VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

LAB REPORT
on

COMPUTER NETWORKS

Submitted by

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in partial fulfillment 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 **ADITYA BASAVARAJ NAGATHAN (1BM20CS193),** who is bonafide student of B.M. **S. College of Engineering.** It isin 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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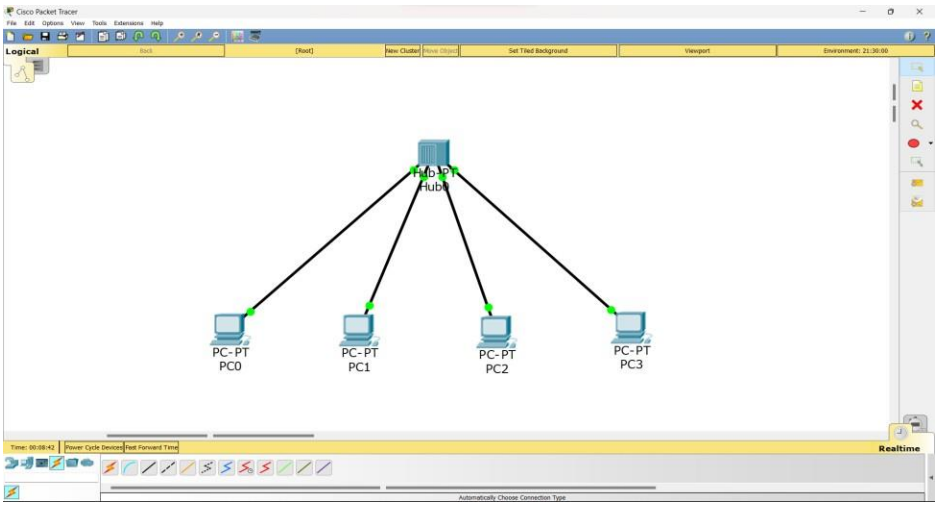
Cycle-1

Experiment No 1

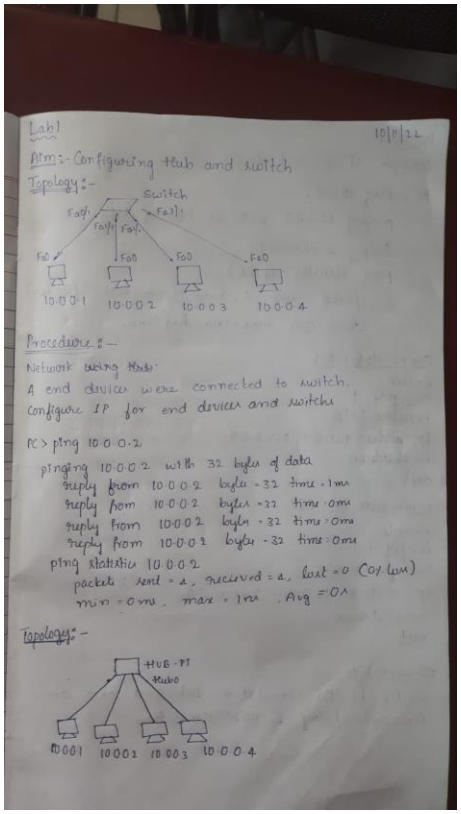
Aim of the program

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

Hub
Topology



Procedure



Lab1 10/8/22

Aim:- Configuring Hub and switch

Topology:-

Procedure:-

Network using Hub:

A end devices were connected to switch.

Configure IP for end devices and switch.

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

reply from 10.0.0.2 bytes = 32 time = 0ms

reply from 10.0.0.2 bytes = 32 time = 0ms

reply from 10.0.0.2 bytes = 32 time = 0ms

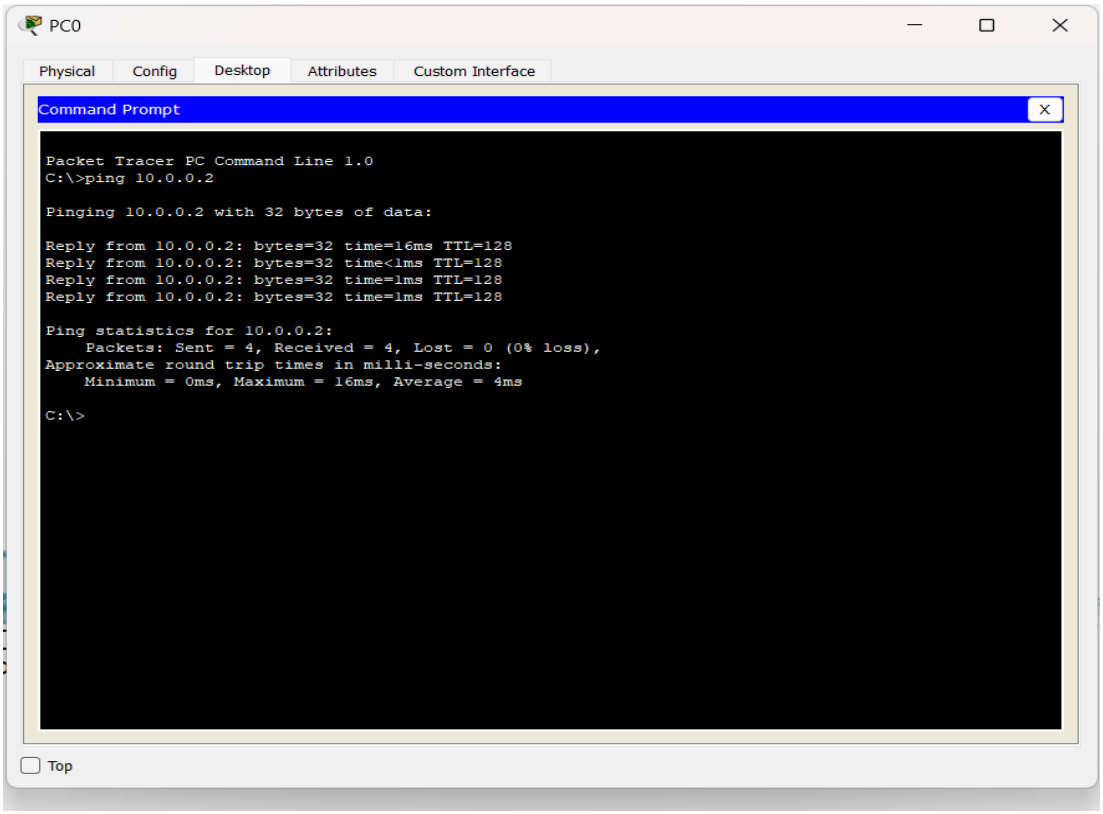
ping statistics 10.0.0.2

packets sent = 4, received = 4, lost = 0 (0% loss)

min = 0ms, max = 1ms, Avg = 0ms

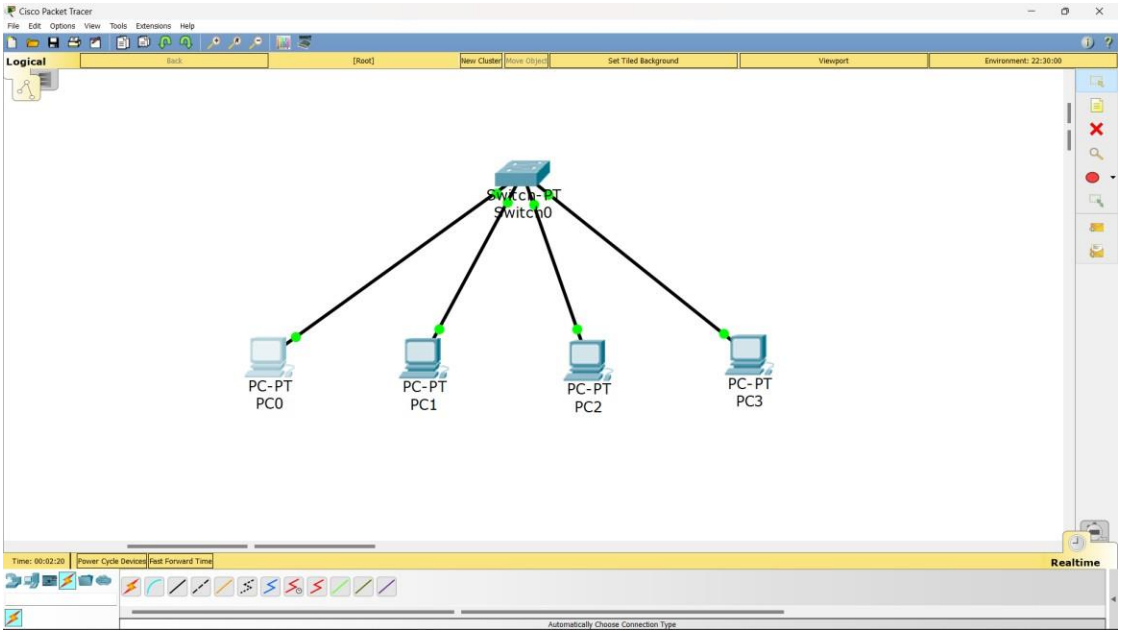
Topology:-

Output

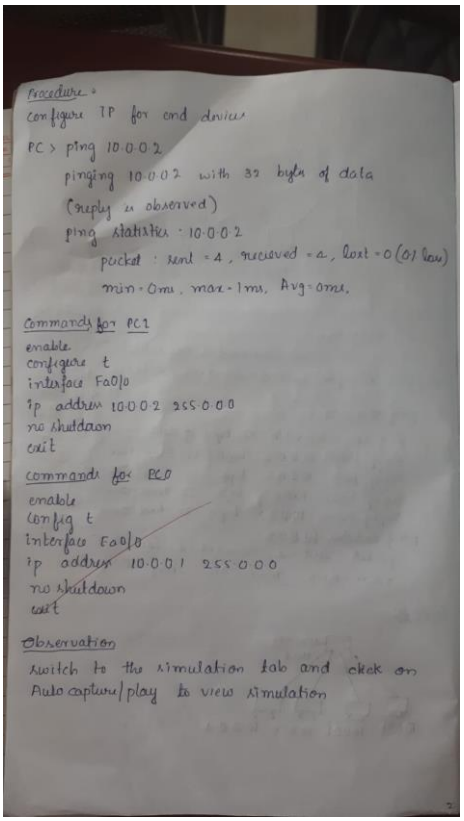


Switch

Topology



Procedure



Procedure:

configure IP for end devices

PC > ping 10.0.0.2

pinging 10.0.0.2 with 32 bytes of data

(reply is observed)

ping statistics : 10.0.0.2

packet : sent = 4, received = 4, lost = 0 (0% loss)

min = 0ms, max = 1ms, Avg = 0ms.

Commands for PC1

enable
configure t
interface Fa0/0
ip address 10.0.0.2 255.0.0.0
no shutdown
exit

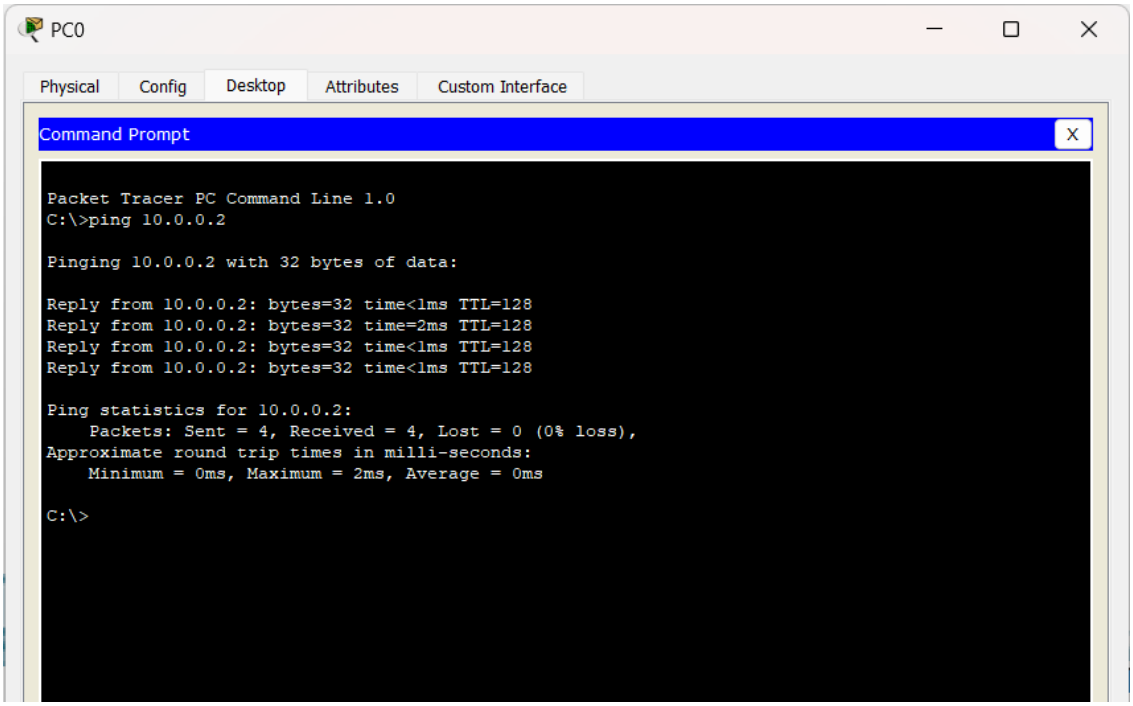
commands for PC0

enable
config t
interface Fa0/0
ip address 10.0.0.1 255.0.0.0
no shutdown
exit

Observation

switch to the simulation tab and click on Auto capture/play to view simulation

Output

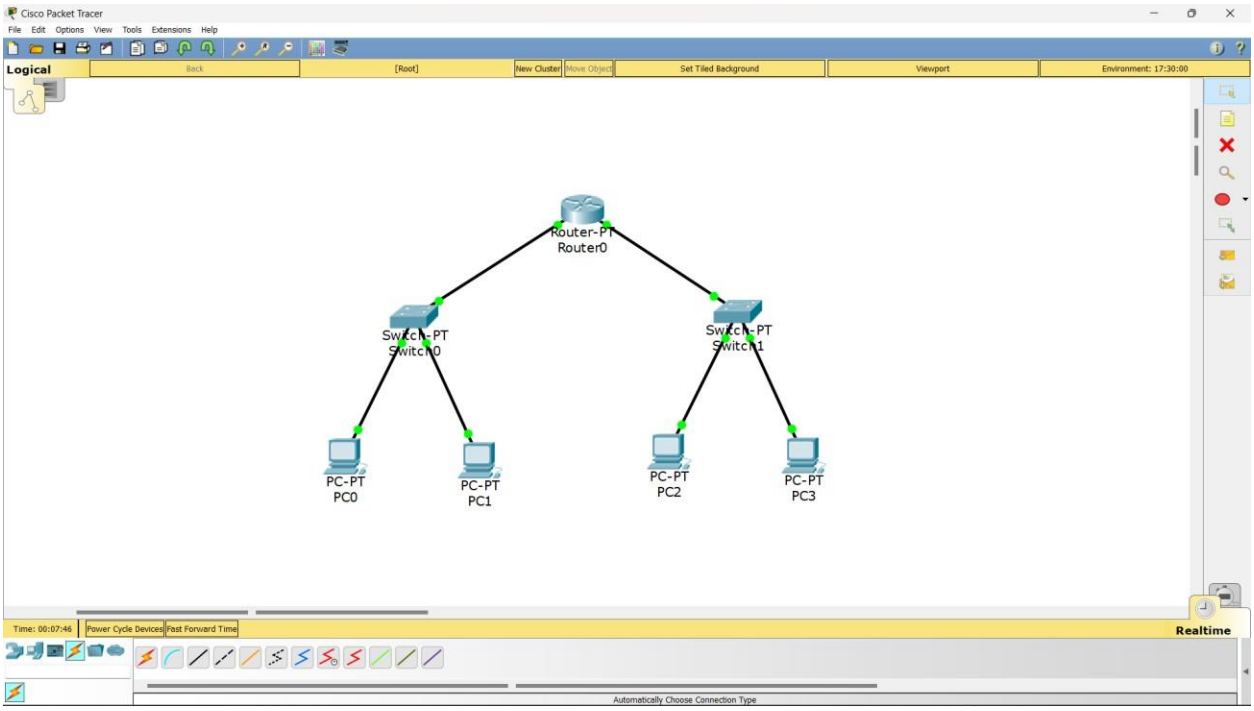


Experiment No 2

Aim of the program

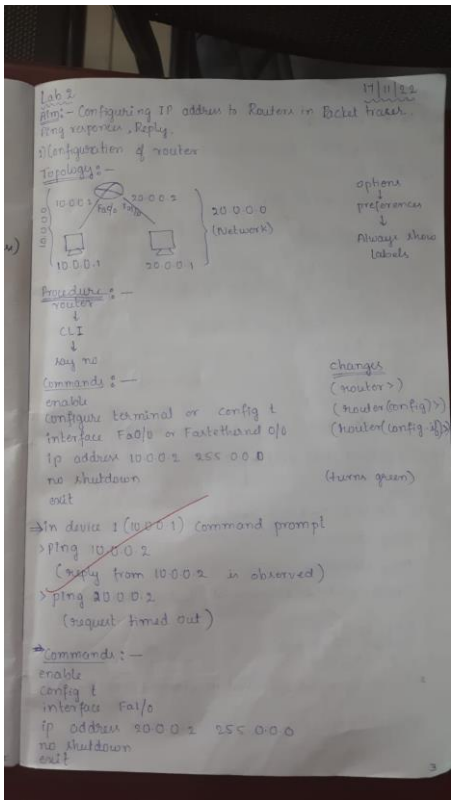
Configuring IP address to Routers in Packet Tracer. Exploring the following messages: Ping Responses, Destination unreachable, Request timed out, Reply.

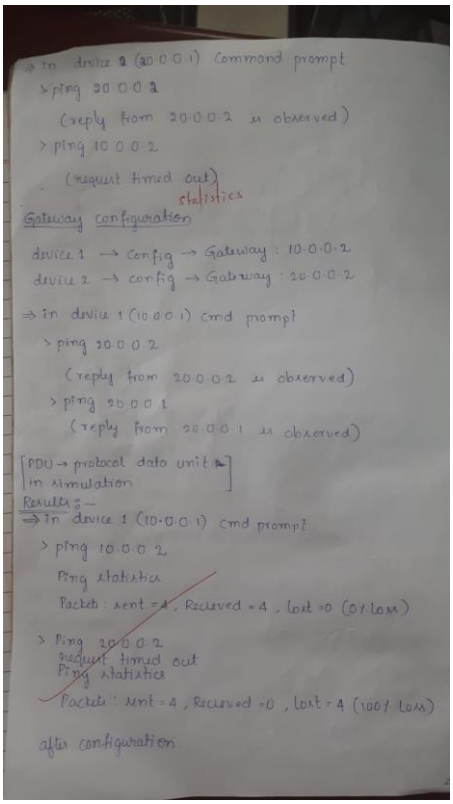
Topology

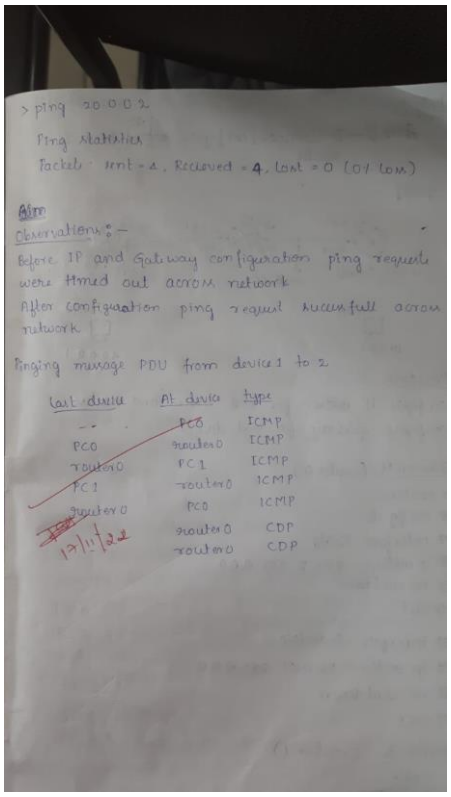


Procedure

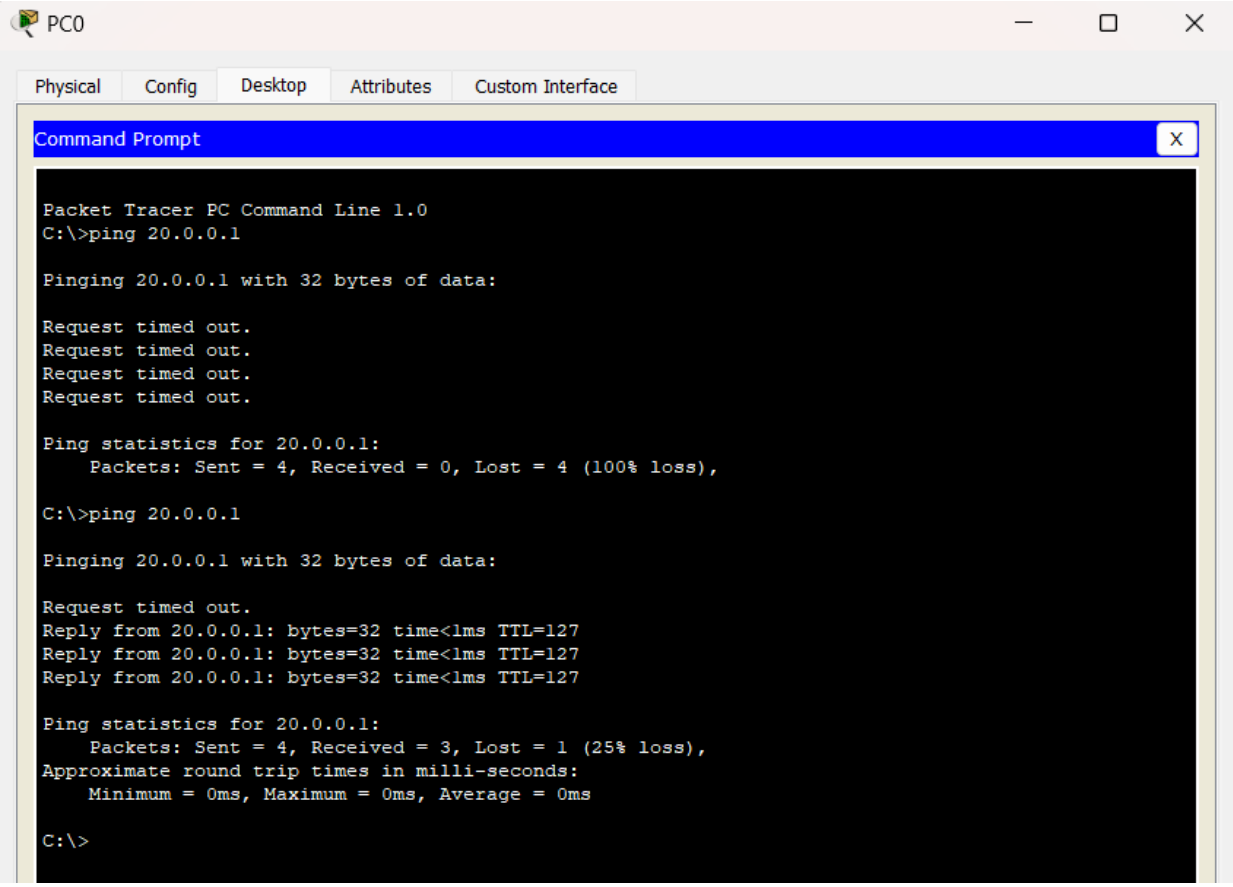
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shutdown

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 20.0.0.10 255.0.0.0
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)#
```


Lab 2
17/11/22
Aim:- Configuring IP address to Routers in Packet Tracer.
Ping responses, Reply.
i) Configuration of router
Topology:-
10.0.0.2
20.0.0.2
Fa0/0
Fa0/0
10.0.0.0
20.0.0.0
(Network)
10.0.0.1
20.0.0.1
options
preferences
Always show labels
Procedure:-
router
CLI
say no
Commands:-
enable
configure terminal or config t
interface Fa0/0 or FastEthernet 0/0
ip address 10.0.0.2 255.0.0.0
no shutdown
exit
changes
(router>)
(router(config)>)
(router(config-if)>)
(turns green)
In device 1 (10.0.0.1) Command prompt
>ping 10.0.0.2
(reply from 10.0.0.2 is observed)
>ping 20.0.0.2
(request timed out)
Commands:-
enable
config t
interface Fa1/0
ip address 20.0.0.2 255.0.0.0
no shutdown
exit


In device 2 (20.0.0.1) Command prompt
>ping 20.0.0.2
(reply from 20.0.0.2 is observed)
>ping 10.0.0.2
(request timed out)
statistics
Gateway configuration
device 1 → Config → Gateway : 10.0.0.2
device 2 → config → Gateway : 20.0.0.2
In device 1 (10.0.0.1) cmd prompt
>ping 20.0.0.2
(reply from 20.0.0.2 is observed)
>ping 20.0.0.1
(reply from 20.0.0.1 is observed)
[PDU → protocol data unit in simulation]
Results:-
In device 1 (10.0.0.1) cmd prompt
>ping 10.0.0.2
Ping statistics
Packets: sent = 4, Received = 4, Lost = 0 (0% loss)
>Ping 20.0.0.2
request timed out
Ping statistics
Packets: sent = 4, Received = 0, Lost = 4 (100% loss)
after configuration


>ping 20.0.0.2
Ping statistics
Packets: sent = 4, Received = 4, Lost = 0 (0% loss)
Aim
Observations:-
Before IP and Gateway configuration ping requests were timed out across network
After configuration ping request successfull across network
Pinging message PDU from device 1 to 2
Last device
At device
Type
PC0
ICMP
PC0
router0
ICMP
router0
PC1
ICMP
PC1
router0
ICMP
router0
PC0
ICMP
router0
CDP
router0
CDP
17/11/22

Output

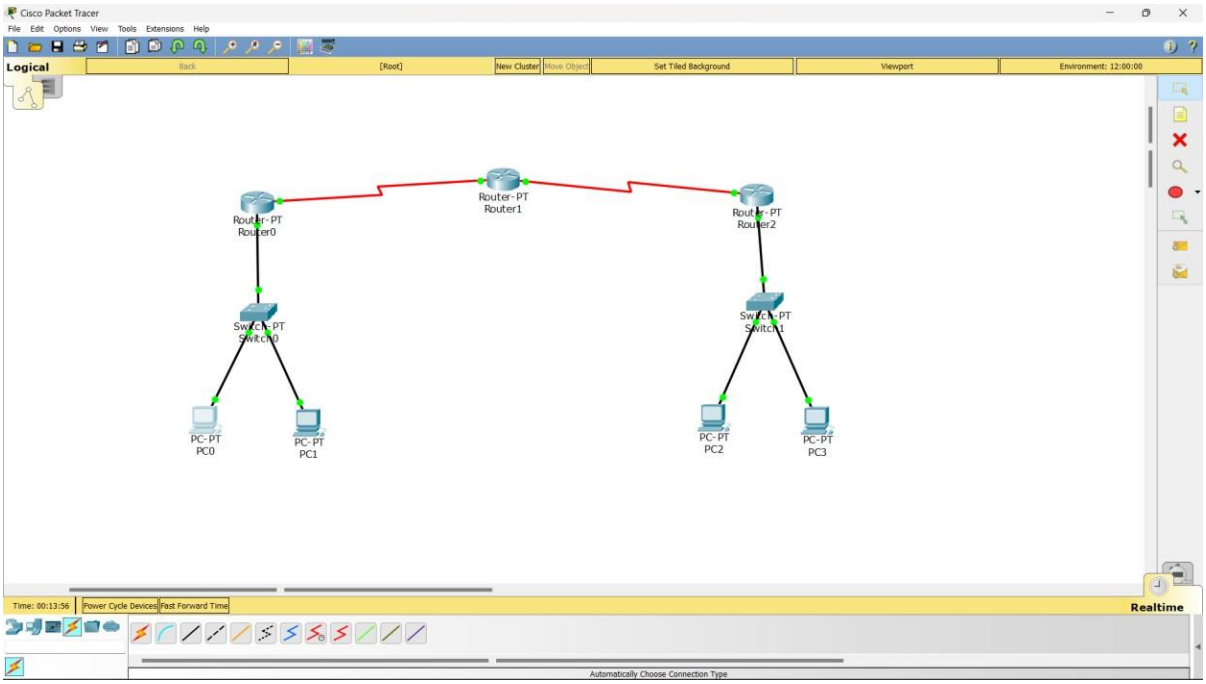

PC0
Physical
Config
Desktop
Attributes
Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 20.0.0.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>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<1ms TTL=127
Reply from 20.0.0.1: bytes=32 time<1ms TTL=127
Reply from 20.0.0.1: bytes=32 time<1ms 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
C:\>

Experiment No 3

Aim of the program

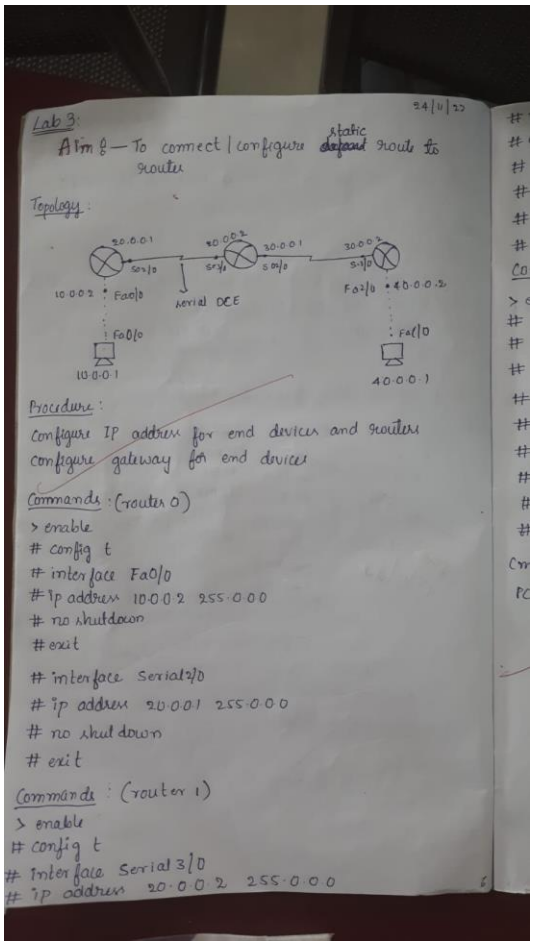
Configuring default route to the Router

Topology



Procedure

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0

Router#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 20.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 20.0.0.2 to network 0.0.0.0

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, Serial2/0
S*   0.0.0.0/0 [1/0] via 20.0.0.2
```



24/4/22

Lab 3:

Aim :— To connect | configure static route to router

Topology:

Procedure:

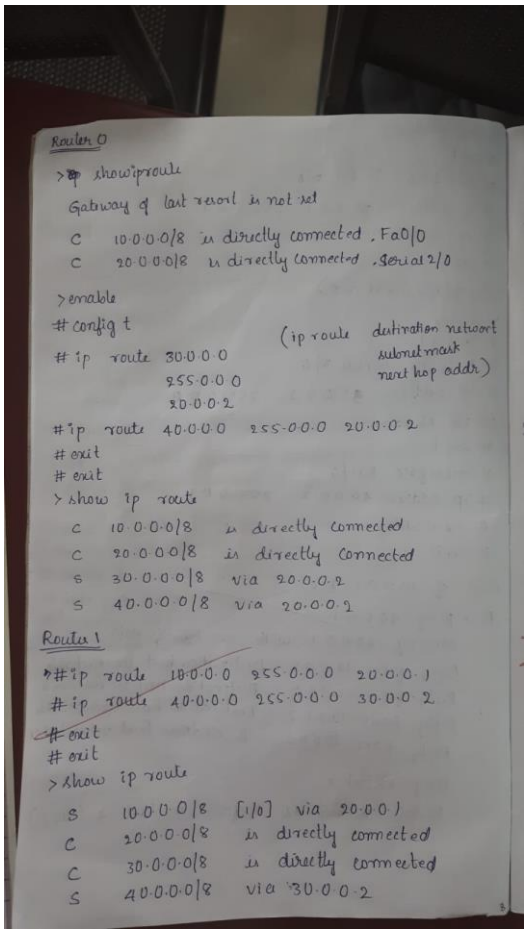
Configure IP address for end devices and routers
configure gateway for end devices

Commands: (router 0)

> enable
config t
interface Fa0/0
ip address 10.0.0.2 255.0.0.0
no shutdown
exit
interface Serial2/0
ip address 20.0.0.1 255.0.0.0
no shut down
exit

Commands: (router 1)

> enable
config t
Interface Serial3/0
ip address 20.0.0.2 255.0.0.0



Router 0

> show ip route
Gateway of last resort is not set
C 10.0.0.0/8 is directly connected, Fa0/0
C 20.0.0.0/8 is directly connected, Serial2/0

> enable
config t
ip route 30.0.0.0 255.0.0.0 20.0.0.2 (ip route destination network subnet mask next hop addr)
ip route 40.0.0.0 255.0.0.0 20.0.0.2
exit
exit
> show ip route
C 10.0.0.0/8 is directly connected
C 20.0.0.0/8 is directly connected
S 30.0.0.0/8 via 20.0.0.2
S 40.0.0.0/8 via 20.0.0.2

Router 1

ip route 10.0.0.0 255.0.0.0 20.0.0.1
ip route 40.0.0.0 255.0.0.0 30.0.0.2
exit
exit
> show ip route
S 10.0.0.0/8 [1/0] via 20.0.0.1
C 20.0.0.0/8 is directly connected
C 30.0.0.0/8 is directly connected
S 40.0.0.0/8 via 30.0.0.2

Output

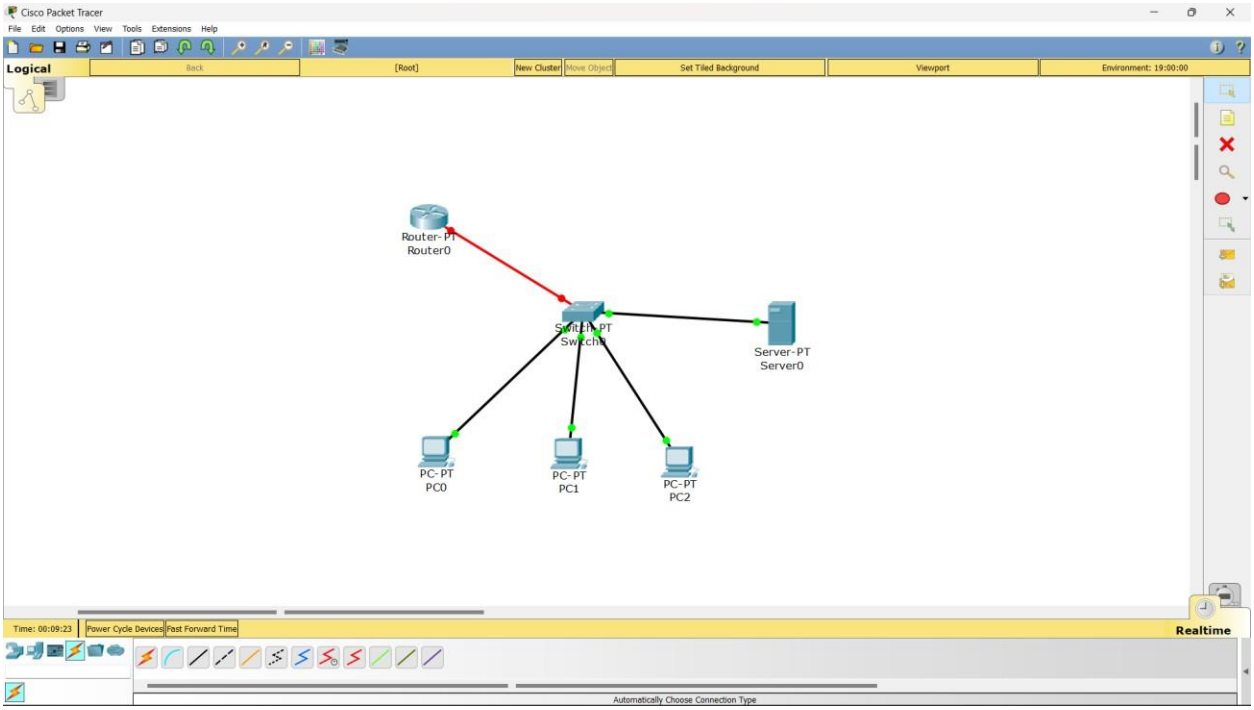
```
Packet Tracer PC Command Line 1.0
C:\>ping 40.0.0.1

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

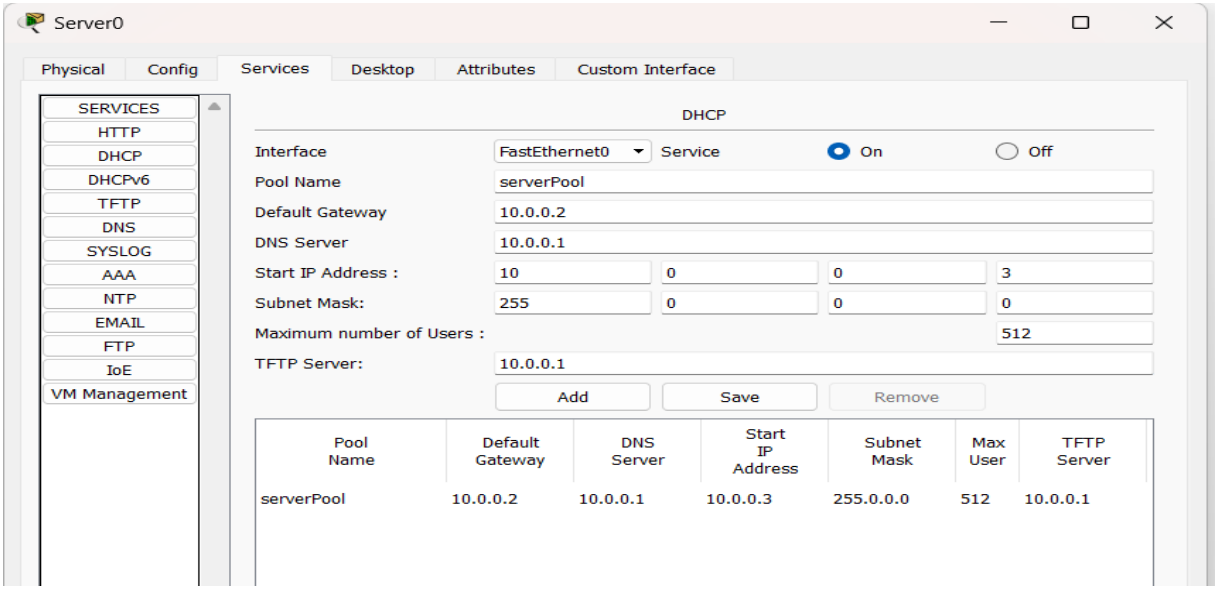
Aim of the program

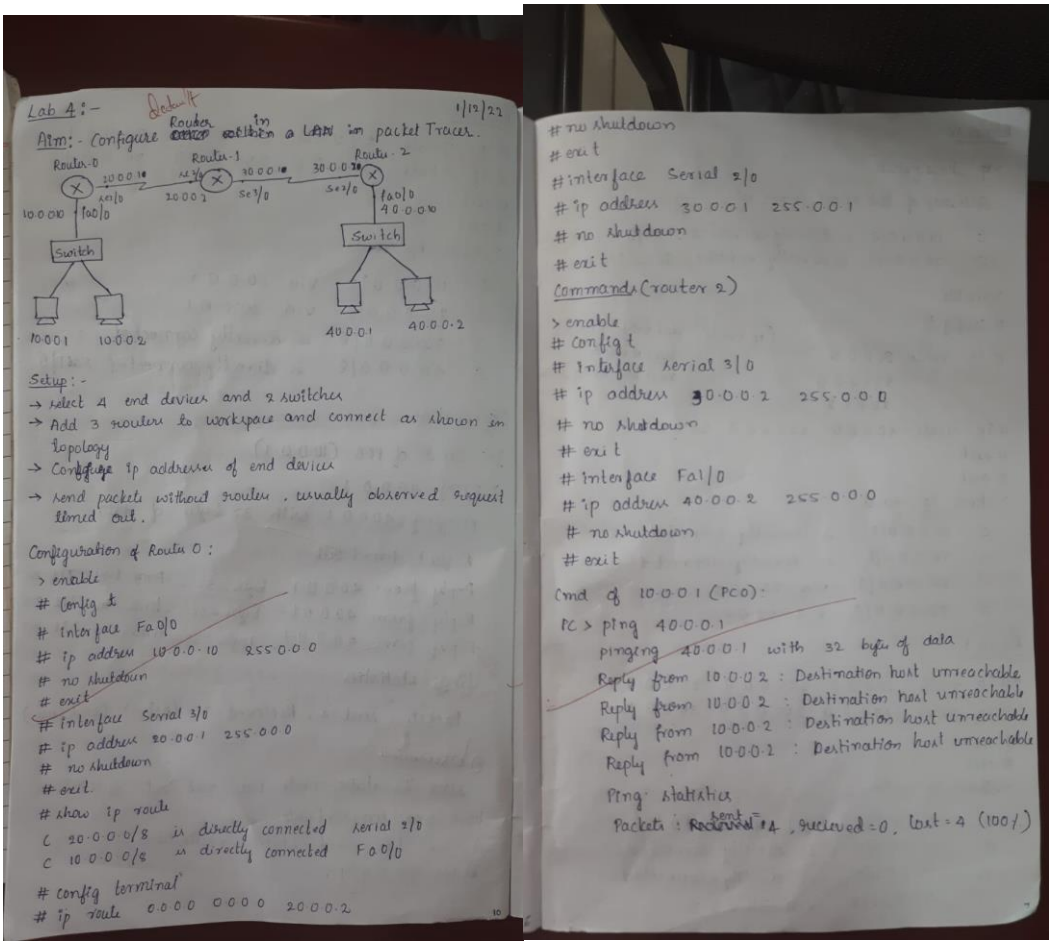
Configuring DHCP within a LAN in a packet Tracer

Topology



Procedure





Lab 4 :- default 1/12/22

Aim: - Configure Router in a LAN in packet Tracer.

Setup: -
→ select 4 end devices and 2 switches
→ Add 3 routers to workspace and connect as shown in topology
→ Configure ip addresses of end device
→ send packets without routes, usually observed request timed out.

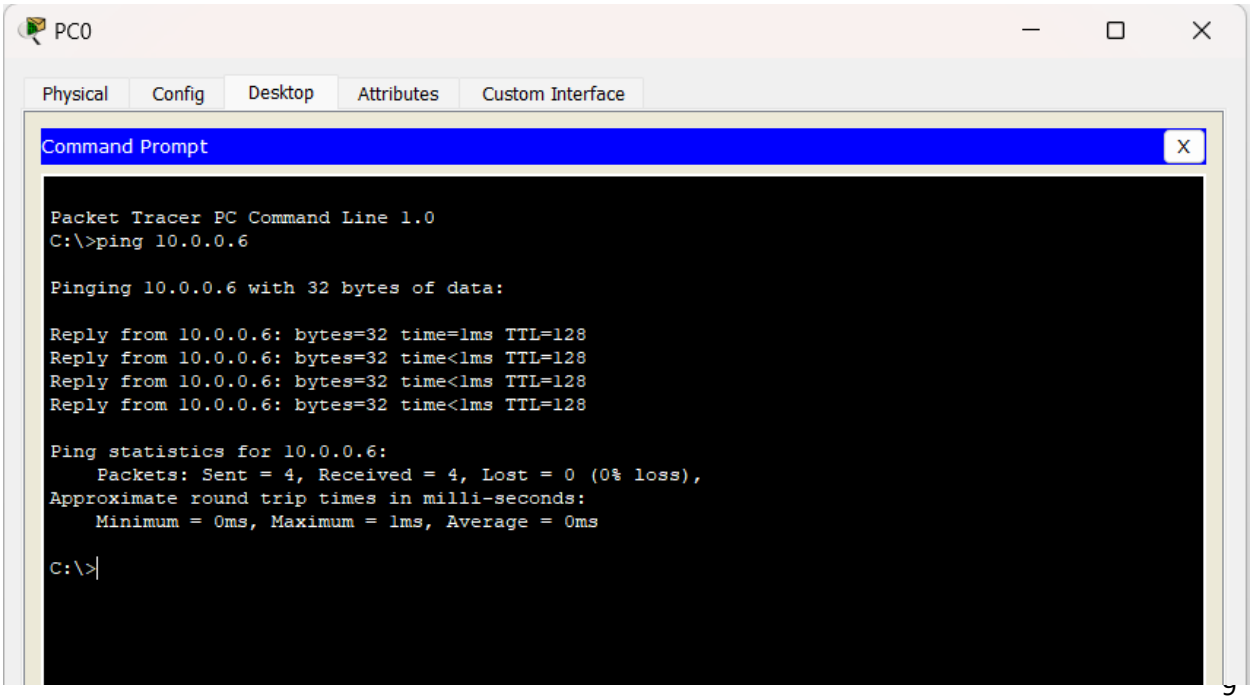
Configuration of Router 0 :
> enable
Config t
interface Fa0/0
ip address 10.0.0.10 255.0.0.0
no shutdown
exit
interface Serial 3/0
ip address 20.0.0.1 255.0.0.0
no shutdown
exit
show ip route
C 20.0.0.0/8 is directly connected Serial 2/0
C 10.0.0.0/8 is directly connected Fa0/0
config terminal
ip route 0.0.0.0 0.0.0.0 20.0.0.2

no shutdown
exit
interface Serial 2/0
ip address 30.0.0.1 255.0.0.1
no shutdown
exit

Commands (router 2)
> enable
Config t
Interface Serial 3/0
ip address 30.0.0.2 255.0.0.0
no shutdown
exit
interface Fa1/0
ip address 40.0.0.2 255.0.0.0
no shutdown
exit

Cmd of 10.0.0.1 (PC0):
PC > ping 40.0.0.1
pinging 40.0.0.1 with 32 byte of data
Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable
Reply from 10.0.0.2 : Destination host unreachable
Ping statistics
Packets : Sent = 4, Received = 0, Lost = 4 (100%)

Output

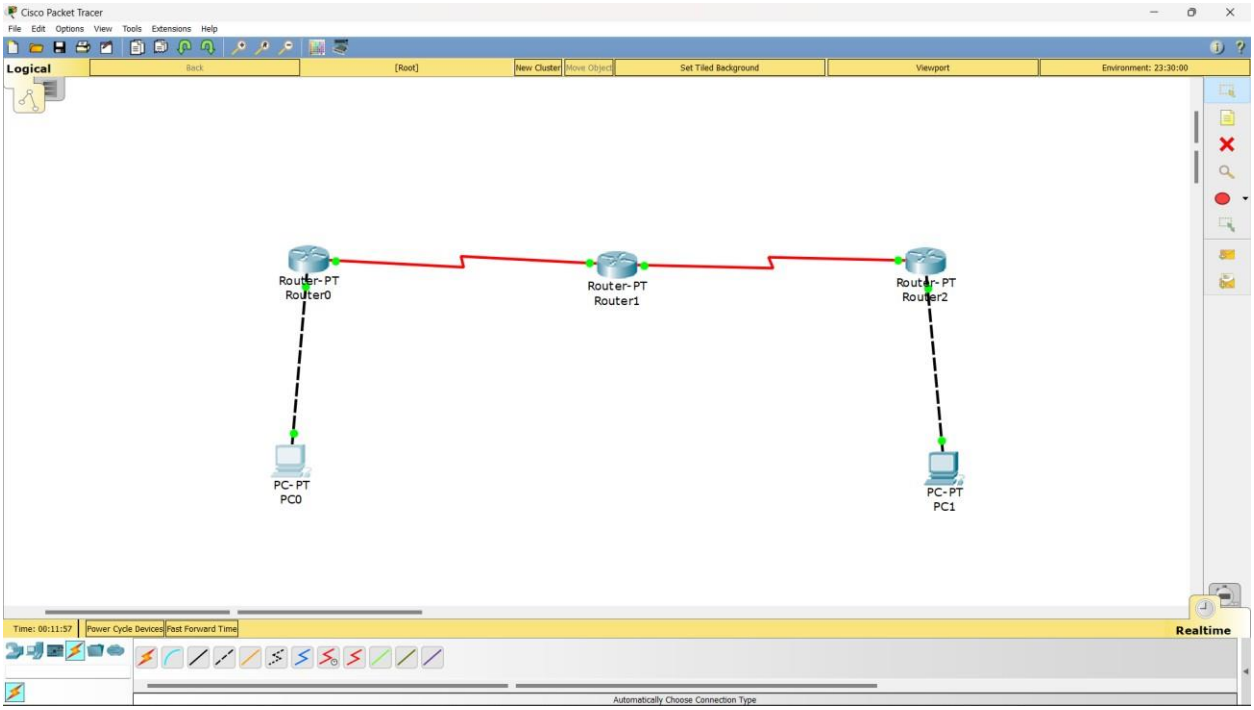


Experiment No 5

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(config-if)#
```

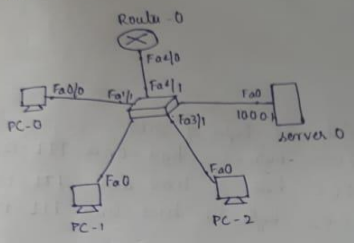
```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface Serial2/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
This command applies only to DCE interfaces
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 5 :- 8/12/22.

Aim :- Configure DHCP within a LAN in packet

Topology :-

DORA
D - discover
O - Offer
R - Request
A - Acknowledgement



Setup :-

→ select 3 end devices, 1 switch, 1 router and a server and connect as shown in topology.

→ do not config static ip address

→ Configure the server by giving the IP address & gateway

Configure server :

services → DHCP → on service

Default Gateway	10.0.0.1
DNS server	10.0.0.2
Start IP addr	10 0 0 3
Subnet mask	255 0 0 0
TFTP server	10.0.0.2

→ save the changes

→ Open IP configuration in desktop change IP configuration from static to DHCP. Follow the same for all other PC's

→ IP addresses will be automatically assigned and now ping can be performed.

→ Procedure has to be followed to activate DHCP. (13)

Router > enable
Router # config t
Router (config-if) # ip address 10.0.0.2 255.0.0.0
no shutdown
exit

Result

> ping 10.0.0.5

pinging 10.0.0.5 with 32 bytes of data

Reply from 10.0.0.5 bytes = 32 time = 0ms TTL = 128
Reply from 10.0.0.5 bytes = 32 time = 0ms TTL = 128
Reply from 10.0.0.5 bytes = 32 time = 0ms TTL = 128

Ping statistics for 10.0.0.5
packets : sent = 4, Received = 4 lost = 0 (0% loss)

Observation :-

DHCP : Dynamic host configuration protocol provides IP address (IP) host automatically with IP with subnet mask and default gateway.

Output:

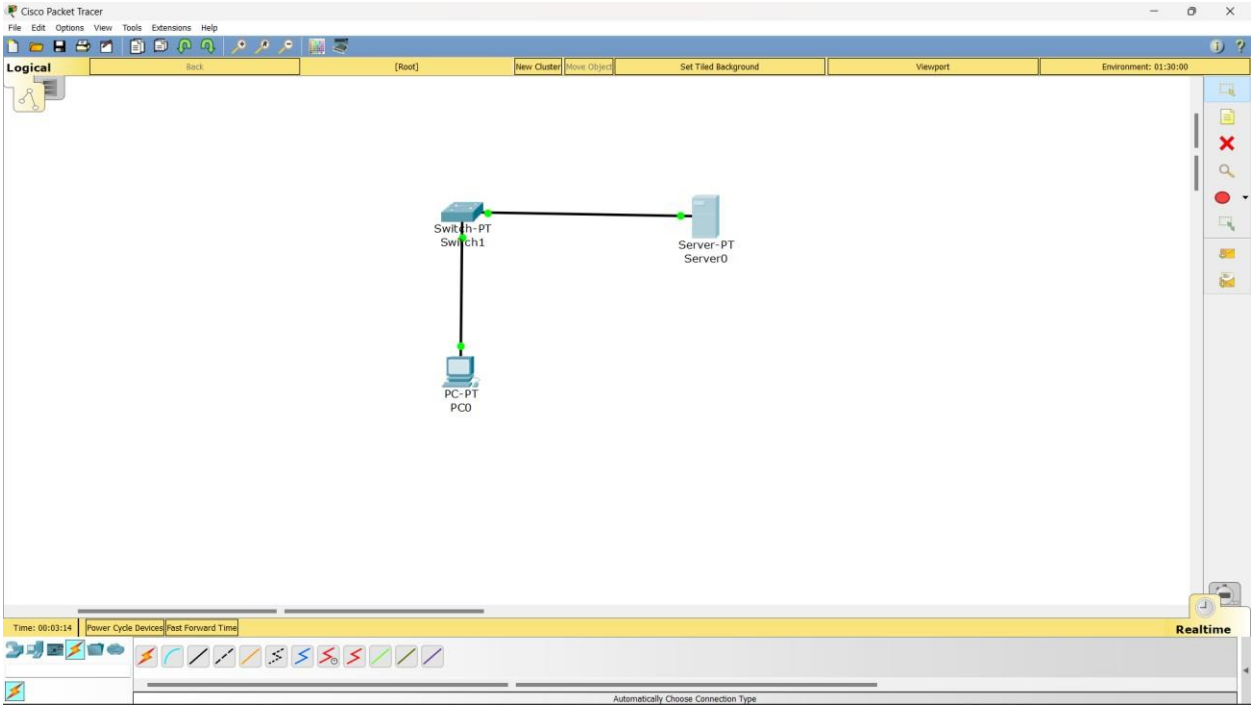
```
C:\>ping 40.0.0.1

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

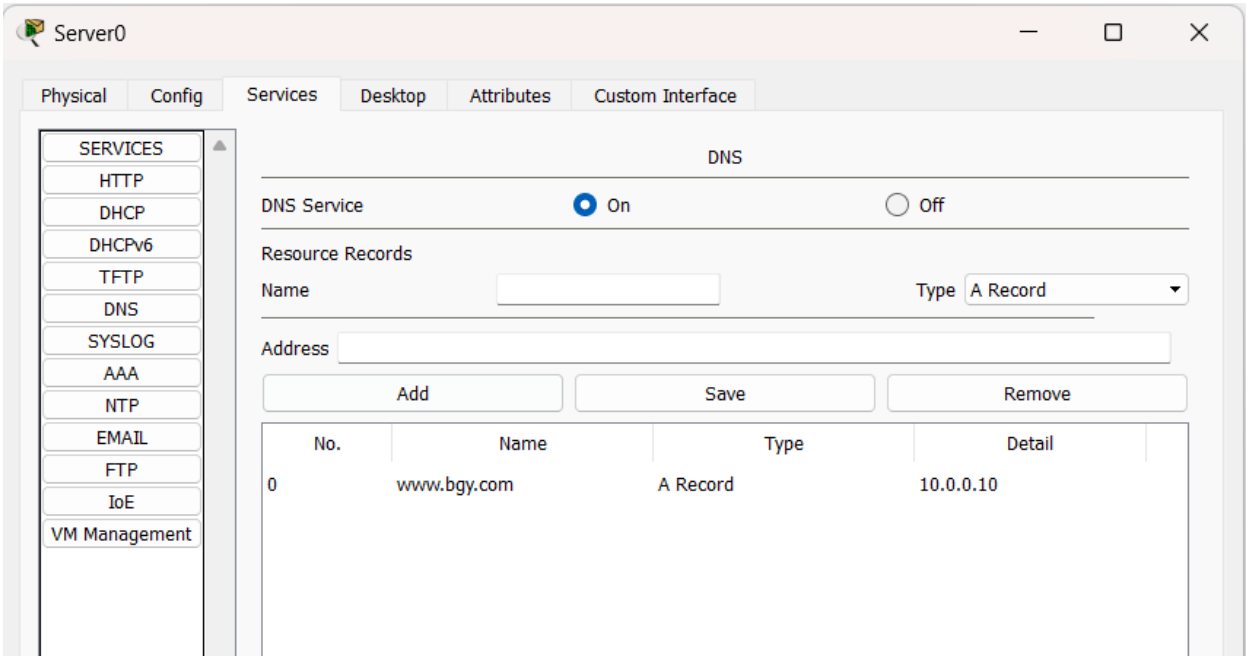
Aim of the program

Demonstration of WEB server and DNS using Packet Tracer

Topology



Procedure

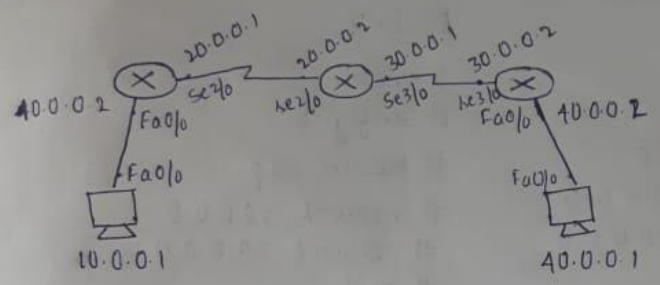


15/12/22

Lab 6 :—

Aim: Configure RIP (Routing ~~Interface~~ Information protocol)

Topology:



* To select best path in network based on hop count.
* margin is 15 hops. it rejects if hop count is greater than 15 and chooses 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
```

Configure fastethernet also

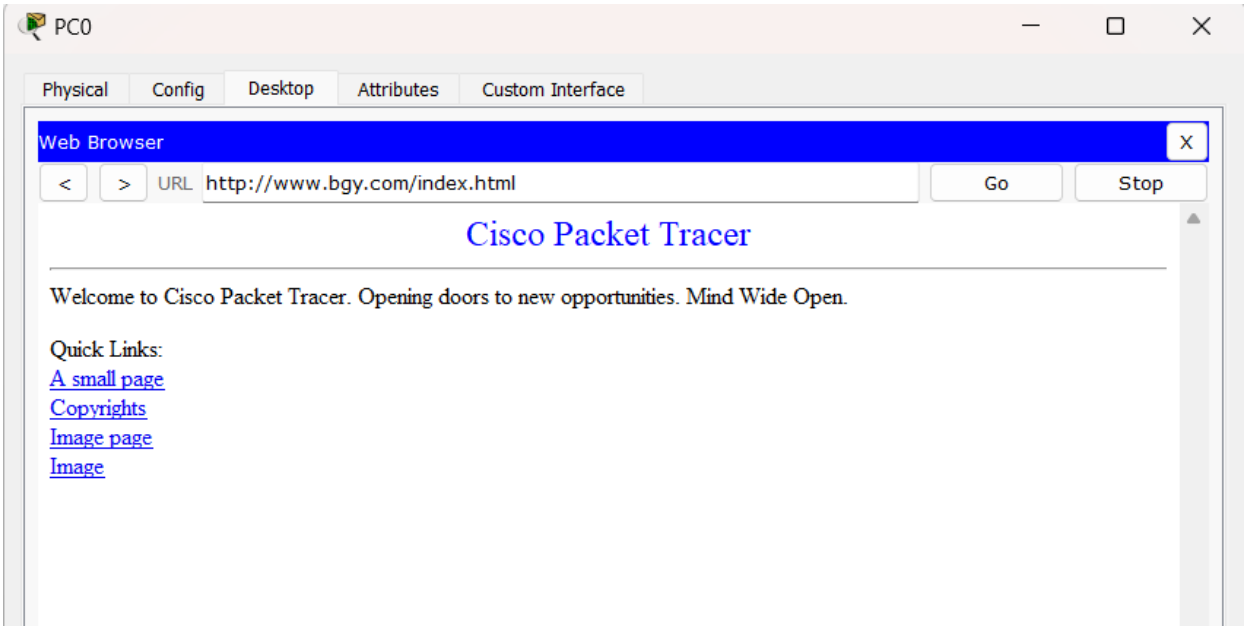
Configuration of Router 3:

```
# interface Serial 3/0
# ip address 30.0.0.2 255.0.0.0
# encapsulation PPP
# clock rate 64000
# no shut down
```

Configuration of Router 2:

```
# interface serial 2/0
# ip address 20.0.0.2 255.0.0.0
# no shut down
# interface serial 3/0
# ip address 30.0.0.1 255.0.0.0
```

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

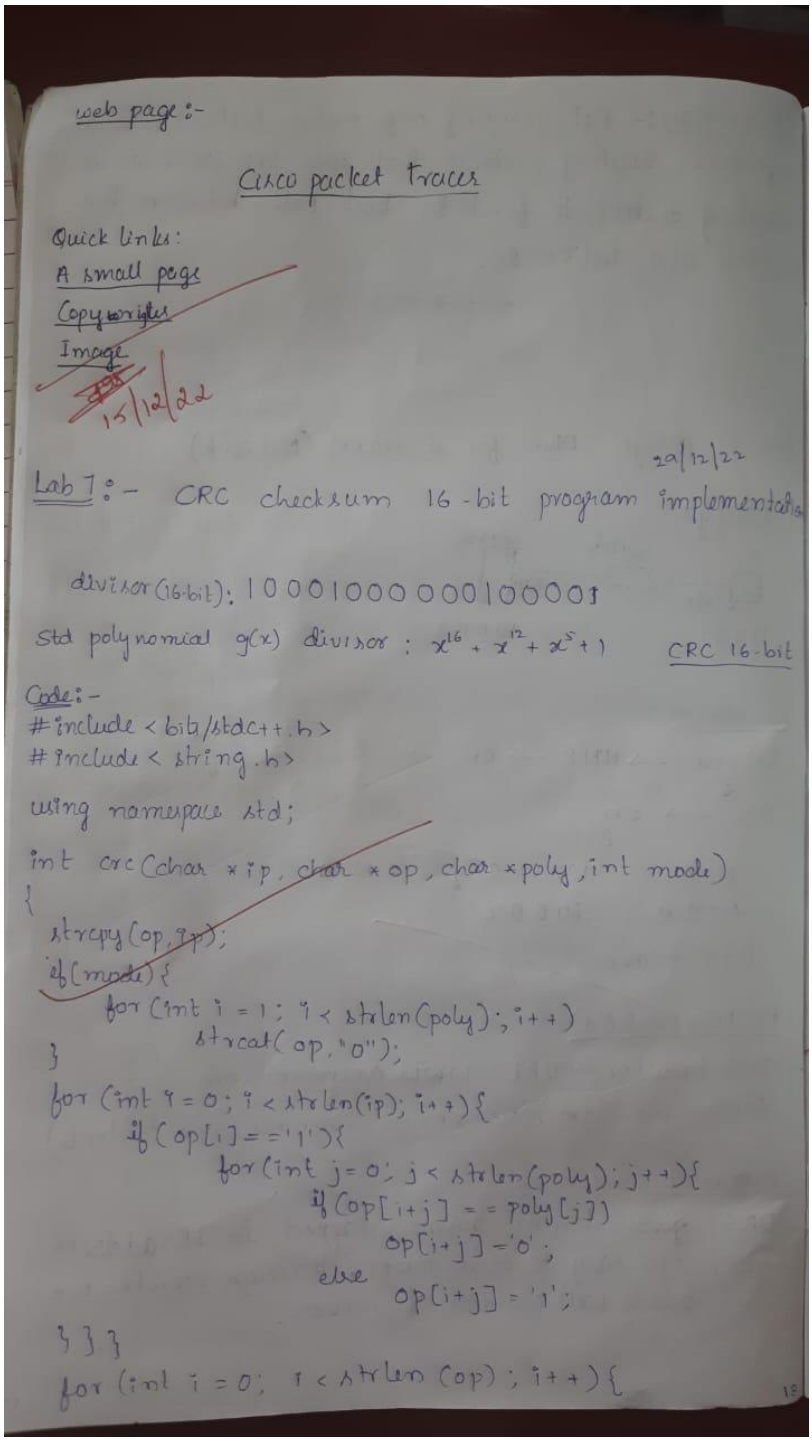
```
#include<bits/stdc++.h>
using namespace std;
void receiver(string data, string key);

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;
}
```

Observation:



web page :-

Cisco packet Tracer

Quick links:
A small page
Copywriter
Image
15/12/22

29/12/22

Lab 7 :- CRC checksum 16-bit program implementation

divisor (16-bit): 10001000000100001

Std polynomial g(x) divisor : $x^{16} + x^{12} + x^5 + 1$ CRC 16-bit

Code:-

```
#include <bits/stdc++.h>
#include <string.h>
using namespace std;
int crc(char *ip, char *op, char *poly, int mode)
{
  strcpy(op, ip);
  if(mode){
      for (int i = 1; i < strlen(poly); i++)
            strcat(op, "0");
  }
  for (int i = 0; i < strlen(ip); i++){
      if (op[i] == '1'){
            for (int j = 0; j < strlen(poly); j++){
                  if (op[i+j] == poly[j])
                        op[i+j] = '0';
                  else
                        op[i+j] = '1';
  }}}
  for (int i = 0; i < strlen (op); i++){
```

Output

```
Remainder : 10001011000
Encoded Data (Data + Remainder) :101110110001011000
correct message recieved


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

Experiment No 2

Aim of the Experiment

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

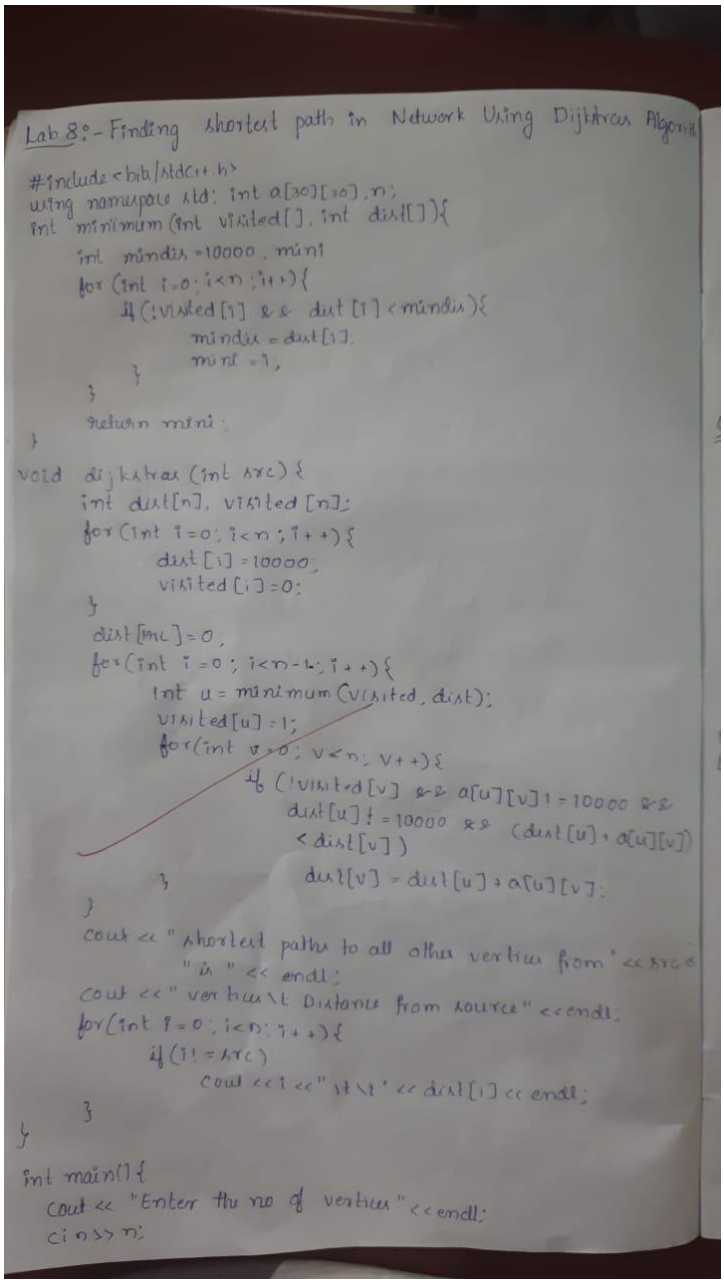
Code

```
#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;
}
```

Observation:



Lab 8:- Finding shortest path in Network Using Dijkstras Algorith

```
#include <bits/stdc++.h>
using namespace std; int a[30][30],n;
int minimum (int visited[], int dist[]){
    int mindis =10000, mini
    for (int i=0; i<n ;i++){
        if (!visited[i] && dist[i] < mindis){
            mindis = dist[i];
            mini = i;
        }
    }
    return mini;
}
void dijkstras (int src){
    int dist[n], visited[n];
    for (int i=0; i<n ; i++){
        dist[i] = 10000;
        visited[i]=0;
    }
    dist[src]=0;
    for (int i =0 ; i<n-1; i++){
        int u = minimum (visited, dist);
        visited[u] = 1;
        for(int v=0; v<n; v++){
            if (!visited[v] && a[u][v]!=10000 &&
                dist[u]!=10000 && (dist[u]+a[u][v])
                < dist[v])
            dist[v] = dist[u]+a[u][v];
        }
    }
    cout << "shortest paths to all other vertices from" << src <<
        " is " << endl;
    cout << "vertices\t Distance from source" <<endl;
    for(int i=0; i<n; i++){
        if (i!=src)
            cout << i << " it \t" << dist[i] << endl;
    }
}
int main(){
    cout << "Enter the no of vertices" <<endl;
    cin>> n;
```

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


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

Experiment No 3

Aim of the Experiment

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

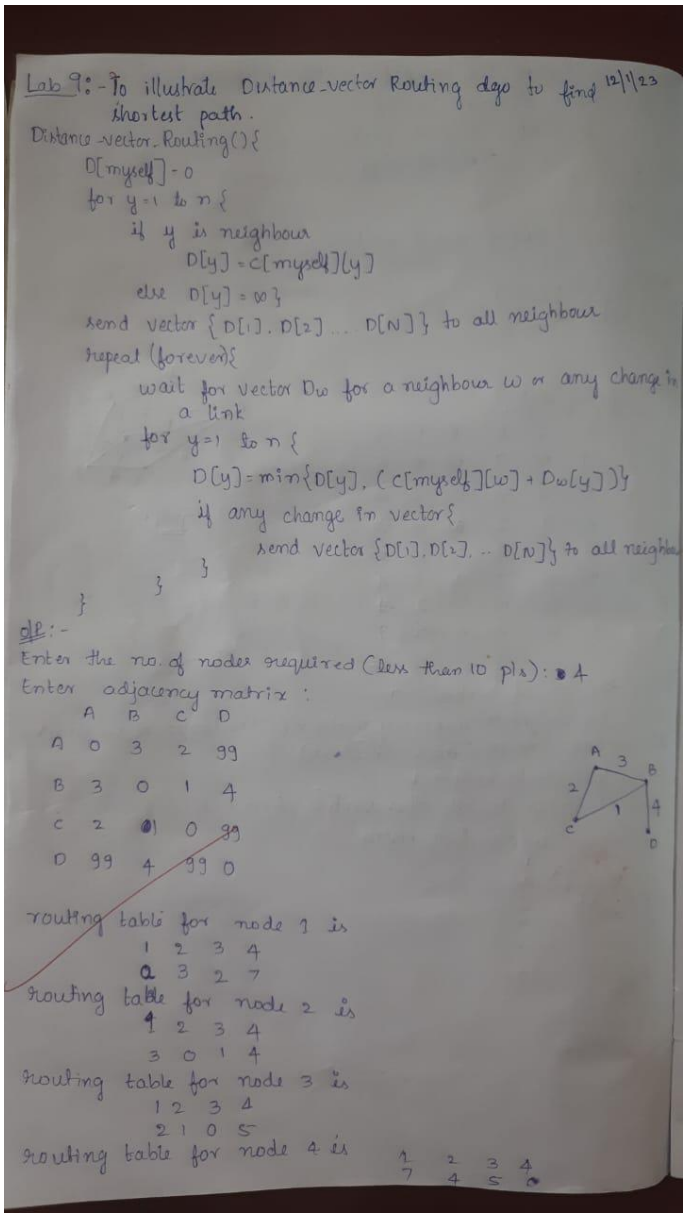
Code

```
#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;
}
```

Observation:



Lab 9:- To illustrate Distance-vector Routing algo to find shortest path. 12/1/23

```
Distance-vector-Routing(){
    D[myself] = 0
    for y = 1 to n {
        if y is neighbour
            D[y] = C[myself][y]
        else D[y] = ∞ }
    send vector { D[1], D[2] ... D[N] } to all neighbour
    repeat (forever){
        wait for vector Dw for a neighbour w or any change in
            a link
        for y = 1 to n {
            D[y] = min{D[y], (C[myself][w] + Dw[y])}
            if any change in vector{
                send vector {D[1], D[2], .. D[N]} to all neighbour
            }
        }
    }
```

Ole:-

Enter the no. of nodes required (less than 10 pls): 4

Enter adjacency matrix :

	A	B	C	D
A	0	3	2	99
B	3	0	1	4
C	2	1	0	99
D	99	4	99	0

routing table for node 1 is

1	2	3	4
0	3	2	7

routing table for node 2 is

1	2	3	4
3	0	1	4

routing table for node 3 is

1	2	3	4
2	1	0	5

routing table for node 4 is

1	2	3	4
7	4	5	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

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

Experiment No 4

Aim of the Experiment

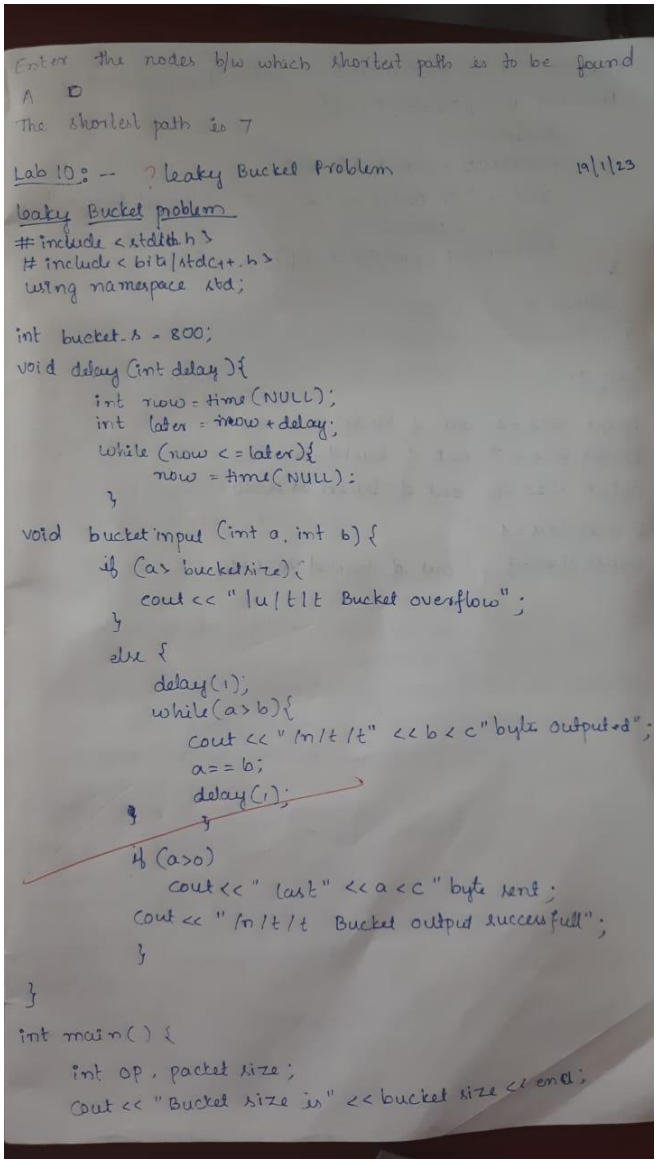
Write a program for congestion control using Leaky bucket algorithm

Code

```
#include <bits/stdc++.h>
using namespace std;
int main()
{
	int no_of_queries, storage, output_pkt_size;
	int input_pkt_size, bucket_size, size_left;
	storage = 0;
	no_of_queries = 4;
	bucket_size = 10;
	input_pkt_size = 4;
	output_pkt_size = 1;
	for (int i = 0; i < no_of_queries; i++) //
	{
		size_left = bucket_size - storage;
		if (input_pkt_size <= size_left) {
			// update storage
			storage += input_pkt_size;
		}
		else {
			printf("Packet loss = %d\n", input_pkt_size);
		}
		printf("Buffer size= %d out of bucket size= %d\n",
			storage, bucket_size);
```

```
        storage -= output_pkt_size;
    }
    return 0;}
```

Observation:



```
Enter the nodes b/w which shortest path is to be found
A D
The shortest path is 7

Lab 10 :-  ? leaky Bucket Problem                    19/1/23

leaky Bucket problem
#include <stdlib.h>
#include <bits/stdc++.h>
using namespace std;

int bucket_s = 800;
void delay (int delay){
        int now = time(NULL);
        int later = now + delay;
        while (now <= later){
            now = time(NULL);
        }
void bucket input (int a, int b) {
        if (a> bucketsize){
            cout << "\n\t\t Bucket overflow";
        }
        else {
            delay(1);
            while(a>b){
                cout << "\n\t\t" << b << "byte outputed";
                a== b;
                delay(1);
            }
        if (a>0)
            cout << " last" << a << " byte sent;
        cout << "\n\t\t Bucket output successfull";
        }
}
int main() {
    int op, packet size;
    cout << "Bucket size is" << bucket size << endl;
```

Output:

```
Buffer size= 4 out of bucket size= 10
Buffer size= 7 out of bucket size= 10
Buffer size= 10 out of bucket size= 10
Packet loss = 4
Buffer size= 9 out of bucket size= 10
```

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

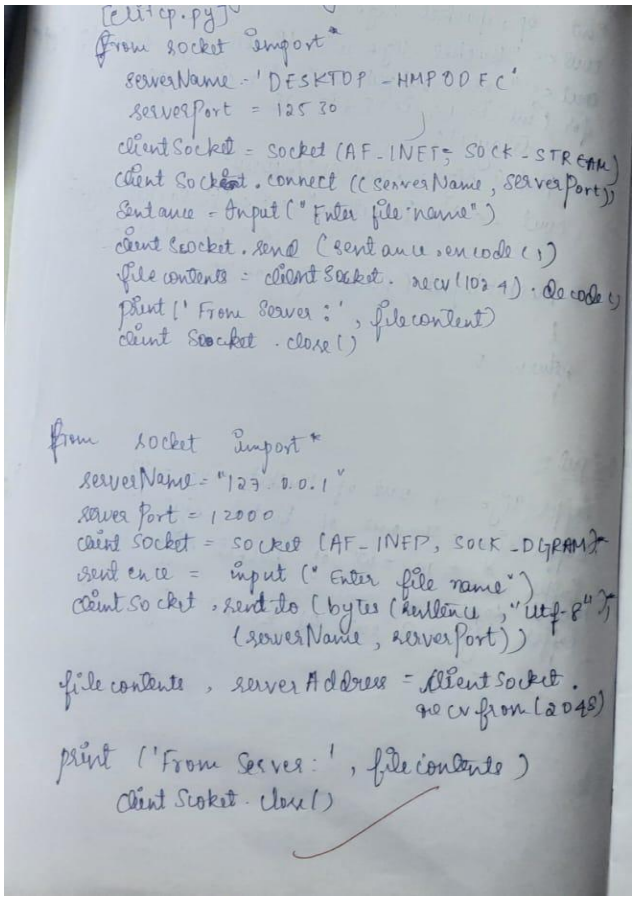
Server:

```
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()
```

Observation:



[client.py]

```
from socket import*
serverName = 'DESKTOP-HMPODFC'
serverPort = 12530
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort))
Sentance = Input("Enter file name")
clientSocket.send(sentance.encode())
filecontents = clientSocket.recv(1024).decode()
print('From Server:', filecontent)
clientSocket.close()
```

```
from socket import*
serverName = "127.0.0.1"
server Port = 12000
client Socket = 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:\Windows\System32\cmd.exe - py server.py
Microsoft Windows [Version 10.0.19045.2486]
(c) Microsoft Corporation. All rights reserved.

D:\con054-main\CON_LAB\lab10>py server.py
The server is ready to receive
```

```
C:\Windows\System32\cmd.exe
icrosoft Windows [Version 10.0.19045.2486]
c) Microsoft Corporation. All rights reserved.

:\con054-main\CON_LAB\lab10>py client.py
nter file name: try.txt
rom Server: HELLO WORLD
```

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:

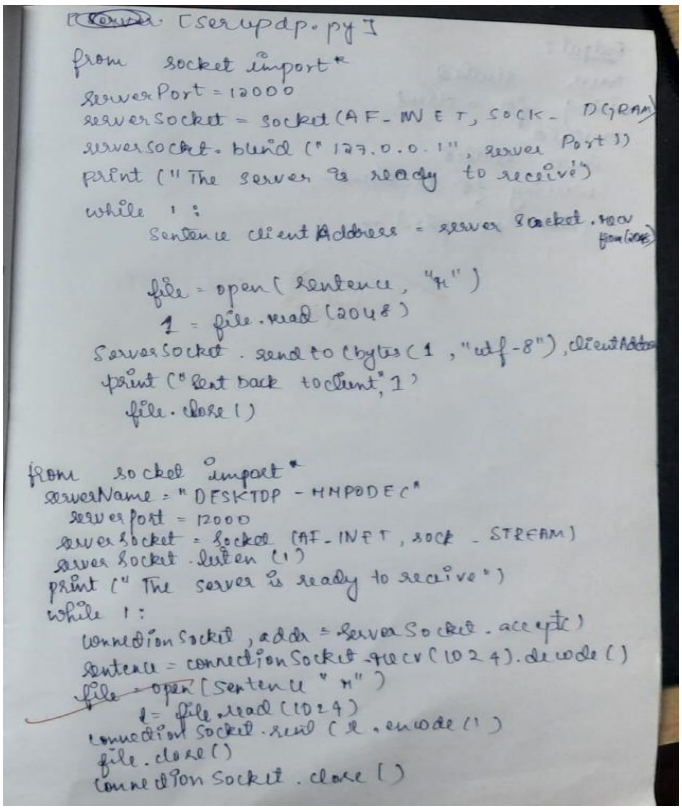
```
from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print("The server is ready to receive")
while 1:
    sentence,clientAddress = serverSocket.recvfrom(2048)

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

    serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
    print("sent back to client",l)
    file.close()
```

Client:

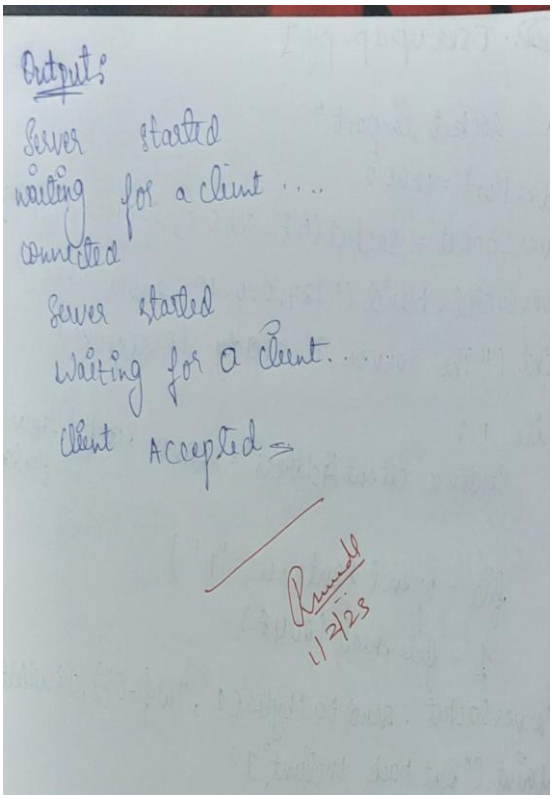
```
from socket import *
serverName = "127.0.0.1"
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_DGRAM)

sentence = input("Enter file name")
clientSocket.sendto(bytes(sentence,"utf-8"),(serverName, serverPort))
```

```
filecontents,serverAddress = clientSocket.recvfrom(2048)
print ('From Server:', filecontents)

clientSocket.close()
```

Observation:



```
[serupdp.py]
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.recv
    file = open( sentence, "r" )
    1 = file.read (2048)
    ServerSocket . sendto (bytes (1 , "utf-8"), clientAddr
    print ("Sent back to client", 1)
    file.close ()

from socket import*
serverName = "DESKTOP - HMPODEC"
serverport = 12000
serverSocket = socket (AF_INET , sock_STREAM)
serversocket.listen (1)
print (" The server is ready to receive")
while 1:
    connectionSocket , addr = serverSocket . accept()
    sentence = connectionSocket.recv(1024).decode()
    file = open [sentence " r" )
    l = file.read (1024)
    connectionSocket.send ( l . encode (1 )
    file.close()
    connection Socket . close ()
```



```
Output:
Server started
waiting for a client ...
connected
Server started
Waiting for a client...
Client Accepted =
```

Output

```
Select C:\Windows\System32\cmd.exe - py userver.py
Microsoft Windows [Version 10.0.19045.2486]
(c) Microsoft Corporation. All rights reserved.

D:\con054-main\CON_LAB\lab10>py userver.py
The server is ready to receive
```

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19045.2486]
(c) Microsoft Corporation. All rights reserved.

D:\con054-main\CON_LAB\lab10>py uclient.py
Enter file name: try.txt
From Server: b'HELLO WORLD\n\n'

D:\con054-main\CON_LAB\lab10>
```

```
C:\Windows\System32\cmd.exe - py  userver.py
Microsoft Windows [Version 10.0.19045.2486]
(c) Microsoft Corporation. All rights reserved.

D:\con054-main\CON_LAB\lab10>py userver.py
The server is ready to receive
sent back to client HELLO WORLD
```