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 BENGALURU-560019 October-2022 to Feb-2023

(Autonomous Institution under VTU)

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 **Krish R Sakriya (1BM20CS076),** who is 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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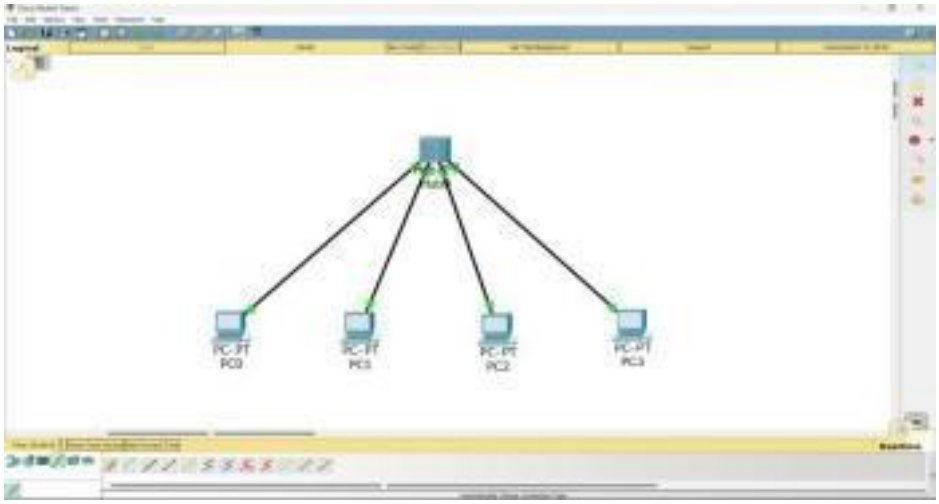
12		Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.	30

Cycle-1 Experiment No 1

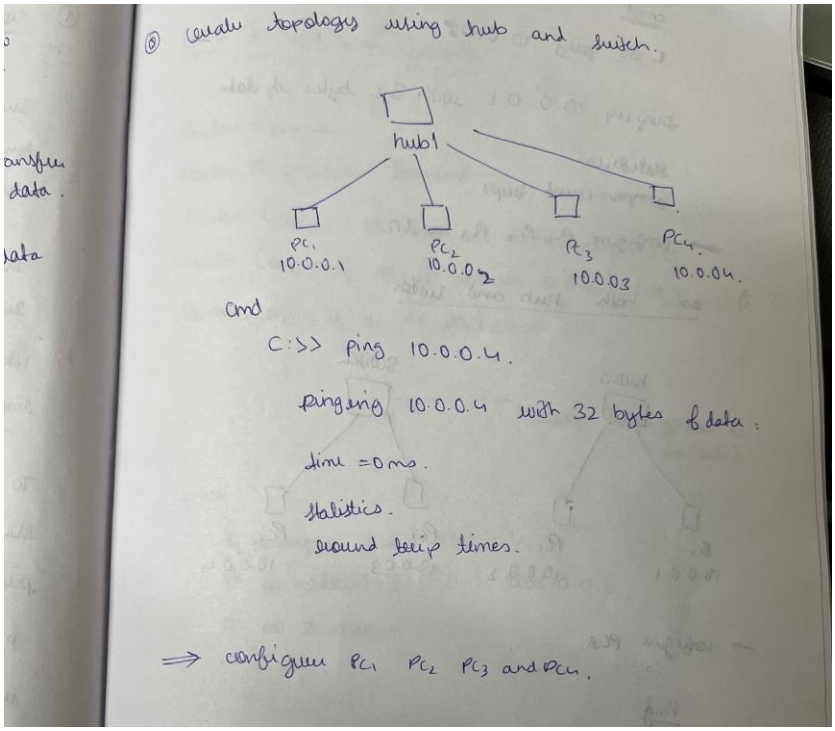
Aim of the program

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

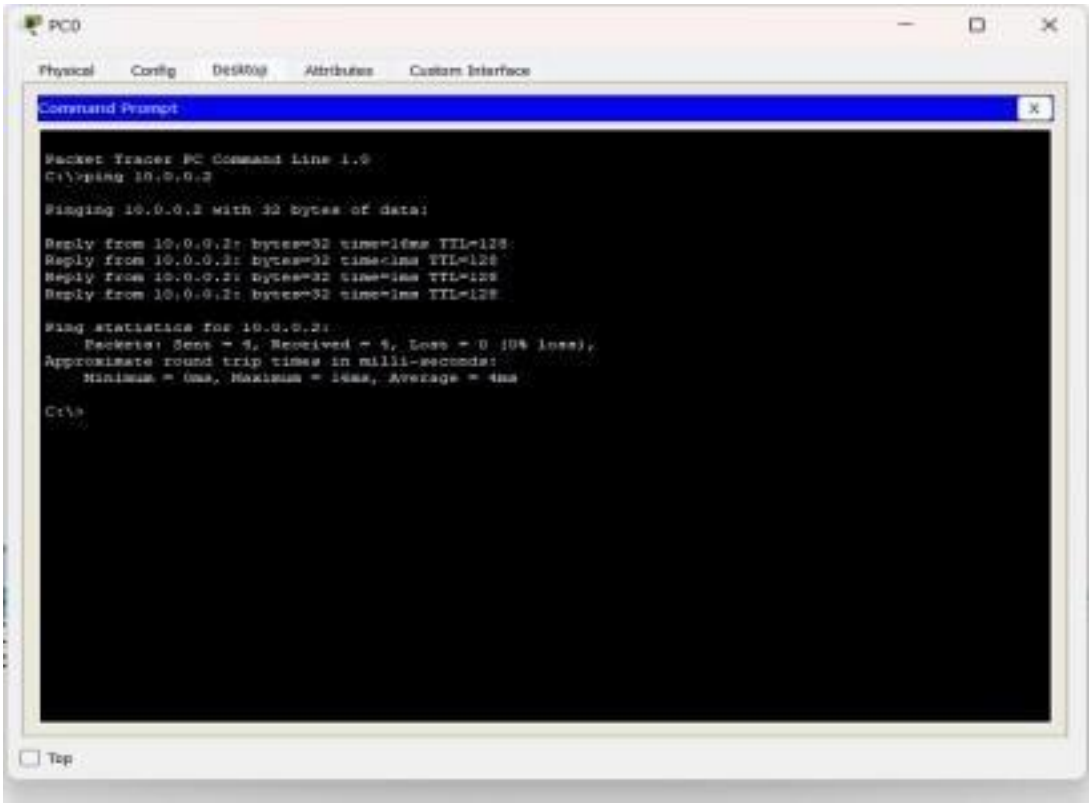
Hub Topology



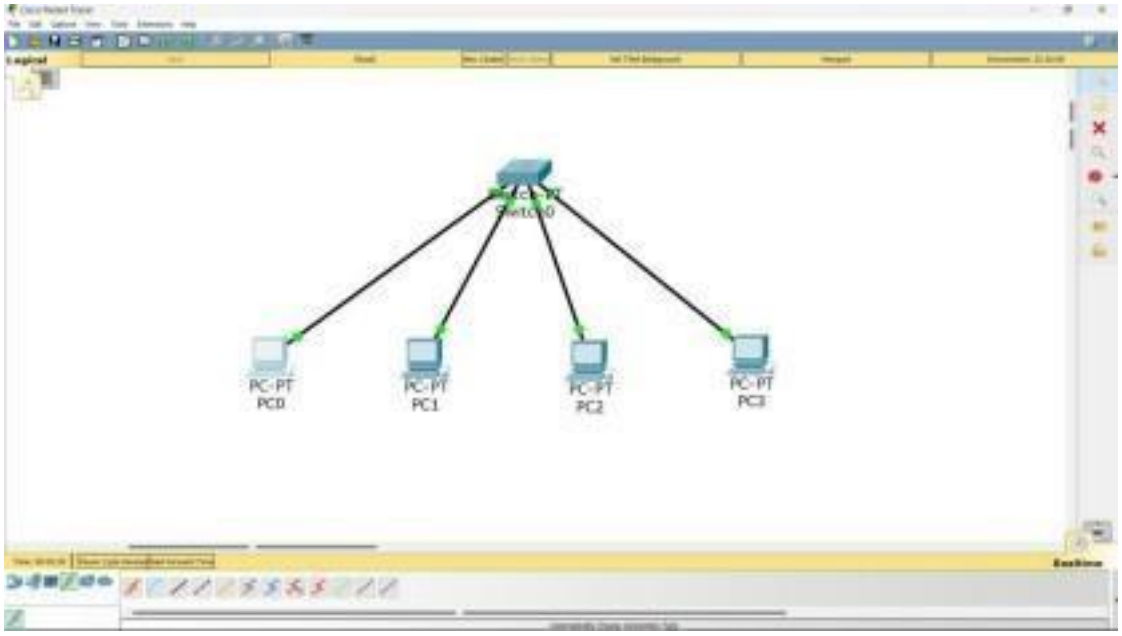
Procedure



Output

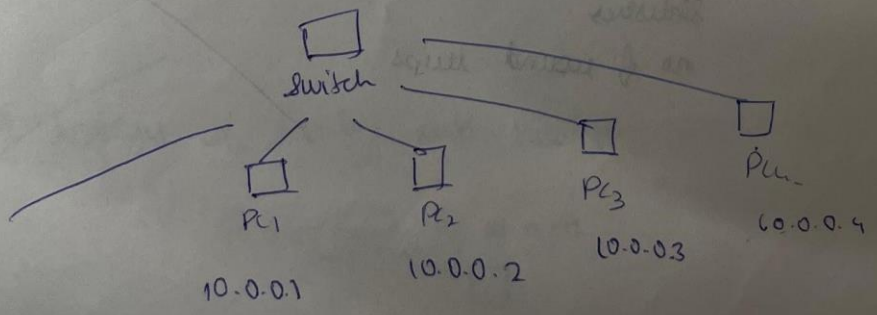


Switch Topology



Procedure

2) using switch.



cmd

C:\> ping 10.0.0.8.

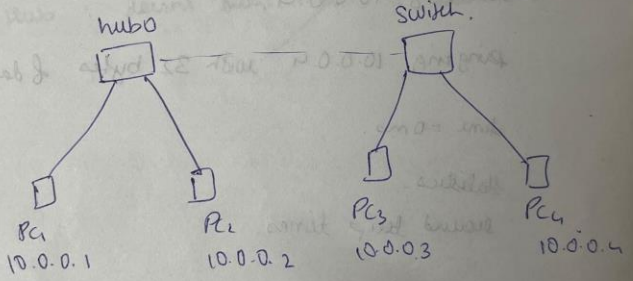
pinging 10.0.0.8 with 32 bytes of data.

Statistics

approx round trips.

→ configure PC_1 PC_2 PC_3 and PC_4.

3) use both hub and switch



→ configure PCs.

Ping

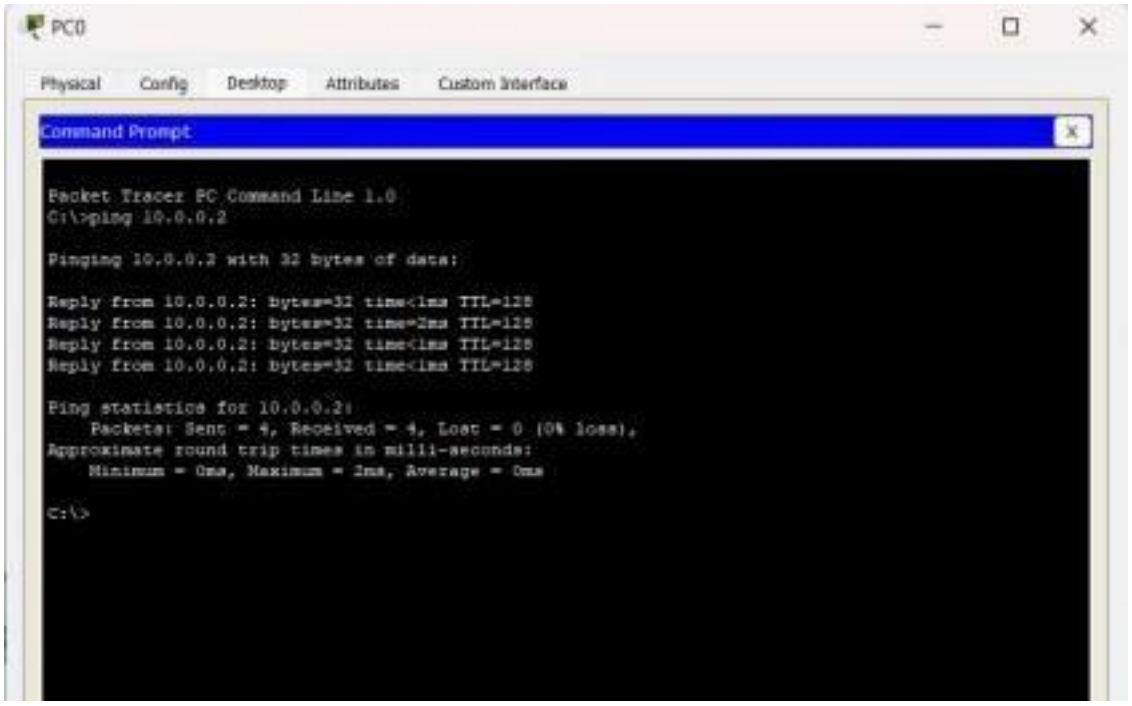
C:\> ping 10.0.0.8.

pinging with 32 bytes.

Statistics

no. of round trips.

Output


PC0
Physical
Config
Desktop
Attributes
Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>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=2ms 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
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 = 2ms, Average = 0ms
C:\>

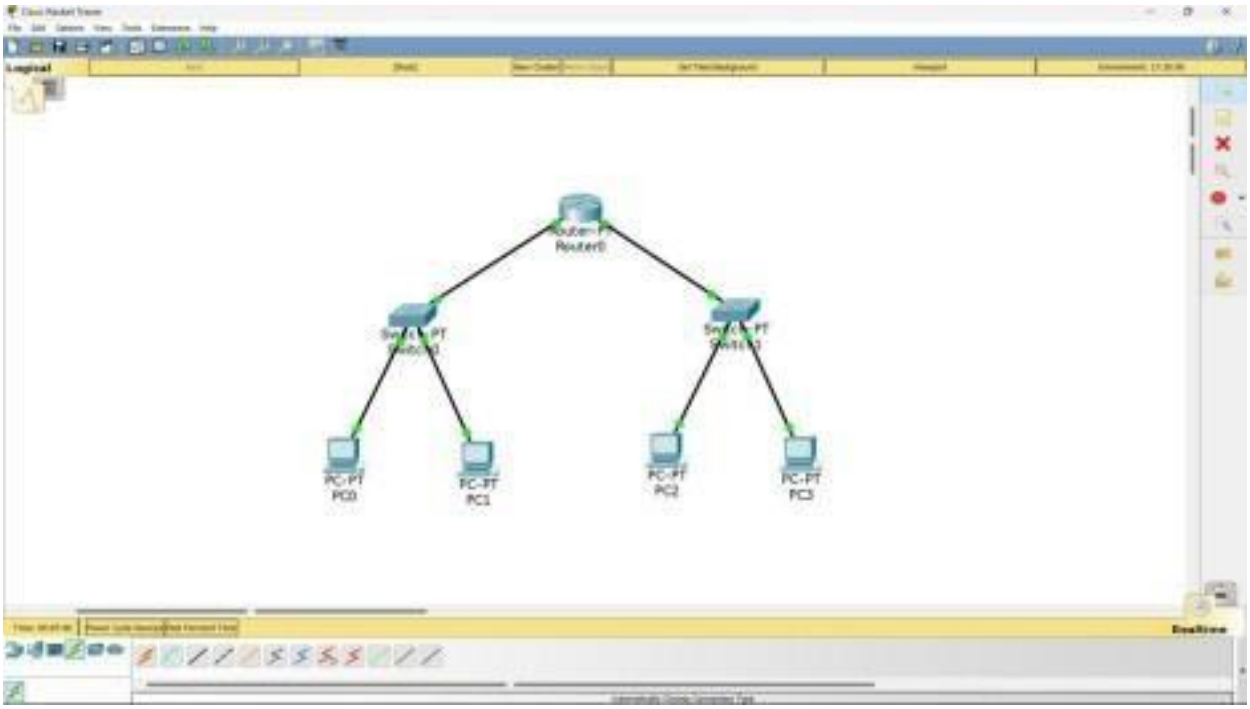
3

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.

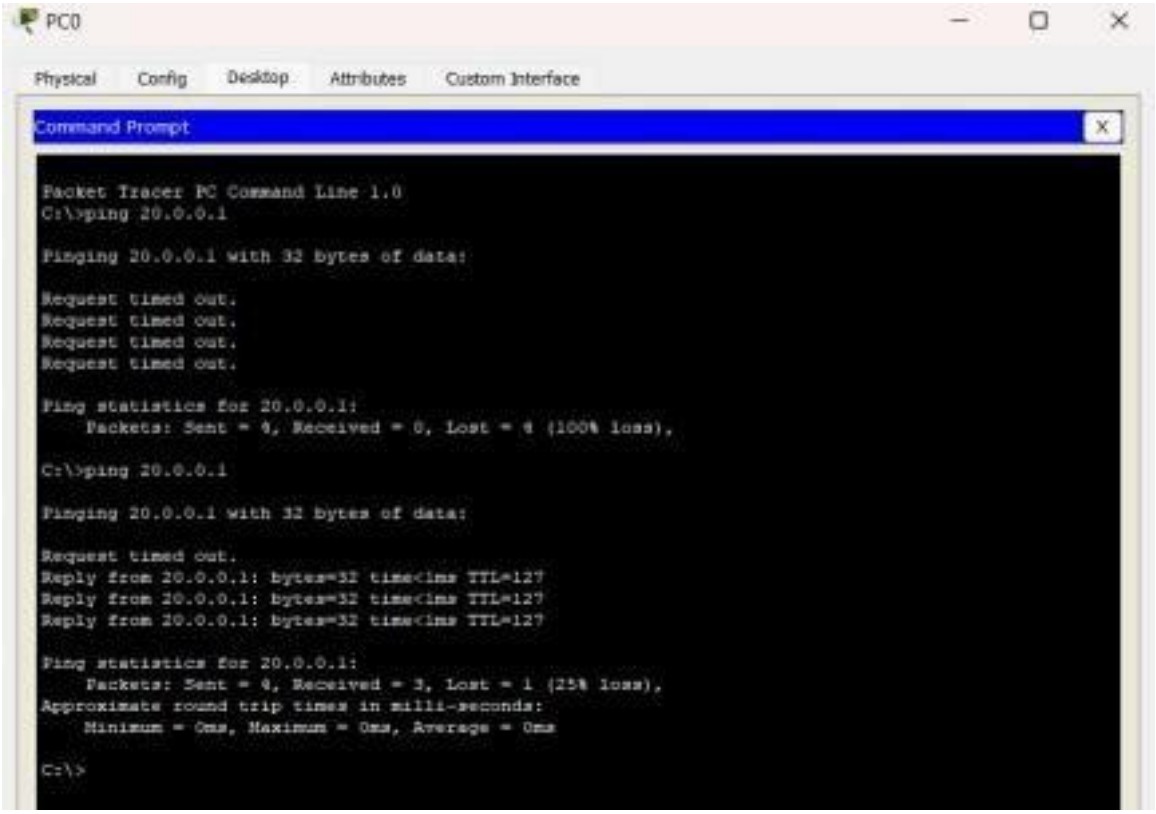
Topology



Procedure

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#exit
Router(config)#
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#
```

Output

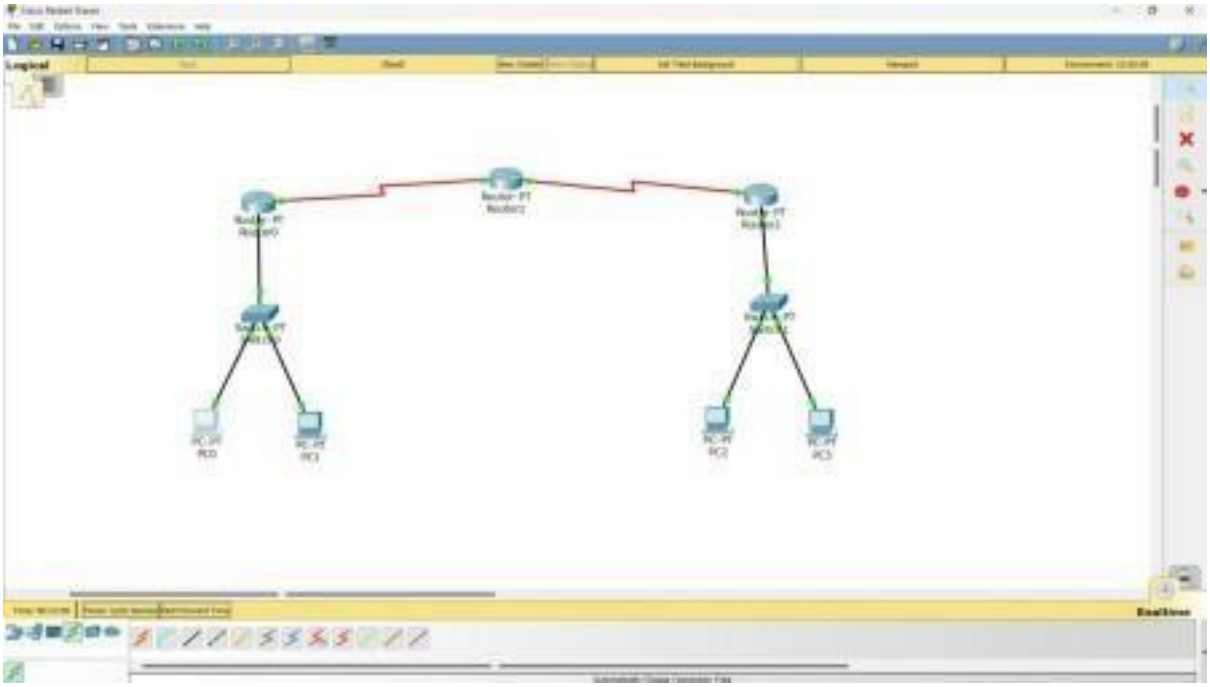


Experiment No 3

Aim of the program

Configuring static and default route to the Router

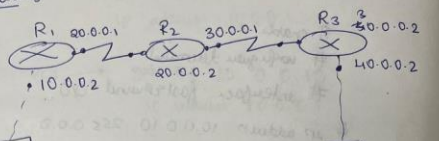
Topology for static routing



Procedure

LAB-4.

Static routing.



Pc> ping 10.0.0.1

reply from 10.0.0.1

Router 1

router > enable

router # config terminal

router (config)# interface fast Ethernet 0/0.

router (config-if) ip address 10.0.0.2 255.0.0.0.

router (config) #no shutdown.

router (config) # interface serial 2/0

router (config) # ip address 20.0.0.1 255.0.0.0.

router (config)# no shutdown.

Router 2

Router > enable

Router # config terminal

Router (config) # interface serial 2/0.

ip address 20.0.0.2 255.0.0.0.

no shutdown

interface serial 3/0

ip address 30.0.0.1 255.0.0.0.

no shut down.

Router 3

Router > enable.

Router # config terminal

→ interface serial 2/0.

Router(config) # ip address 30.0.0.2 255.0.0.0.

no shutdown

interface fast Ethernet 0/0

ip add. 40.0.0.2 255.0.0.0

no shutdown.

Router 1.

Router > show ip router.

C 10.0.0.0/8 is directly connected to fast ethernet 0/0

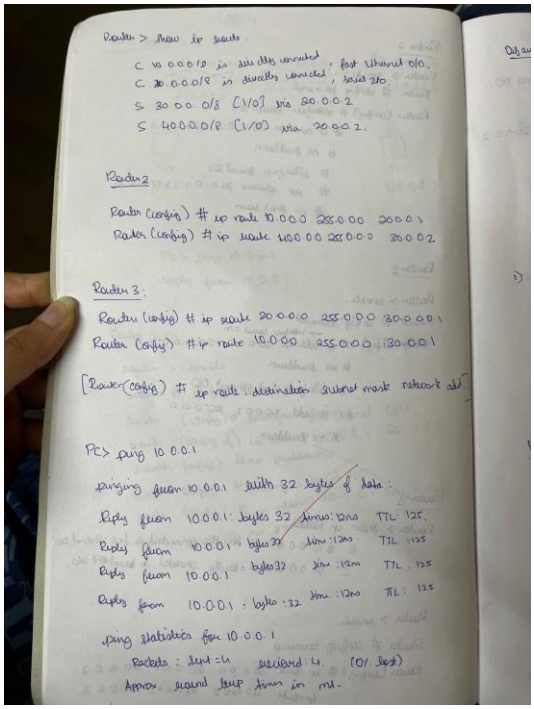
C 20.0.0.0/8 is directly connected to serial 0/1 2/0.

Router > enable.

Router # config terminal.

Router (config) # ip route 30.0.0.0 255.0.0.0 20.0.0.2

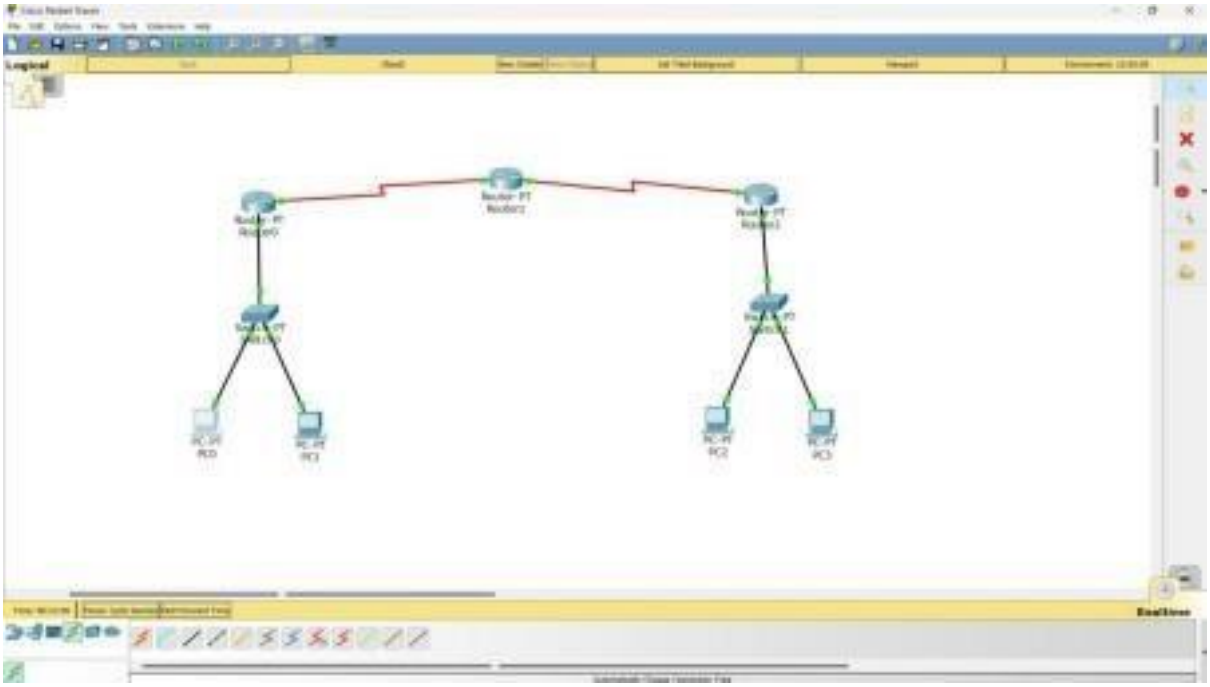
ip route 40.0.0.0 255.0.0.0 30.0.0.2



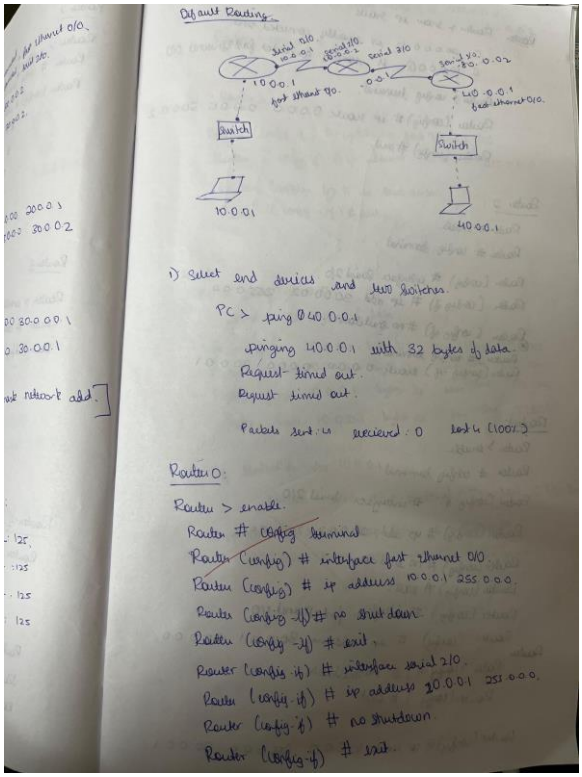
Output

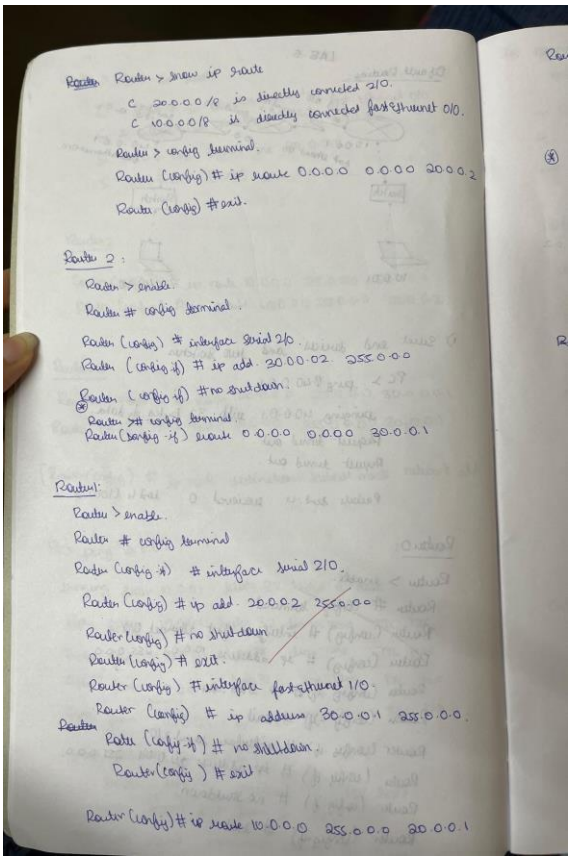
```
C:\>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 40.0.0.1: bytes=32 time<1ms TTL=127
Reply from 40.0.0.1: bytes=32 time<1ms TTL=127
Reply from 40.0.0.1: bytes=32 time<1ms TTL=127
Reply from 40.0.0.1: bytes=32 time<1ms TTL=127

Ping statistics for 40.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

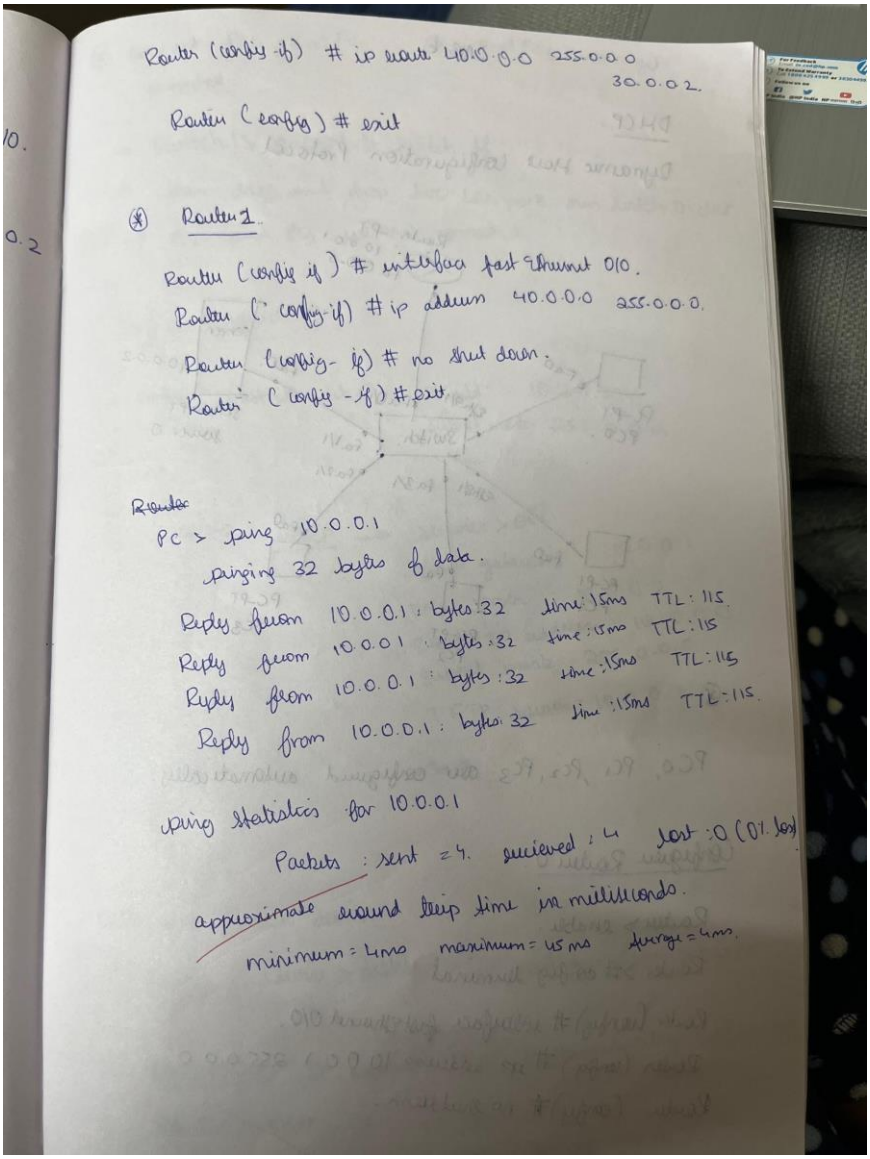
Topology for default routing



Procedure


Default Routing
Switch
Switch
10.0.0.1
40.0.0.1
i) select end devices and two switches.
PC > ping @ 40.0.0.1
pinging 40.0.0.1 with 32 bytes of data.
Request timed out.
Request timed out.
Packets sent is received. 0 lost 4 (100%)
Router 0:
Router > enable.
Router # config terminal
Router (config) # interface fast ethernet 0/0.
Router (config) # ip address 10.0.0.1 255.0.0.0.
Router (config-if) # no shut down
Router (config-if) # exit.
Router (config) # interface serial 2/0.
Router (config-if) # ip address 20.0.0.1 255.0.0.0.
Router (config-if) # no shutdown
Router (config-if) # exit.


Router > show ip route
C 20.0.0.0/8 is directly connected 2/0.
C 10.0.0.0/8 is directly connected fastEthernet 0/0.
Router > config terminal.
Router (config) # ip route 0.0.0.0 0.0.0.0 20.0.0.2
Router (config) # exit.
Router 2:
Router > enable.
Router # config terminal.
Router (config) # interface serial 2/0.
Router (config-if) # ip add 30.0.0.02 255.0.0.0
Router (config-if) # no shut down.
Router >#
Router (config-if) route 0.0.0.0 0.0.0.0 30.0.0.1
Router:
Router > enable.
Router # config terminal
Router (config-if) # interface serial 2/0.
Router (config) # ip add 20.0.0.2 255.0.0.0
Router (config) # no shut down
Router (config) # exit.
Router (config) # interface fast ethernet 1/0.
Router (config) # ip address 30.0.0.1 255.0.0.0.
Router (config-if) # no shutdown.
Router (config) # exit
Router (config) # ip route 10.0.0.0 255.0.0.0 20.0.0.1



Output

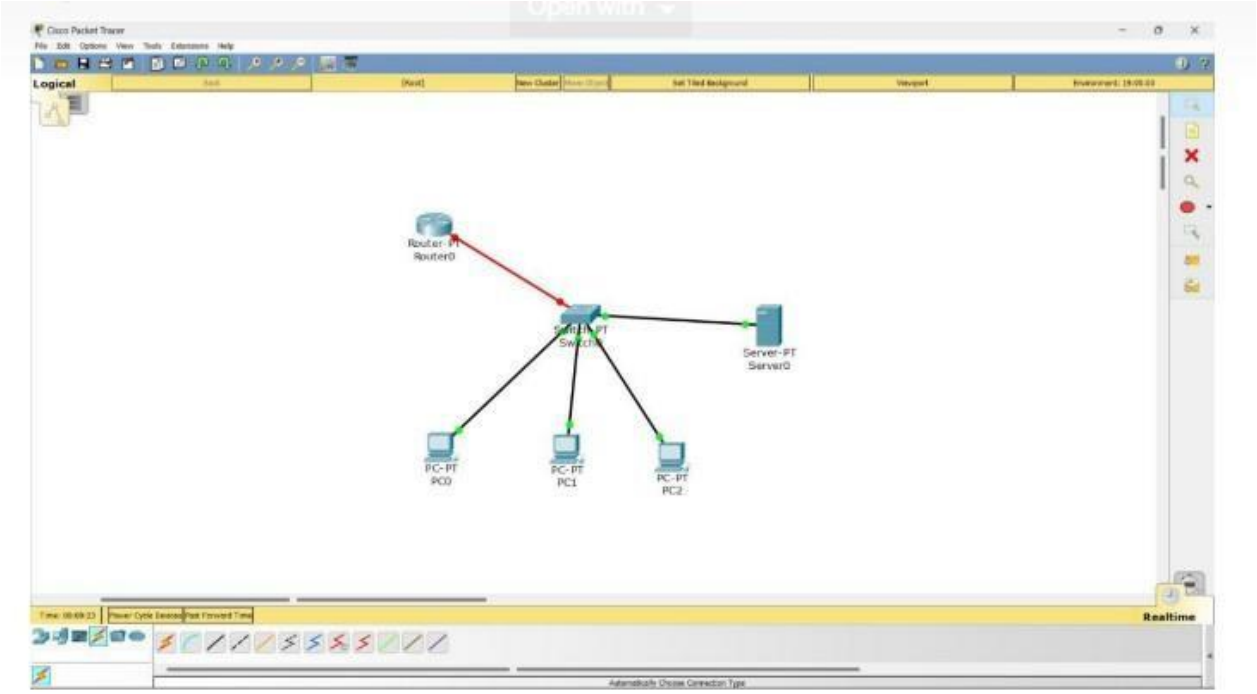
```
C:\>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 40.0.0.1: bytes=32 time<1ms TTL=127
Reply from 40.0.0.1: bytes=32 time<1ms TTL=127
Reply from 40.0.0.1: bytes=32 time<1ms TTL=127
Reply from 40.0.0.1: bytes=32 time<1ms TTL=127

Ping statistics for 40.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Experiment No 4

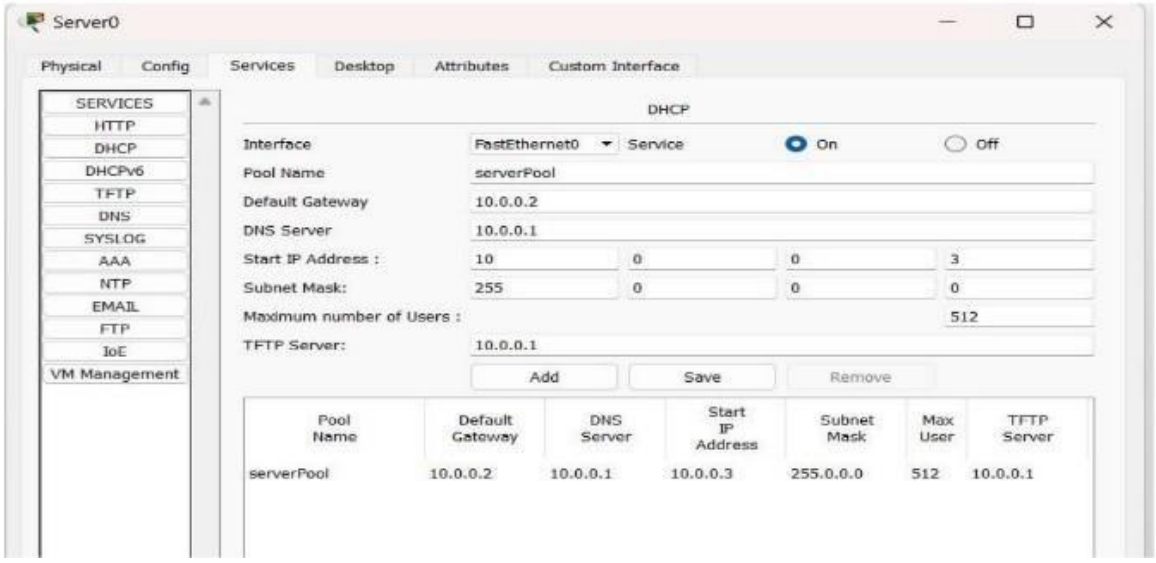
Aim of the program

Configuring DHCP within a LAN in a packet Tracer

Topology



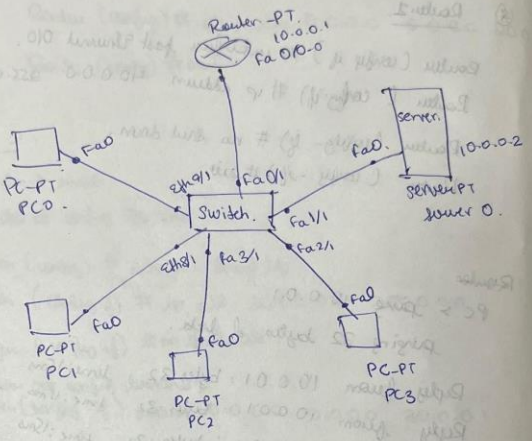
Procedure



LAB-6

DHCP.

Dynamic Host Configuration Protocol.



PC0, PC1, PC2, PC3 are configured automatically.

Configure Router 0.

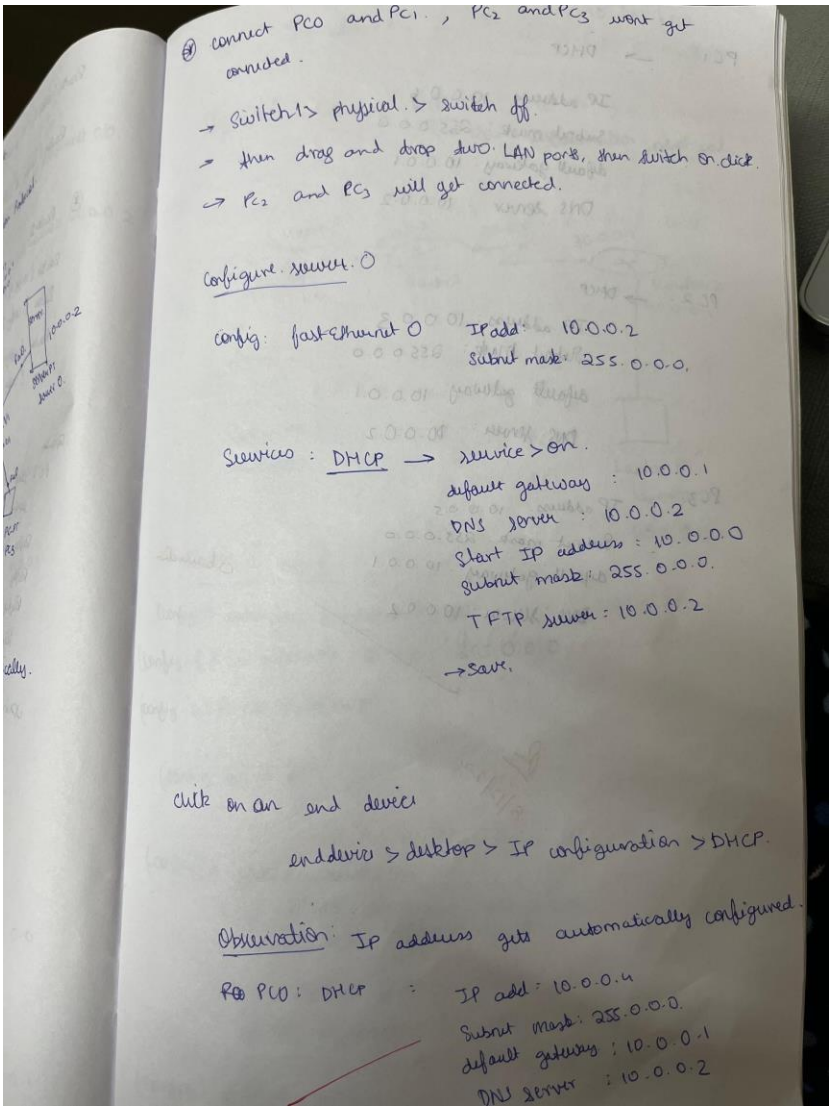
Router > enable.

Router >#config terminal

Router (config)# interface fastEthernet 0/0.

Router (config)# ip address 10.0.0.1 255.0.0.0

Router (config)# no shutdown.



④ connect PC0 and PC_1, PC_2 and PC_3 wont get connected.

→ Switch1 > physical > switch off.

→ then drag and drop two LAN ports, then switch on click.

→ PC_2 and PC_3 will get connected.

Configure server:

config: fastEthernet 0 IP add: 10.0.0.2
Subnet mask: 255.0.0.0.

Services : DHCP → service > on.
default gateway : 10.0.0.1
DNS server : 10.0.0.2
Start IP address : 10.0.0.0
Subnet mask : 255.0.0.0.
TFTP server : 10.0.0.2

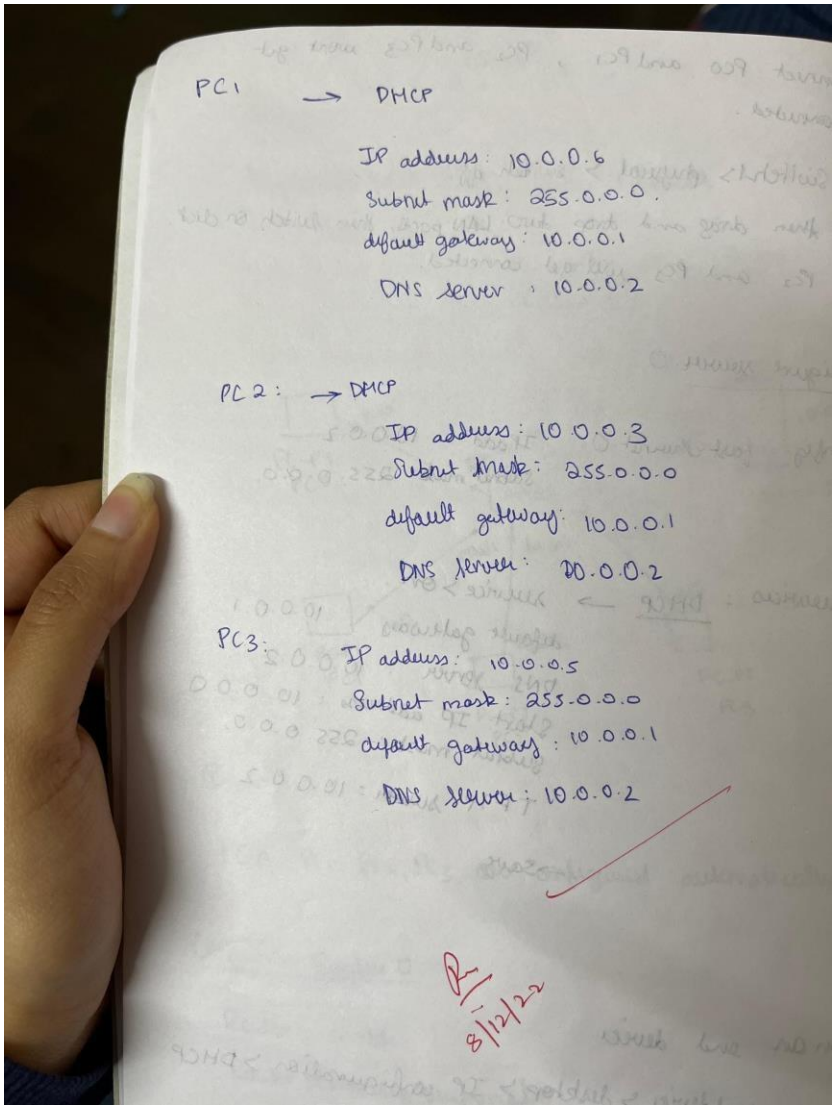
→ save.

Click on any end device

end device > desktop > IP configuration > DHCP.

Observation: IP address gets automatically configured.

PC0 : DHCP : IP add : 10.0.0.4
Subnet mask : 255.0.0.0.
default gateway : 10.0.0.1
DNS server : 10.0.0.2



PC1 → DHCP

IP address: 10.0.0.6
Subnet mask: 255.0.0.0
default gateway: 10.0.0.1
DNS server: 10.0.0.2

PC2: → DHCP

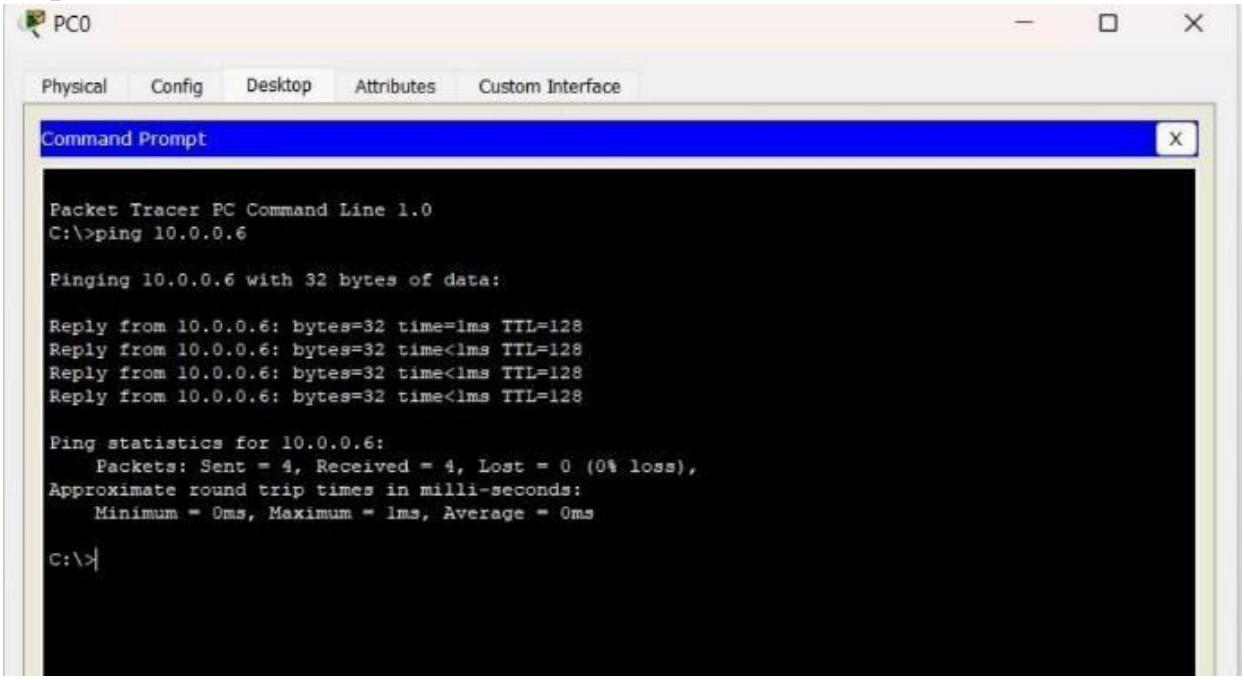
IP address: 10.0.0.3
Subnet mask: 255.0.0.0
default gateway: 10.0.0.1
DNS server: 10.0.0.2

PC3:

IP address: 10.0.0.5
Subnet mask: 255.0.0.0
default gateway: 10.0.0.1
DNS server: 10.0.0.2

8/12/22

Output

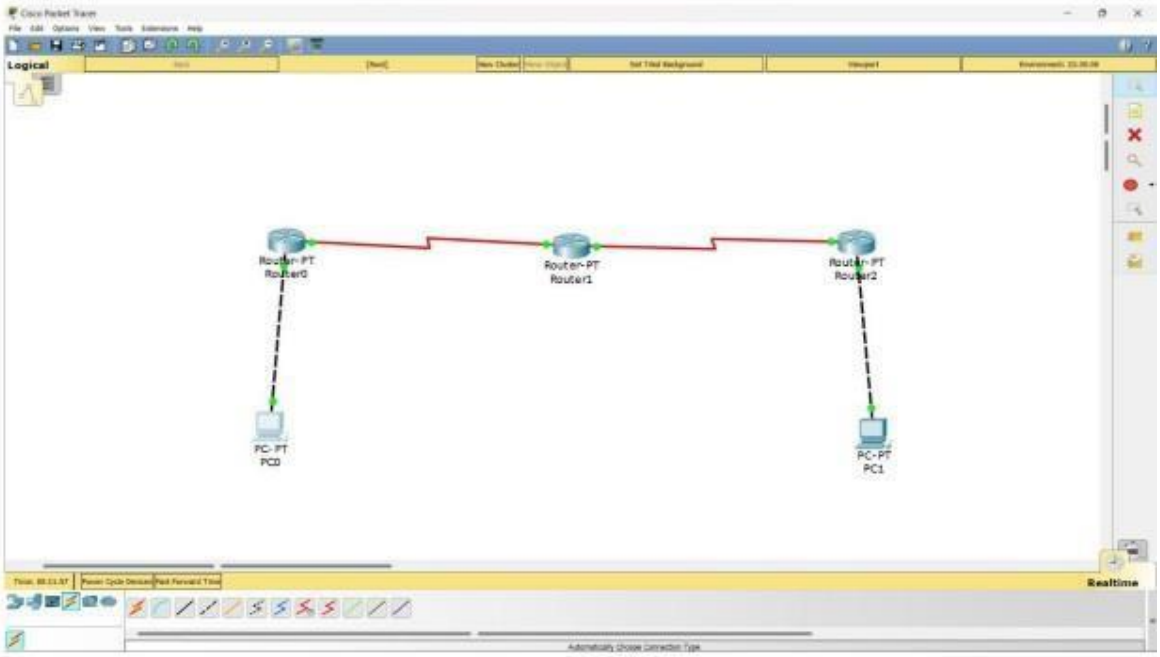

PC0
Physical
Config
Desktop
Attributes
Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.6
Pinging 10.0.0.6 with 32 bytes of data:
Reply from 10.0.0.6: bytes=32 time=1ms TTL=128
Reply from 10.0.0.6: bytes=32 time<1ms TTL=128
Reply from 10.0.0.6: bytes=32 time<1ms TTL=128
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 RIP Routing Protocol in Routers

Topology



Procedure

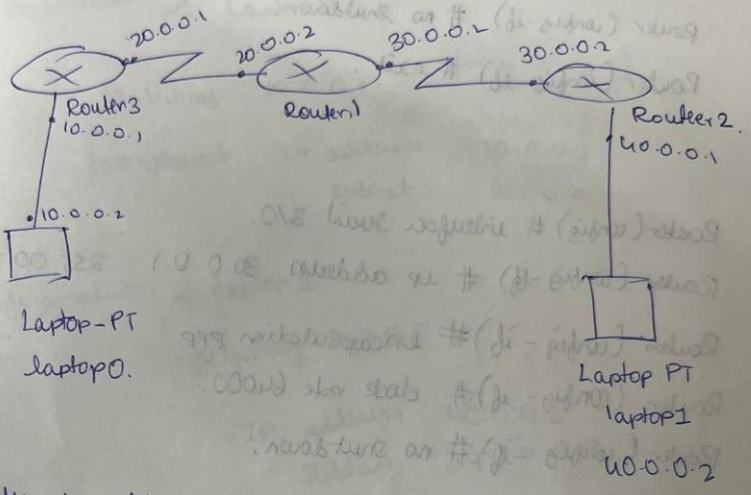
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 30.0.0.0
Router(config-router)#exit
Router(config)#
Router(config)#interface Serial2/0
Router(config-if)#no shutdown
```

```
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 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
This command applies only to DCE interfaces
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#
Router(config-if)#exit
Router(config)#interface serial3/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 30.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#exit
Router(config)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
```

LAB-7. 15/12/22

Dynamic Routing RIP.

↳ Router information protocal.



Router 1 config.

(config)# interface fastEthernet 0/0.

(config-if)# ip address 10.0.0.1 255.0.0.0.

(config-if)# no shutdown.

(config-if)# exit

(config)# interface serial 2/0.

ip address 20.0.0.1 255.0.0.0.

encapsulation PPP

clock rate 64000.

no shutdown.

(config)# router rip

Router(config-router)#network 10.0.0.0.

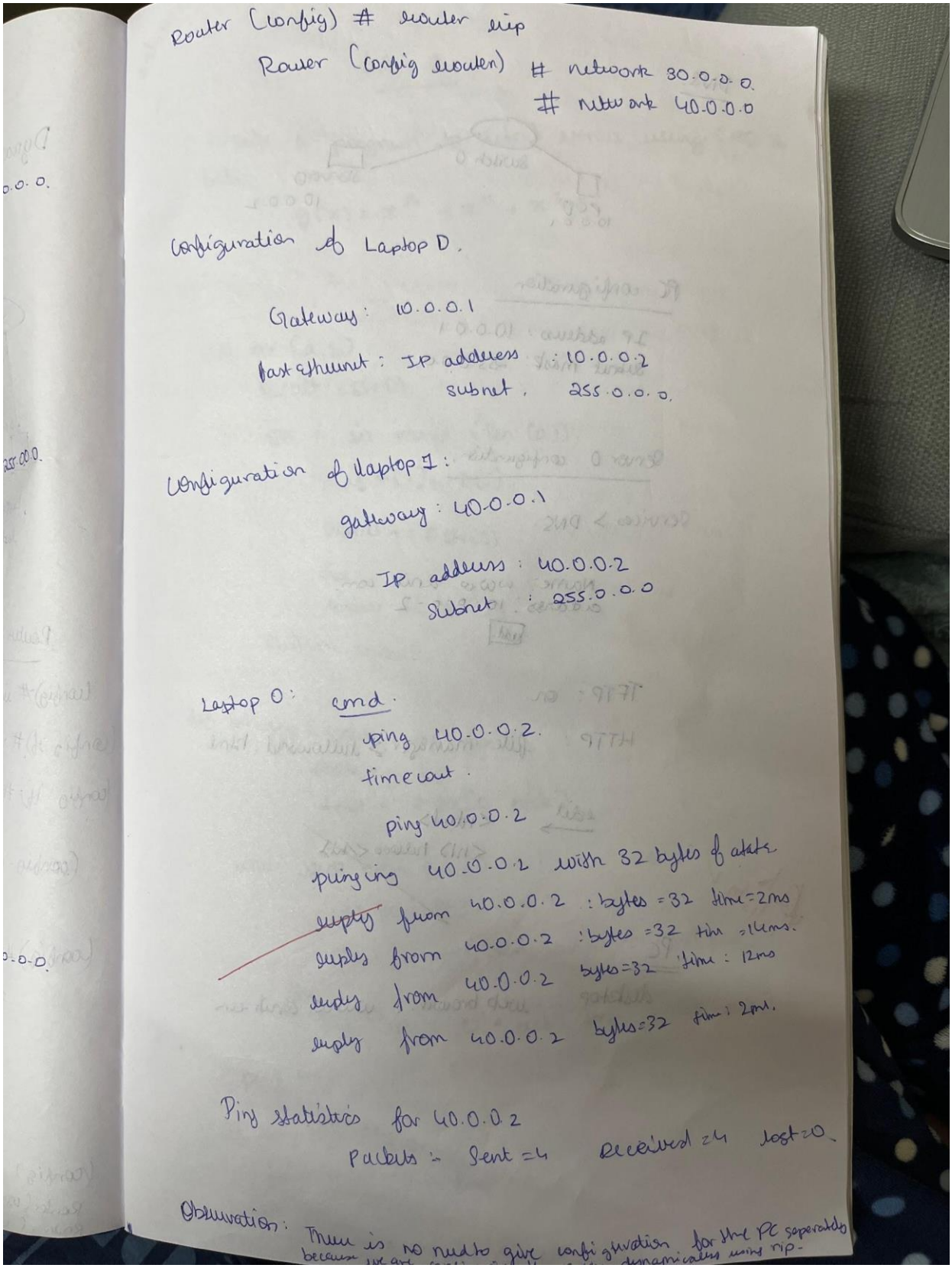
Router(config-router)# network 20.0.0.0.

Router 1 Configuration

```
Router (config)#. interface serial 2/0.
Router (config-if) # ip address 20.0.0.2 255.0.0.0.
Router (config-if) # encapsulation PPP.
Router (config-if). # no shutdown.
Router (config-if) # exit.

Router (config) # interface serial 3/0.
Router (config-if) # ip address 30.0.0.1 255.00.0.
Router (config-if) # encapsulation PPP
Router (config-if) # clock rate 64000.
Router (config-if) # no shutdown.

Router (config) # router rip
  Router (config-router) # network 20.0.0.0.
  Router (config-router) # network 30.0.0.0
```

Router 2 config

```
Router (config) # interface fast-ethernet 0/0
  Router (config-if) # ip address 40.0.0.1 255.0.0.0.
                     # no shutdown.

  Router (config) # interface serial 2/0.
  Router (config-if) # ip add. 30.0.0.2 255.0.0.0.
                     # encapsulation PPP
                     # no shutdown
```



Router (config) # router rip

Router (config router) # network 30.0.0.0.

network 40.0.0.0

Configuration of Laptop D.

Gateway: 10.0.0.1

fast ethernet: IP address : 10.0.0.2

subnet. 255.0.0.0.

Configuration of laptop I:

gateway: 40.0.0.1

IP address: 40.0.0.2

Subnet : 255.0.0.0

Laptop 0: cmd.

ping 40.0.0.2.

timeout.

ping 40.0.0.2

pinging 40.0.0.2 with 32 bytes of data:

reply from 40.0.0.2 : bytes = 32 time=2ms

reply from 40.0.0.2 : bytes = 32 time =14ms.

reply from 40.0.0.2 bytes=32 time: 12ms

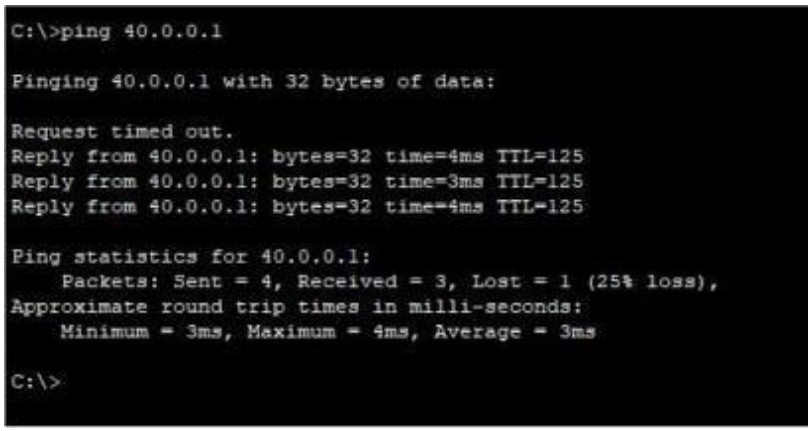
reply from 40.0.0.2 bytes=32 time: 2ms.

Ping statistics for 40.0.0.2

Packets: Sent =4 Received =4 lost=0.

Observation: There is no need to give configuration for the PC seperately because we are dynamically using rip.

Output:

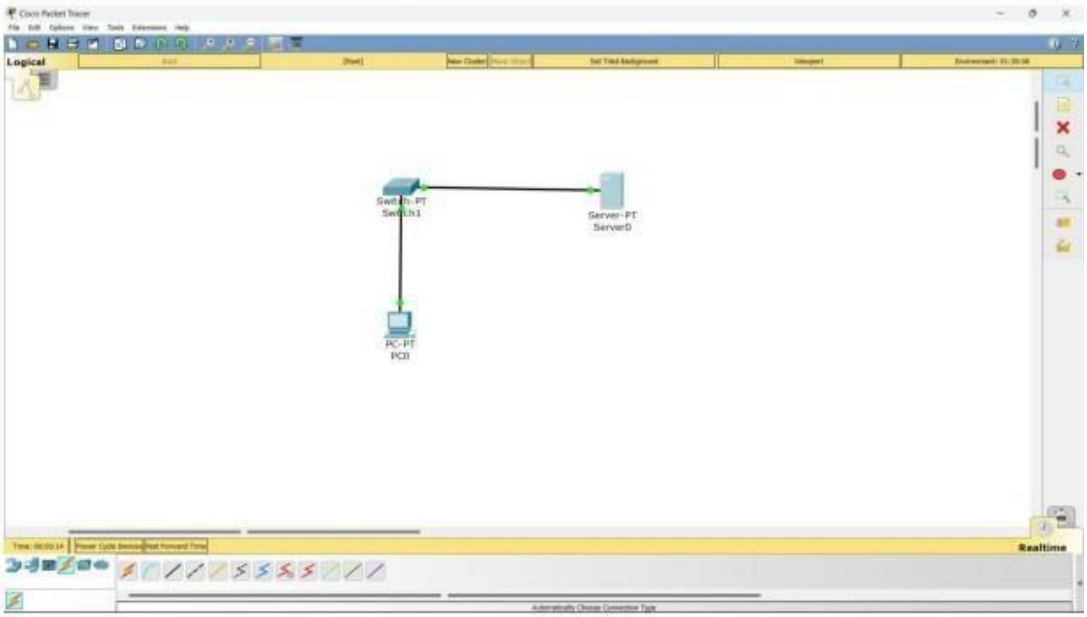

C:\>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Reply from 40.0.0.1: bytes=32 time=3ms TTL=125
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),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

Experiment No 6

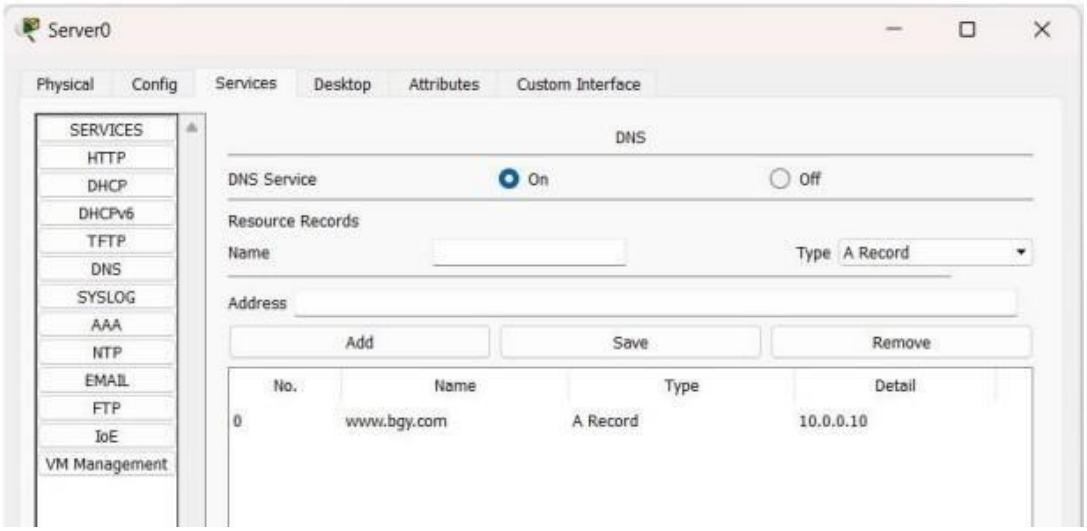
Aim of the program

Demonstration of WEB server and DNS using Packet Tracer

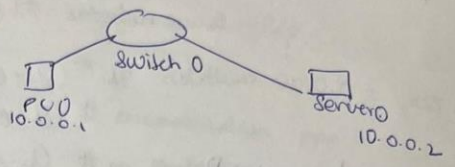
Topology



Procedure



DNS.



PC configuration.

IP address : 10.0.0.1
Subnet mask : 255.0.0.0

Server 0 configuration.

Services > DNS

Name : www.anik.com
address : 10.0.0.2
add.

TFTP : on.

HTTP : file manager > helloworld.html.

edit → <html>
<h1> hellooo </h1>

PC

desktop : web browser : www.anik.com

29/12/22.

Output


PC0
Physical
Config
Desktop
Attributes
Custom Interface
Web Browser
X
<
>
URL
http://www.bgy.com/index.html
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 No 1

Aim of the Experiment

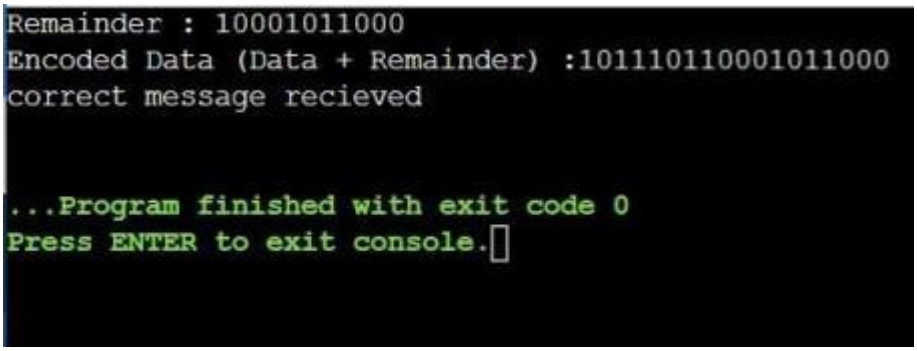
Write a program for error detecting code using CRC-CCITT (16-bits).

Code

```
import
java.util.*;
public class Main{
                                public static int n;   public static
void main(String[] args){
                                Scanner in=new Scanner(System.in);
                                Main ob=new Main();
                                       String data,data_copy,zero="0000000000000000",ans,data_r;
                                    System.out.print("Enter the data to be
                                transferred:"); data=in.nextLine(); data_copy=data;
                                data+=zero; n=data_copy.length();

                                System.out.println("Divisor:10001000000100001");

                                System.out.println("Modified poly: "+data);
                                data=ob.divide(data);

                                System.out.println("CheckSum: "+data.substring(n));
                                data_copy=data_copy.substring(0,n)+data.substring(n);
                                System.out.println("Final Codeword: "+data_copy);

                                System.out.print("Enter the data received at the destination:"); data_r=in.nextLine();
                                data_r=ob.divide(data_r);
                                System.out.println("Remainder:"+data_r);
zero="00000000000000000000"; if(data_r.equals(zero)==true){
                                System.out.println("No error");
                                }
                                else{
                                System.out.println("Error detected");
                                }
                                }
public String divide(String s){ int i,j; char x;
                                String div="10001000000100001";
for(i=0;i<n;i++){ x=s.charAt(i);
```

```
for(j=0;j<17;j++){ if(x=='1'){
if(s.charAt(i+j)!=div.charAt(j)
)
                        s=s.substring(0,i+j)+"1"+s.substring(i+j+1);
else
                        s=s.substring(0,i+j)+"0"+s.substring(i+j+1);
}
}
}


return s;
}
}
```

Output



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];
                     unsigned hopcount[20];
                    }rt[10]; int
                    main()
                    { int costmat[20][20]; int
                     nodes,i,j,k,count=0; printf("\nEnter the
                     number of routers : "); scanf("%d",&nodes);
                     printf("\nEnter the cost matrix :\n");
                     for(i=0;i<nodes;i++)
```

```
 {
 for(j=0;j<nodes;j++)
 { scanf("%d",&costmat[i][j]);
 if(costmat[i][j]>0){
 rt[i].hopcount[j]=1;
 } else rt[i].hopcount[j]=0; 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].hopcount[j]=rt[i].hopcount[k]+rt[k].hopcount[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("\tHop
 count:%d",rt[i].hopcount[j]); }
 }
 printf("\n\n");
 getch();
}
```

```
Enter the number of routers : 5

Enter the cost matrix :
0 1 2 -99 -99
1 0 -99 -99 -99
2 -99 0 3 4
-99 -99 3 0 -99
-99 -99 4 -99 0


 For router 1

node 1 via 1 Distance 0         Hop count:0
node 2 via 2 Distance 1         Hop count:1
node 3 via 3 Distance 2         Hop count:1
node 4 via 3 Distance 5         Hop count:2
node 5 via 3 Distance 6         Hop count:2

 For router 2

node 1 via 1 Distance 1         Hop count:1
node 2 via 2 Distance 0         Hop count:0
node 3 via 1 Distance 3         Hop count:2
node 4 via 1 Distance 6         Hop count:3
node 5 via 1 Distance 7         Hop count:3

 For router 3

node 1 via 1 Distance 2         Hop count:1
node 2 via 1 Distance 3         Hop count:2
node 3 via 3 Distance 0         Hop count:0
node 4 via 4 Distance 3         Hop count:1
node 5 via 5 Distance 4         Hop count:1

 For router 4

node 1 via 3 Distance 5         Hop count:2
node 2 via 3 Distance 6         Hop count:3
node 3 via 3 Distance 3         Hop count:1
node 4 via 4 Distance 0         Hop count:0
node 5 via 3 Distance 7         Hop count:2

 For router 5

node 1 via 3 Distance 6         Hop count:2
node 2 via 3 Distance 7         Hop count:3
node 3 via 3 Distance 4         Hop count:1
node 4 via 3 Distance 7         Hop count:2
node 5 via 5 Distance 0         Hop count:0
```

Experiment No 3 Aim of the Experiment

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

Code

```
#include
<stdio.h>
#define INFINITY 9999
#define MAX 10   void Dijkstra(int Graph[MAX][MAX],
int n, int start);   void Dijkstra(int Graph[MAX][MAX], int n, int start) { int
cost[MAX][MAX], distance[MAX], pred[MAX]; int visited[MAX], count, mindistance,
nextnode, i, j;
// Creating cost matrix
for (i = 0; i < n; i++)
for (j = 0; j < n; j++)
if (Graph[i][j] == 0)
cost[i][j] = INFINITY;
else cost[i][j] =
Graph[i][j];
  for (i = 0; i < n; i++) { distance[i] = cost[start][i];
pred[i] = start; visited[i] = 0;
}
  distance[start] = 0; visited[start] = 1; count
= 1;
  while (count < n - 1) { mindistance = INFINITY;


for (i = 0; i < n; i++) if (distance[i] <
mindistance && !visited[i]) { mindistance =
distance[i]; nextnode = i;
}
```



```
visited[nextnode] = 1;
for (i = 0; i < n; i++)
if (!visited[i])
if (mindistance + cost[nextnode][i] < distance[i]) {
distance[i] = mindistance + cost[nextnode][i]; pred[i]
= nextnode;
}
count++;
```

```
                            }
  for (i = 0; i < n; i++) if (i != start) { printf("\nDistance from source to %d: %d", i,
distance[i]); }
                           } int
                           main() {
                            int Graph[MAX][MAX], i, j, n, u;
                            printf("Enter number of
                            vertices:"); scanf("%d",&n);
                            printf("Enter adjacency matrix:");
                            for(i=0;i<n;i++){ for(j=0;j<n;j++){
                            scanf("%d",&Graph[i][j]);
                            } } printf("Enter the starting
                            vertex:"); scanf("%d",&u);
                            Dijkstra(Graph, n,
u);   return 0;
                           }
```

```
Enter number of vertices:5
Enter adjacency matrix:0 1 2 0 0
1 0 0 0 0
2 0 0 3 4
0 0 3 0 0
0 0 4 0 0
Enter the starting vertex:0

Distance from source to 1: 1
Distance from source to 2: 2
Distance from source to 3: 5
Distance from source to 4: 6

...Program finished with exit code 0
Press ENTER to exit console.
```

Experiment No 4

Aim of the Experiment

Write a program for congestion control using leaky bucket algorithm.

CODE

```
  #include<stdio.h>
                          #define bucketSize 500   void
bucketInput(int a,int b)
                          { if(a > bucketSize) printf("\n\t\tBucket
                                 overflow");
                                 else{   while(a   >   b){   printf("\n\t\t%d   bytes
                                        outputted.",b);
                                               a-=b;
                                        } if(a > 0) printf("\n\t\tLast %d bytes
                                        sent\t",a);
                                        printf("\n\t\tBucket output successful"); }
```

```
} int
main()
{ int op,pktSize; printf("Enter output
       rate : "); scanf("%d",&op);
       for(int i=1;i<=5;i++)
       { pktSize=rand()%700;
              printf("\nPacket no %d \tPacket size = %d",i,pktSize);
              bucketInput(pktSize,op);
       } return
       0;
}
```


OUTPUT:

Experiment No 5 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()
```

Output

```
C:\Users\Bhargava\Downloads>python clitcp.py
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 No 6

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()

Output

```
C:\Users\Bhargava\Downloads>python cliudp.py
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\tprev->left = newNode;\n\t\telse\n\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}'
```