VISVESVARAYATECHNOLOGICALUNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.

LAB RECORD

Computer Network Lab (23CS5PCCON)

Submitted by

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in partial fulfillment for the award of the degree of

BACHELOROFENGINEERING

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 Network (23CS5PCCON)" carried out by **Gautam Gandhani (1BM22CS101),** 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. The Lab report has been approved as it satisfies the academic requirements of the above-mentioned subject and the work prescribed for the said degree.

Dr. Lata N.R Associate Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE

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16	18-12-24	Using TCP/IP 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.	62
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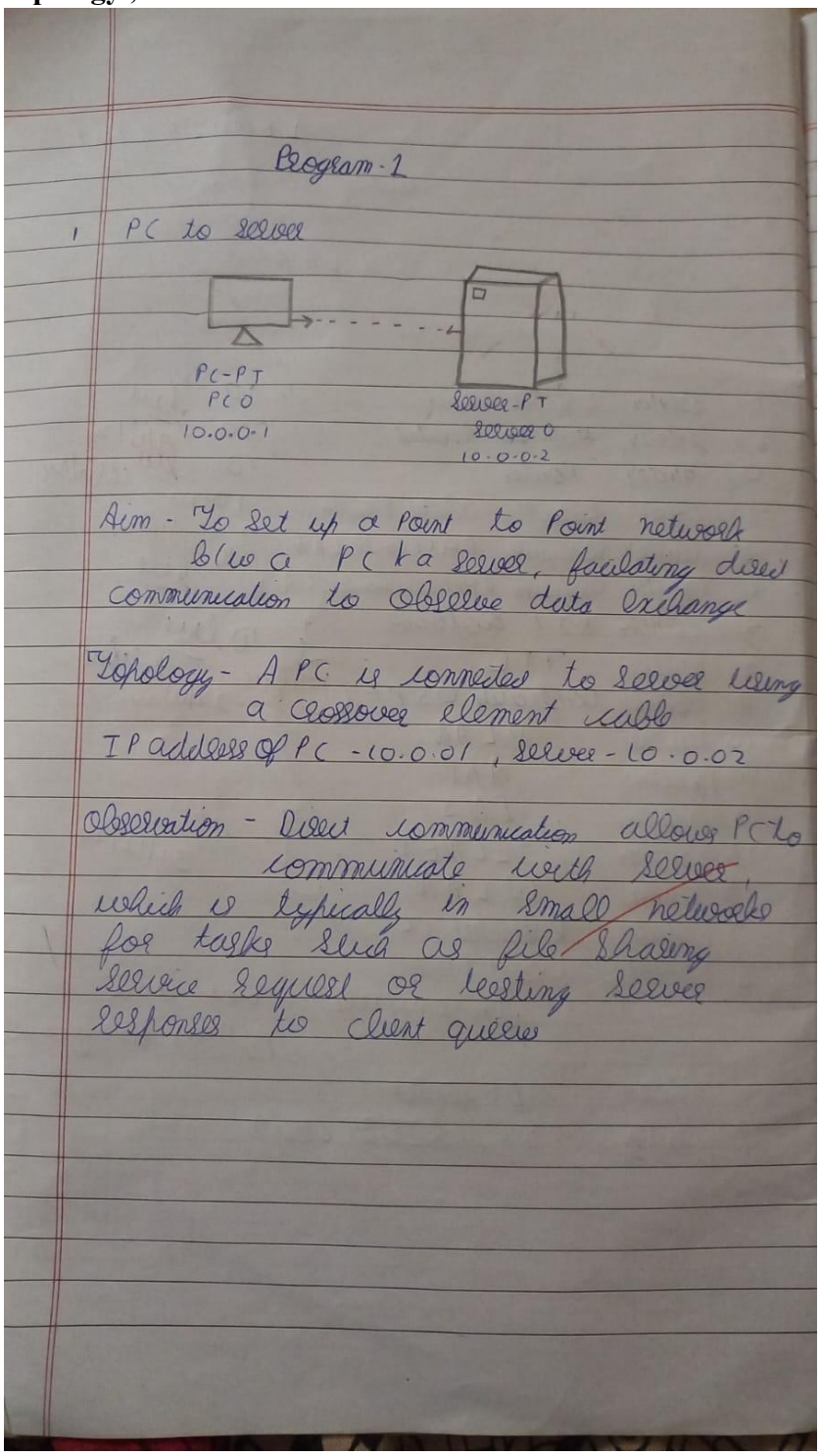
Github Link: LINK

Program 1

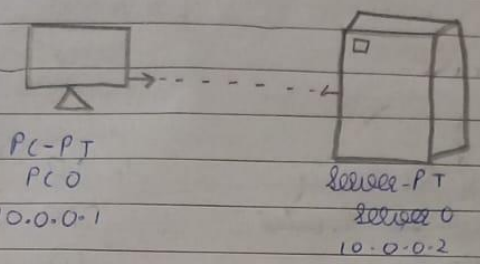
Aim: Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping messages.

Topology , Procedure and Observation:



Program - 1

1 PC to server



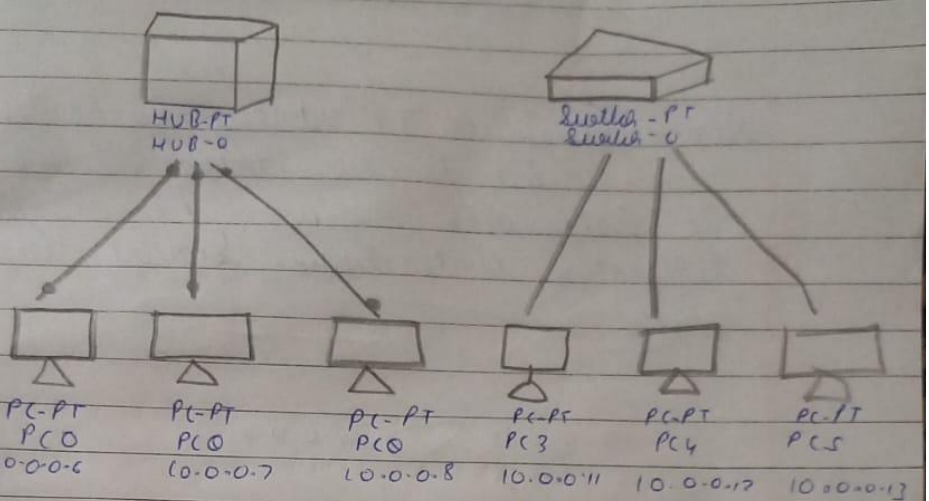
Aim - To set up a Point to Point network b/w a PC to a server, facilating direct communication to observe data exchange

Topology - A PC is connected to server using a crossover element cable
IP address of PC - 10.0.0.1, server - 10.0.0.2

Observation - Direct communication allows PC to communicate with server, which is typically in small networks for tasks such as file sharing service request or testing server responses to client queries

Bafna Gold
Date: Page:

2) Hub & Switch

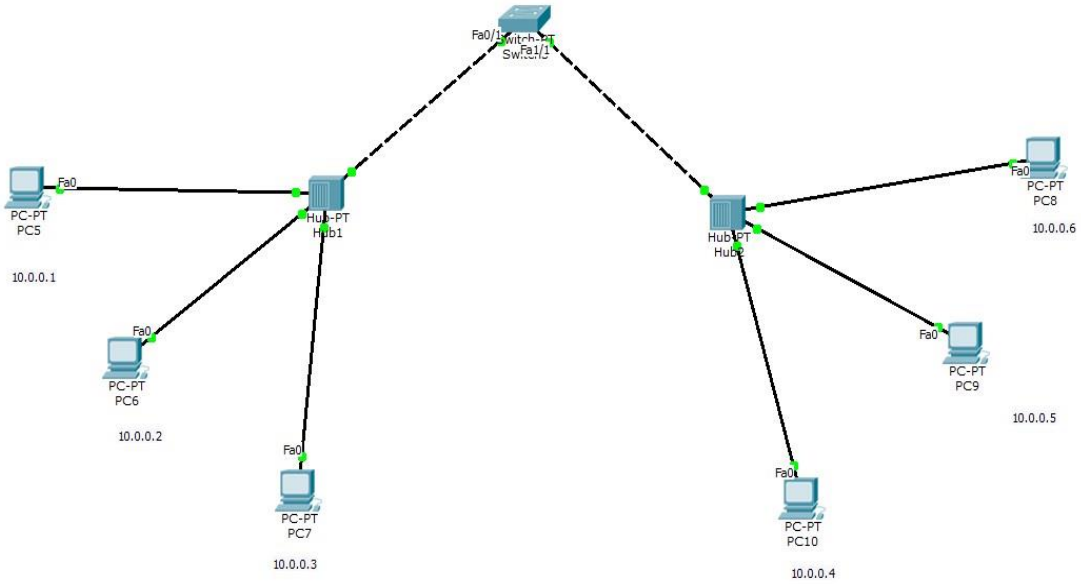


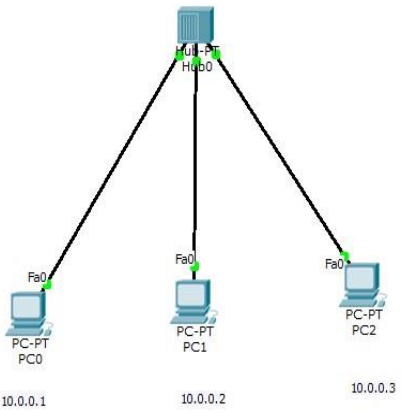
Aim - To create simple network consisting of 3PCs to connected to a central hub and a network with 3Pc connected to switch. This connection ~~with~~ will help observe of data transmission using hub & switch device

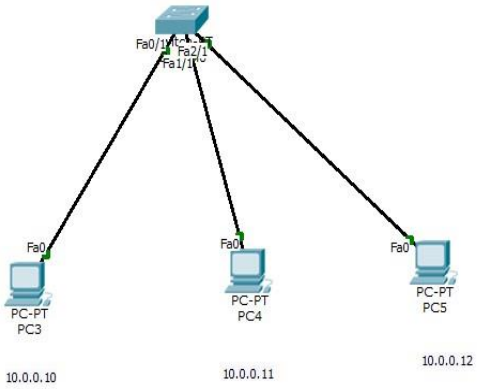
Topology - 3PCS are connected to hub & switch using straight through ethernet cable

Observation - Hub broadcast packets to all device which may cause unnecessary traffic. Switch forwards packet only to appropriate device by learning mac address, making it more efficient in reducing traffic.

Screen Shots:



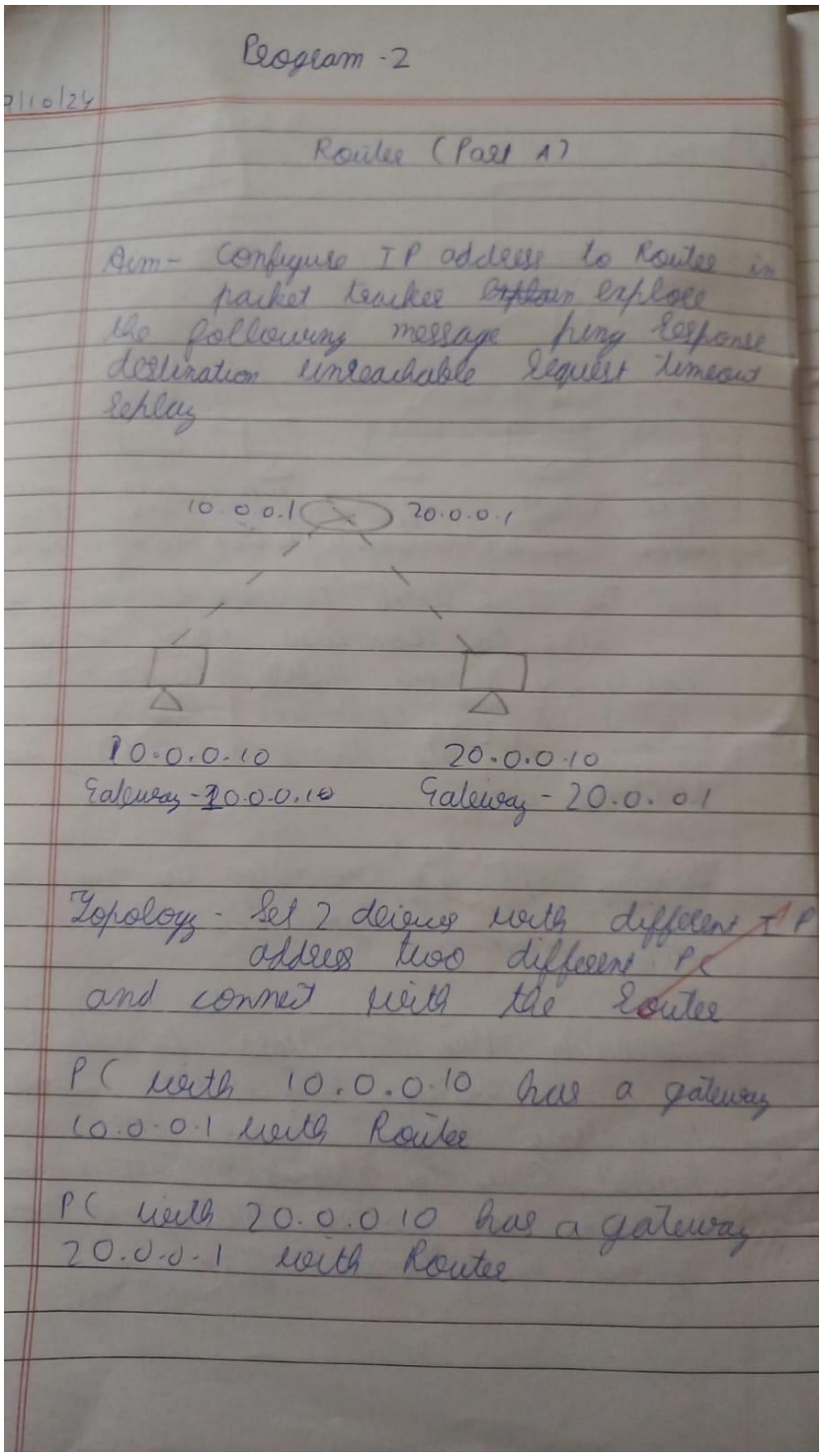




Program 2

Aim: Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.

Topology , Procedure and Observation:



Bafna Gold
Date: Page:

Observation <

~~10.0~~

Procedure

Router - enable
Router# - config terminal
Router Config - interface fastethernet 0/0
ip address 10.0.0.1 255.0.0.0
no shutdown

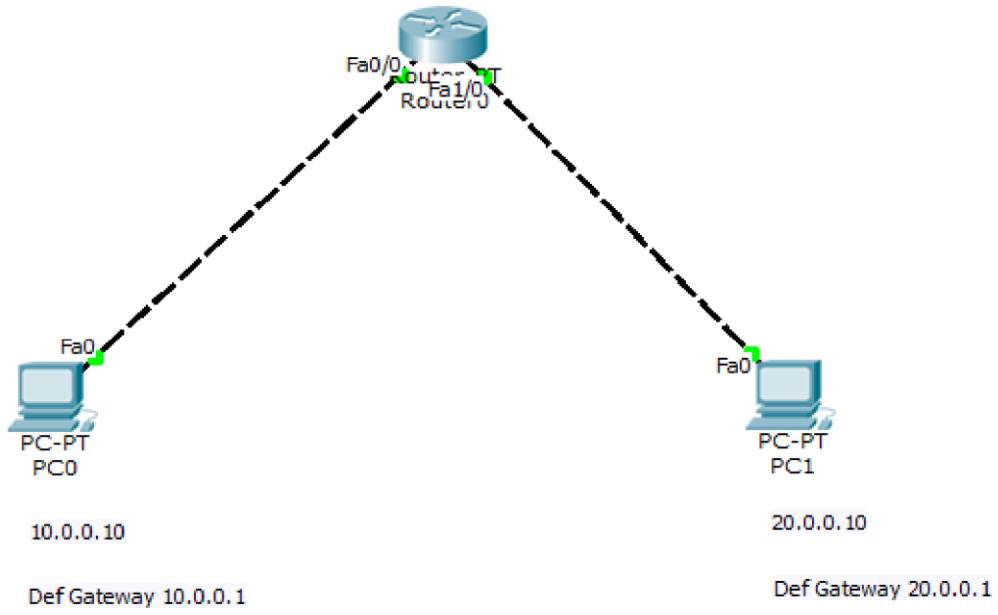
interface fastethernet 1/0
ip address 20.0.0.1 255.0.0.0
no shutdown

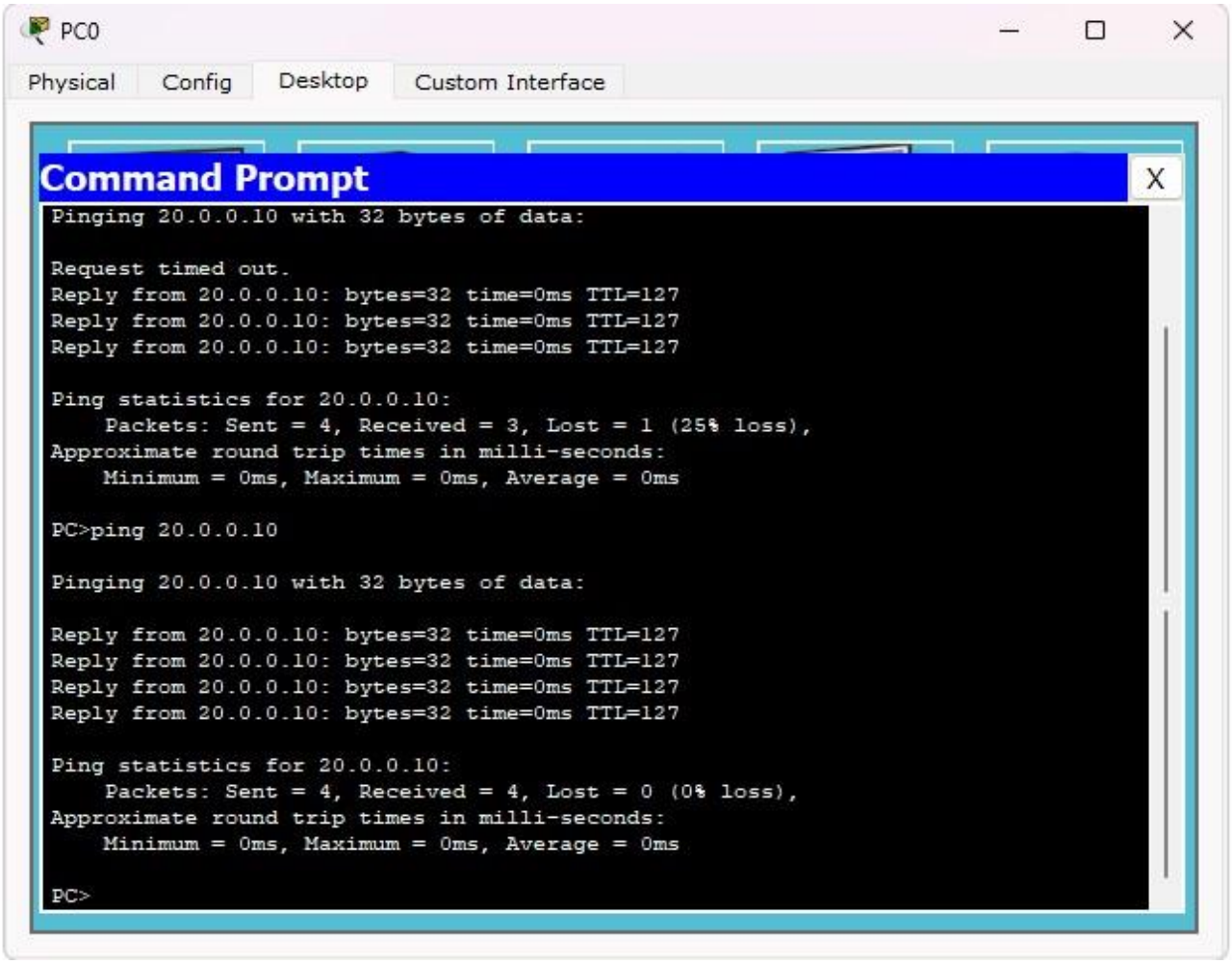
Result
show ip route

10.0.0.0/8 is directly connected
20.0.0.0/8 is directly connected

16/10/22

Screen Shots:

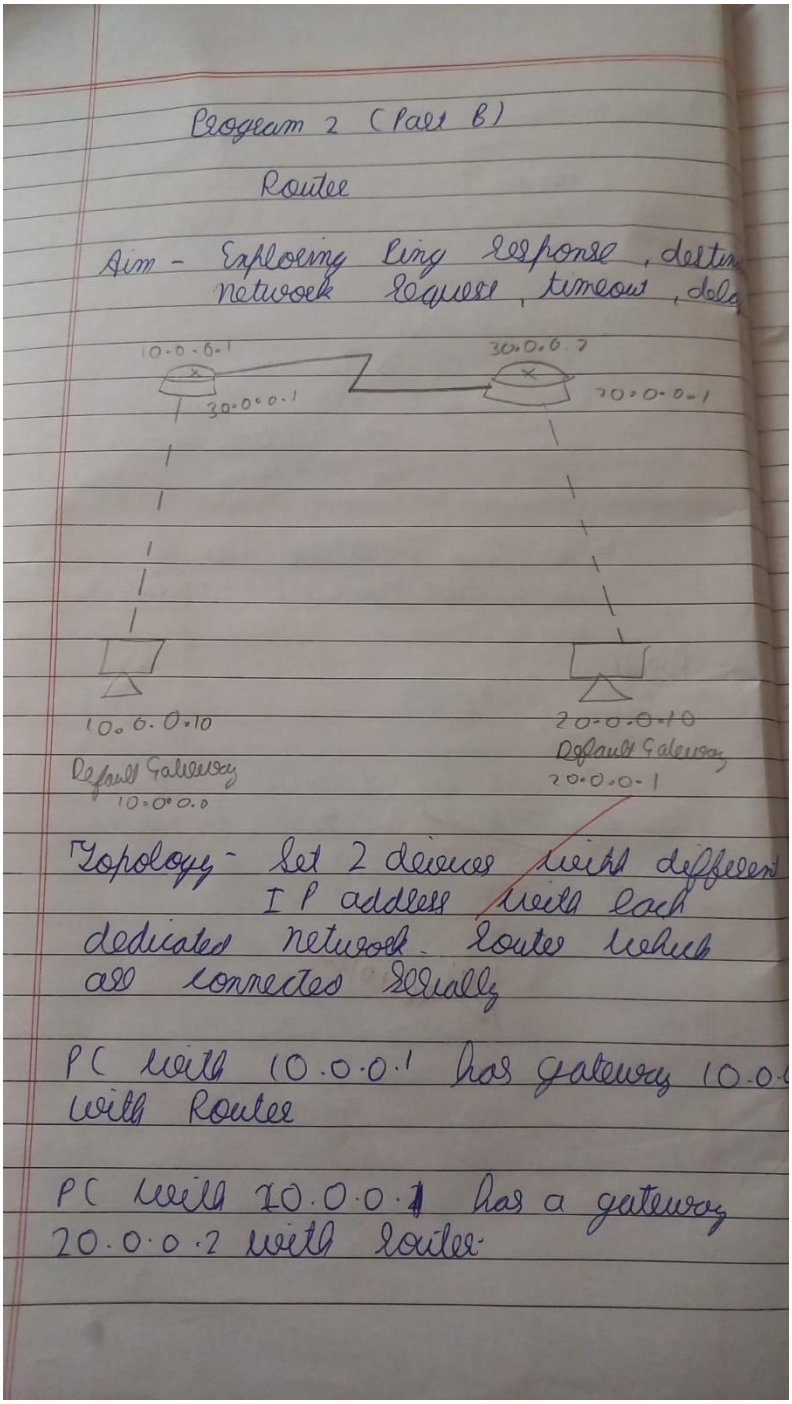




Program 3

Aim: Configure default route, static route to the Router(Part 1).

Topology , Procedure and Observation:



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Router 1 is serially connected with Router 2 and having ip address 30.0.0.1 & 30.0.0.2

Procedure

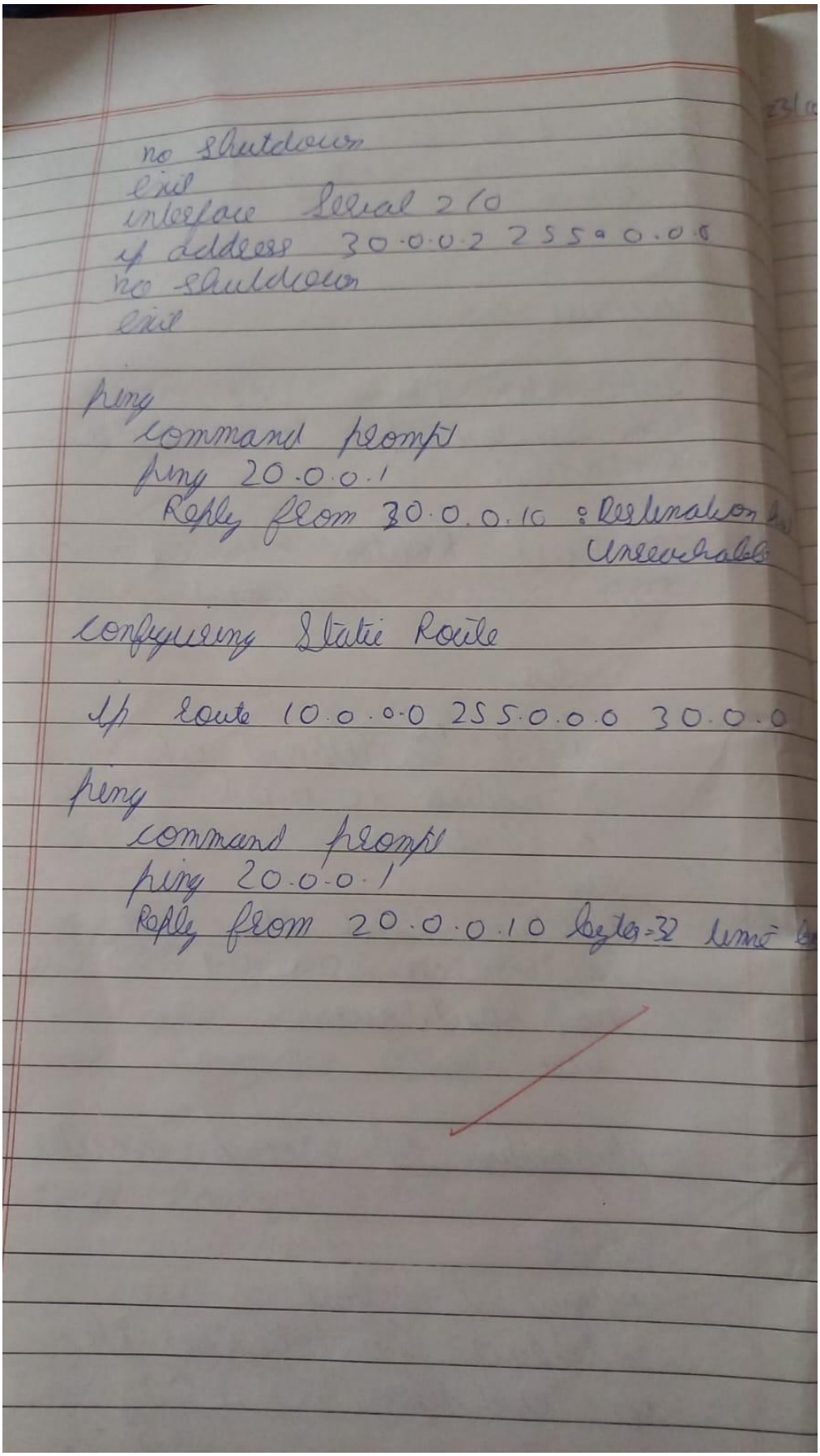
① Take two Routers and connect the two System to two Routers respectively

② In First Router open CLI and type below command

Enable
Config terminal
Interface fastethernet 0/0
ip address 10.0.0.1 255.0.0.0
no shutdown
exit
interface serial 2/0
ip address 30.0.0.1 255.0.0.0
no shutdown
exit

Configuration of Second Router

Enable
Config terminal
interface fastethernet 1/0
ip address 20.0.0.1 255.0.0.0


no shutdown
exit
interface Serial 2/0
ip address 30.0.0.2 255.0.0.0
no shutdown
exit

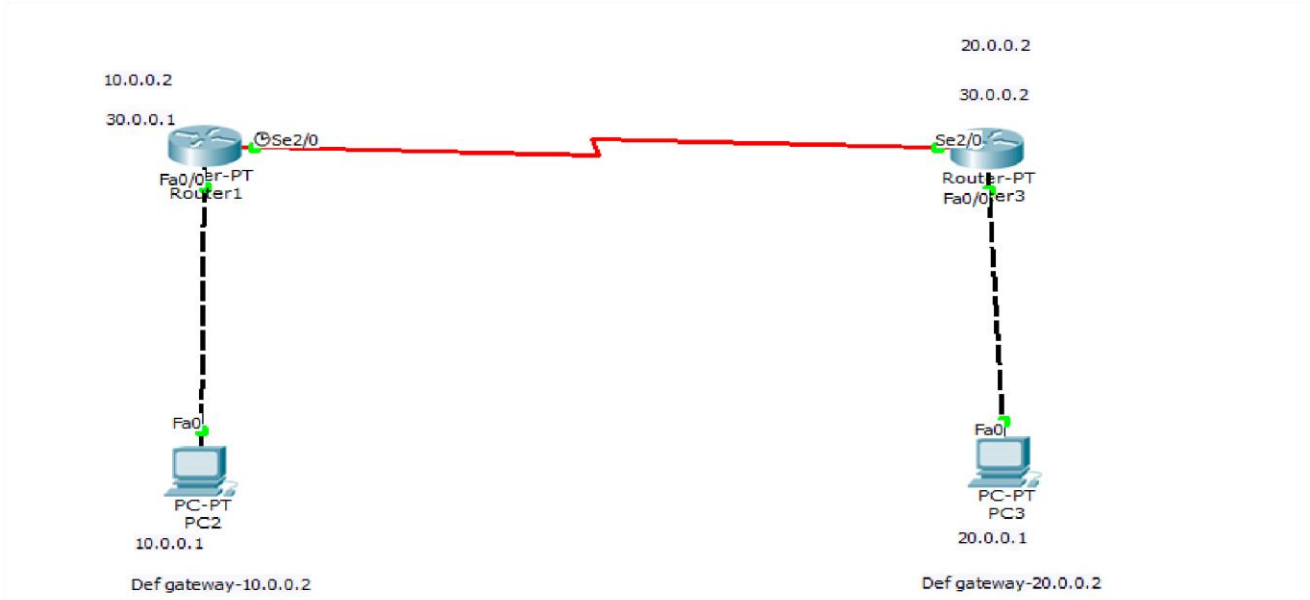
ping
command prompt
ping 20.0.0.1
Reply from 30.0.0.10 : Destination
Unreachable

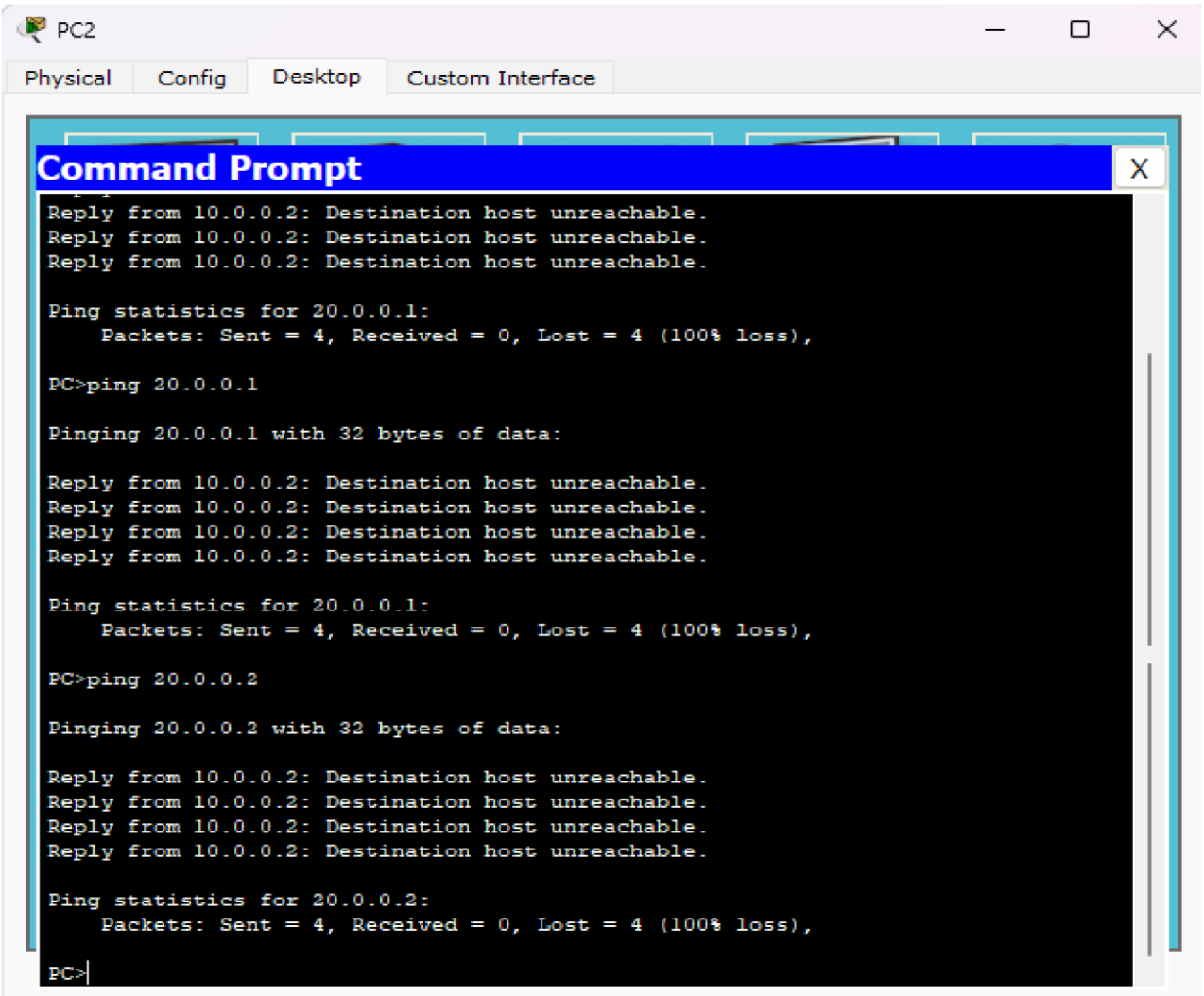
Configuring Static Route

ip route 10.0.0.0 255.0.0.0 30.0.0.

ping
command prompt
ping 20.0.0.1
Reply from 20.0.0.10 bytes=32 time

Screen Shots:

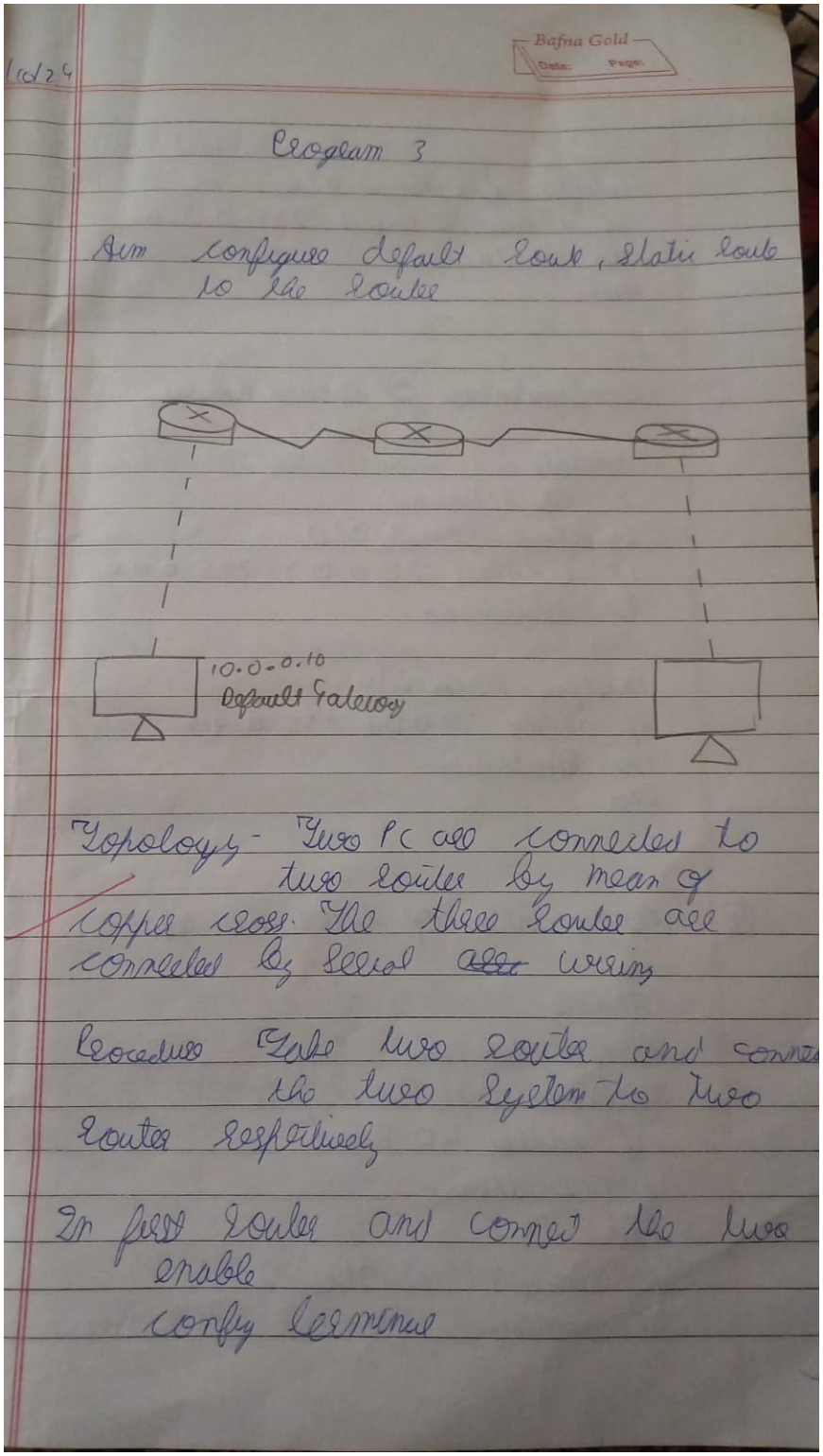




Program 4

Aim: Configure default route, static route to the Router(Part 2).

Topology , Procedure and Observation:



interface fastethernet 0/0
ip address 10.0.0.1 255.0.0.0
no shutdown
exit

③ Configuration of second Router

enable
config terminal
interface serial 3/0
ip address 20.0.0.2 255.0.0.0
no shutdown
exit
interface serial 2/0
ip address 30.0.0.1 255.0.0.0
no shutdown
end

④ Configuration of third Router

enable
config terminal
interface fastethernet 1/0
ip address 40.0.0.1
no shutdown
exit
interface serial 3/0
ip address 30.0.0.2 255.0.0.0

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no shutdown
exit

5) Static configuration second router

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

6) Static configuration first Router

ip route 0.0.0.0 0.0.0.0 20.0.0.2

7) Static configuration third router

ip route 0.0.0.0 0.0.0.0 30.0.0.1

~~Observation~~
Router 1
show ip route

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

Router 2

S 10.0.0.0/8 [1/0] via 20.0.0.1
C 20.0.0.0/8 is directly connected Serial3

C 30.0.0.0/8 is directly connected Serial 2/0
S 40.0.0.0/8 [1/0]

Router 3

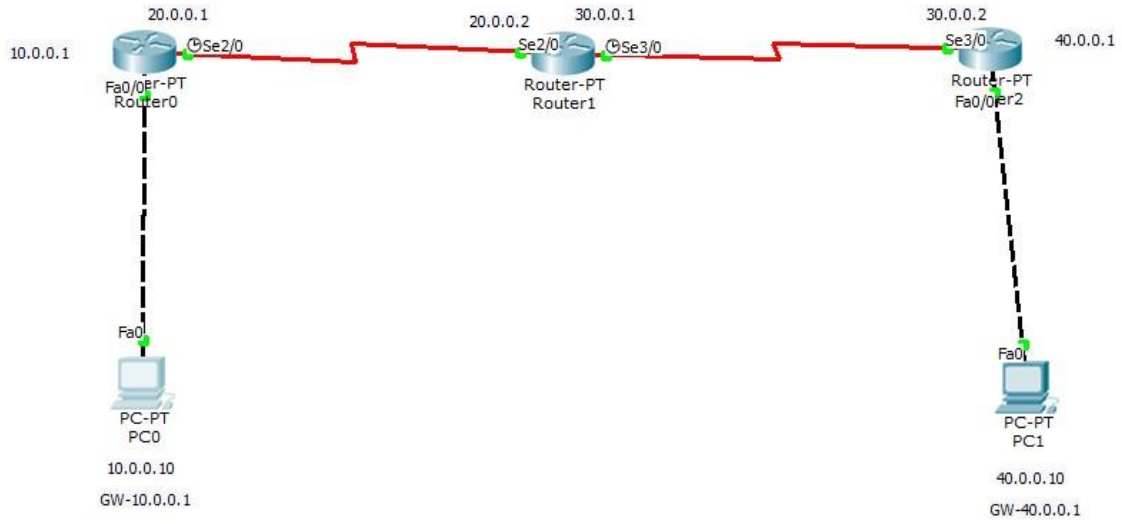
show ip route

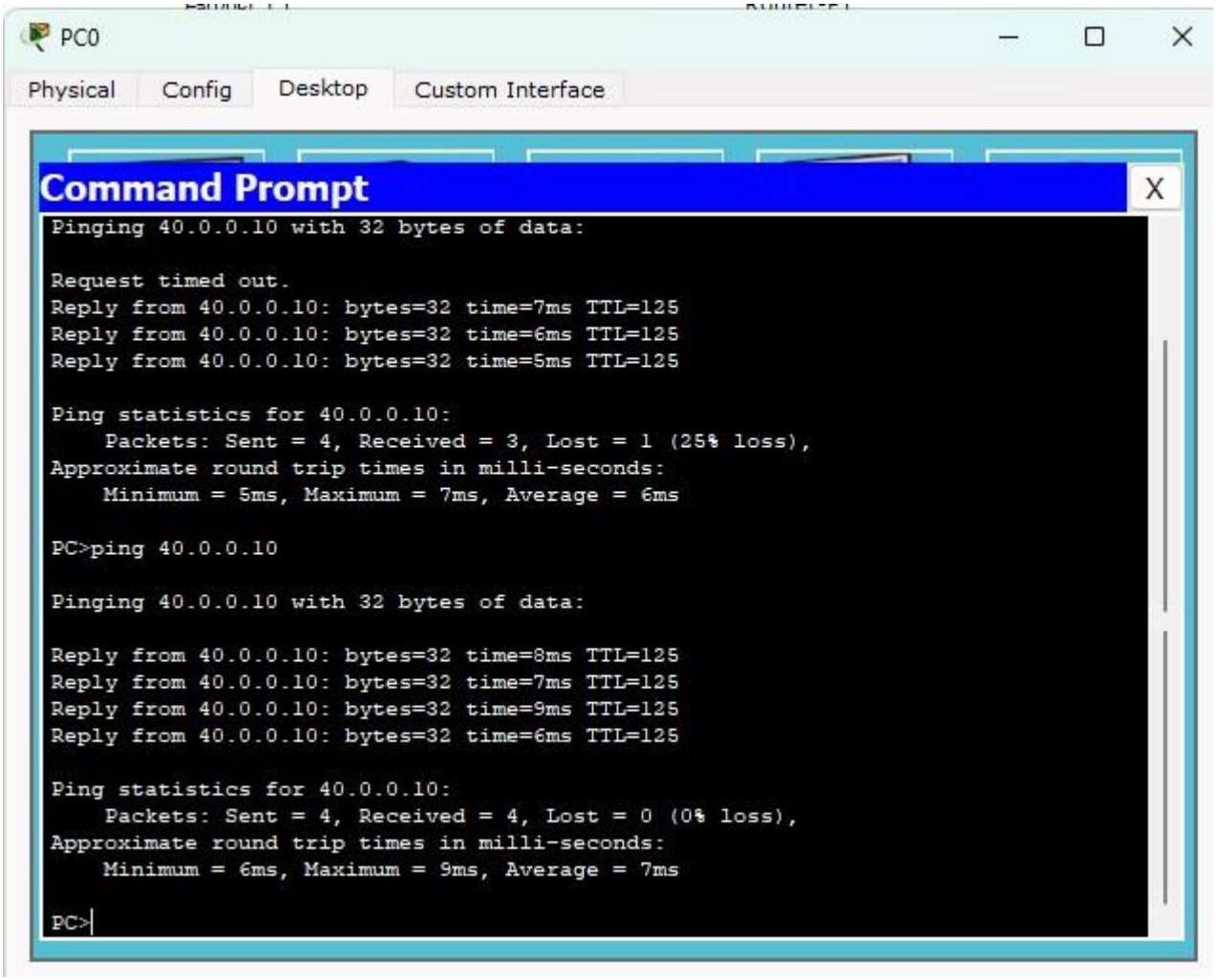
C 30.0.0.0/8 is directly connected Serial 2/0
C 40.0.0.0/8 is directly connected
S* 0.0.0.0/0 [1/0] via 30.0.0.1

ping 40.0.0.10
ping statistic for 40.0.0.10

23/10/24

Screen Shots:

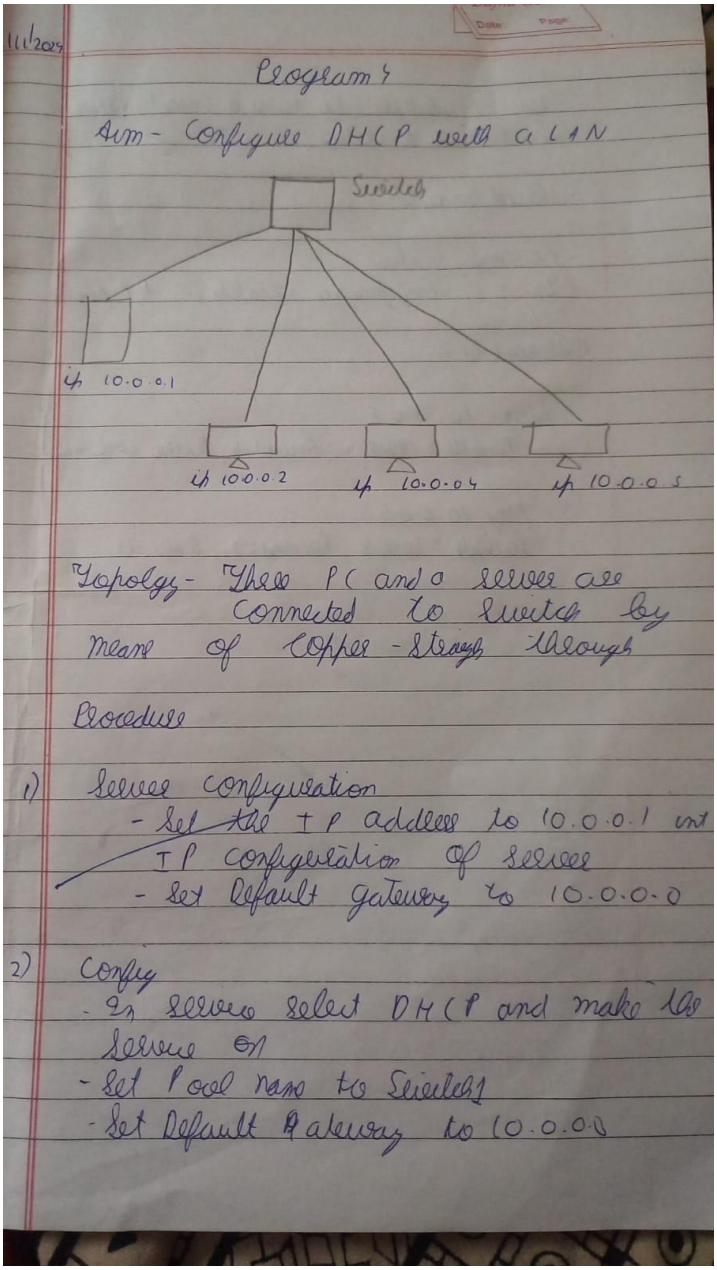




Program 5

Aim: Configure DHCP within a LAN and outside LAN.

Topology , Procedure and Observation:



- Set IP address to 10.0.0.3 and select first 3 IP address

- Click on add

- PC configuration
- In IP configuration enable DHCP for all

Observation -

ping 10.0.0.5
Packets : Sent: 4, Recived = 4, Lost = 10% of host

ping 10.0.0.4
Packets : Sent: 4, Recived: 4, Lost = 0

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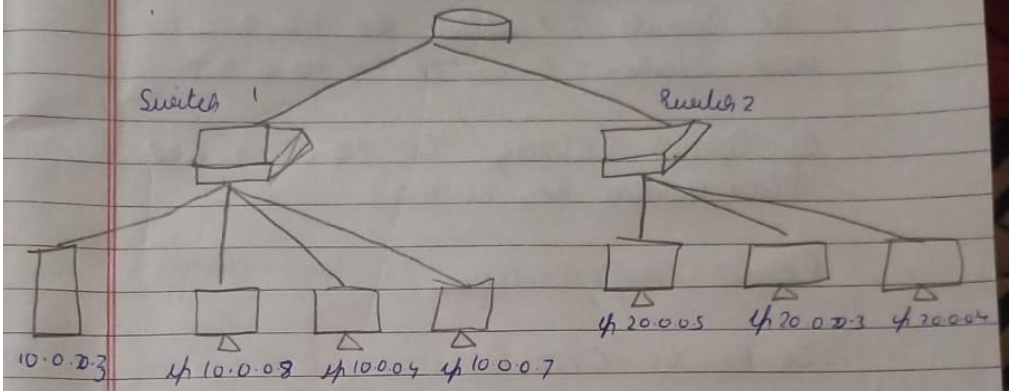
Aim - Configure DHCP outside LAN



Topology - Set 6 pcs and a server are connected to ~~router~~ respective switch of a network 10.0.0.0 and 20.0.0.0 by means of copper straight through

Procedure

1) Server Configuration

- Set the IP address of a IP configured server
- Set default gateway to 10.0.0.0 for Router 1 and 20.0.0.1 for Router 2

2) Config

In service select DHCP and make the service on

Set Default IP address to 10.0.0.1 and Static IP address to 10.0.0.3

By Default Gateway to 20.0.0.1 and Start address to 20.0.0.3

Router Configuration

In Router CLI

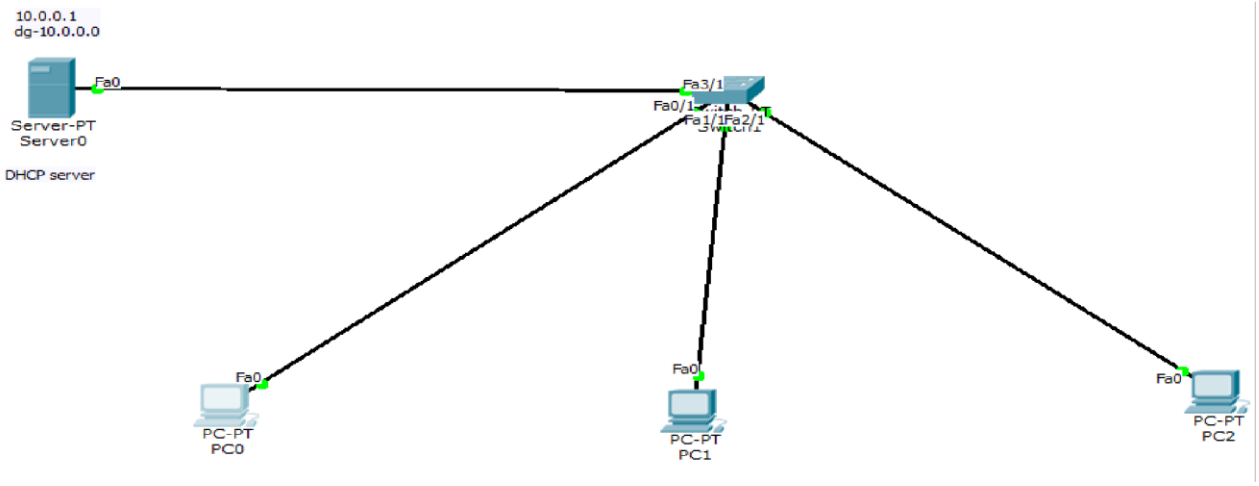
1) enable
config - terminal
interface fastethernet 4/0
ip address 10.0.0.1 255.0.0.0
ip helper-address 10.0.0.3
no shutdown

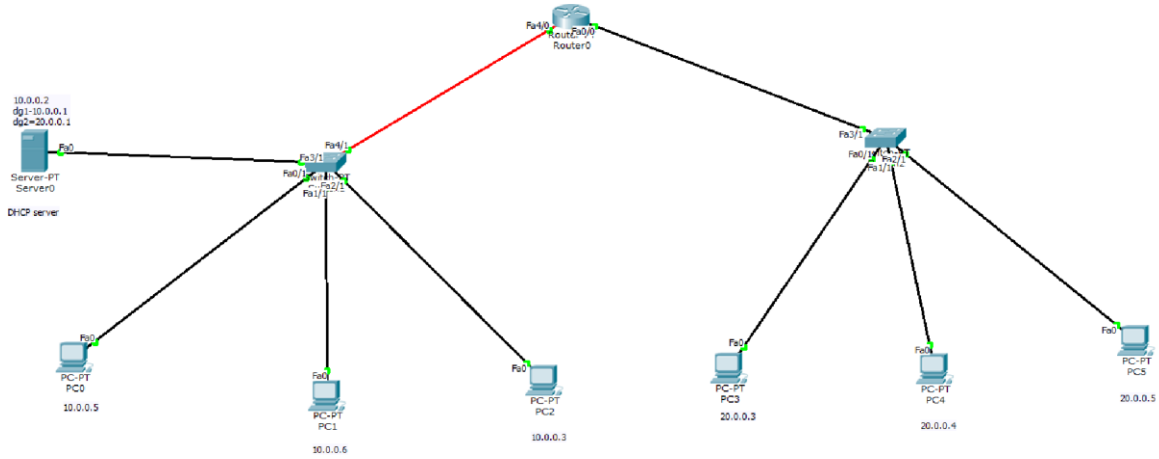
2) interface fastethernet 0/0
ip address 20.0.0.1 255.0.0.0
ip helper-address 10.0.0.3
no shutdown
end

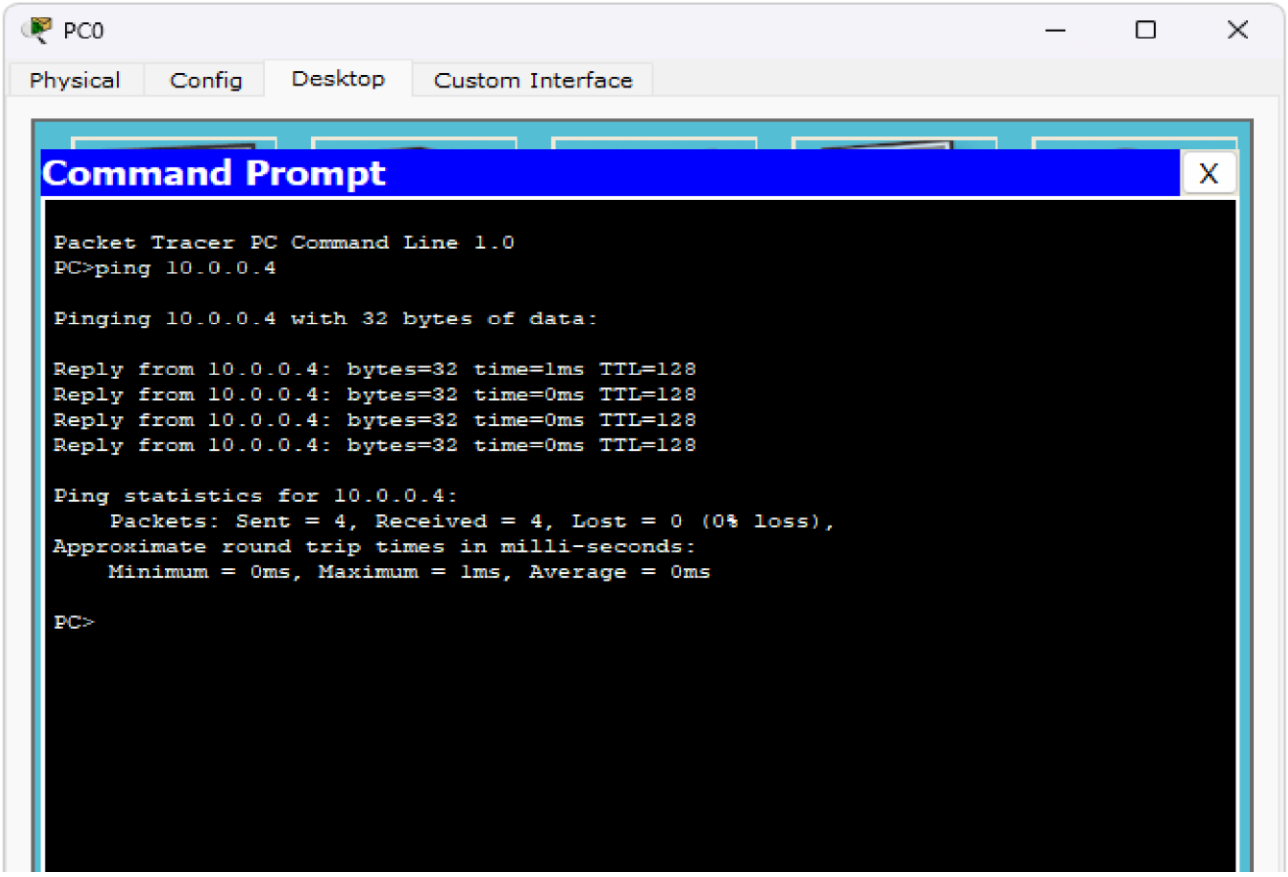
Observation

show ip route
C 10.0.0.18 is directly fastethernet 0/0
C 20.0.0.18 is directly connected fastethernet 0/0

Screen Shots:



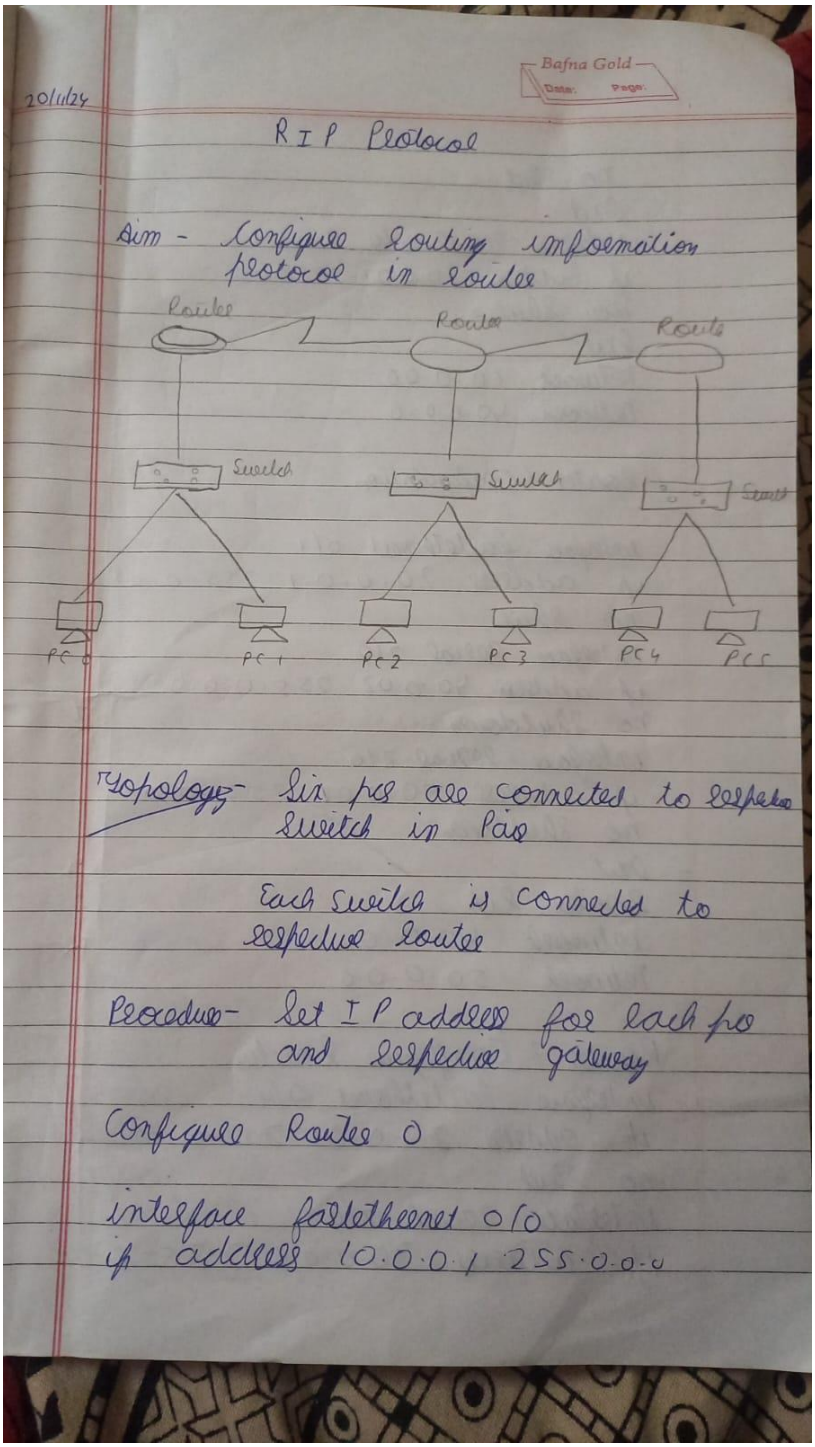



PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.4
Pinging 10.0.0.4 with 32 bytes of data:
Reply from 10.0.0.4: bytes=32 time=1ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Ping statistics for 10.0.0.4:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
PC>

Program 6

Aim: Configure RIP routing Protocol in Routers .

Topology , Procedure and Observation:



no shut
exit
interface serial 2/0
ip address 10.0.0.1 255.0.0.0
no shut
exit
network 10.0.0.0
network 40.0.0.0

Router(configuration)

interface fastethernet 0/1
ip address 20.0.0.1 255.0.0.0
no shut
interface serial 2/0
ip address 40.0.0.2 255.0.0.0
no shutdown
interface serial 3/0
ip address 50.0.0.1 255.0.0.0
no shutdown
exit
Router(config)
network 40.0.0.0
network 50.0.0.0

Router > Configure Router
interface fastethernet 0/1
ip address 20.0.0.1 255.0.0.0
no shut
interface serial 2/0
ip address 30.0.0.1 255.0.0.0

no shut
exit

router rip
network 30.0.0.0
network 50.0.0.0

observation

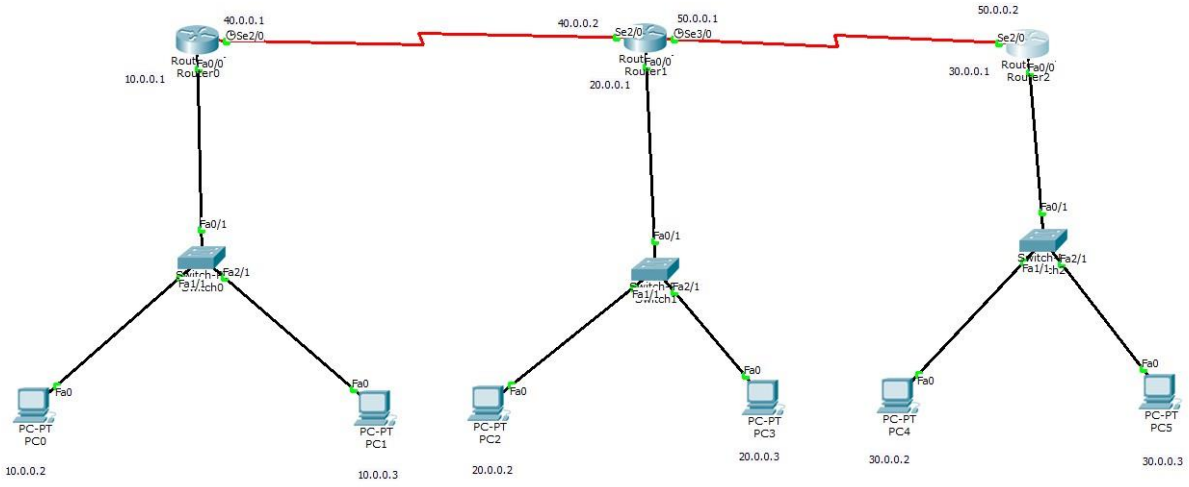
C 10.0.0.018 is directly connected
R 20.0.0.018 [120/1] via 40.0.0.2, 00:00:2
R 30.0.0.018 [120/2] via 40.0.0.2
C 40.0.0.018 is directly connected
R 50.0.0.018 via 40.0.0.2

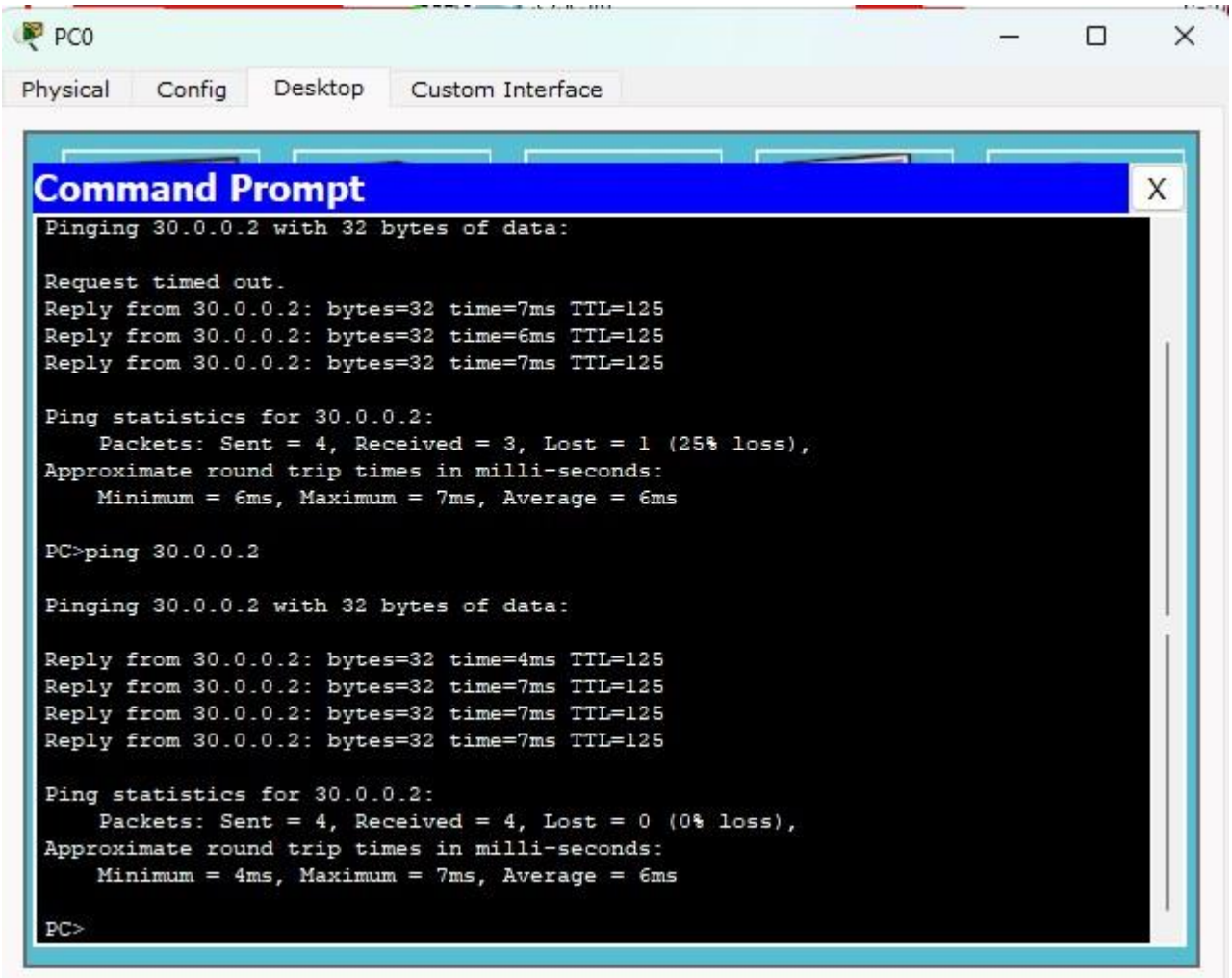
ping
ping 30.0.0.3
Reply from 30.0.0.3
Reply from 30.0.0.3
Reply from 30.0.0.3
Reply from 30.0.0.3

Packets: sent=4 Recived=4 Lost=0

Select simulation
Select simple PDU
Select source to destination
press autocapture
when the packet come to router press
click on the packet
PDU information

Screen Shots:

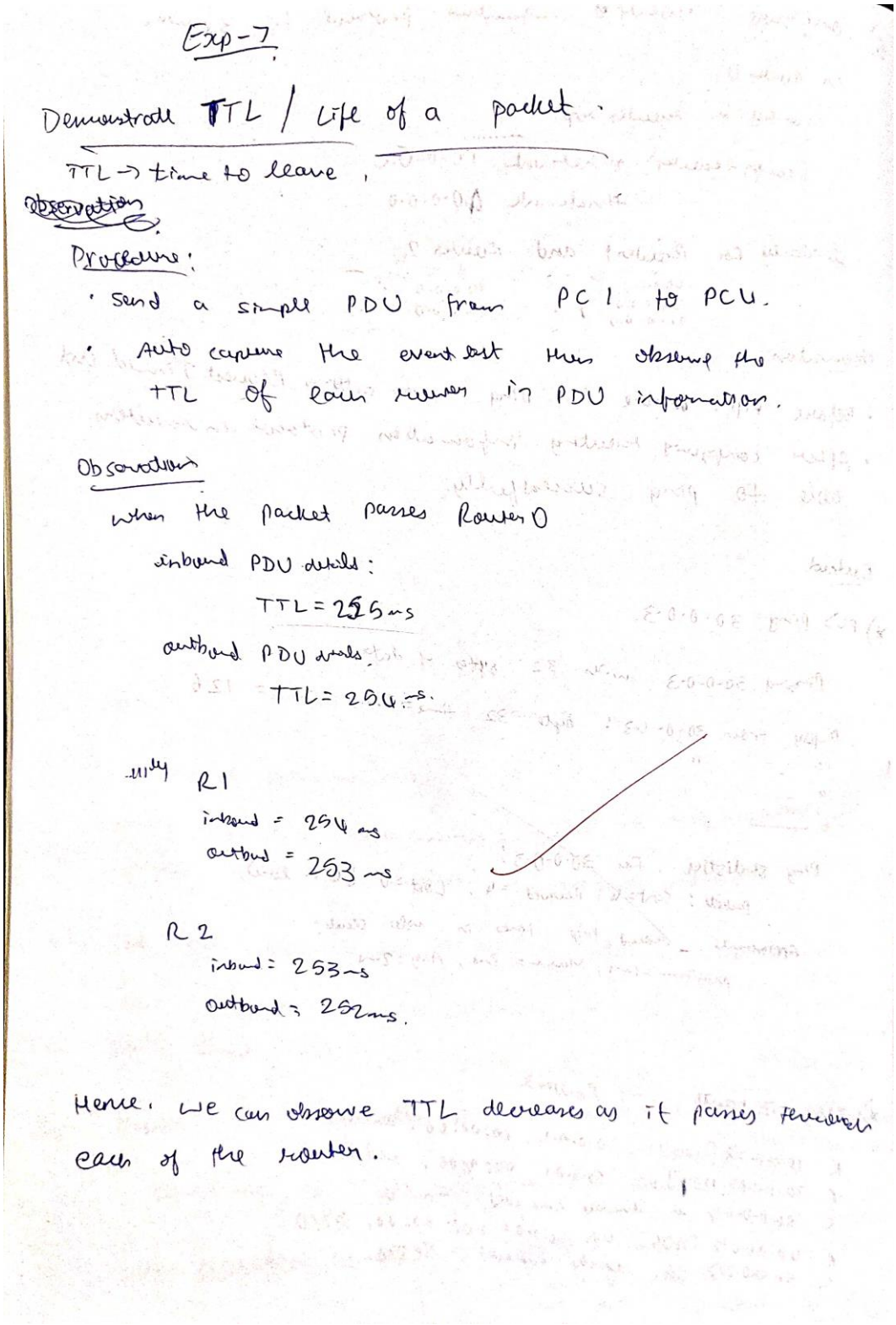




Program 7

Aim: Demonstrate the TTL/ Life of a Packet .

Topology , Procedure and Observation:



Exp-7

Demonstrate TTL / Life of a packet.

TTL → time to leave.

Observation:

Procedure:

- Send a simple PDU from PC1 to PC4.
- Auto capture the event list then observe the TTL of each router in PDU information.

Observation

When the packet passes Router 0

inbound PDU details:

TTL = 255 ms

outbound PDU details:

TTL = 254 ms.

Similarly R1

inbound = 254 ms

outbound = 253 ms

R2

inbound = 253 ms

outbound = 252 ms.

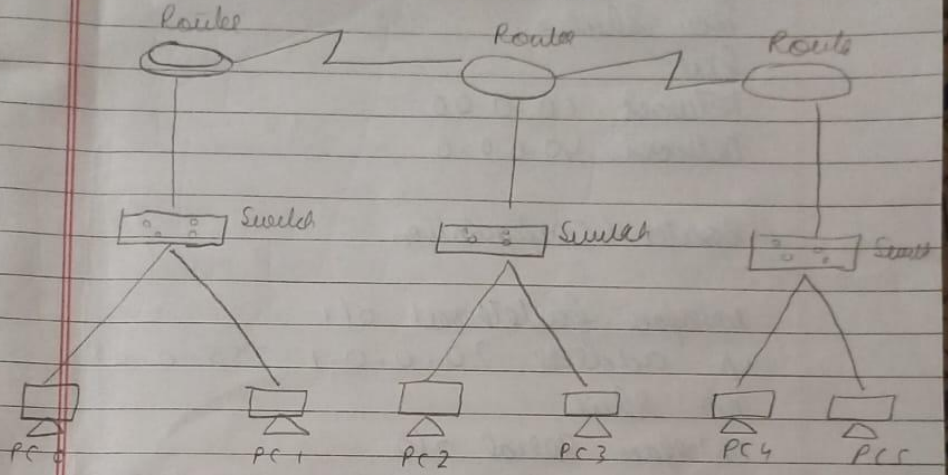
Hence, we can observe TTL decreases as it passes through each of the router.

20/11/24

Bafna Gold
Date: Page:

RIP Protocol

Aim - Configure routing information protocol in router



Topology - Six pcs are connected to respective switch in pair

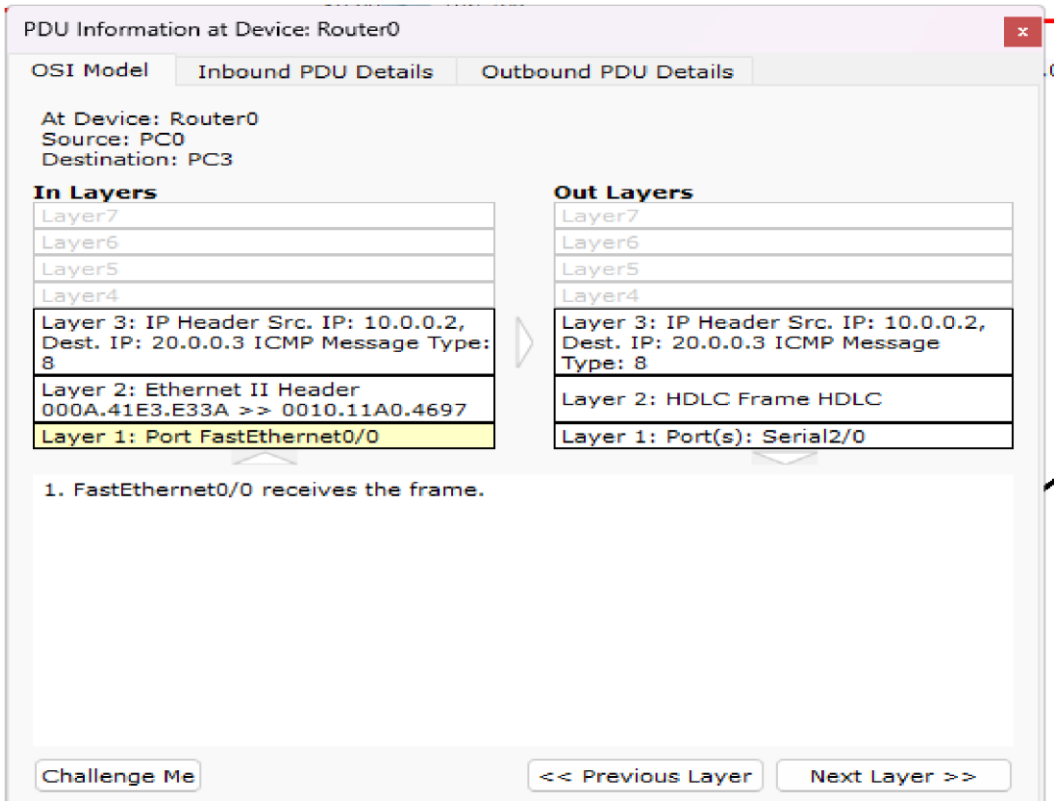
Each switch is connected to respective router

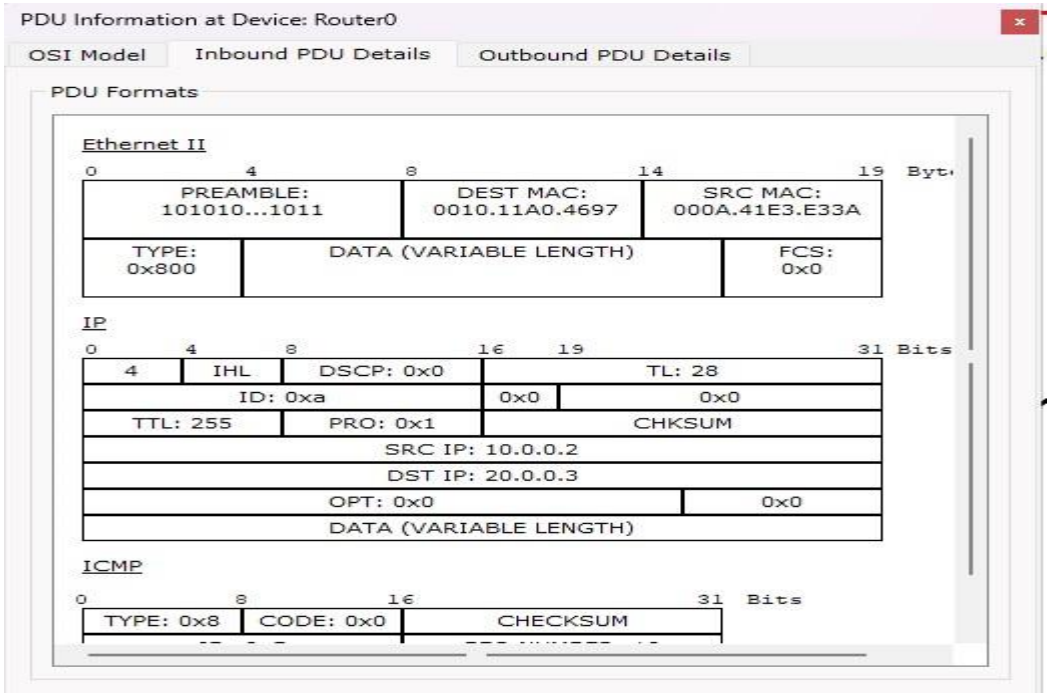
Procedure - Set IP address for each pc and respective gateway

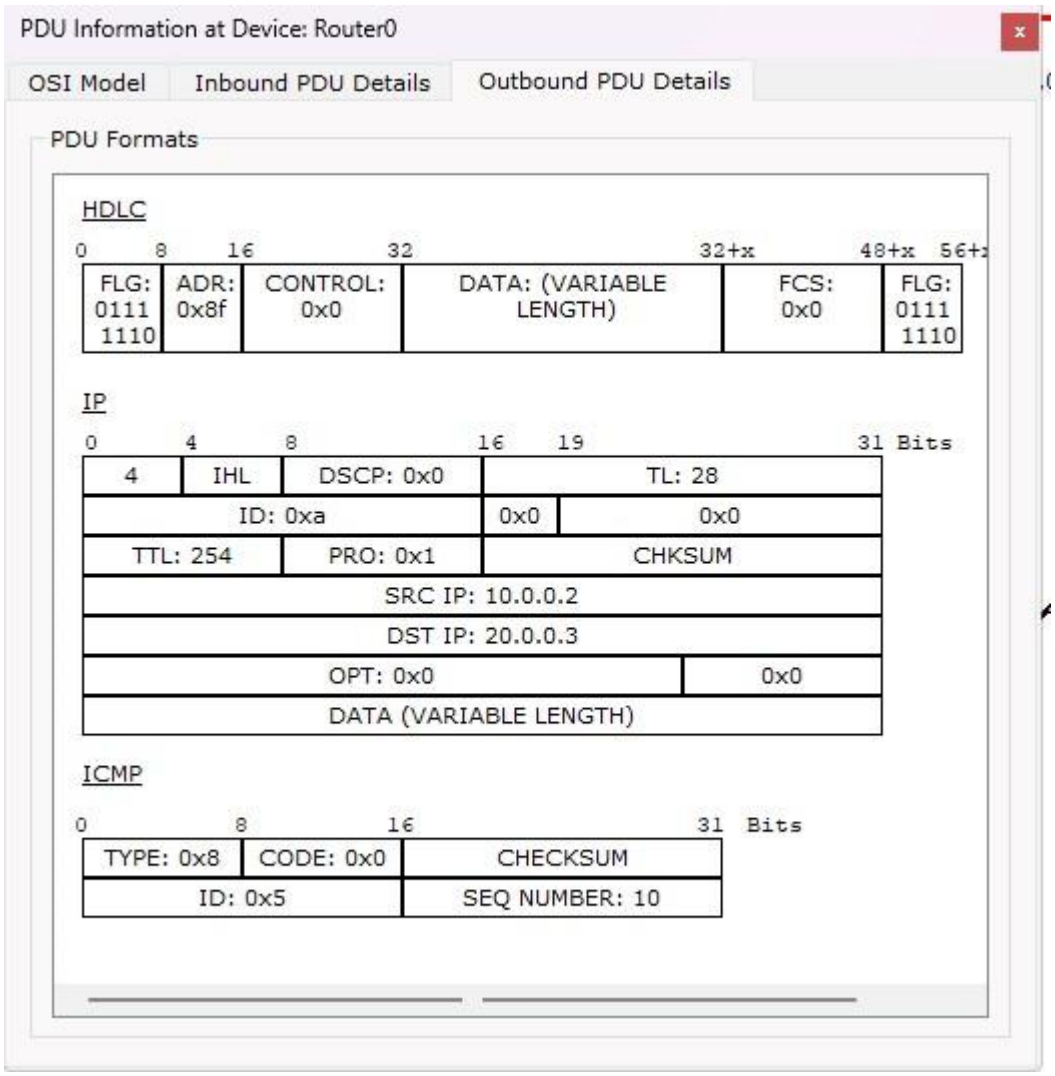
Configure Router 0

interface fastethernet 0/0
ip address 10.0.0.1 255.0.0.0

Screen Shots:



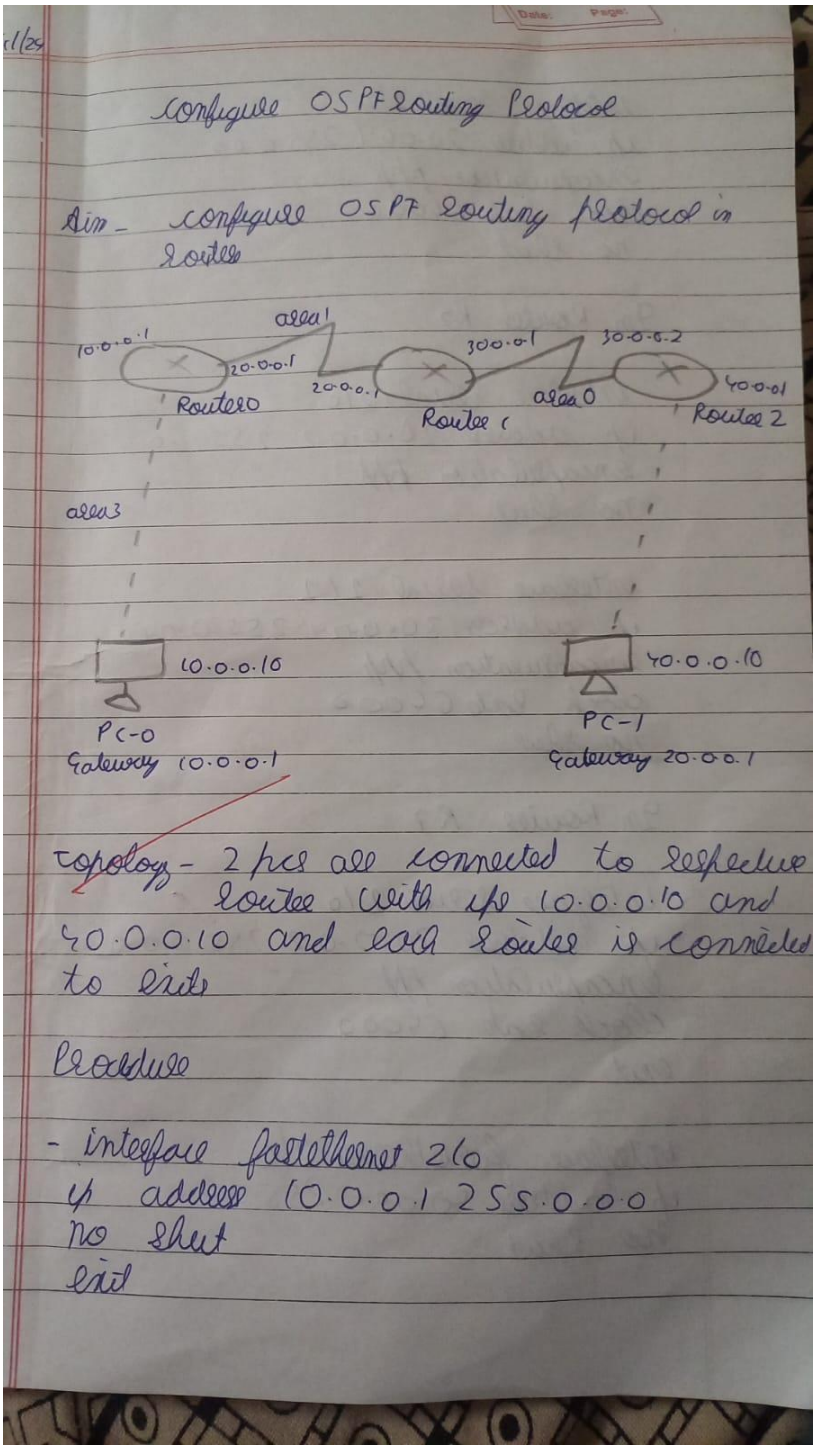



PDU Information at Device: Router0
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
HDLC
0 8 16 32 32+x 48+x 56+x
FLG: 0111 1110
ADR: 0x8f
CONTROL: 0x0
DATA: (VARIABLE LENGTH)
FCS: 0x0
FLG: 0111 1110
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0xa
0x0
0x0
TTL: 254
PRO: 0x1
CHKSUM
SRC IP: 10.0.0.2
DST IP: 20.0.0.3
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x8
CODE: 0x0
CHECKSUM
ID: 0x5
SEQ NUMBER: 10

Program 8

Aim: Configure OSPF routing protocol .

Topology , Procedure and Observation:



interface serial 2/0
ip address 20.00.1 255.0.00
Encapsulation ppp
clock rate 64000
no shut

In Router R2

interface serial 2/0
ip address 20.0.0.2 255.0.0.0
encapsulation ppp
no shut

interface serial 1/1
ip address 30.0.0.1 255.0.0.0
encapsulation ppp
clock rate 64000
no shut

In Router R3

interface serial 2/0
ip address 30.0.0.2 255.0.0.0
encapsulation ppp
clock rate 64000
exit

interface fastethernet 2/0
ip address 40.0.0.1 255.0.0.0
no shut

In Router R1
Router OSPF 1
Router-id 1.1.1.1
Network 10.0.0.0 255.255.0.0 area 3
Network 20.0.0.6 255.255.255.0 area 1

In Router R2

Router ospf 1
Router-id 2.2.2.2
network 20.0.0.0 255.255.255.0 area 1
network 30.0.0.0 255.255.255.0 area 0

In Router R3

Router ospf 1
Router-id 3.3.3.3
Network 30.0.0.0 255.255.255.0 area 0
network 40.0.0.0 255.255.255.0 area 2
End

Output

show ip route
C 10.0.0.0/8
C 20.0.0.0/8
O 40.0.0.0/8
O 30.0.0.0/8

Router 1
interface loopback 0
ip add 172.16.1.252 255.255.255.0
no shut

In Router 2

interface loopback 0
ip add 172.16.1.253 255.255.0.0
no shut

In Router 3

interface loopback 0
ip add 172.16.1.254 255.255.255.0
no shut

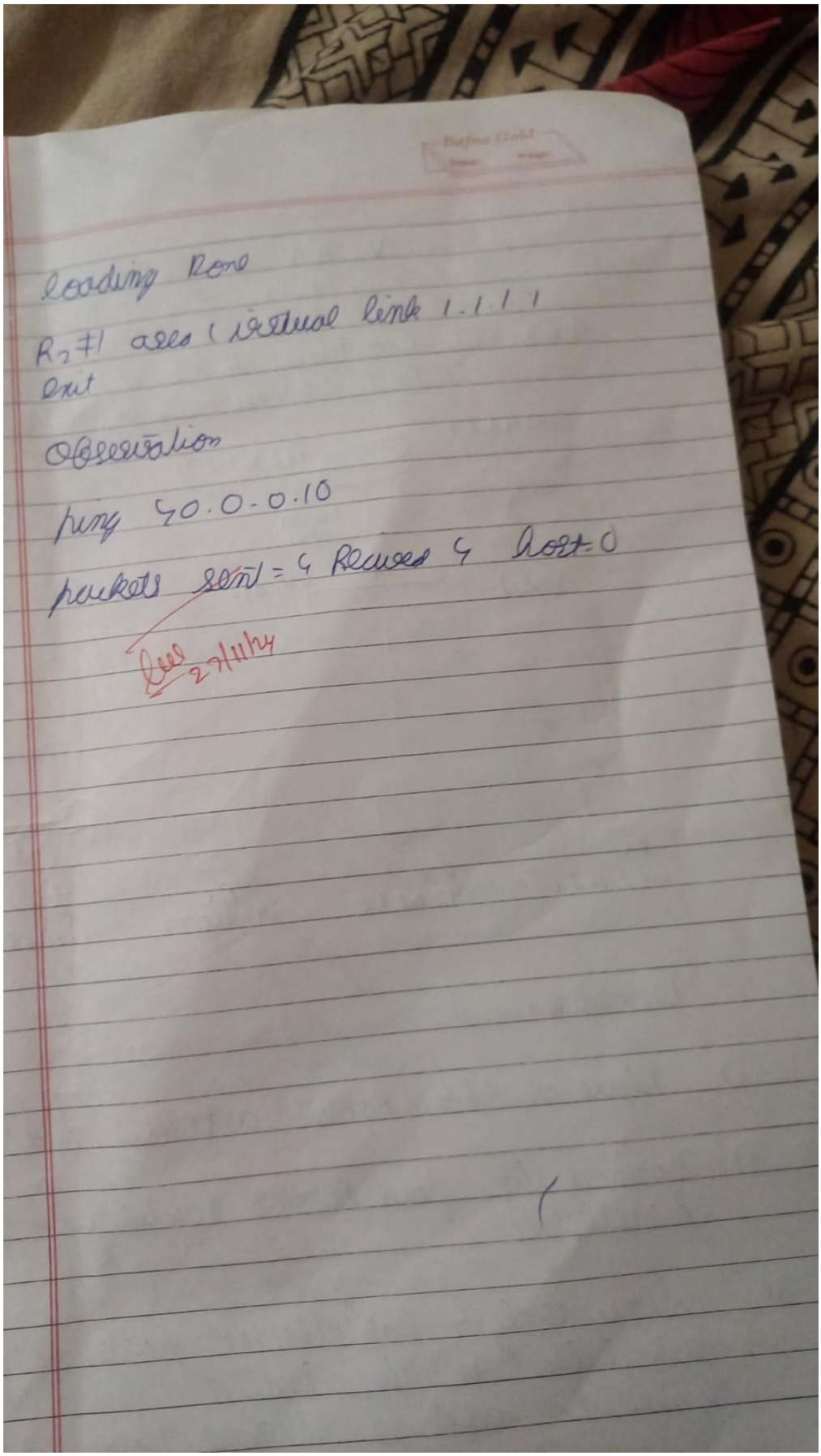
Observation

O 20.0.0.0/8
C 40.0.0.0/8
C 30.0.0.0/8

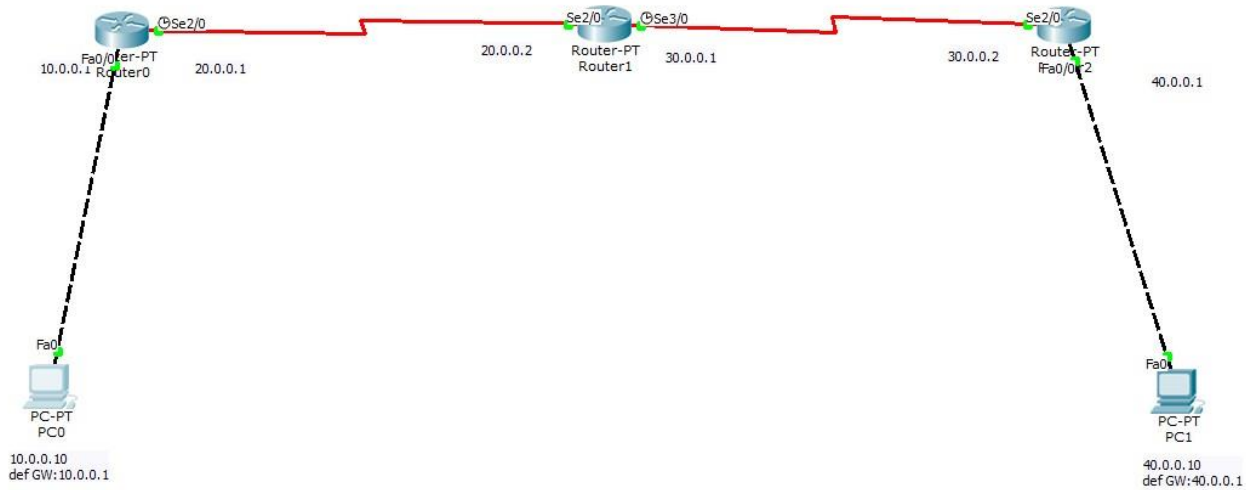
Router 1

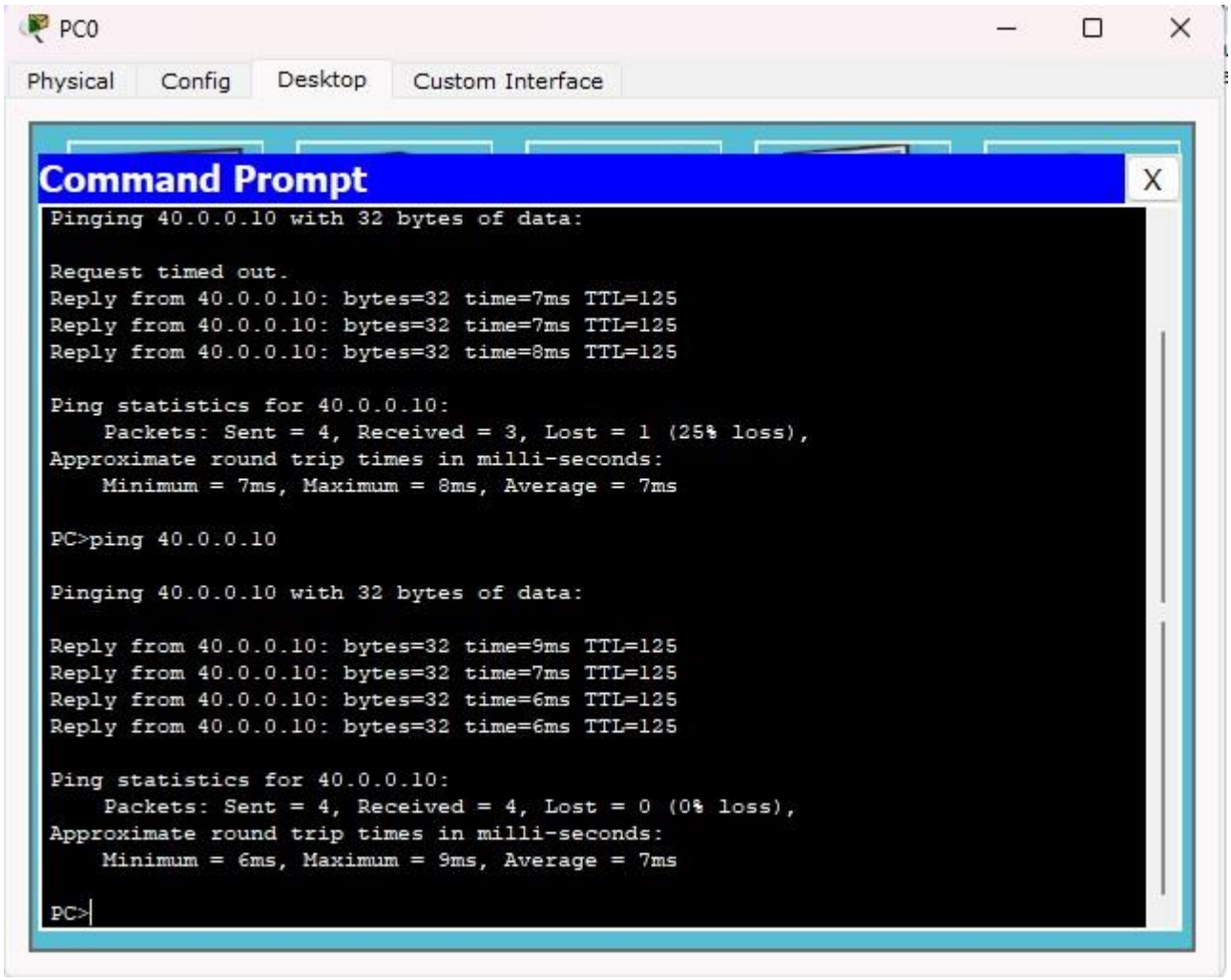
router ospf 1
area 1 virtual link 2.2.2.2
loading done

In Router 2
virtual link not found


Loading Done
R2#! ases (virtual link 1.1.1.1
Exit
Observation
ping 40.0.0.10
packets sent = 4 Recived 4 lost=0
2/11/24

Screen Shots:

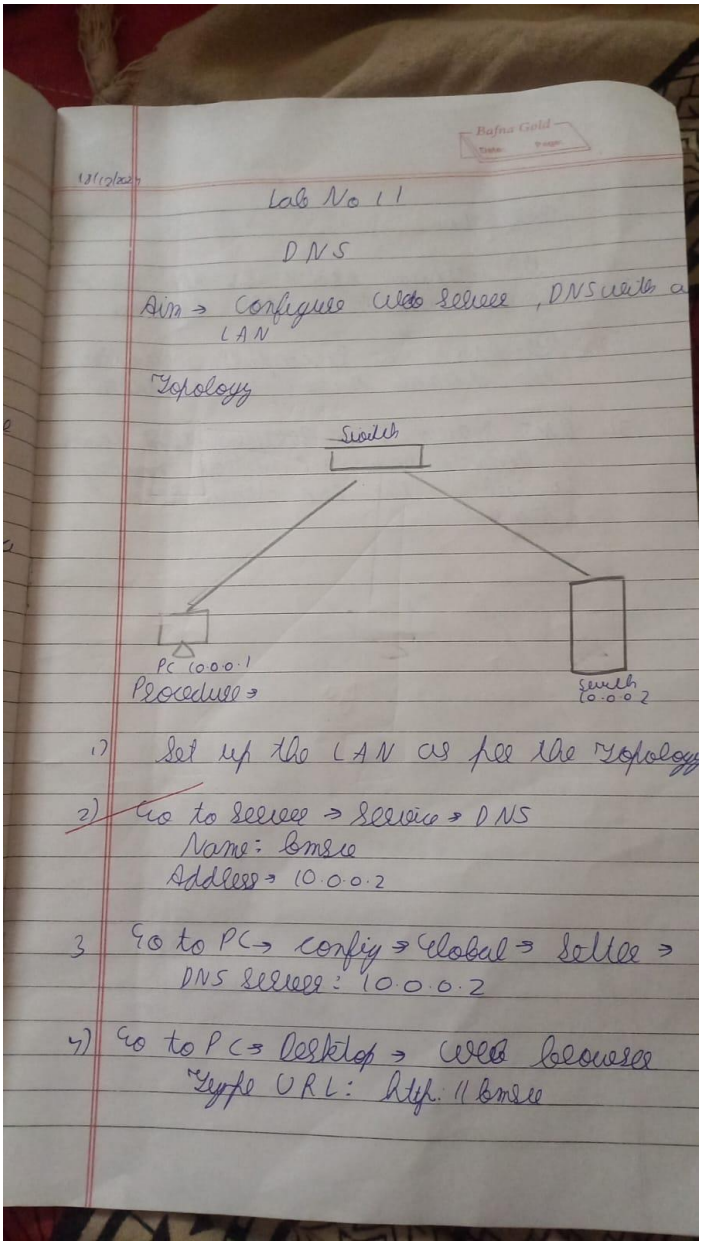




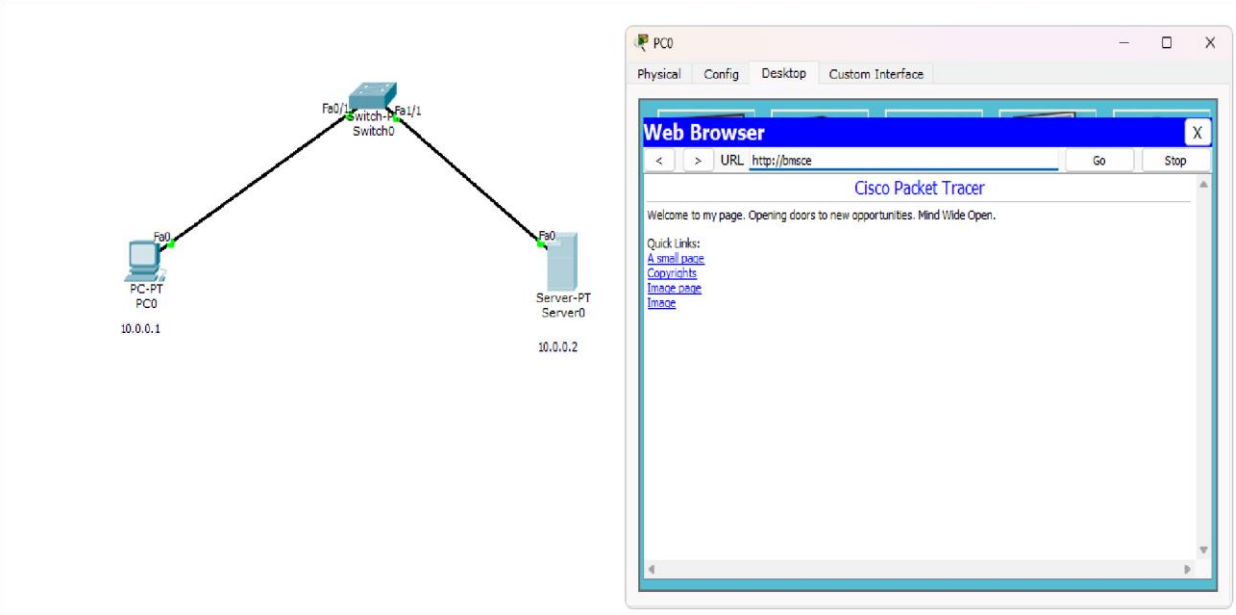
Program 9

Aim: Configure Web Server, DNS within a LAN.

Topology , Procedure and Observation:



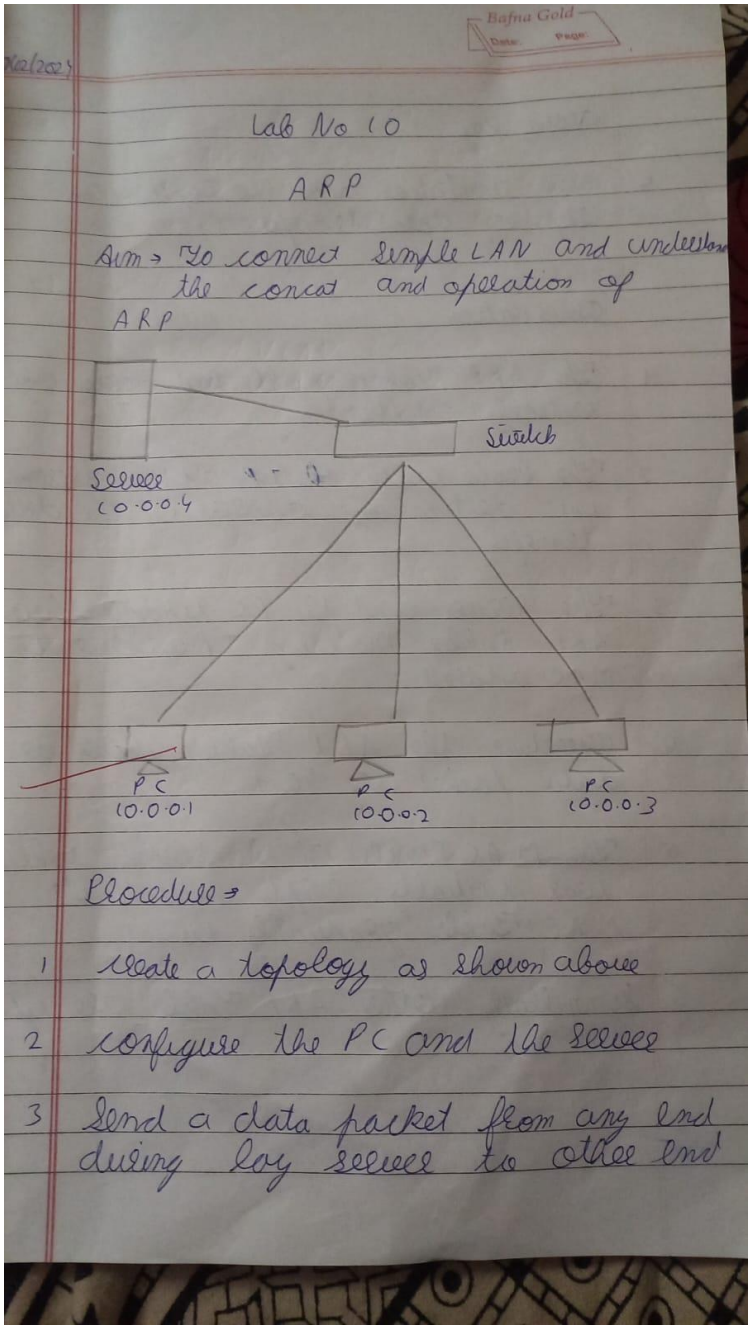
Screen Shots:



Program 10

Aim: To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)

Topology , Procedure and Observation:



device lay

4 open simulation mode to capture each step of data transfer

Observation

1 The ARP Table of all end device are initially emptied

2 The device with the IP address present int destination address of the data transfer

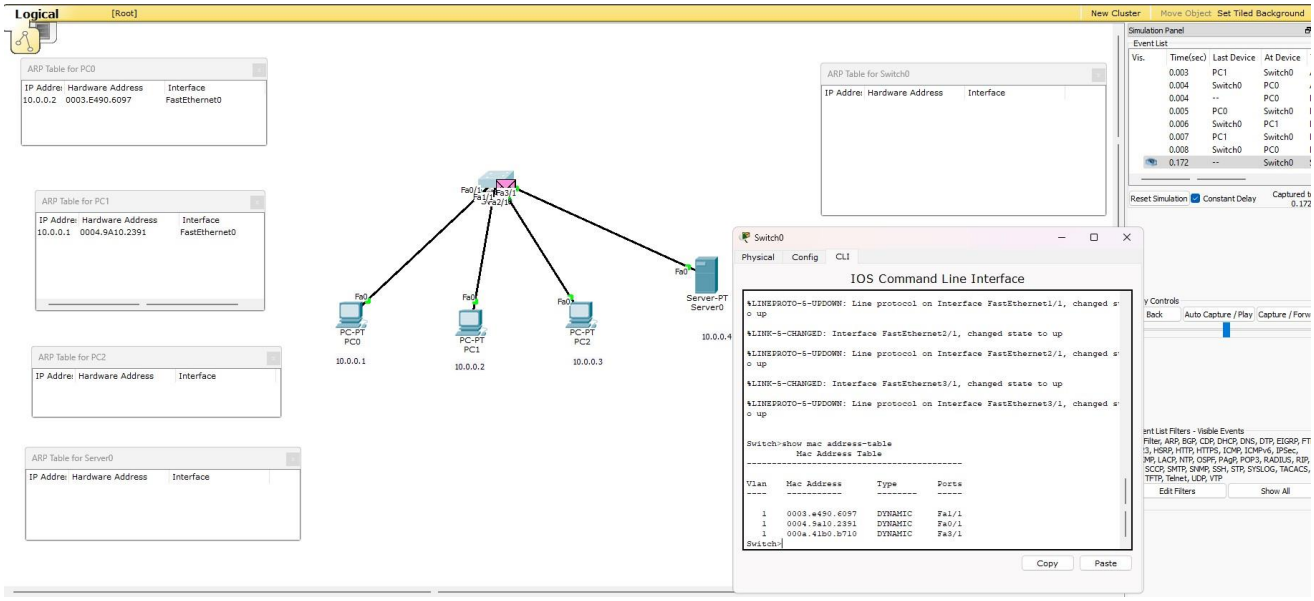
3 The server and the PC update their ARP tables matching IP address to MAC address

4 Overtime the ARP Table grows as data packet are sent

5 The MAC Table of the switch which was initially empty update its MAC Table gradually to

6 Simmilarly other ARP Table are upd

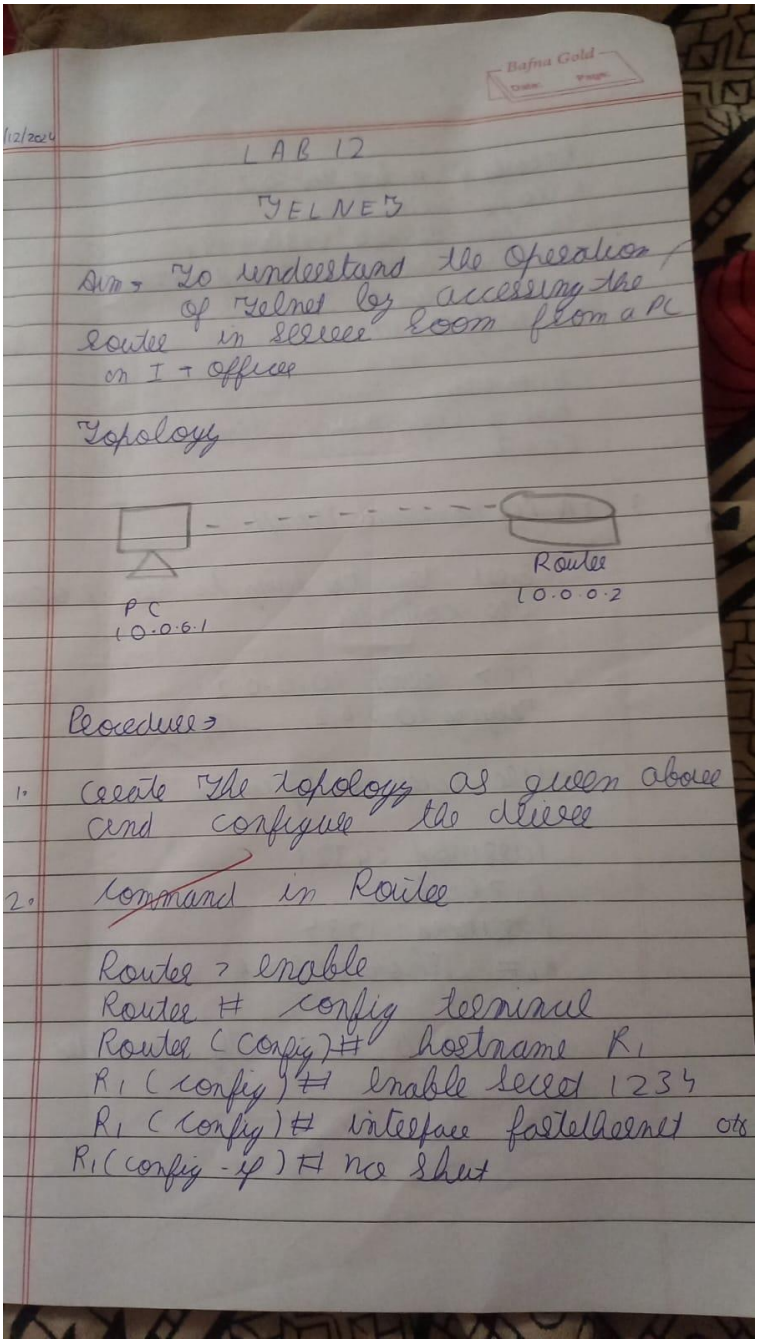
Screen Shots:



Program 11

Aim: To understand the operation of TELNET by accessing the router in the server room from a PC in the IT office.

Topology , Procedure and Observation:



R1(config-if) # line vty 0 3
R1(config-line)# login
% login disable on line 194
R1(config-line)# password 4321
R1(config-line)# exit
R1(config)# exit

R1# wr
Building configuration...
[OK]

3 IN PC: command Prompt

First try to ping to see if devices are connected

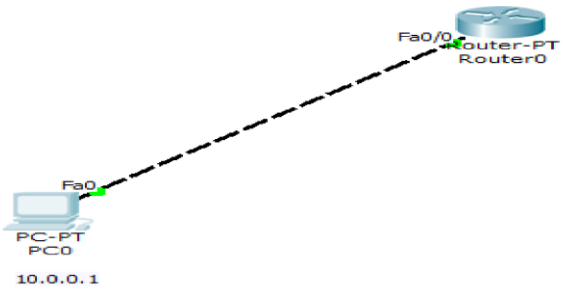
PC> telnet 10.0.0.2
Trying 10.0.0.2 ... Open

We access verification

Password: 4321
R1> enable
Password: 1234
R1# show IP route

C 10.0.0.0/8 is directly connected

Screen Shots:



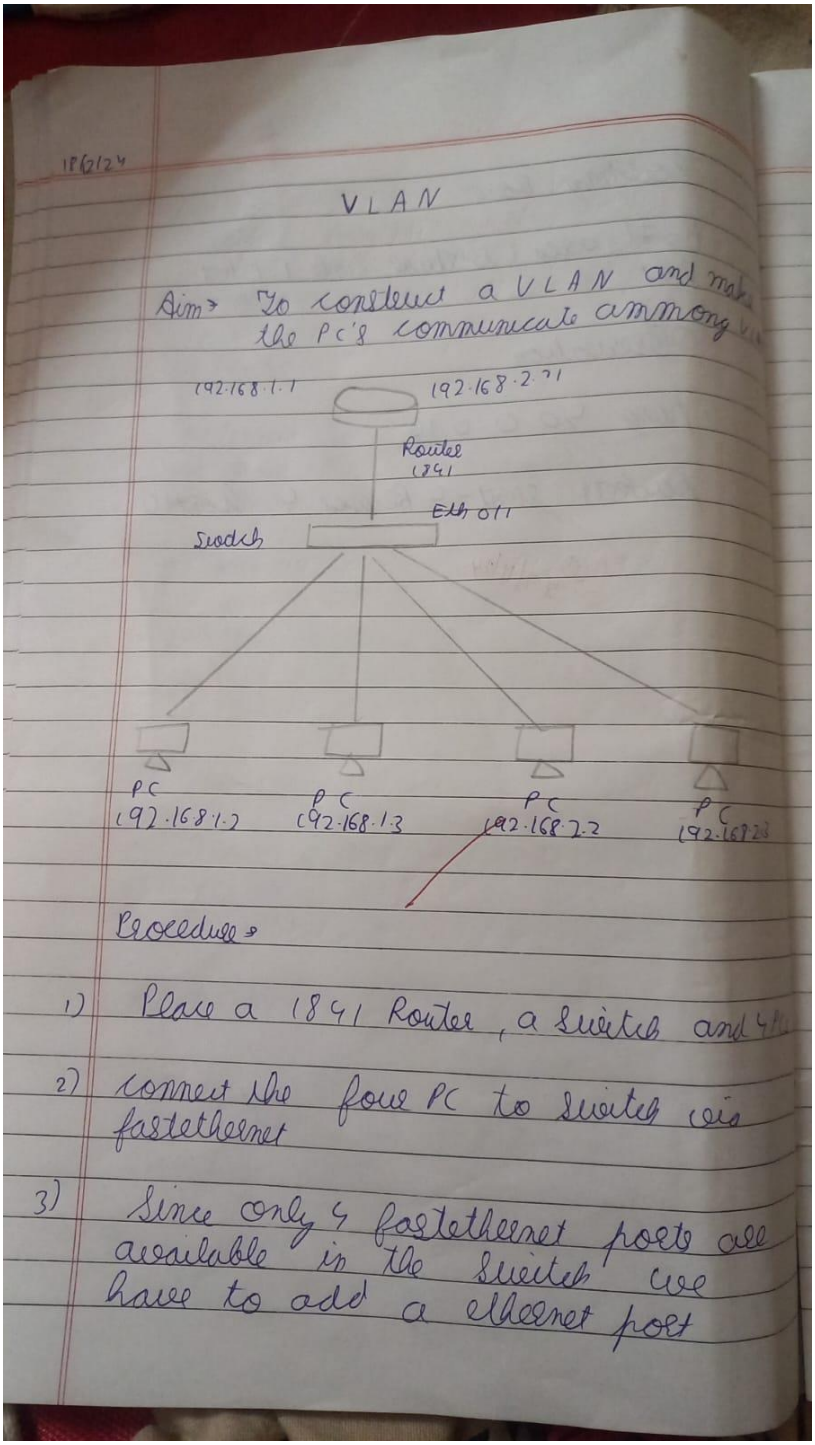
Command Prompt

```
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=0ms 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 = 0ms, Average = 0ms

PC>telnet 10.0.0.2
Trying 10.0.0.2 ...Open


User Access Verification

Password:
R1>enable
Password:
R1#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
R1#
```

Program 12

Aim: To construct a VLAN and make the PC's communicate among a VLAN .

Topology , Procedure and Observation:



Bafna Gold
Date: Page:

4 Switch off power button of Switch
→ Add the Ethernet Port to Switch
5) Add the → Switch on Power Button
→ Connect Router to Switch

5) In the Switch go to to Config tab

→ Select VLAN Database
→ Give VLAN number say 2
→ Add it to Database

6 Select the Switch

→ Go to Config
→ Go to Ethernet 0/1 is connected to Router

7 Configure the PC as shown in Topology

8 ~~Select~~ Switch

→ Go to Config
→ Go to fastethernet 2/1
→ Set VLAN number as 2

9 Configure the Router

Router (config)# interface fastethernet
Router (Config-if)# no shut
Router (Config-if)# exit

Now to Confire the Router VLAN inter...

Router (config)# interface fastethernet ...
Router (config-subif)# encapsulation dot...
Router (config-subif)# no shut
Router (config-subif)# shut

Observation

1) When device are pinged within same VL...

→ Pinging 192.168.1.3 from 192.168.1.2
→ The Data Packet doesn't go to Router

2 When device ping a device of another V...

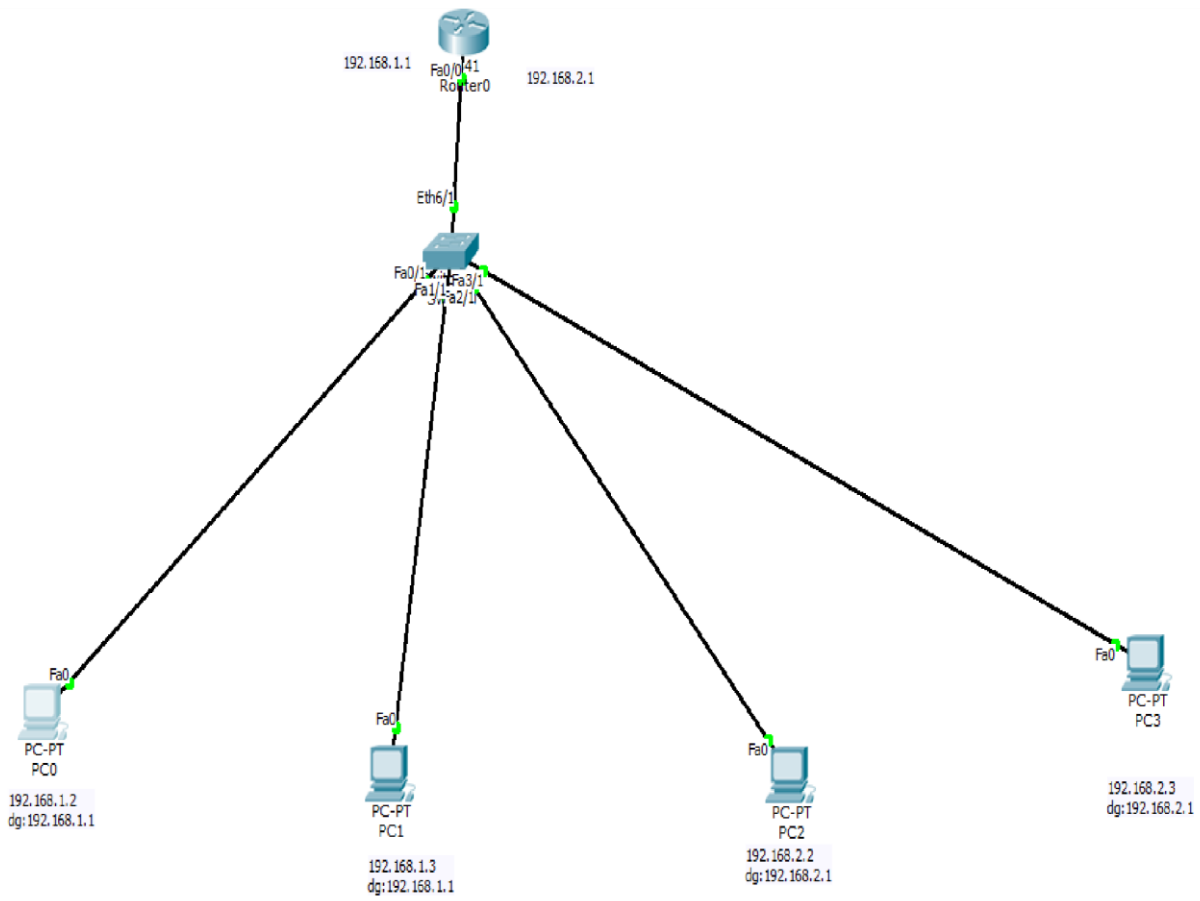
→ Pinging 192.168.2.3 from 192.168.1.2

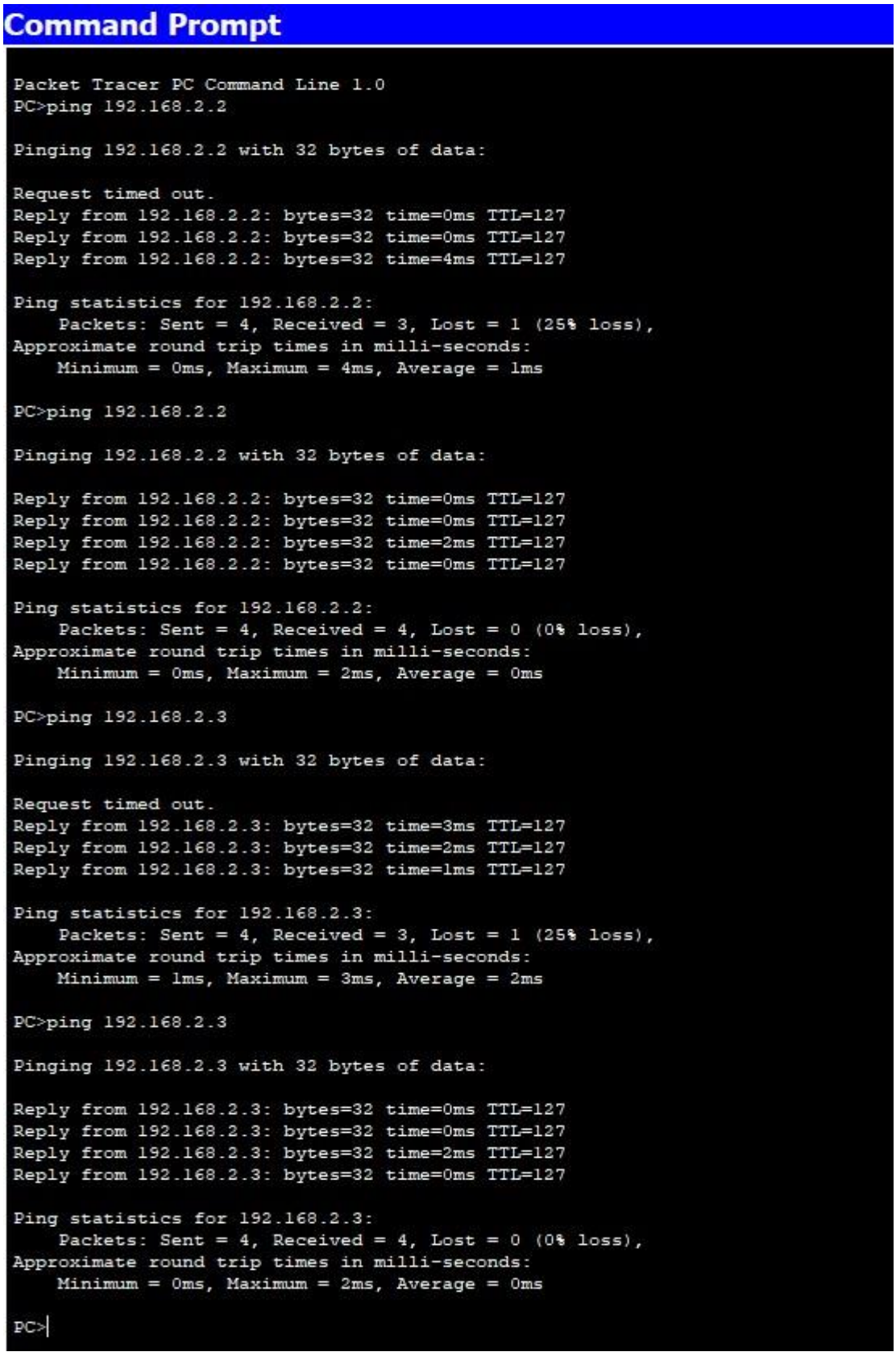
The router packet journey is as follow

192.168.1.2 → Switch → Router

192.168.1.3 ← Switch

Screen Shots:

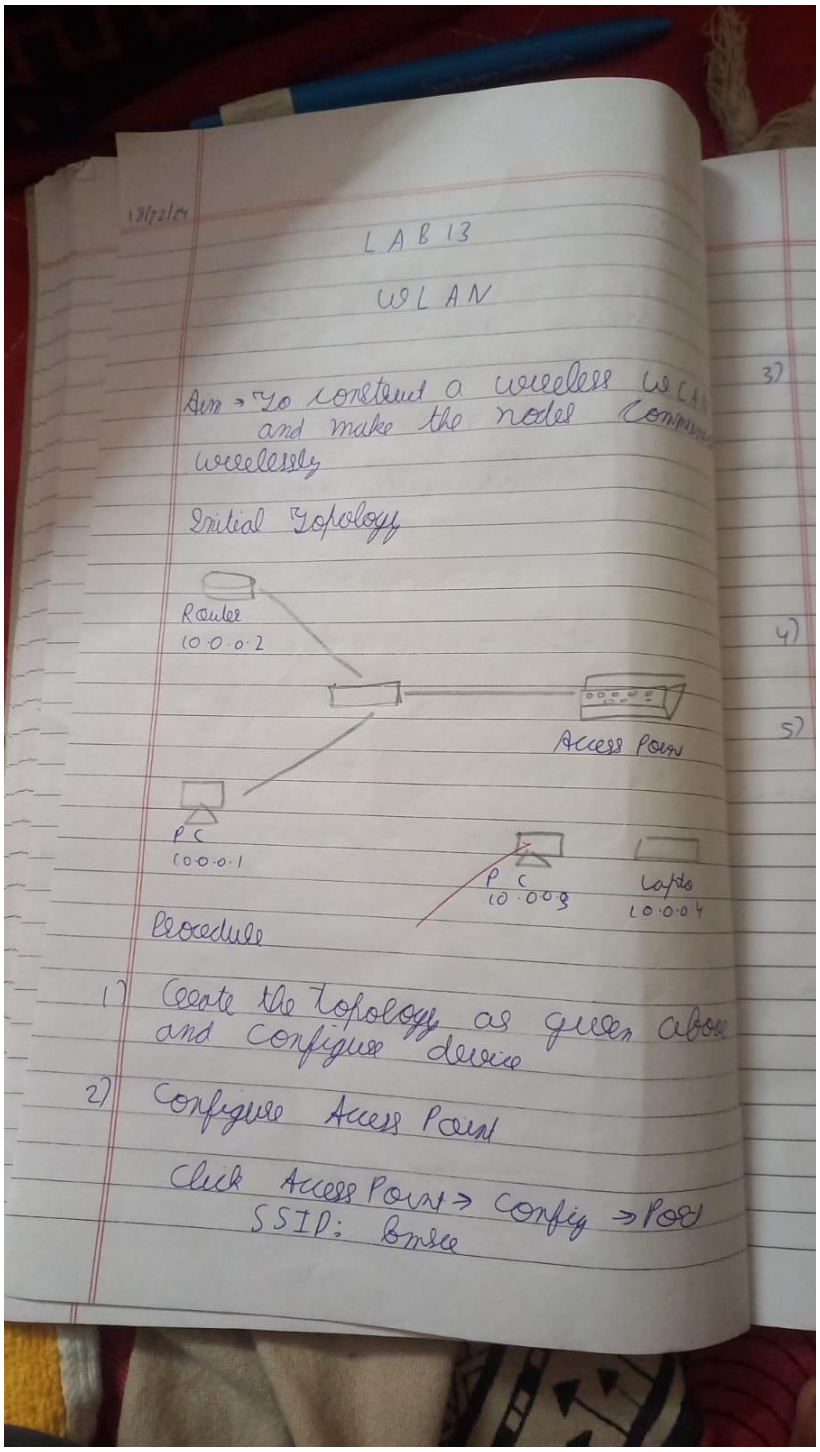



Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.168.2.2
Pinging 192.168.2.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=4ms TTL=127
Ping statistics for 192.168.2.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 4ms, Average = 1ms
PC>ping 192.168.2.2
Pinging 192.168.2.2 with 32 bytes of data:
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Reply from 192.168.2.2: bytes=32 time=2ms TTL=127
Reply from 192.168.2.2: bytes=32 time=0ms TTL=127
Ping statistics for 192.168.2.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 2ms, Average = 0ms
PC>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.3: bytes=32 time=3ms TTL=127
Reply from 192.168.2.3: bytes=32 time=2ms TTL=127
Reply from 192.168.2.3: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 3ms, Average = 2ms
PC>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Reply from 192.168.2.3: bytes=32 time=0ms TTL=127
Reply from 192.168.2.3: bytes=32 time=0ms TTL=127
Reply from 192.168.2.3: bytes=32 time=2ms TTL=127
Reply from 192.168.2.3: bytes=32 time=0ms TTL=127
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 2ms, Average = 0ms
PC>

Program 13

Aim: To construct a WLAN and make the nodes communicate wirelessly.

Topology , Procedure and Observation:



Select : WEP
Set Key : 1234567890

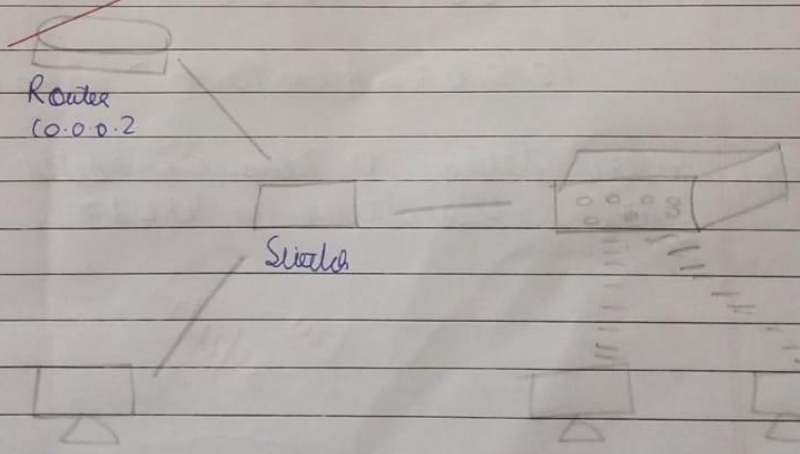
3) Config PC and Laptop with Wireless Standard

- Switch off device
- Drag WMP 300 N wireless interface to the empty port
- Switch off the device

4) In the Config tab, a new wireless interface was added

5) Config the device by entering SSID WEP Key, IP address & Gateway

Topology after wireless configuration



Observation

1. We were able to ping from every device to every other device

2. WMP 300N wireless interface:
   → Wireless network adapter that enables device to communicate with access point using wireless signal

3. Pinging 10.0.0.1 → 10.0.0.3

   10.0.0.1 → ~~to~~ Switch → Access Point → 10.0.0.3

4) Pinging 10.0.0.3 to 10.0.0.1

   10.0.0.3 → ~~Accesspoint~~ → Switch → 10.0.0.1

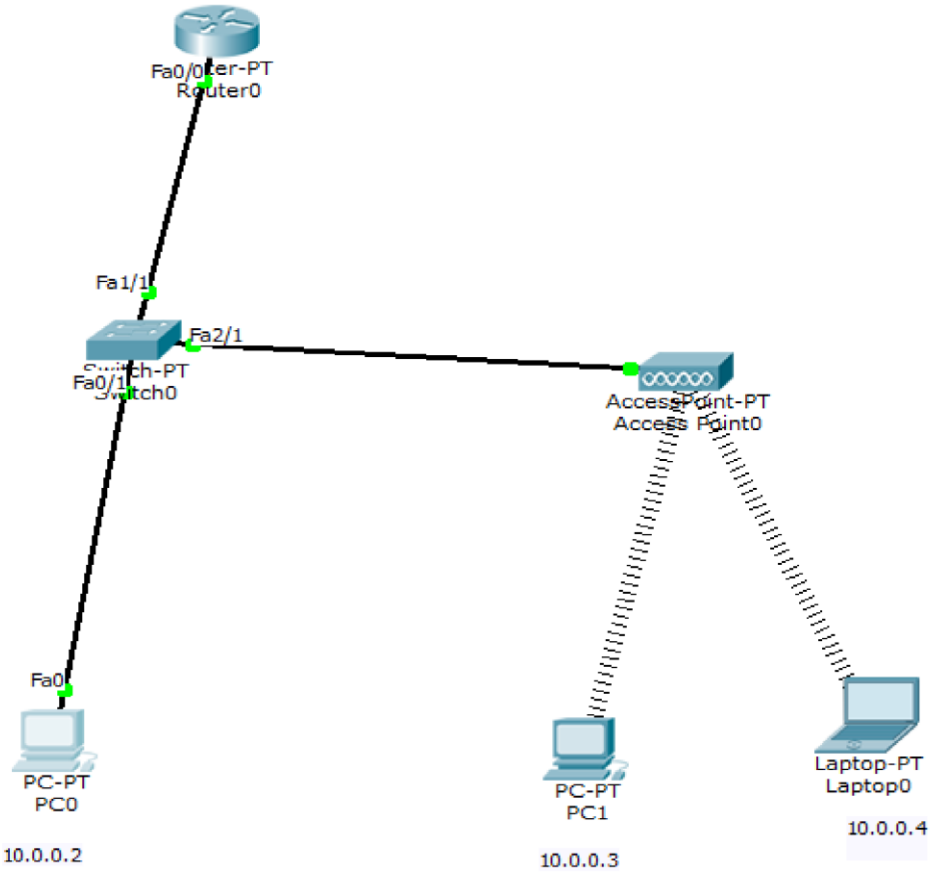
5) Ping 10.0.0.3 → 10.0.0.4

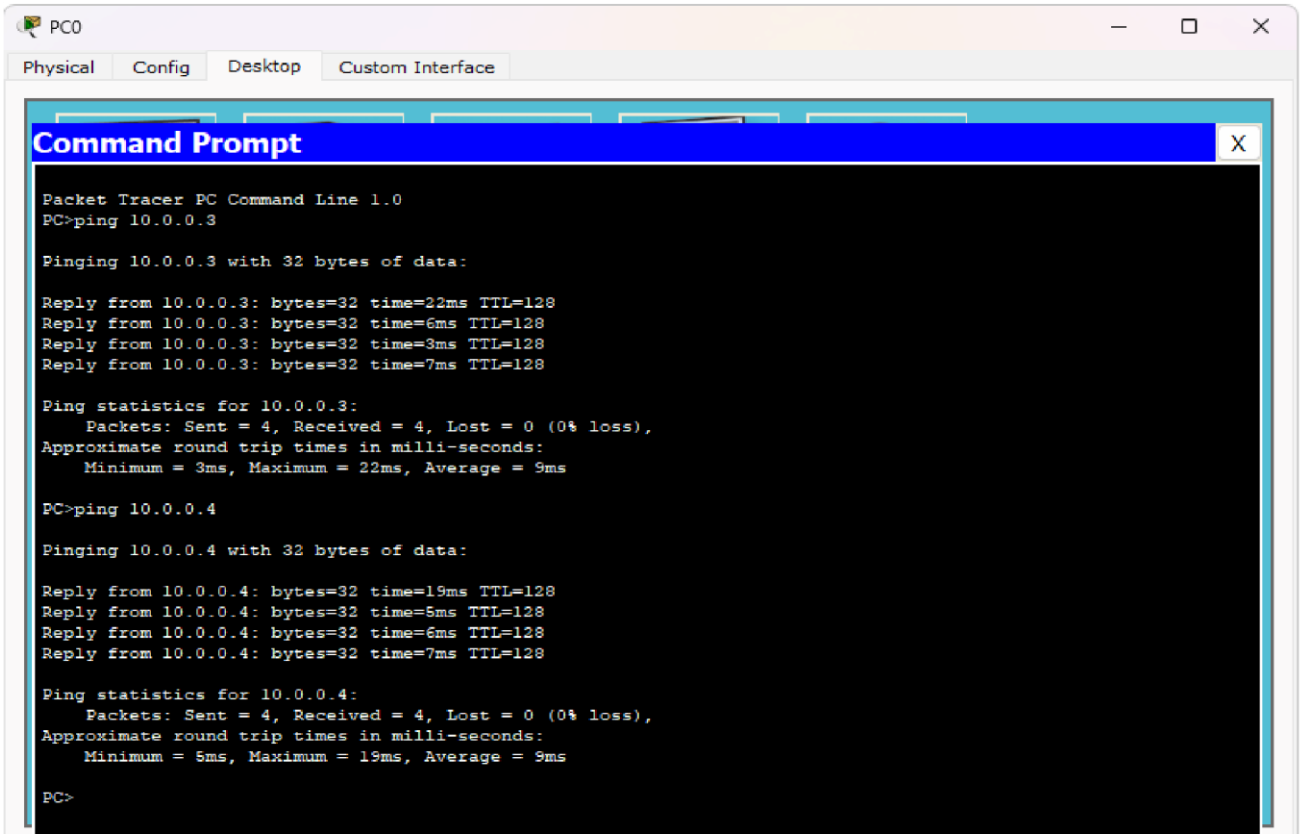
   10.0.0.3 → Access Point → 10.0.0.4

6) Every device is now connected to every other device in WLAN

31/12/24

Screen Shots:



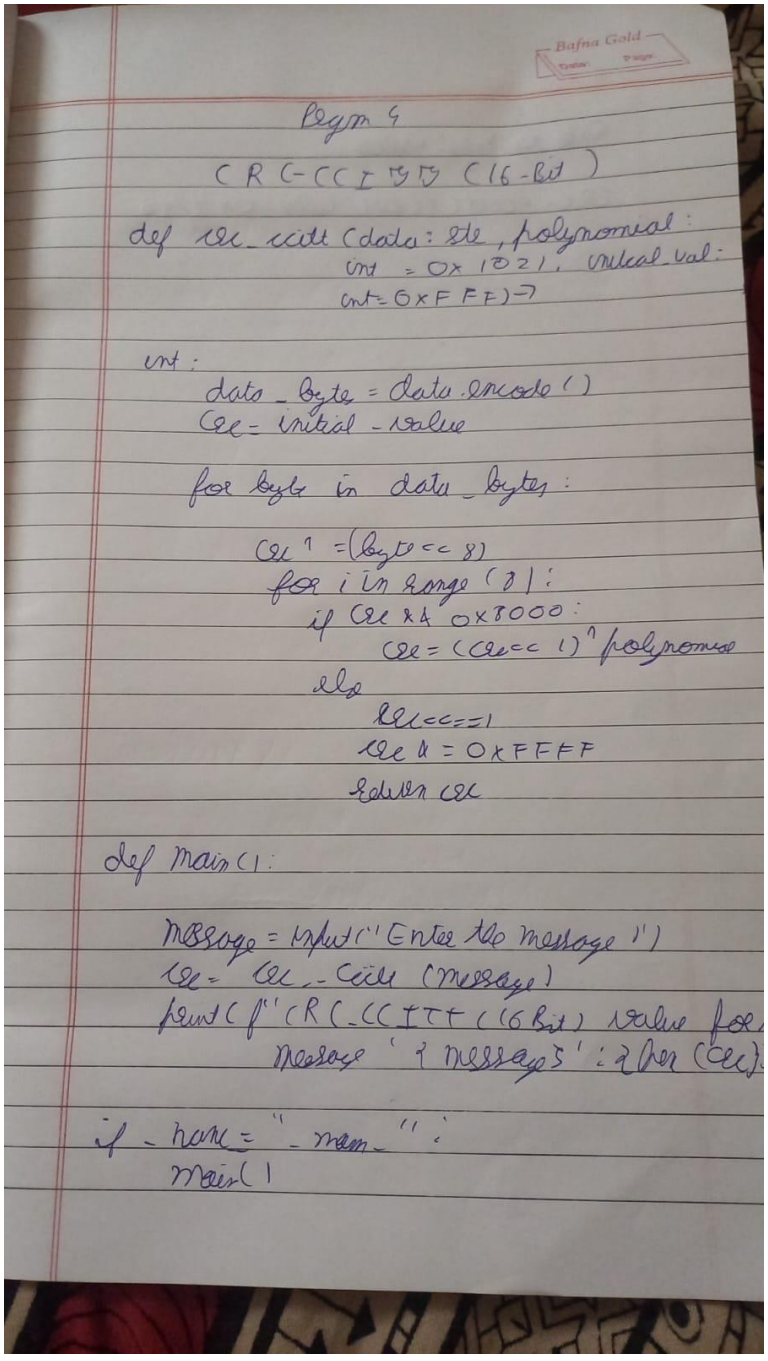


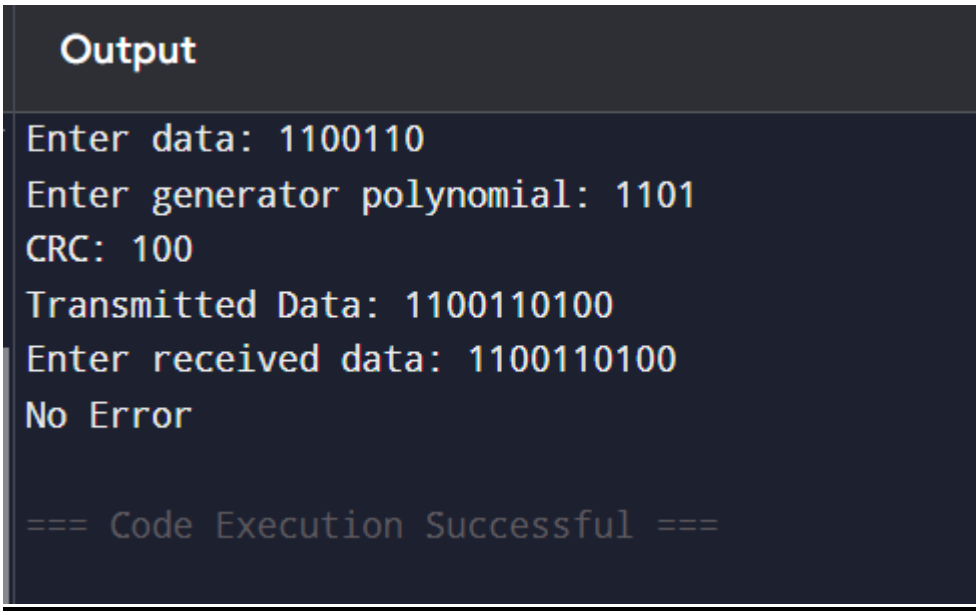
PART-B

Program 14

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

Code :

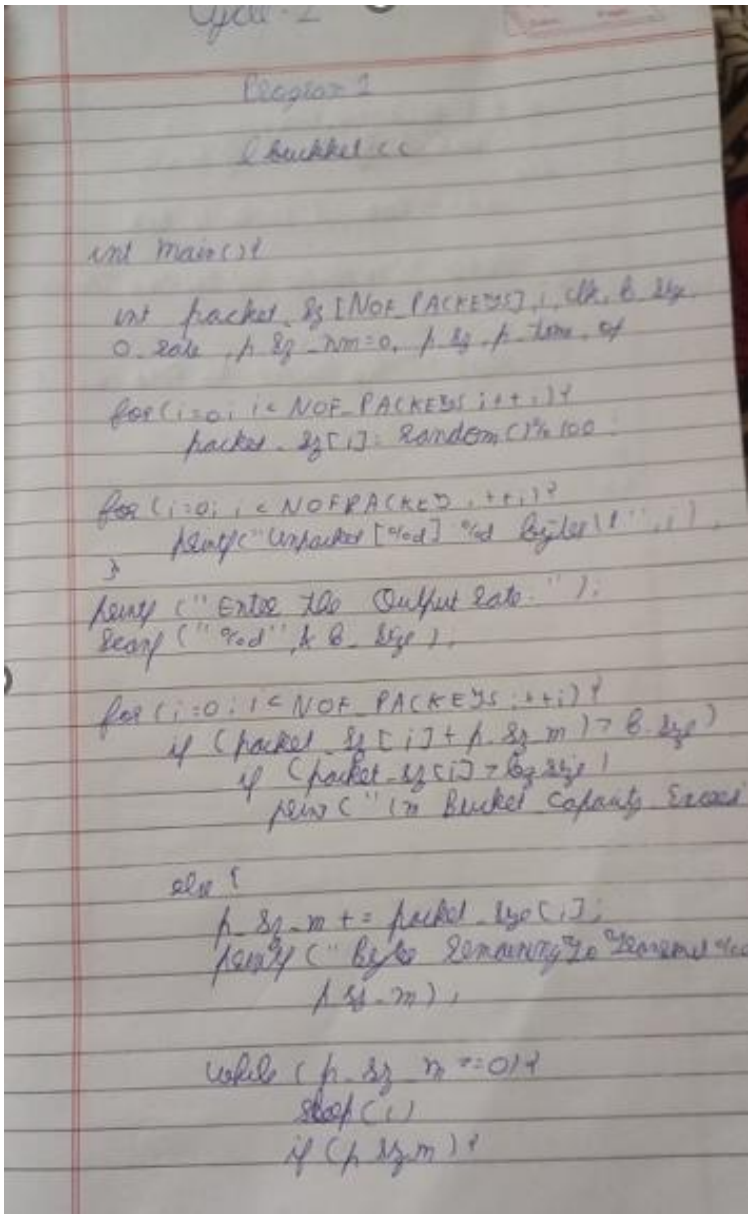


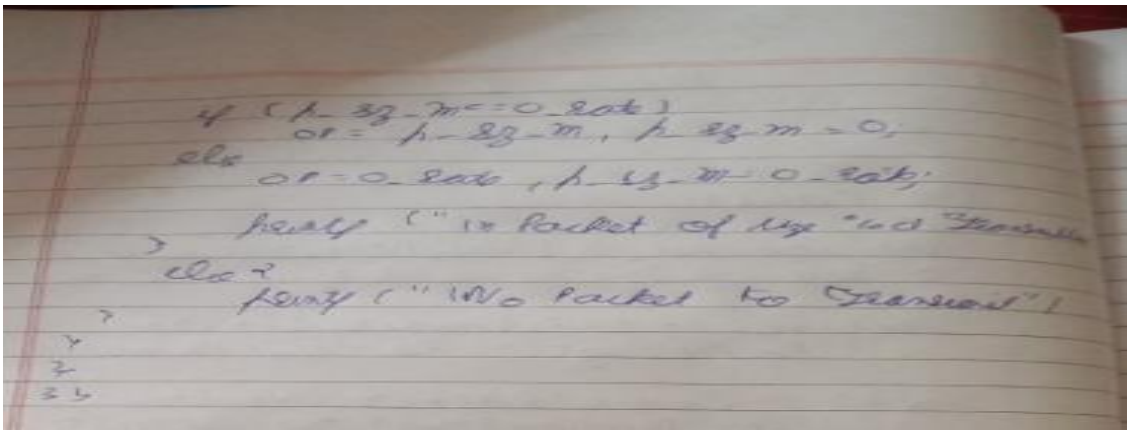

Output
Enter data: 1100110
Enter generator polynomial: 1101
CRC: 100
Transmitted Data: 1100110100
Enter received data: 1100110100
No Error
=== Code Execution Successful ===

Program 15

Write a program for congestion control using Leaky bucket algorithm.

Code :



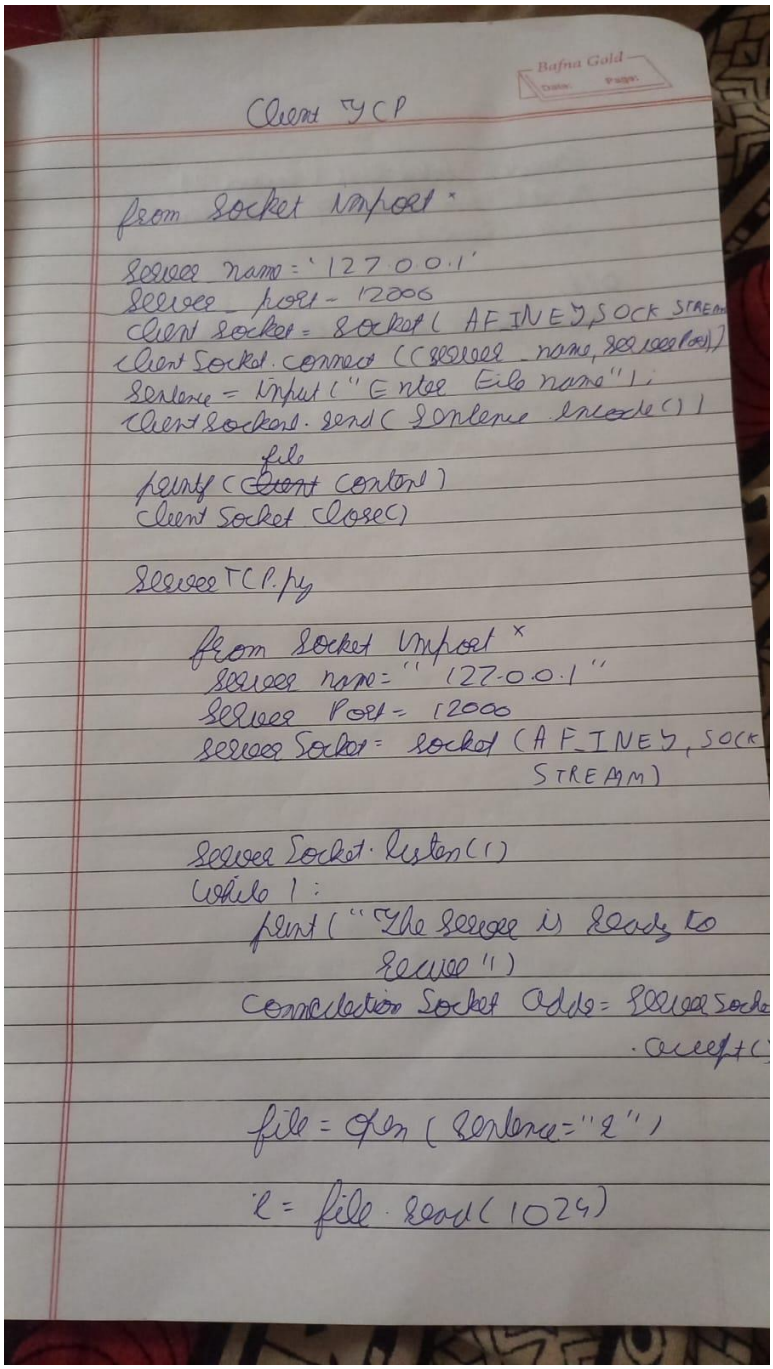


```
Output                                                          Clear
Generated packets: [80, 63, 57, 12, 69]
Enter bucket size: 60
Enter output rate: 30
Packet of size 80 bytes exceeds bucket capacity (60 bytes) - REJECTED
Packet of size 63 bytes exceeds bucket capacity (60 bytes) - REJECTED

Packet of size 57 bytes added to bucket
Bytes in bucket: 57
Transmitting 30 bytes
Bytes remaining in bucket: 27
Transmitting 27 bytes
Bytes remaining in bucket: 0

Packet of size 12 bytes added to bucket
Bytes in bucket: 12
Transmitting 12 bytes
Bytes remaining in bucket: 0
Packet of size 69 bytes exceeds bucket capacity (60 bytes) - REJECTED

=== Code Execution Successful ===
```

Program 16

Using TCP/IP 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.

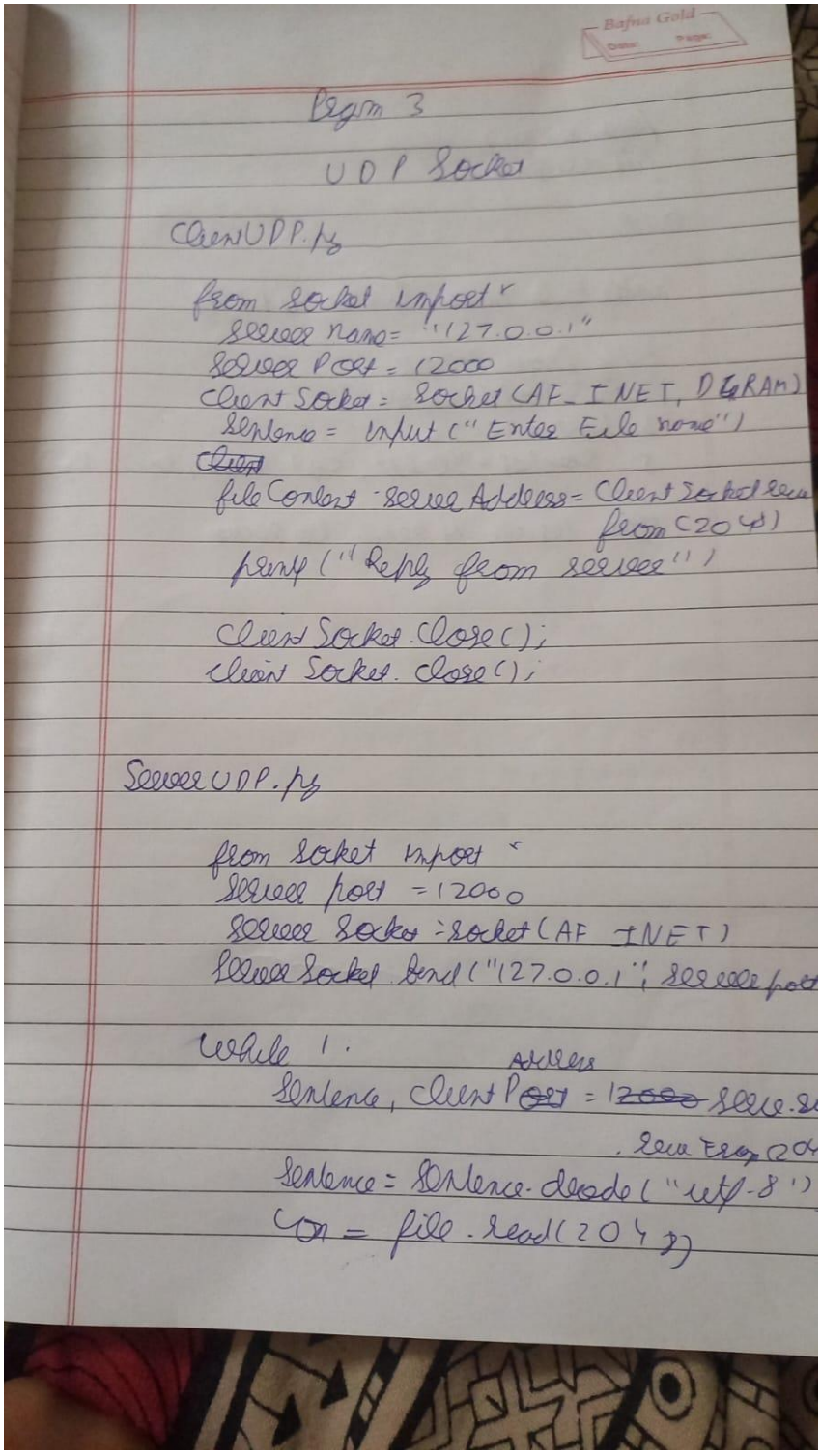
Code and Output:

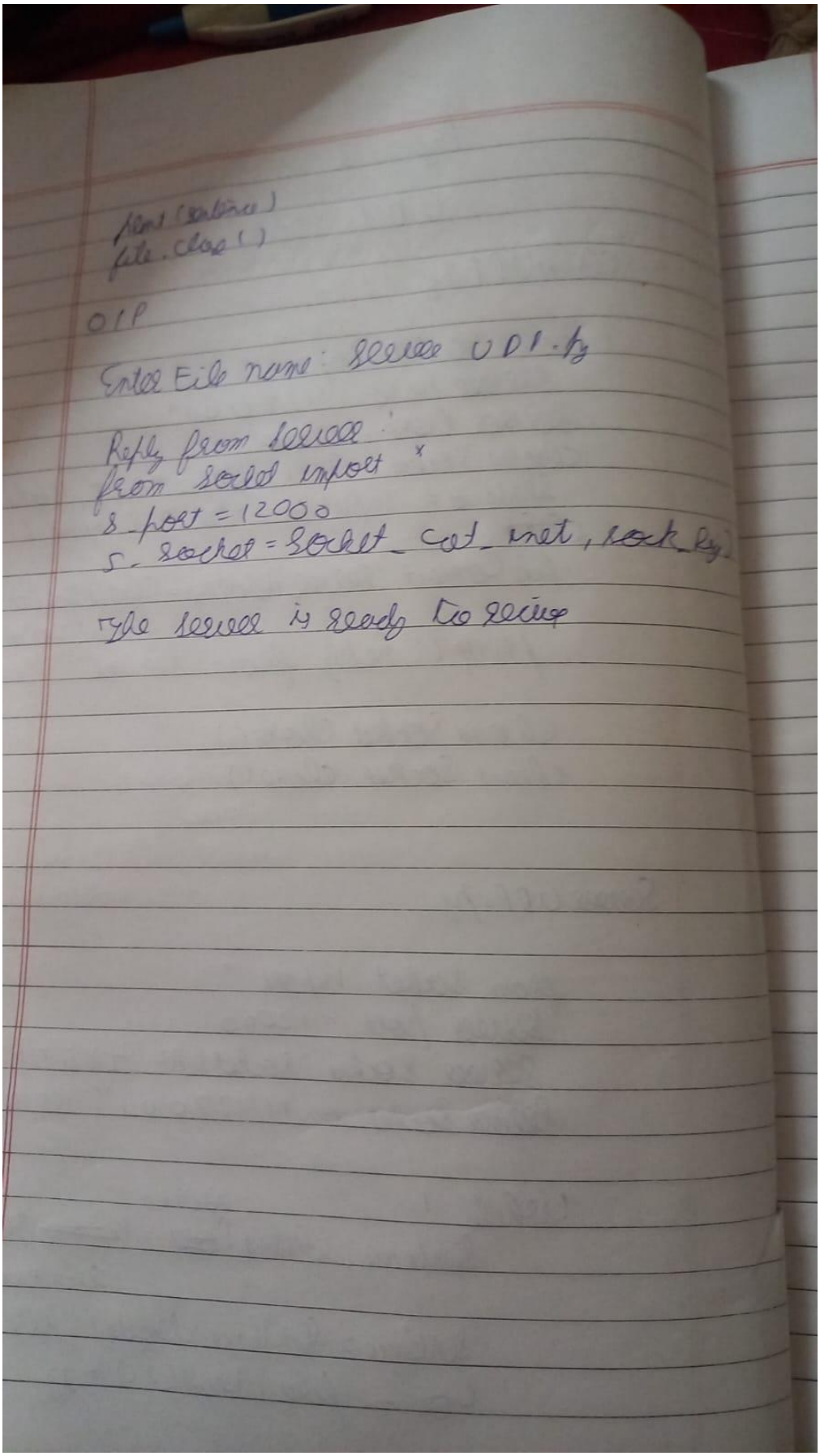


Program 17

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.

Code and Output:




file.close()
O/P
Enter File name: recvd UDP.txt
Reply from server
from socket import *
s_port = 12000
s_socket = socket_cat_inet, sock_dg
The server is ready to recieve