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

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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 **TUSHAR SHARMA(1BM20CS175),** 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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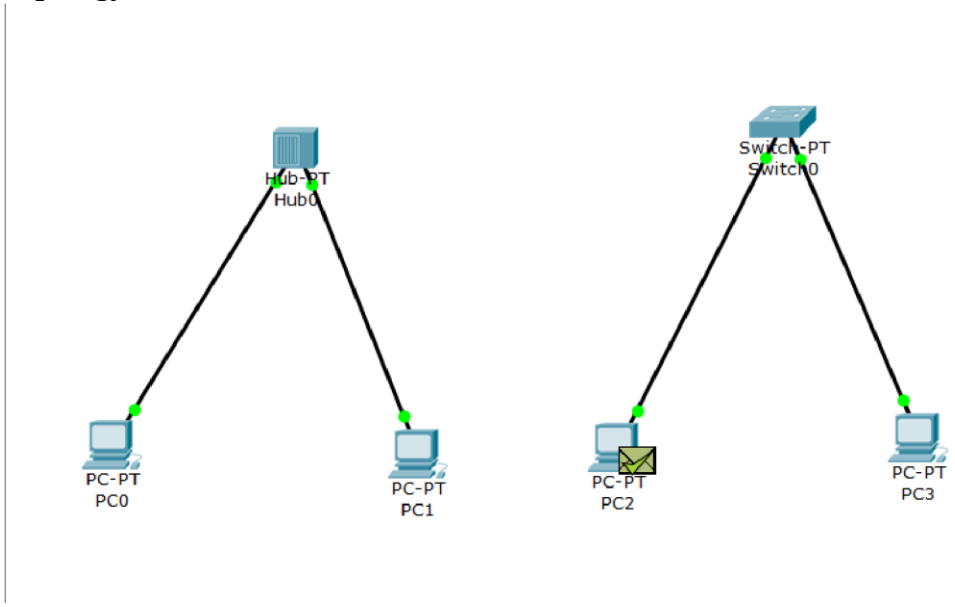
Cycle-1

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



Procedure

output :-

* when the packets are placed to the node that is connected to the switch as a source & the destination node will be present in the hub connected nodes.

* when the simulation starts the packets start processing / transferring from the source to all other nodes with the help of hub & switch.

- Result :-

For hub :-

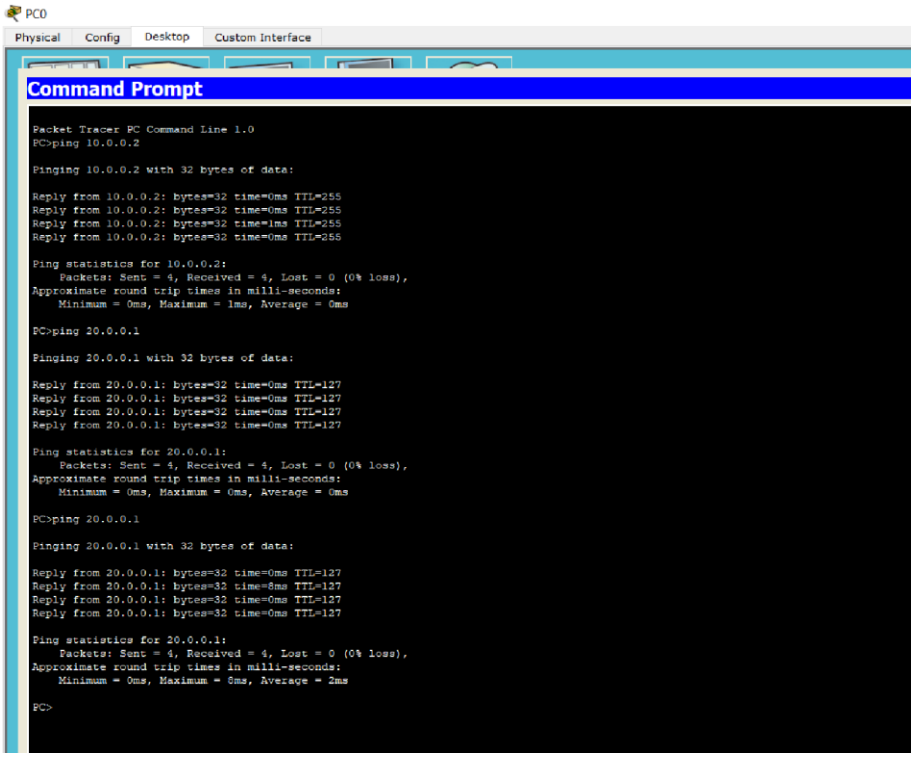
PC > ping 10.0.0.2 (input)
Pinging 10.0.0.2 with 32 bytes of data:
Reply from 10.0.0.2 bytes 32 time 2ms TTL 128
Reply from 10.0.0.2 bytes 32 time 0ms TTL 128
Reply from 10.0.0.2 bytes 32 time 0ms TTL 128
Reply from 10.0.0.2 bytes 32 time 4ms TTL 128
ping Statistics for 10.0.0.2
packets, sent 4, recieved : 4 loss = (0%)
Approximate round trip times in
min :- 0 ms , max = 4ms av = 2ms.

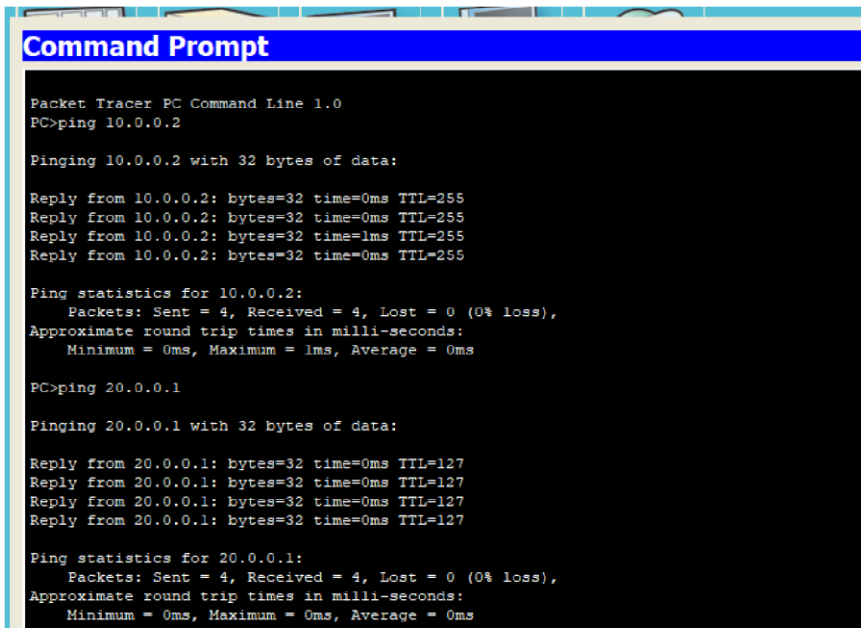
For switch :-

PC > ping 10.0.0.71 with 32 bytes of data :-
Reply from 10.0.0.71 : bytes 32 time 0ms TTL = 128
Reply from 10.0.0.71 : bytes 32 time 0ms TTL = 128
Reply from 10.0.0.71 : bytes 32 time 2ms TTL = 128
Reply from 10.0.0.71 : bytes 32 time 0ms TTL = 128

- To connect the nodes & switch & hub ~~node~~ copper straight through is used.
- To connect hub & switch copper cross-over cable is used.
- Switch act as broadcasting before knowing the IP address of destination node.
- Once the IP address is known it act as a forwarding or unicast.
- ARP [address resolution protocol] - to know the IP address.

Output:


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
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>

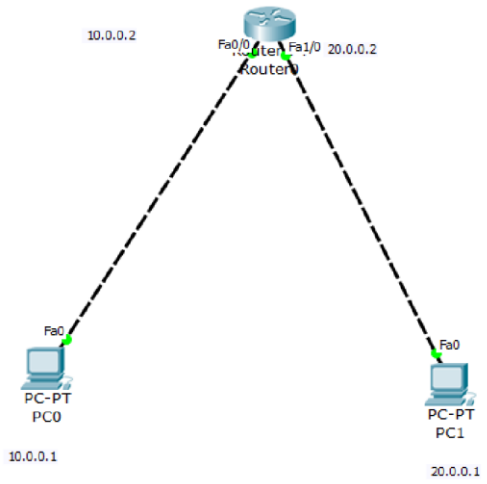

Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2
Pinging 10.0.0.2 with 32 bytes of data:
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Reply from 10.0.0.2: bytes=32 time=1ms TTL=255
Reply from 10.0.0.2: bytes=32 time=0ms TTL=255
Ping statistics 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

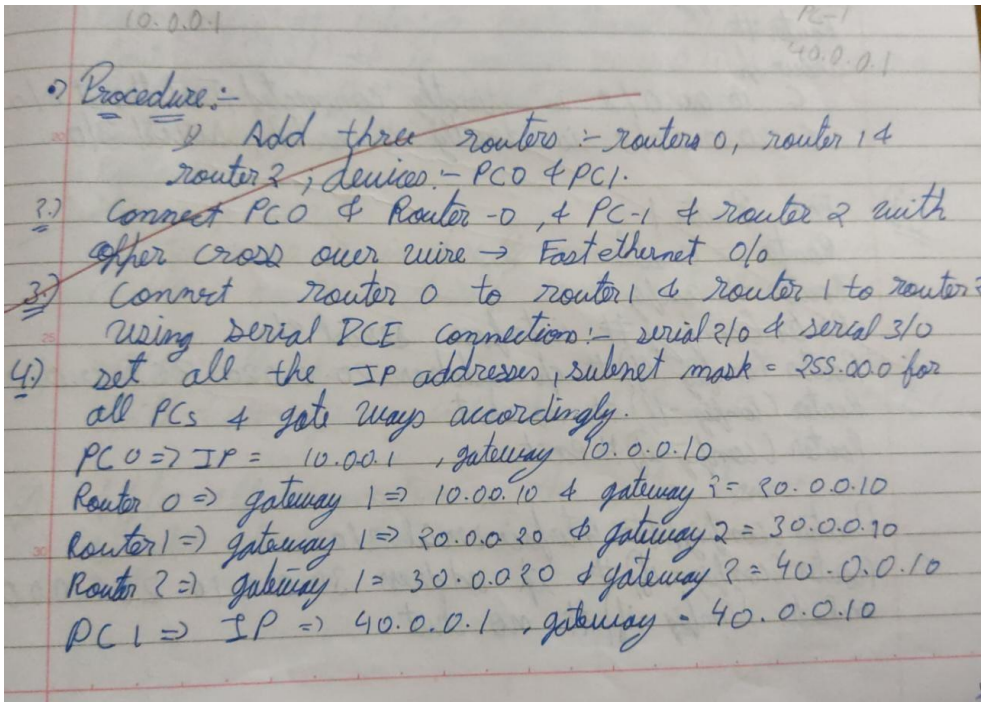
Aim of the program

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

Topology



Procedure



• Procedure :-

1) Add three routers :- routers 0, router 1 & router 2, devices :- PC0 & PC1.

2) Connect PC0 & Router -0, & PC-1 & router 2 with ether cross over wire → Fast ethernet 0/0

3) Connect router 0 to router 1 & router 1 to router 2 using serial DCE connections :- serial 2/0 & serial 3/0

4) set all the IP addresses, subnet mask = 255.0.0.0 for all PCs & gate ways accordingly.

PC 0 => IP = 10.0.0.1, gateway 10.0.0.10

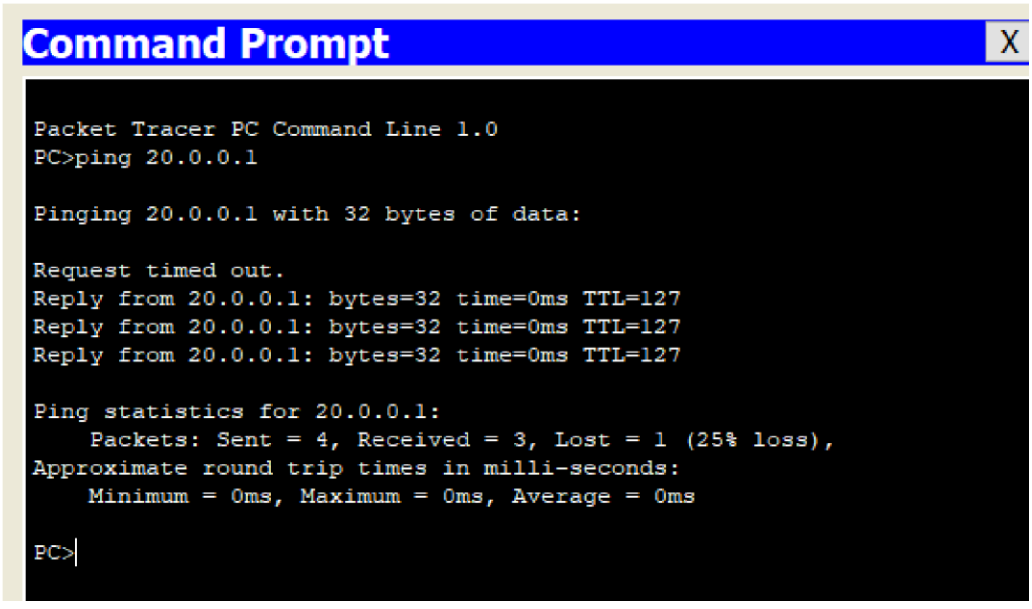
Router 0 => gateway 1 => 10.0.0.10 & gateway 2 = 20.0.0.10

Router 1 => gateway 1 => 20.0.0.20 & gateway 2 = 30.0.0.10

Router 2 => gateway 1 = 30.0.0.20 & gateway 2 = 40.0.0.10

PC 1 => IP => 40.0.0.1, gateway = 40.0.0.10

Output:



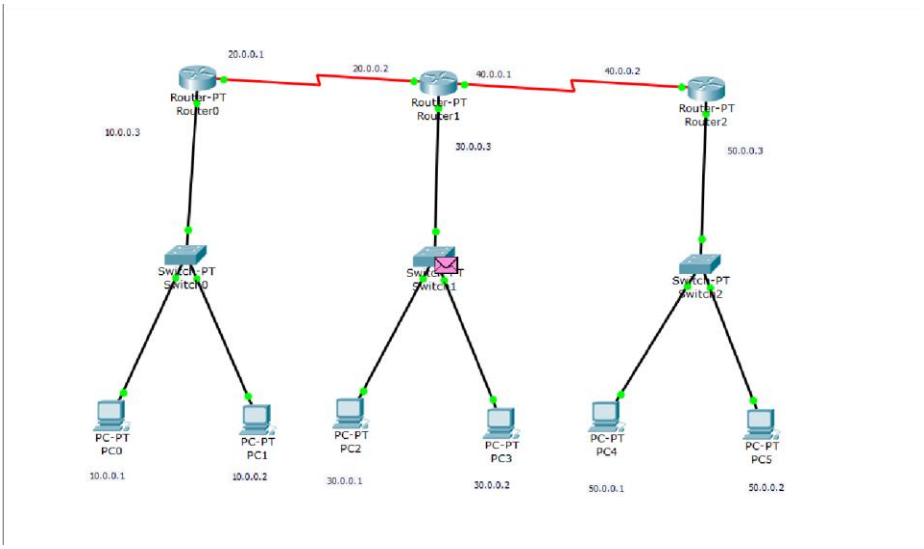
```
Command Prompt                                                    X

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

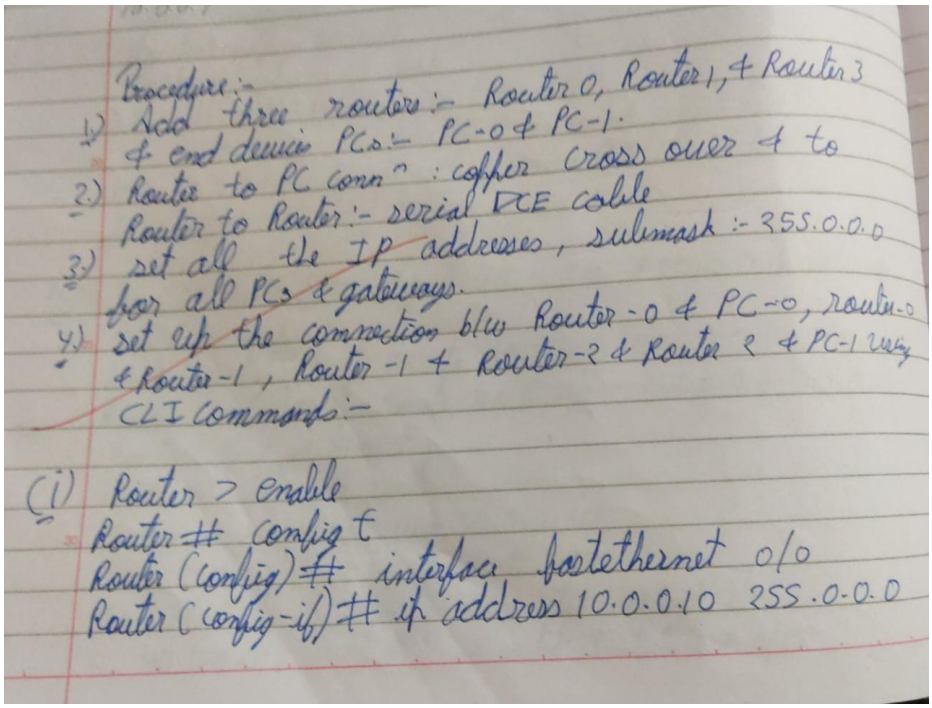
Aim of the program

Configuring default route to the Router

Topology



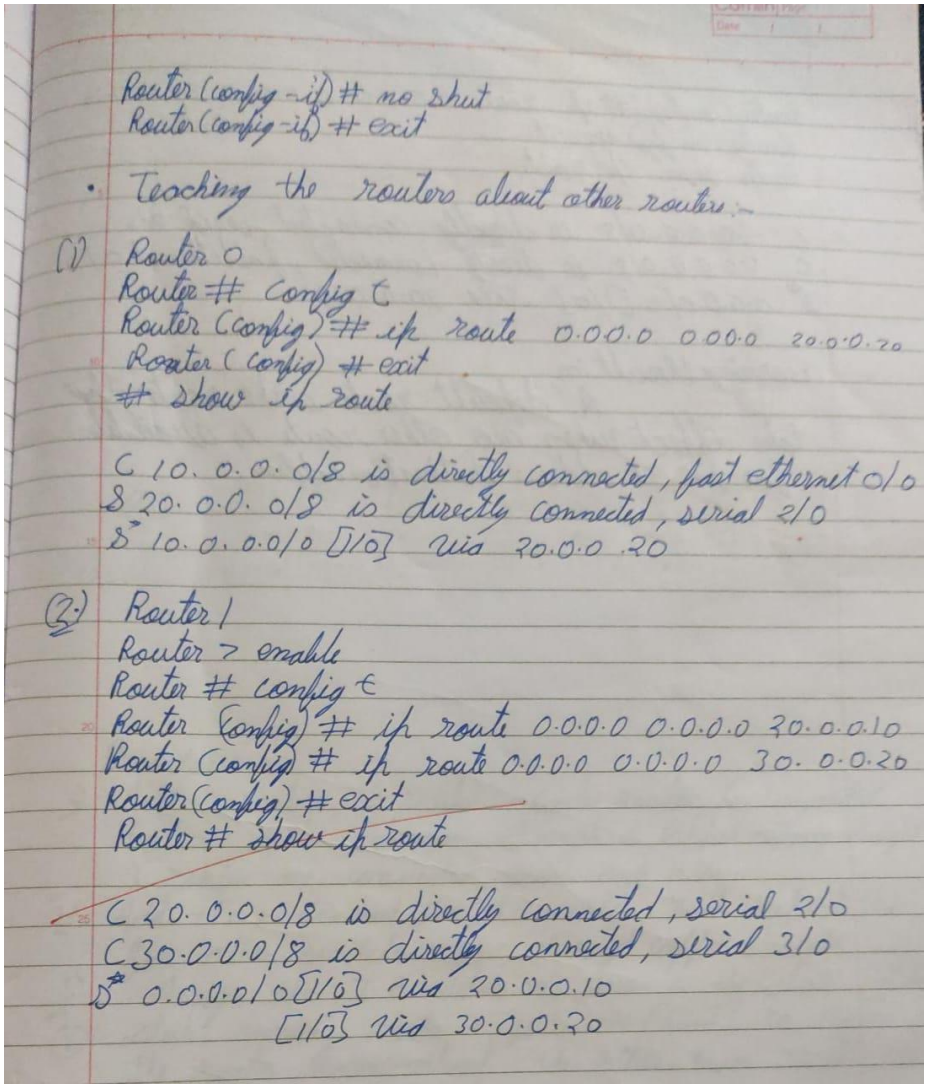
Procedure



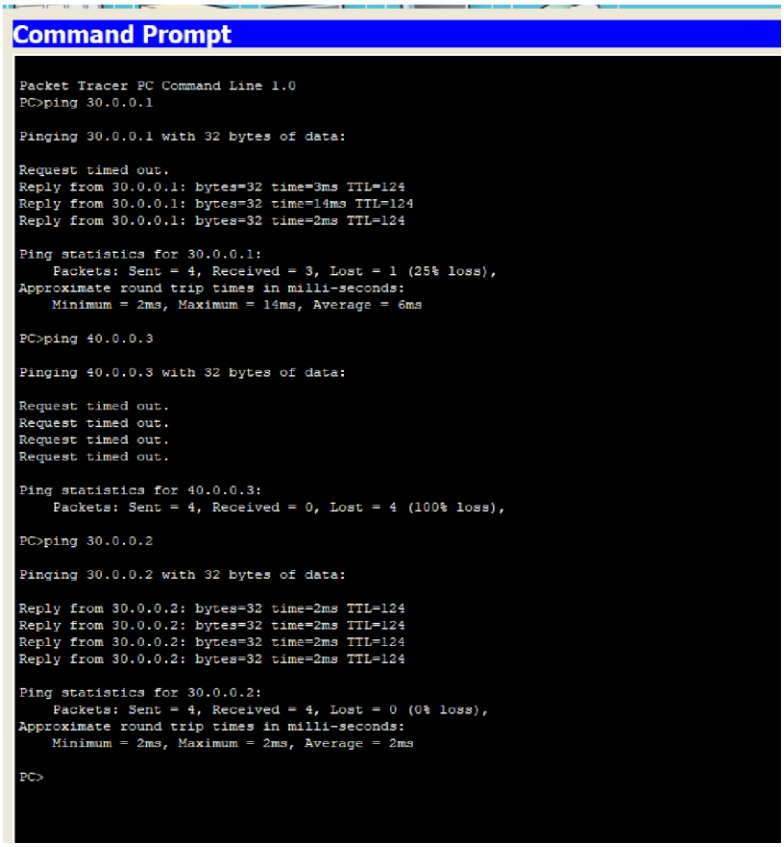
Procedure:-

1) Add three routers :- Router 0, Router 1, & Router 3 & end devices PCs :- PC-0 & PC-1.
2) Router to PC conn^n : coffee Cross over & to Router to Router :- serial DCE cable
3) set all the IP addresses, subnetmask :- 255.0.0.0 for all PCs & gateways.
4) set up the connection blw Router-0 & PC-0, router-0 & Router-1, Router-1 & Router-2 & Router 2 & PC-1 using CLI commands :-

(i) Router > enable
Router # config t
Router (config) # interface fastethernet 0/0
Router (config-if) # ip address 10.0.0.10 255.0.0.0


Router (config-if) # no shut
Router (config-if) # exit
• Teaching the routers about other routers:-
(1) Router 0
Router # config t
Router (config) # ip route 0.0.0.0 0.0.0.0 20.0.0.20
Router (config) # exit
show ip route
C 10.0.0.0/8 is directly connected, fast ethernet 0/0
S 20.0.0.0/8 is directly connected, serial 2/0
S* 10.0.0.0/0 [1/0] via 20.0.0.20
(2) Router 1
Router > enable
Router # config t
Router (config) # ip route 0.0.0.0 0.0.0.0 20.0.0.10
Router (config) # ip route 0.0.0.0 0.0.0.0 30.0.0.20
Router (config) # exit
Router # show ip route
C 20.0.0.0/8 is directly connected, serial 2/0
C 30.0.0.0/8 is directly connected, serial 3/0
S* 0.0.0.0/0 [1/0] via 20.0.0.10
[1/0] via 30.0.0.20

Output:

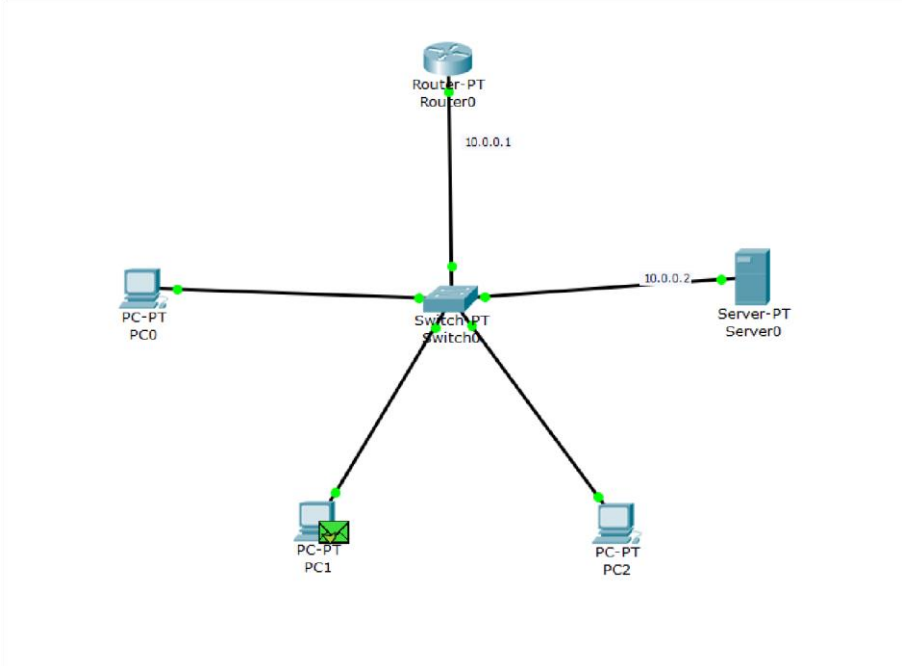

Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 30.0.0.1
Pinging 30.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 30.0.0.1: bytes=32 time=3ms TTL=124
Reply from 30.0.0.1: bytes=32 time=14ms TTL=124
Reply from 30.0.0.1: bytes=32 time=2ms TTL=124
Ping statistics for 30.0.0.1:
Packets: 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

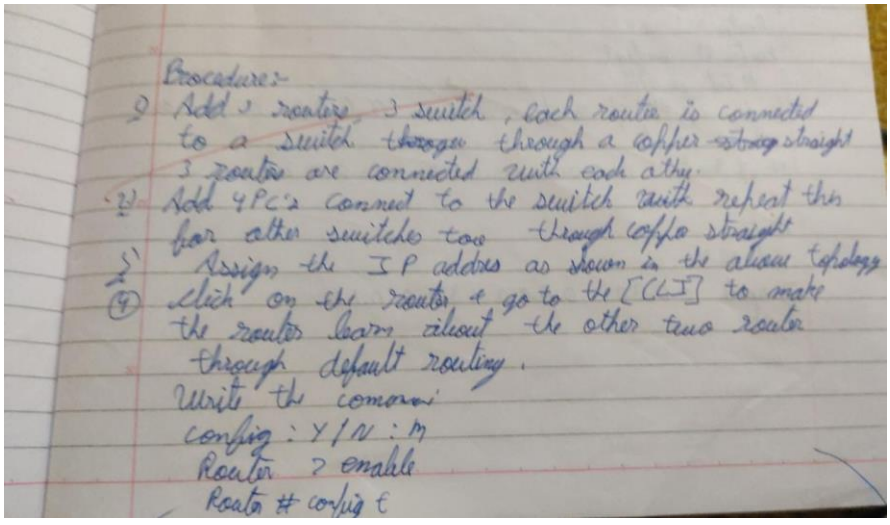
Aim of the program

Configuring DHCP within a LAN in a packet Tracer

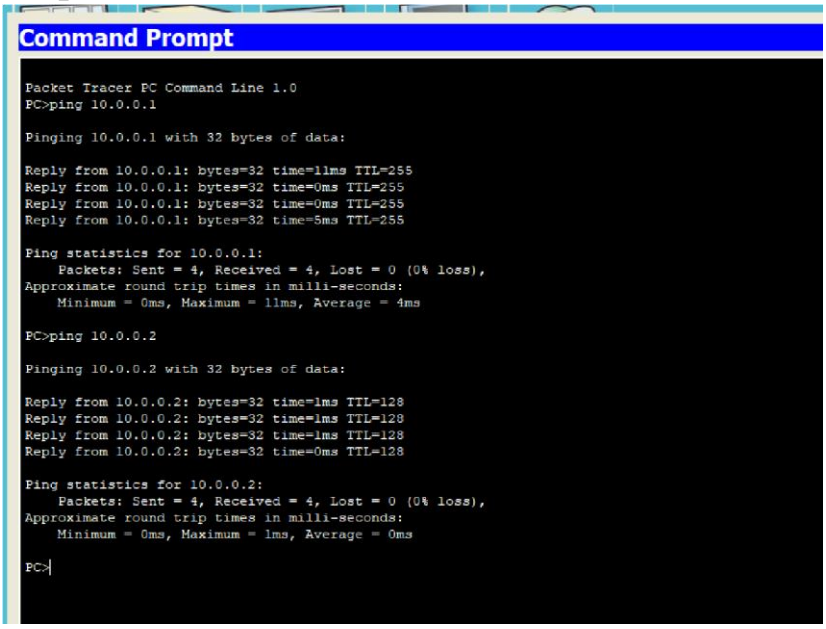
Topology



Procedure



Output

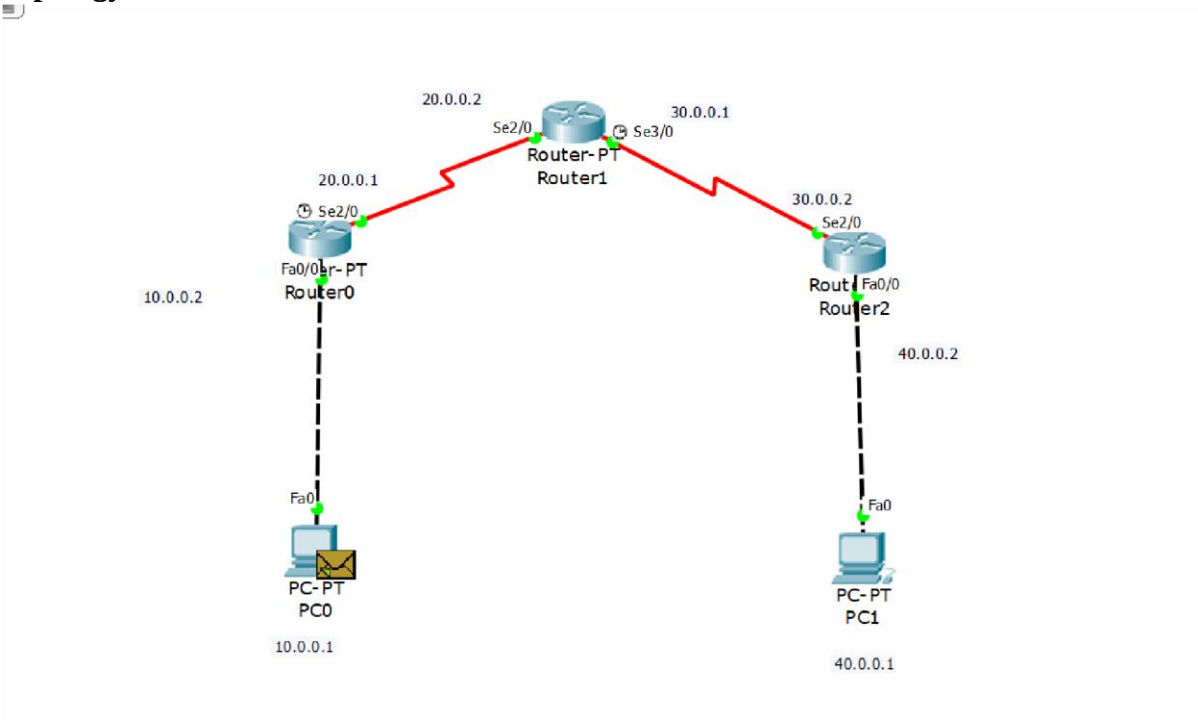

Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.1
Pinging 10.0.0.1 with 32 bytes of data:
Reply from 10.0.0.1: bytes=32 time=11ms TTL=255
Reply from 10.0.0.1: bytes=32 time=0ms TTL=255
Reply from 10.0.0.1: bytes=32 time=0ms TTL=255
Reply from 10.0.0.1: bytes=32 time=5ms TTL=255
Ping statistics 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

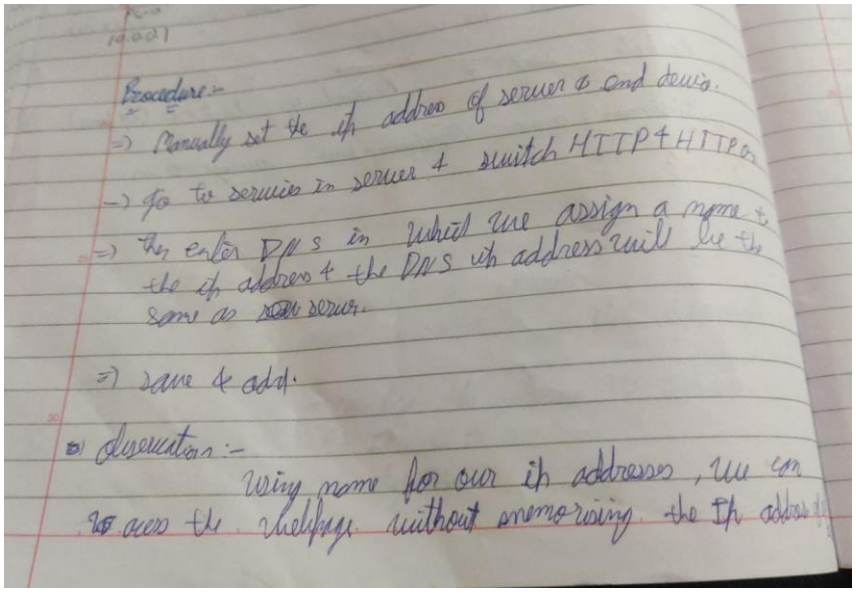
Aim of the program

Configuring RIP Routing Protocol in Routers

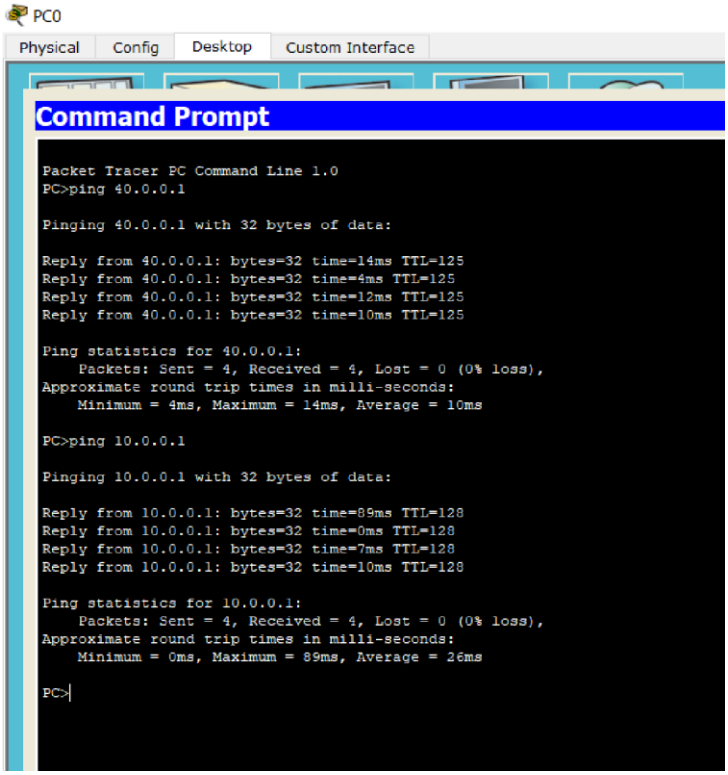
Topology



Procedure



Output

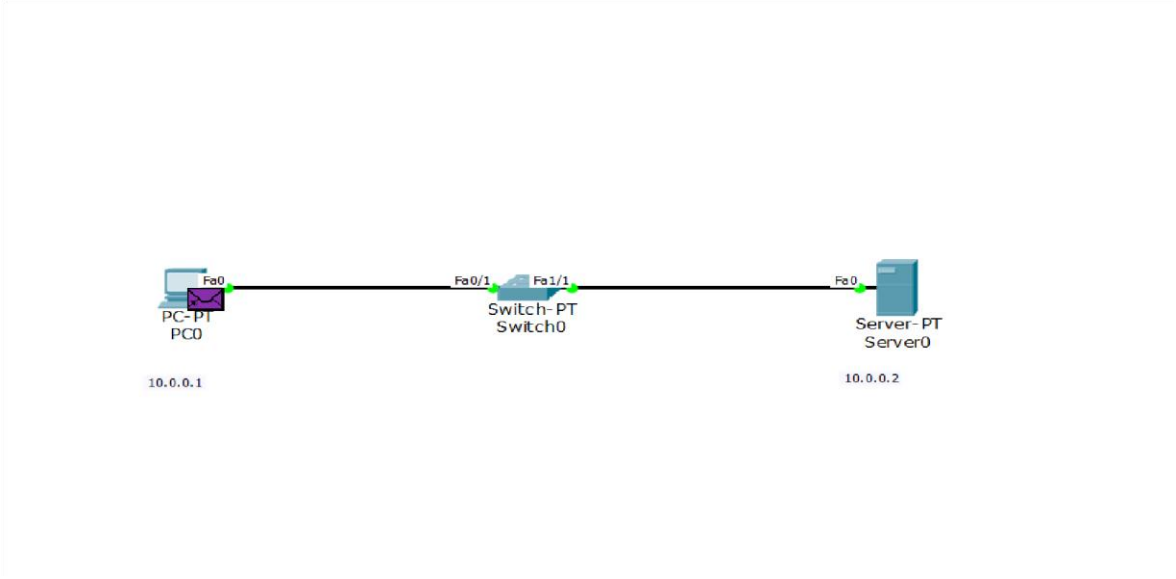

PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Reply from 40.0.0.1: bytes=32 time=14ms TTL=125
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Reply from 40.0.0.1: bytes=32 time=12ms TTL=125
Reply from 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

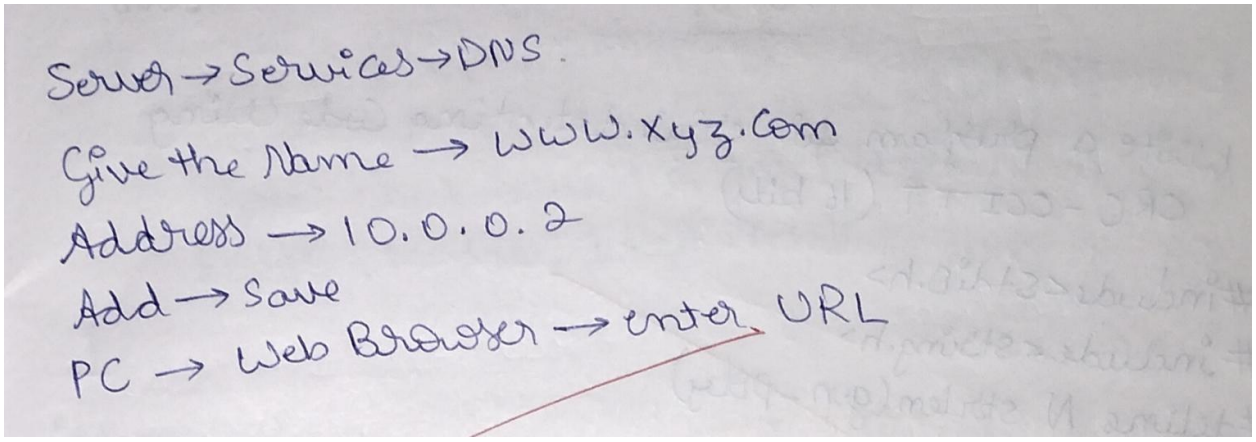
Aim of the program

Demonstration of WEB server and DNS using Packet Tracer

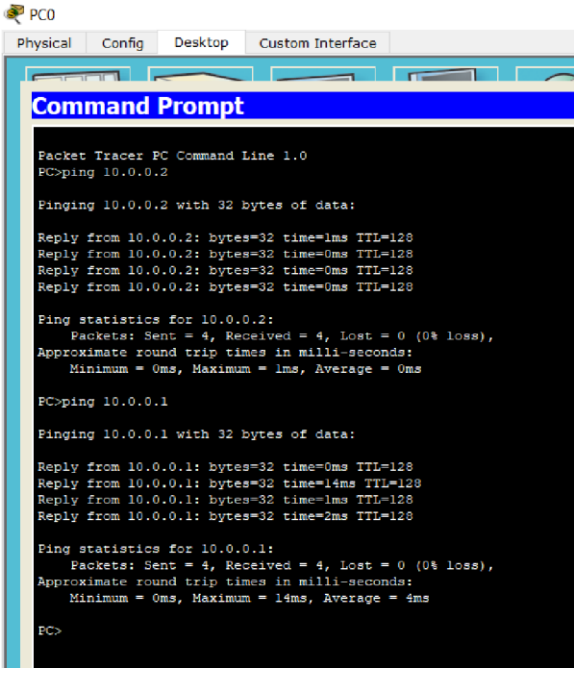
Topology

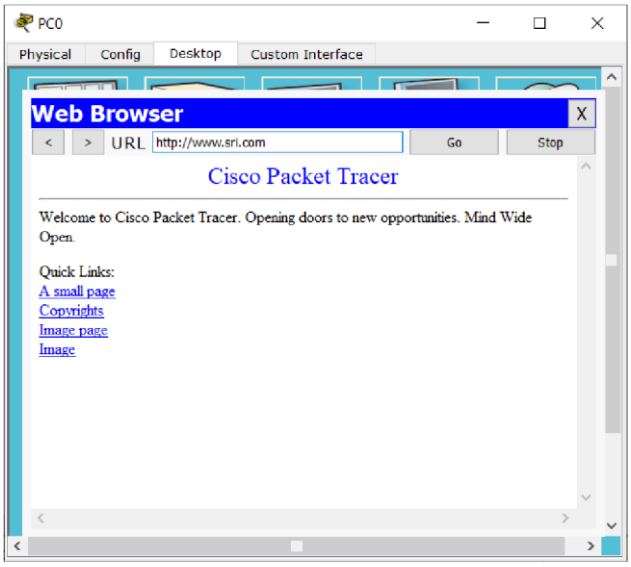


Procedure



Output


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
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>


PC0
Physical
Config
Desktop
Custom Interface
Web Browser
X
URL
http://www.sri.com
Go
Stop
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

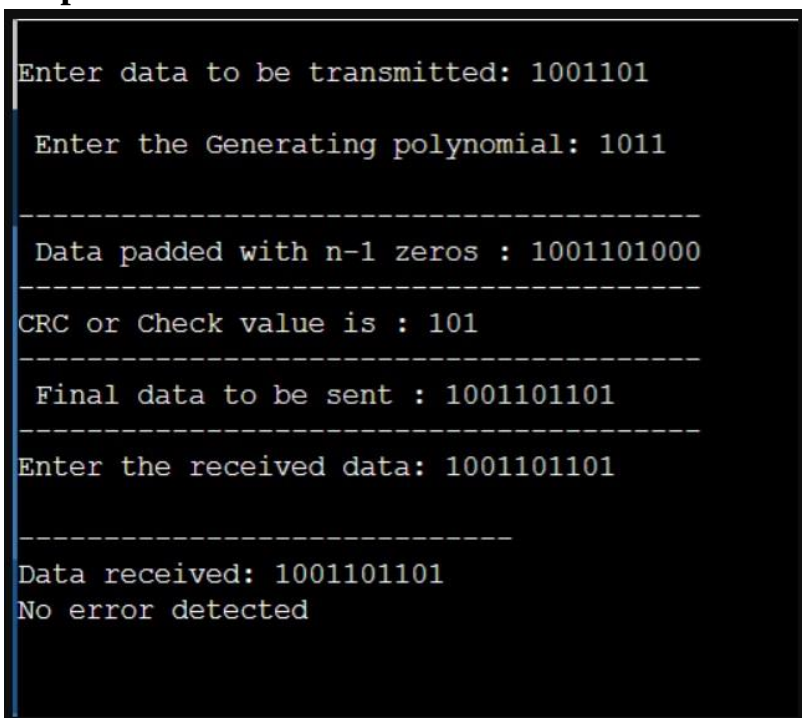
Aim of the Experiment

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
```

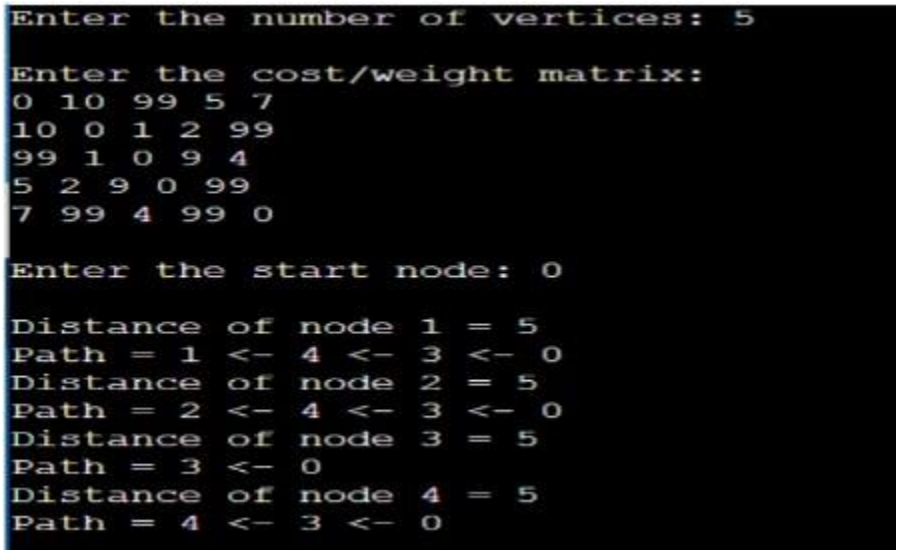
Experiment 3

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 the server 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