poly);
    data_length=strlen(data);
    for(i=data_length;i<data_length+N-1;i++)
    data[i]='0'; printf("\n..................................................-----
    --"); printf("\n Data padded with n-1 zeros :
    %s",data); printf("\n..........................................................
    -"); crc(); printf("\nCRC or Check value is :
    %s",check_value);
    for(i=data_length;i<data_length+N-1;i++)
    data[i]=check_value[i-data_length]; printf("\n--------
    ..............................................."); printf("\n Final data to
    be sent : %s",data); printf("\n----------------------------
    ------------\n"); receiver(); return 0;
}
```

Output



```
Enter data to be transmitted: 1001101

 Enter the Generating polynomial: 1011

----------------------------------------
 Data padded with n-1 zeros : 1001101000
----------------------------------------
CRC or Check value is : 101
----------------------------------------
 Final data to be sent : 1001101101
----------------------------------------
Enter the received data: 1001101101

-----------------------------
Data received: 1001101101
No error detected
```

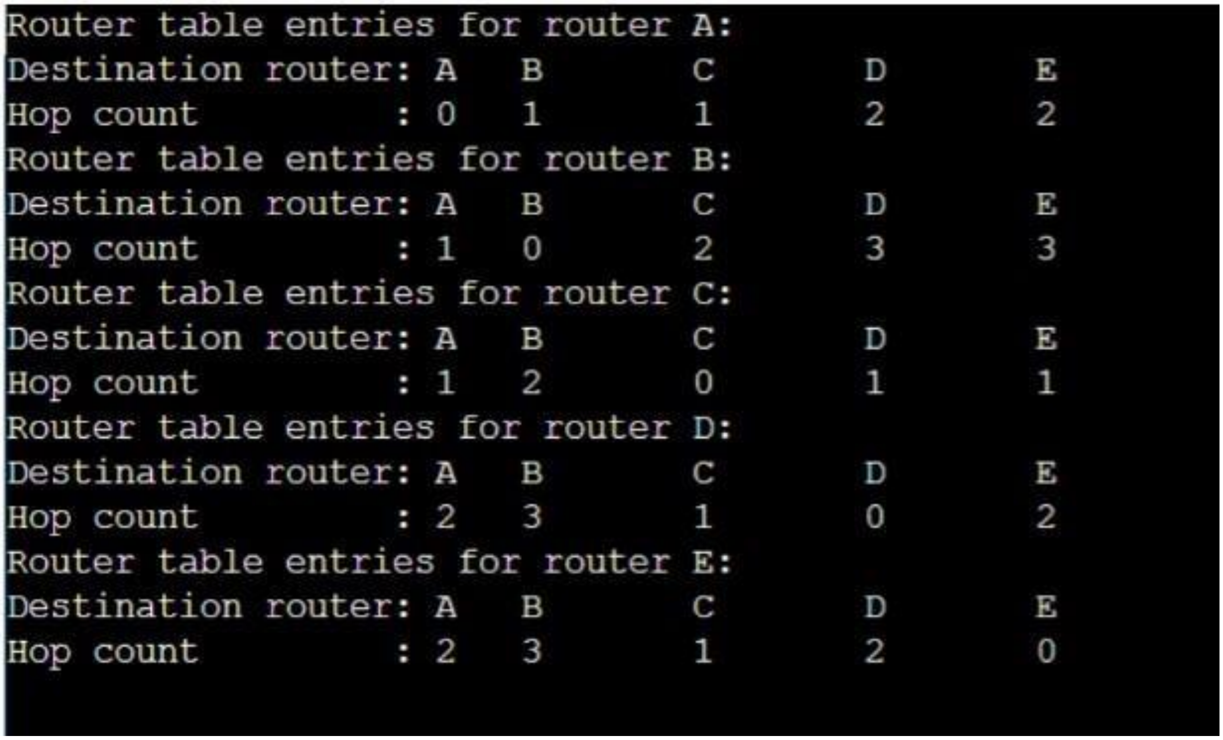
Experiment 2

Aim of the Experiment

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

```
#include<stdio.h>
#define INF 99999 #define
n 5 void printSolution(int
g[n])
{
printf("Hop count : ");
for(int j=0;j<n;j++)
{
if(g[j] == INF)
printf("INF\t");
else
printf("%d\t",g[j]);
}
printf("\n");
}
void findShortestPath(int dist[][n])
{ for(int
k=0;k<n;k++)
{
for(int i=0;i<n;i++)
{
for(int j=0;j<n;j++)
{
if(dist[i][j] > dist[i][k] + dist[k][j]
&&(dist[i][k] != INF && dist[k][j] != INF))
{
dist[i][j] = dist[i][k] + dist[k][j];
}
}
}
}
char c = 'A'; for(int
i=0; i<n; i++ )
{
printf("Router table entries for router %c:\n", c);
printf("Destination router: A\tB\tC\tD\tE\n");
printSolution(dist[i]); c++; }
}
int main()
{
int graph[][n] = { {0, 1, 1, INF, INF},
{1, 0, INF, INF, INF},
{1, INF, 0, 1, 1},
{INF, INF, 1, 0, INF},
{INF, INF, 1, INF, 0}};

findShortestPath(graph);
return 0;
}
```

Output:



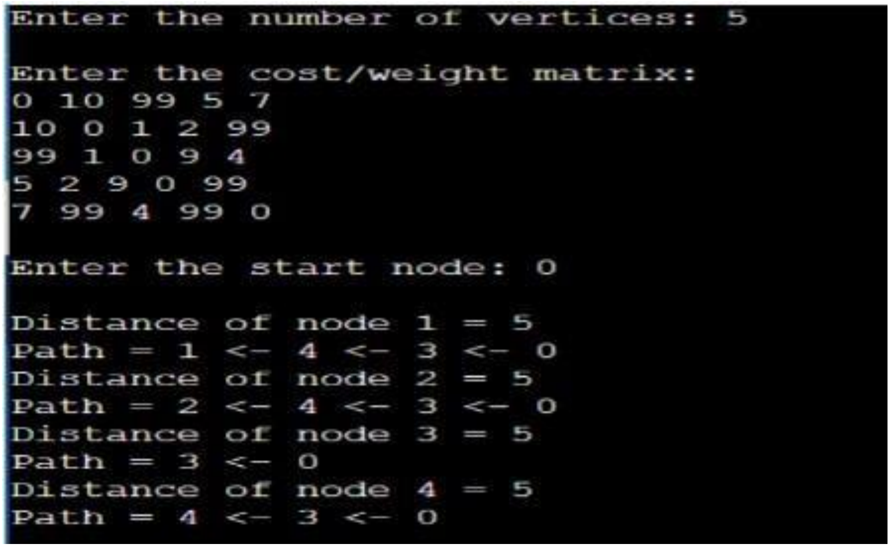
```
Router table entries for router A:
Destination router: A   B       C       D       E
Hop count         : 0   1       1       2       2
Router table entries for router B:
Destination router: A   B       C       D       E
Hop count         : 1   0       2       3       3
Router table entries for router C:
Destination router: A   B       C       D       E
Hop count         : 1   2       0       1       1
Router table entries for router D:
Destination router: A   B       C       D       E
Hop count         : 2   3       1       0       2
Router table entries for router E:
Destination router: A   B       C       D       E
Hop count         : 2   3       1       2       0
```

Experiment 3

Aim of the Experiment: Implement Dijkstra’s algorithm to compute the shortest path for a given topology.

```
#include <stdio.h> #include
<stdlib.h> void dijkstra(int
graph[10][10],int V)
{
int distance[V], predefine[V], visited[V]; int
startnode, count, min_distance, nextnode, i, j;
printf("\nEnter the start node: "); scanf("%d",
&startnode); for(i=0; i<V; i++) { distance[i] =
graph[startnode][i]; predefine[i] = startnode;
visited[i] = 0;
}
distance[startnode] = 0; visited[startnode] = 1;
count = 1; while(count<V-1) { min_distance =
99; for(i=0; i<V; i++) { if(distance[i] <
min_distance && visited[i]==0)
{ min_distance =
distance[i]; nextnode = i;
}
} visited[nextnode] =
1; for(i=0;i<V;i++)
{
if(visited[i] == 0)
{ if((min_distance + graph[nextnode][i]) <
distance[i])
{ distance[i] = min_distance +
graph[nextnode][i]; predefine[i] = nextnode;
}} } count = count + 1; } for(i=0;i<V;i++) {
if(i!=startnode) { printf("\nDistance of node %d =
%d", i, distance[i]); printf("\nPath = %d",i);
j = i;
do
{
j = predefine[j];
printf(" <- %d",j);
} while (j != startnode);
}
}
}
int main()
{
int i, j; int V; printf("Enter the number of
vertices: "); scanf("%d", &V); int
graph[V][V]; printf("\nEnter the
cost/weight matrix: \n"); for(i=0; i<V; i++)
{ for(j=0;j<V;j++) { scanf("%d",
&graph[i][j]);} dijkstra(graph, V); return 0;
}
```

Output:



```
Enter the number of vertices: 5

Enter the cost/weight matrix:
0 10 99 5 7
10 0 1 2 99
99 1 0 9 4
5 2 9 0 99
7 99 4 99 0

Enter the start node: 0

Distance of node 1 = 5
Path = 1 <- 4 <- 3 <- 0
Distance of node 2 = 5
Path = 2 <- 4 <- 3 <- 0
Distance of node 3 = 5
Path = 3 <- 0
Distance of node 4 = 5
Path = 4 <- 3 <- 0
```

Experiment 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.

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()
```

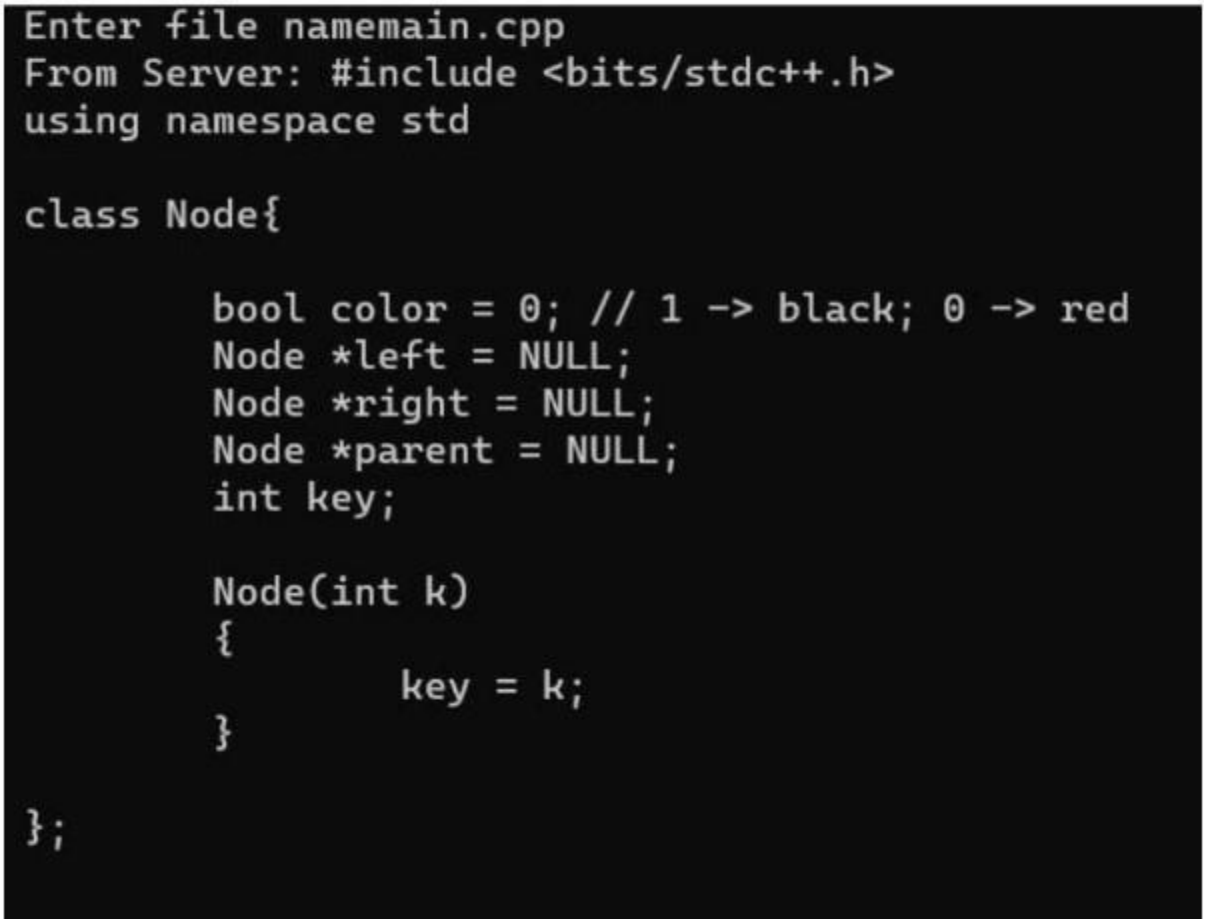
Client:

```
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()

Output



```
Enter file namemain.cpp
From Server: #include <bits/stdc++.h>
using namespace std

class Node{

        bool color = 0; // 1 -> black; 0 -> red
        Node *left = NULL;
        Node *right = NULL;
        Node *parent = NULL;
        int key;

        Node(int k)
        {
                key = k;
        }

};
```

Experiment 5

Aim of the Experiment

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

Server:

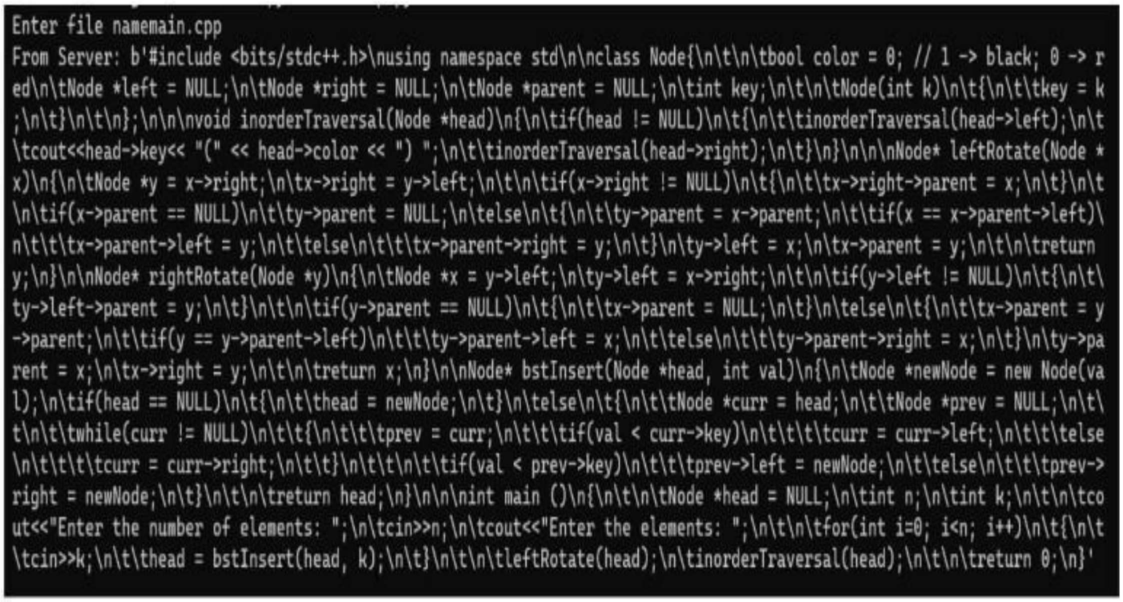
```
from socket import *
serverPort = 12000
serverSocket =
socket(AF_INET,
SOCK_DGRAM)
serverSocket.bind(("127.0.0.1"
, serverPort)) print("The server
is ready to receive") while
1:
sentence,clientAddress =
serverSocket.recvfrom(2048)
file=open(sentence,"r")
l=file.read(2048)
serverSocket.sendto(bytes(l,"utf-
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()
```

Output



```
Enter file namemain.cpp
From Server: b'#include <bits/stdc++.h>\nusing namespace std\n\nclass Node{\n\t\n\tbool color = 0; // 1 -> black; 0 -> r
ed\n\tNode *left = NULL;\n\tNode *right = NULL;\n\tNode *parent = NULL;\n\tint key;\n\t\n\tNode(int k)\n\t{\n\t\tkey = k
;\n\t}\n\t\n};\n\n\nvoid inorderTraversal(Node *head)\n{\n\tif(head != NULL)\n\t{\n\t\tinorderTraversal(head->left);\n\t
\tcout<<head->key<< "(" << head->color << ") ";\n\t\tinorderTraversal(head->right);\n\t}\n}\n\n\nNode* leftRotate(Node *
x)\n{\n\tNode *y = x->right;\n\tx->right = y->left;\n\t\n\tif(x->right != NULL)\n\t{\n\t\tx->right->parent = x;\n\t}\n\t
\n\tif(x->parent == NULL)\n\t\ty->parent = NULL;\n\telse\n\t{\n\t\ty->parent = x->parent;\n\t\tif(x == x->parent->left)\
n\t\t\tx->parent->left = y;\n\t\telse\n\t\t\tx->parent->right = y;\n\t}\n\ty->left = x;\n\tx->parent = y;\n\t\n\treturn
y;\n}\n\nNode* rightRotate(Node *y)\n{\n\tNode *x = y->left;\n\ty->left = x->right;\n\t\n\tif(y->left != NULL)\n\t{\n\t\
ty->left->parent = y;\n\t}\n\t\n\tif(y->parent == NULL)\n\t{\n\t\tx->parent = NULL;\n\t}\n\telse\n\t{\n\t\tx->parent = y
->parent;\n\t\tif(y == y->parent->left)\n\t\t\ty->parent->left = x;\n\t\telse\n\t\t\ty->parent->right = x;\n\t}\n\ty->pa
rent = x;\n\tx->right = y;\n\t\n\treturn x;\n}\n\nNode* bstInsert(Node *head, int val)\n{\n\tNode *newNode = new Node(va
l);\n\tif(head == NULL)\n\t{\n\t\thead = newNode;\n\t}\n\telse\n\t{\n\t\tNode *curr = head;\n\t\tNode *prev = NULL;\n\t\
t\n\t\twhile(curr != NULL)\n\t\t{\n\t\t\tprev = curr;\n\t\t\tif(val < curr->key)\n\t\t\t\tcurr = curr->left;\n\t\t\telse
\n\t\t\t\tcurr = curr->right;\n\t\t}\n\t\t\n\t\tif(val < prev->key)\n\t\t\tprev->left = newNode;\n\t\telse\n\t\t\tprev->
right = newNode;\n\t}\n\t\n\treturn head;\n}\n\n\nint main ()\n{\n\t\n\tNode *head = NULL;\n\tint n;\n\tint k;\n\t\n\tco
ut<<"Enter the number of elements: ";\n\tcin>>n;\n\tcout<<"Enter the elements: ";\n\t\n\tfor(int i=0; i<n; i++)\n\t{\n\t
\tcin>>k;\n\t\thead = bstInsert(head, k);\n\t}\n\t\n\tleftRotate(head);\n\tinorderTraversal(head);\n\t\n\treturn 0;\n}'
```