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

(Autonomous Institution under VTU)

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B.M.S. College of Engineering

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled " Computer Network (23CS5PCCON)" carried out by **Harsh Ticku (1BM22CS109),** 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. Latha N.R. Associate Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE

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Github Link: https://github.com/HarshTicku/CN-Lab

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:

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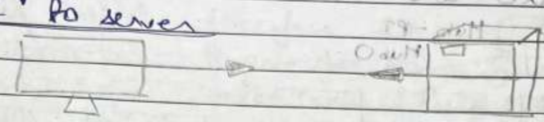
Exp 1

PC to server



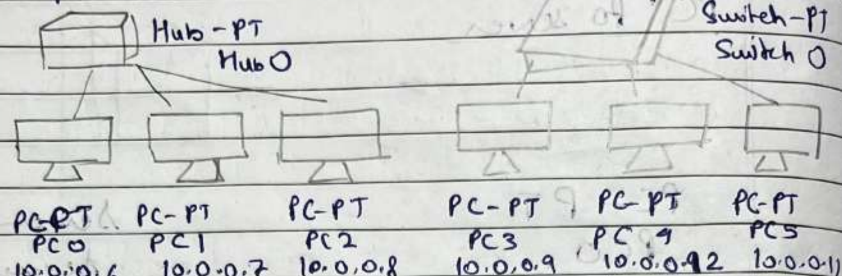
PC-PT	Server-PT
PC0	Server 0
10.0.0.1	10.0.0.2

Aim: To set up a point-to-point network between a PC & a server, facilitating direct communication to discern data exchange.

Topology - A PC is connected to server using a crossover ethernet cable.
IP addresses of PC - 10.0.0.1, server - 10.0.0.2

Observation - Direct connection allows PC to communication which is typical in small networks for tasks such as file sharing, service requests or testing server responses to client queries.

Hub and Switch



Aim- To create sample network consisting of 3 pcs connected to a central hub & another network with 3 PCs connected to a switch. The connection will help observe the behaviour of data transmission using hub and switch device.

Topology- 3PCs are connected to a hub and switch using straight-through ethernet cables

Observation- Hub ~~ge~~ broadcasts packets to all devices which may cause unnecessary traffic switch ~~statent~~ forward packets only to appropriate device by learning MAC address, making it more efficient in reducing traffic.

- Cisco Packet Tracer

This initial interface contains ten components.

1. Menu Bar - It provides the file, edit options, view, tools, extensions & help menu. You will find basic commands such as open, save, save as, print & preferences in these menus. You will also be able to access the activity wizard from extensions menu.

2. Main Tool Bar - This bar provides short-cut icons to the file & edit menu commands. This bar also provides buttons for copy, paste, undo, redo, zoom, the drawing palette and the custom devices dialog. On the right, you will also find the network info button, which can be used to enter a description for current network.

3. Common Tools Bar - This bar provides access to these commonly used workspace tools: select, move, layout, place note, delete, inspect, resize reshape, and simple PDU & add complex PDU.

4. Logical/Physical Workspace & Navigation Bar - You can toggle between the physical workspace & logical workspace with the tabs on the bar. In logical workspace, this bar allows you to go back to a previous level in a cluster, create a new cluster & many more.

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5- Workspace -
This area is where you will create your network, watch simulations & view many kinds of info & statistics.

6- Realtime / Simulation Bar - You can toggle between real time mode & simulation mode with tools on this bar.

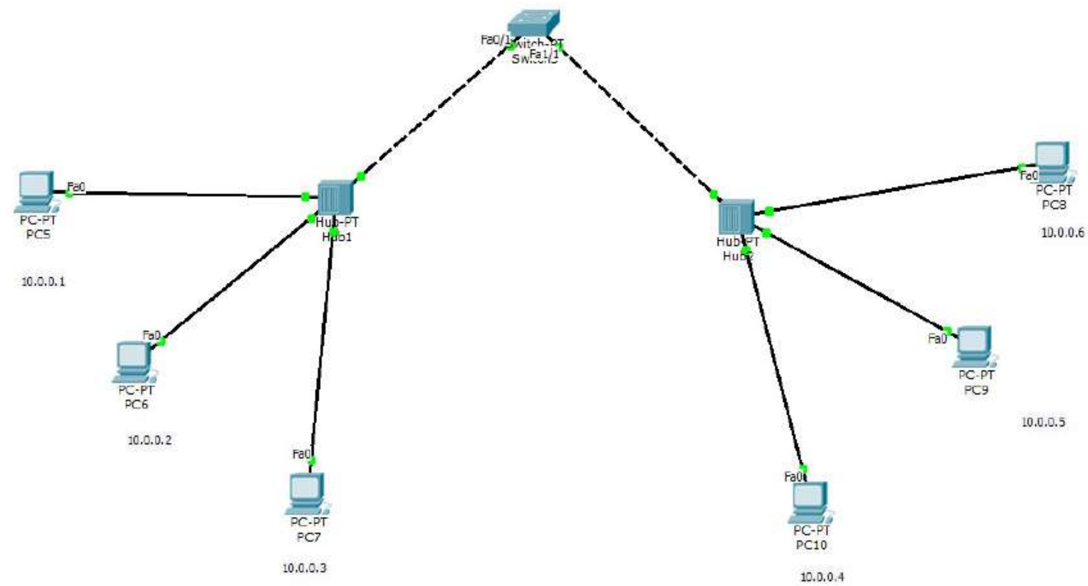
- Network component Box - This box is where you choose devices and connectors to put into workspace.

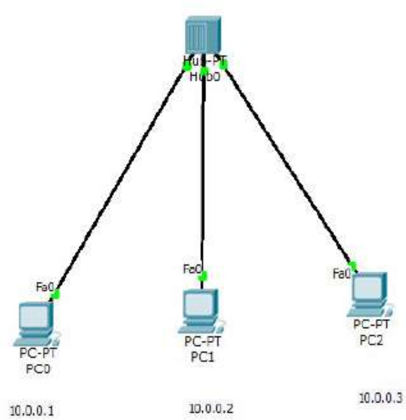
- Device - type selection Box. This box contains the types of devices & connections available in packet tracer.

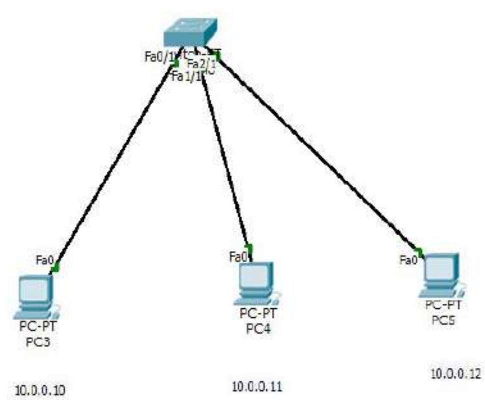
Device - specific selection Box - This box is where you choose specifically which devices you want to put in your network & which connections to make.

User Created Packet Window - This window manages the packets you put in the network during simulation scenarios.

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:

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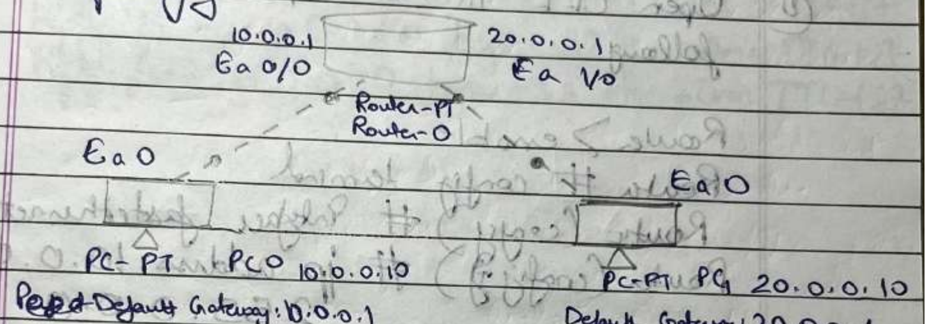
Lab-2

Aim- To create a network consisting of 2 PCs connected to a router. This connection will help observe the behavior of data transmission using router.

Topology:-



1. PC0 - connected to router's Interface Fa 0/0 using a cross over cable
IP address : 10.0.0.10
Default Gateway : 10.0.0.1

2. PC1 - connected to router's interface Fa 1/0 using a cross over cable
IP address : 20.0.0.10
Default Gateway : 20.0.0.1

3. Router :
Interface Fa 0/0 connected to PC0
Interface Fa 1/0 connected to PC1
IP address of Fa 0/0 : 10.0.0.1
IP address of Fa 1/0 : 20.0.0.1

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Procedure: Two PCs (P0 & PC1) are assigned with IP address 10.0.0.10 & 20.0.0.10 & gateway 10.0.0.1 & 20.0.0.1 respectively

② Open CLI in router & enter the following

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-if) # no shutdown
exit

Router (config) # interface fastethernet 1/0
Router (config-if) # ip address 20.0.0.1 255.0.0.0
Router (config-if) # no shutdown
exit

③ Ping another system or interface from the command prompt of PC0 or PC1 using CMD

> ping 20.0.0.10

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=> Observation -
Command Promt gives output
Pinging 20.0.0.10 with 32 bytes of data

Reply from 20.0.0.10: bytes =32 time=0ms TTL=1[illegible]
Reply from 20.0.0.10 bytes=32 time=0ms TTL=127
Reply from 20.0.0.10: bytes=32 time=0ms TTL=127
Reply from 20.0.0.10: bytes =32 time =0ms TTL=12[illegible]

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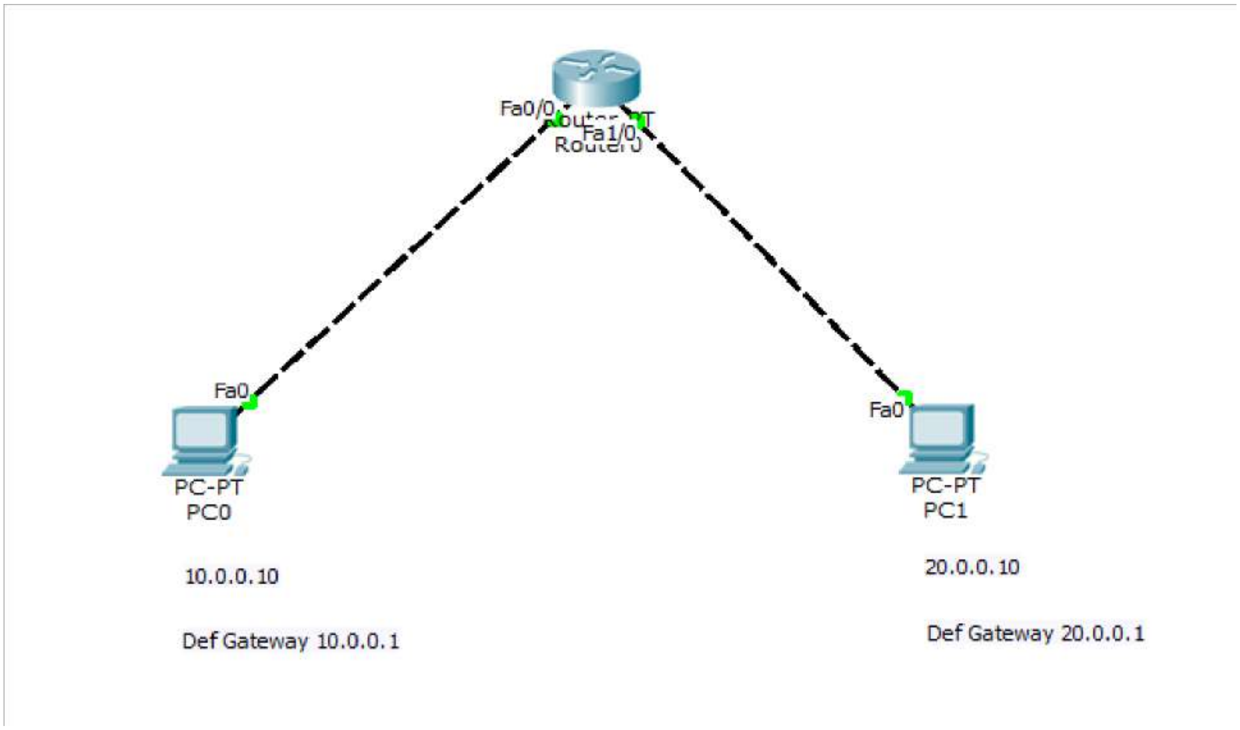
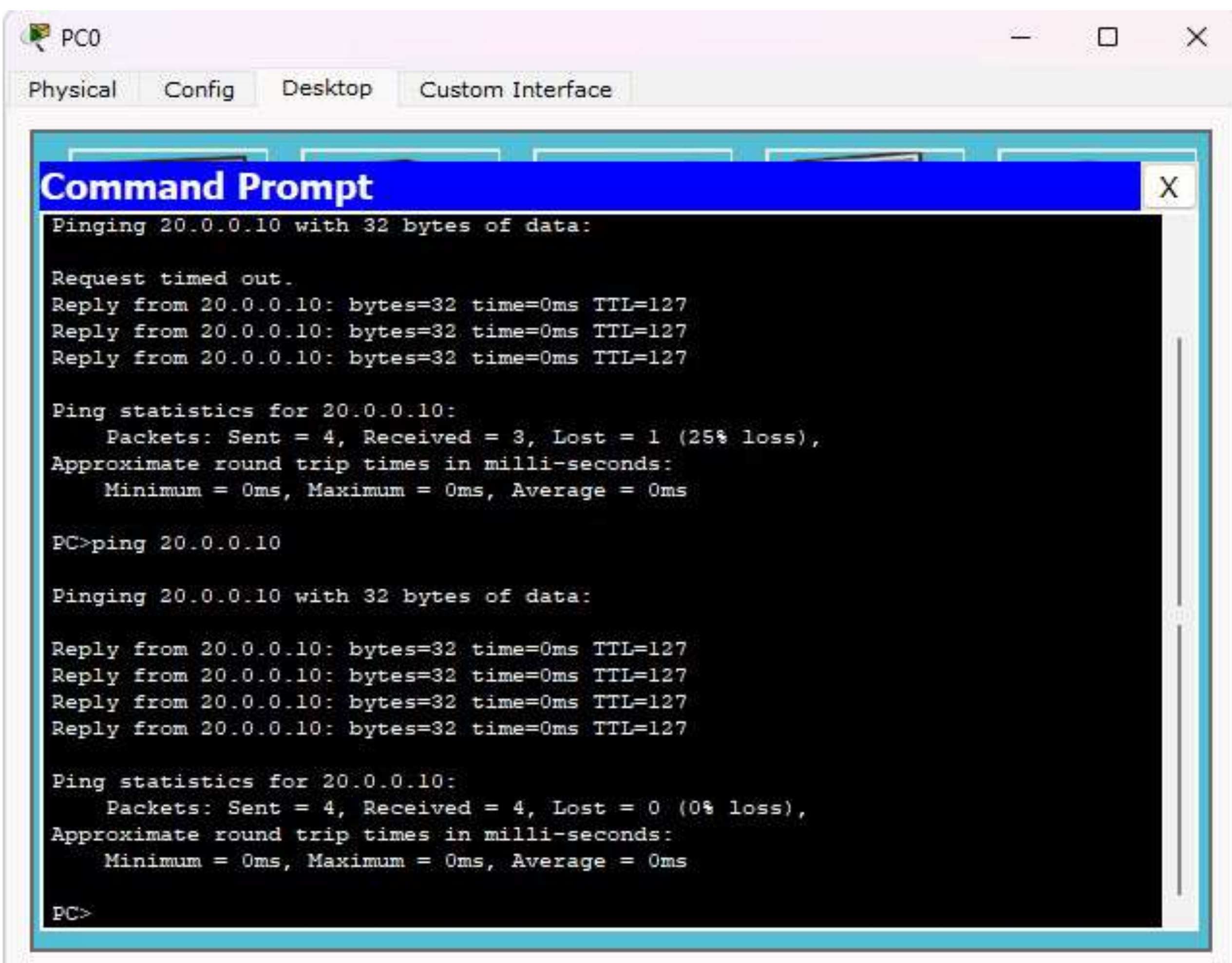
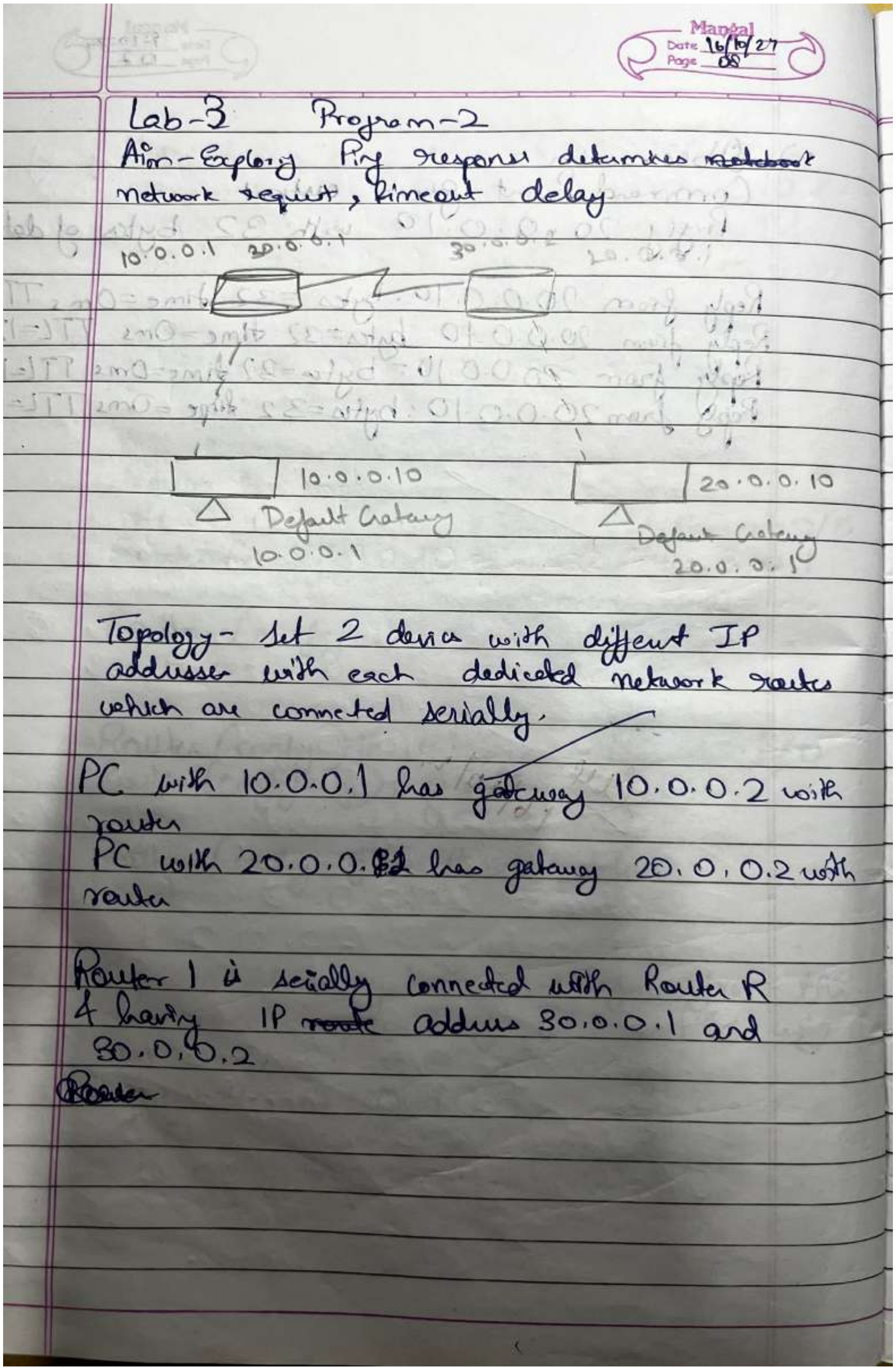
Screen Shots:





Program 3
Aim: Configure default route, static route to the Router(Part 1).

Topology , Procedure and Observation: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Lab-3 Program-2

Aim- Explore Ping responses determines ~~notebook~~ network request, timeout delay

Topology- set 2 device with different IP addresses with each dedicated network routes which are connected serially.

PC with 10.0.0.1 has gateway 10.0.0.2 with router

PC with 20.0.0.~~2~~ has gateway 20.0.0.2 with router

Router 1 is serially connected with Router R & having IP ~~route~~ address 30.0.0.1 and 30.0.0.2

~~Router~~

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Procedure -
PC to router1

router-> enable
router # config terminal
router (config) # interface fastethernet 0/0
router (config-if)# ip address 10.0.0.2 255.0.0.0
router (config-if)# no shutdown
router (config-if)# interface ~~fastethernet~~ serial 2/0
router (config-if) # ip address 30.0.0.1 255.0.0.0
router (config-if)# no shutdown
router (config-if)# exit

Observation -
router- show ip route
Gateway of last resort is not set
C 10.0.0.0/8 is directly connected to fastethernet 0/0 S 20.0.0.0/8 (1/0) via ~~300~~ 30.0.0.2 (30.0.0.0/8 is directly connected server 2/0

PC to route 2

router - enable
route # config termial
router (config) # interface fastethernet 1/0
ip address 20.0.0.1 255.0.0.0
no shutdown
exit

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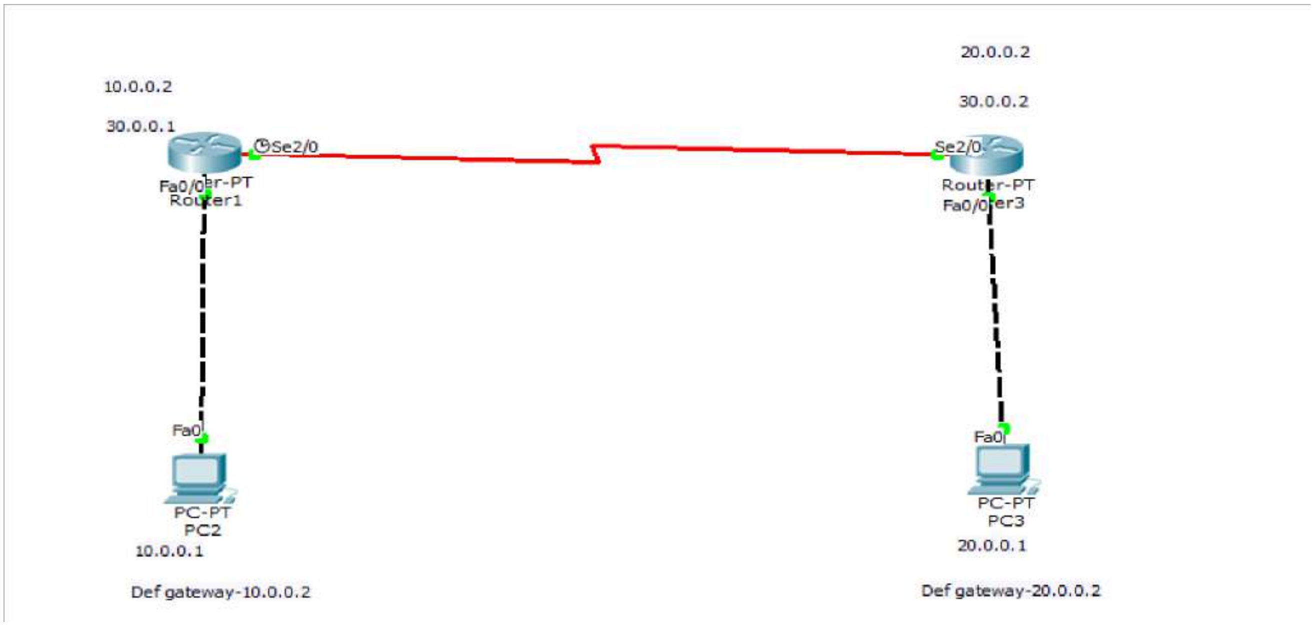
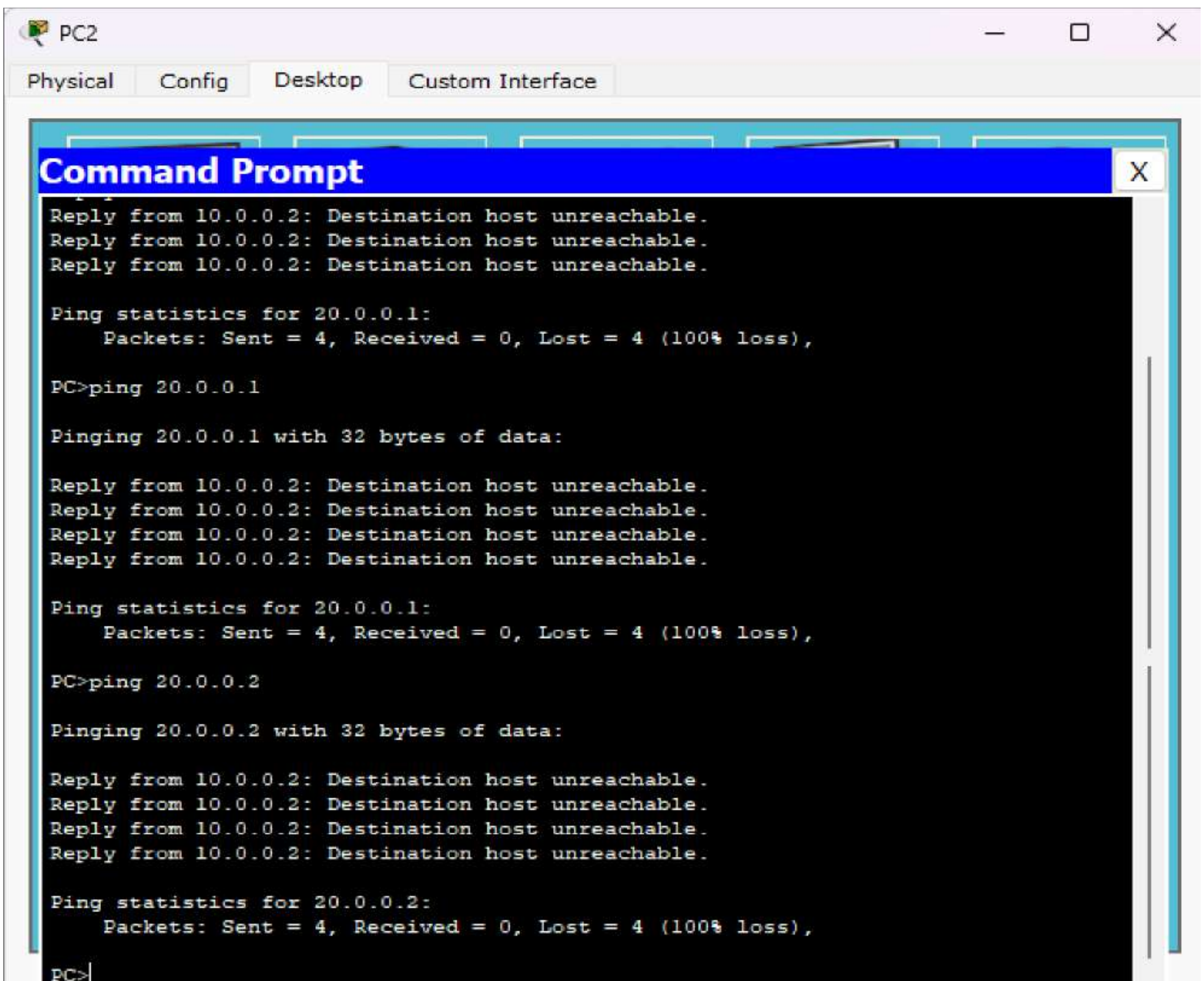
ping
command promt
ping 20.0.0.1
reply from 20.0.0.10: Destination host unreachable

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 byte -32 time = 3 ms
TTL=126

Screen Shots:

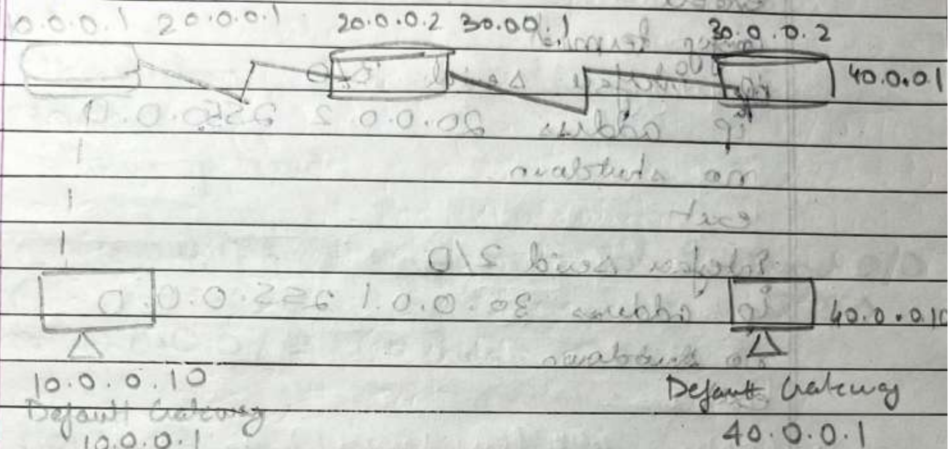




Program 4
Aim: Configure default route, static route to the Router(Part 2).

Topology , Procedure and Observation:

Lab-4 Program-3
Aim: Configure, default route, static route to the router



Topology - Two PCs are connected to two router by using copper cross. The three router are connected by serial arrangement

Procedure

1. Take two router & connect the two systems to two router respectively
2. In first router open CLI & type below command
   - Enable
   - Config terminal
   - interface fastethernet 0/0
   - ip address 10.0.0.1 255.0.0.0
   - no shutdown
   - exit

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(3) Configuration of second router
enable
config terminal
~~ip~~ 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
exit

(4) Configuration of third router
enable
config terminal
interface fastethernet 1/0
ip address 40.0.0.1
no shutdown
exit
interface ~~[illegible]~~ serial 3/0
ip address 30.0.0.2 255.0.0.0
no shutdown
exit

(5) Static Configuration first router
ip route 0.0.0.0 0.0.0.0 20.0.0.2

(6) Static Configuration second router
ip router 10.0.0.0.0 255.0.0.0 20.0.0.1
ip route 40.0.0.0.0 255.0.0.0 30.0.0.2

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(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, Fastethernet 0/0
C 20.0.0.0/8 is directly connected, serial 2/0
S* 0.0.0.0/0 [1/0] via 20.0.0.2

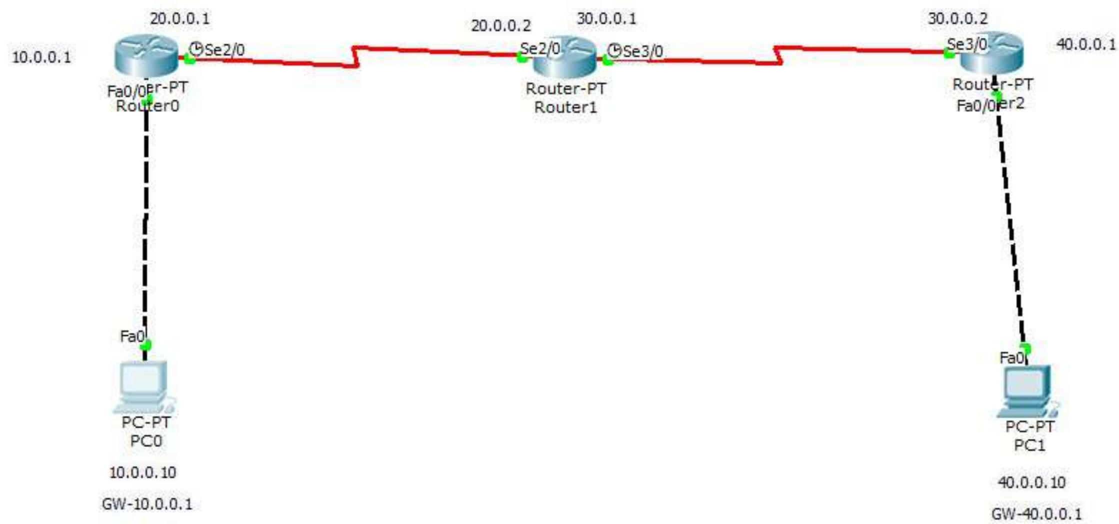
Router 2
Show ip route

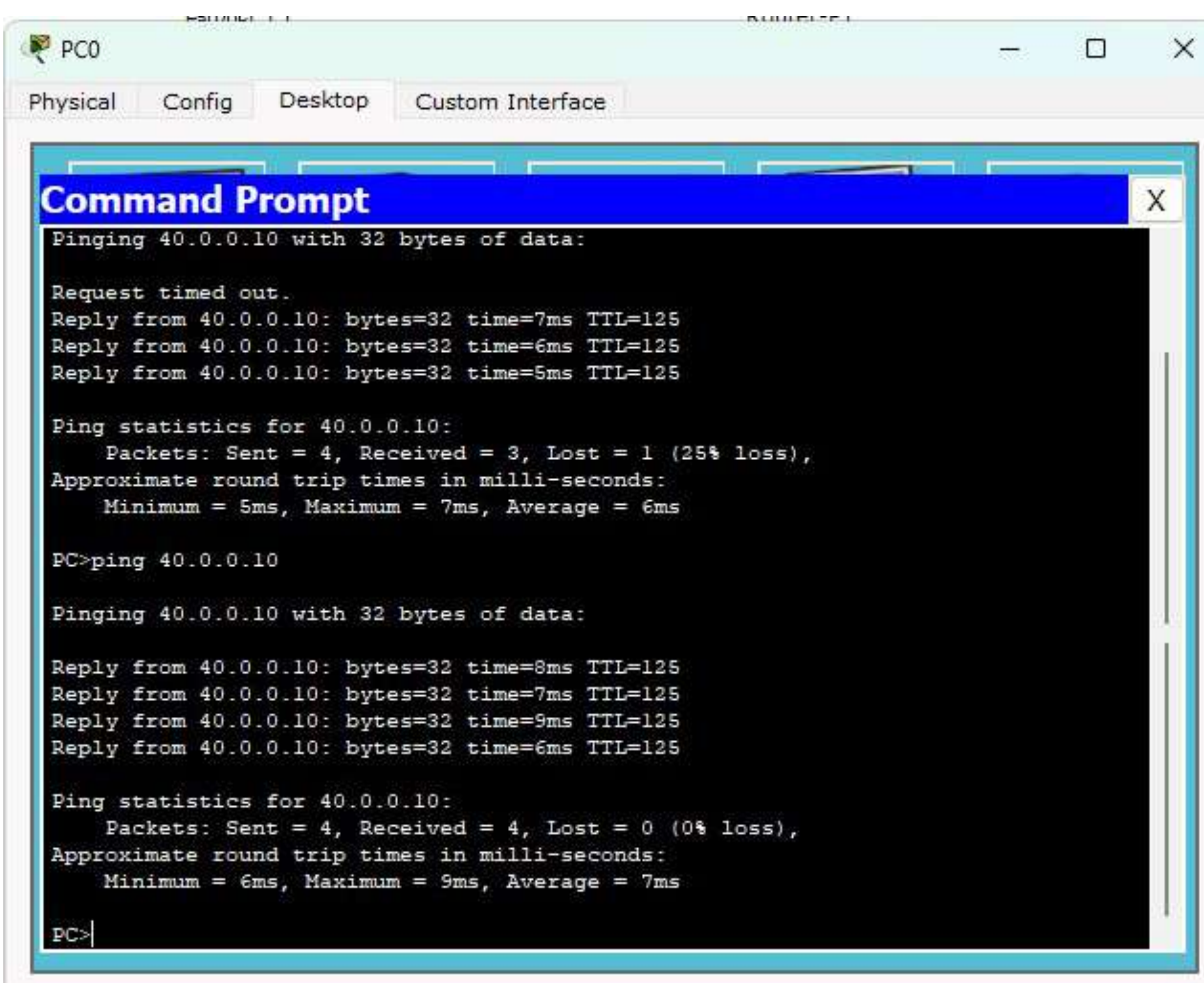
S 10.0.0.0/8 [1/0] via 20.0.0.1
C 20.0.0.0/8 is directly connected, Serial 3/0
C 30.0.0.0/8 is directly connected, serial 2/0
S 40.0.0.0/8 [1/0] via 30.0.0.2

Router 3
Show ip route
C 30.0.0.0/8 is directly connected, serial 3/0
C 40.0.0.0/8 is directly connected, fastethernet 1/0
S* 0.0.0.0/0 [1/0] via 30.0.0.1

ping 40.0.0.10
Ping statistics for 40.0.0.0.10
Packets: Sent=4, Recieved=4, Lost=0

Screen Shots:





Program 5

Aim: Configure DHCP within a LAN and outside LAN.

Topology , Procedure and Observation:

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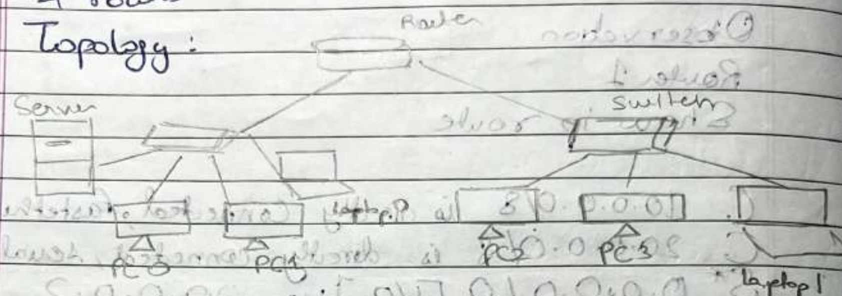
Lab-5 Program 4

Q Configure DHCP within a LAN and outside LAN

Aim: To connect various end devices & switches & router

Topology:



Procedure:

1. Configure all the server 0 as given
2. Under DHCP in config create a pool such that name is switch 1; default gateway 10.0.0.1, start ip as 10.0.0.3
3. Click on DHCP under Iconfig in PC 0,1,2 IP address will be dynamically set

OBSERVATION

PB DHCP request successful

IP address 10.0.0.2

Procedure (2)

1. To enable DHCP for outside LAN router is configured as such

Router (config)# fastethernet 4/10

Router (config-if) ip address 10.0.0.1 255.0.0.0

Router (config-if) ip helper address 10.0.0.2

Router (config-if) no shutdown

exit

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Router(config)# fastethernet 0/0
Router (config-if) ip address 20.0.0.1 255.0.0.0
Router (config-if) ip helper address 10.0.0.2
Router (config-if) # no shut
exit

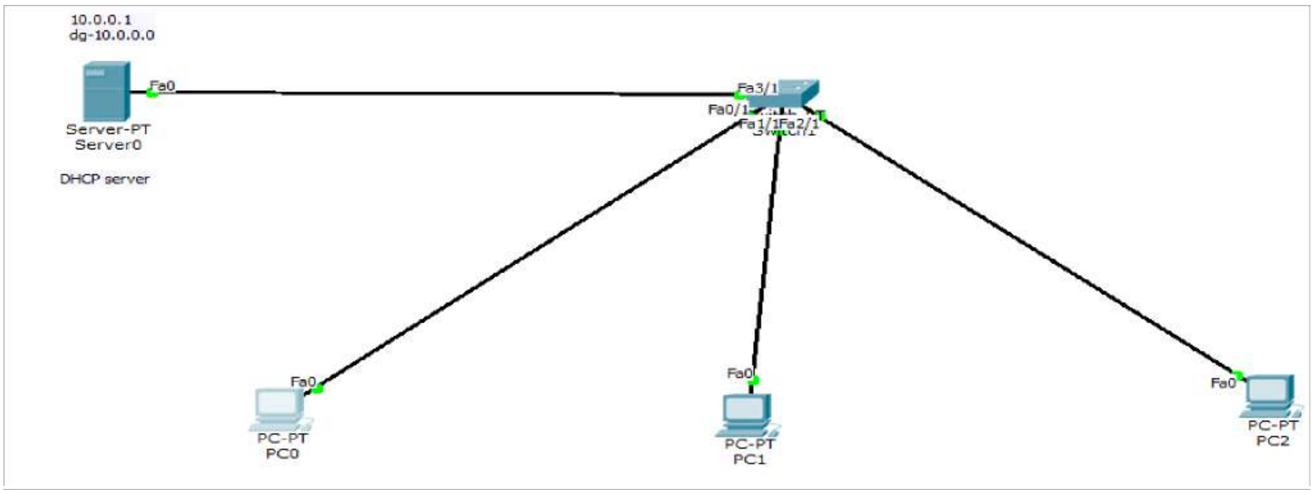
2. Dynamically enable ip address for end device

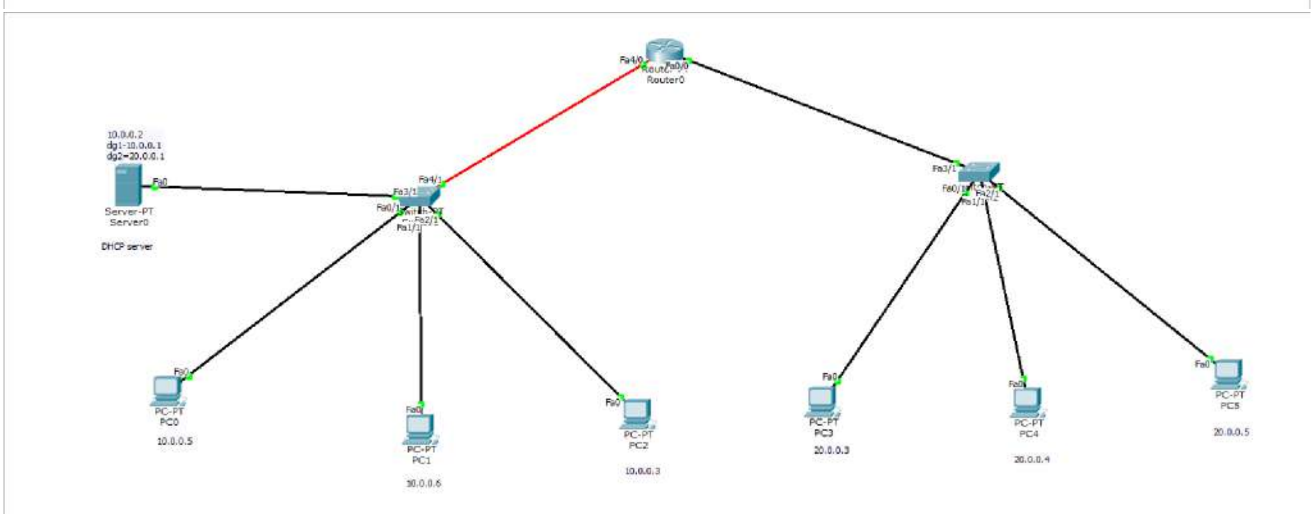
OBSERVATION

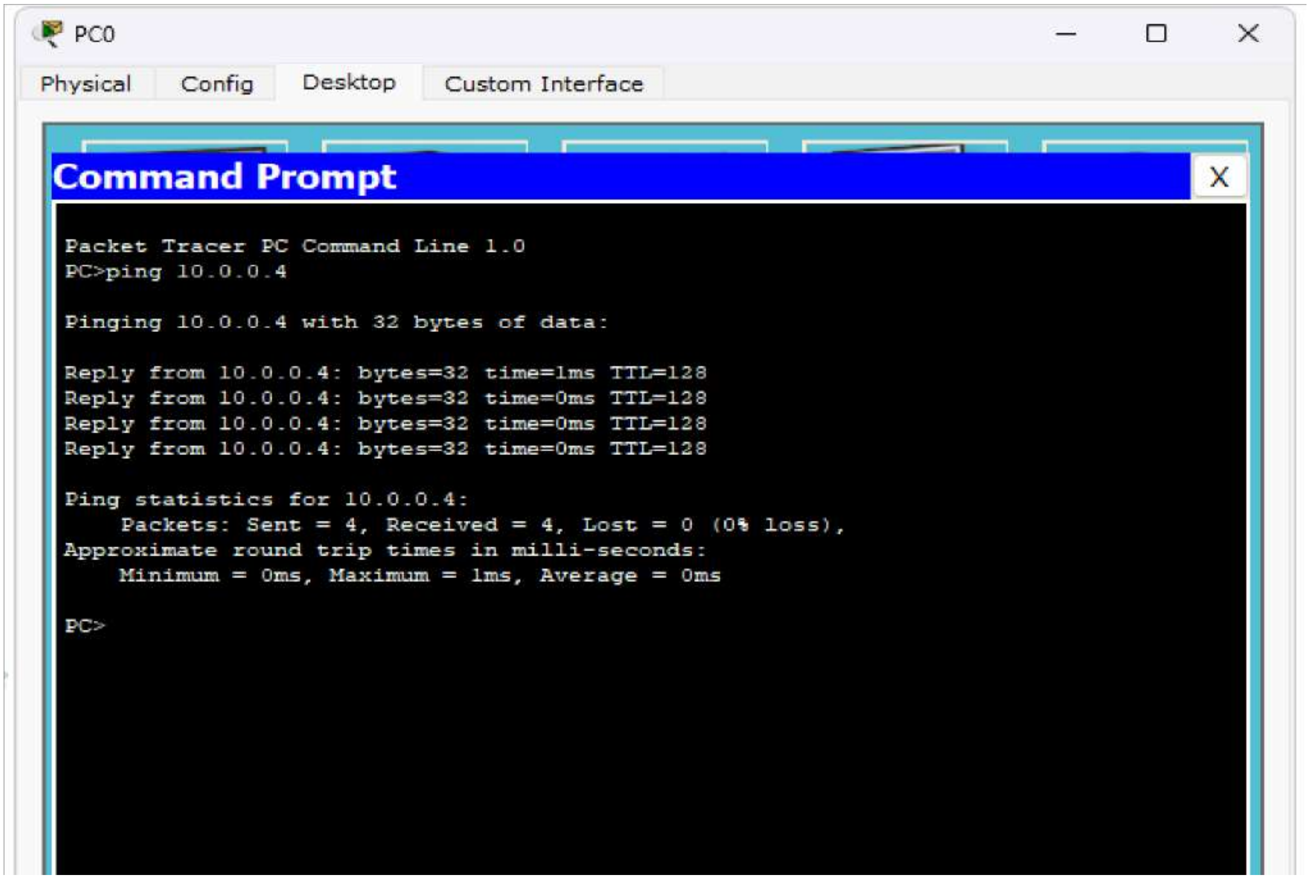
1. IP address dynamically set
2. On pinging network 2 device from network 1:

Pinging 20.0.0.9 with 32 bytes of data
Packets : Sent = 4, Recieved = 4, Lost = 0 (0% Loss

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:

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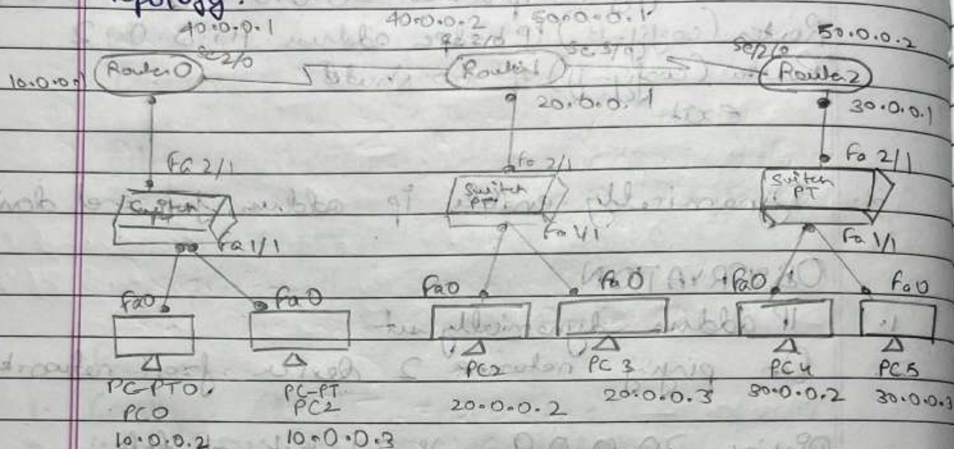
Topology:



PROCEDURE:

1) Setup the devices as shown above
2) Configure PC's & router by assigning the IP addresses and the connection of one network to another.
3) For routing by RIP
   Go to Router 0
   CLI → Router (config)# mode
   and follow the below commands
   Router (config)# router rip
   Router (config-router)# network 10.0.0.0
   Router (config-router)# network 40.0.0.0
4) When show ip route is given as the next command there is a new routing connection 'R'

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5) Repeat the same Command for the other two routers but the network address is 40.0.0.0, 20.0.0.0 and 50.0.0.0 for Router 1 and 50.0.0.0 and 30.0.0.0 for Router 2

6) This completes the routing in the topology

7) Ping a message from PC0 (10.0.0.2) to PC4 (30.0.0.2)

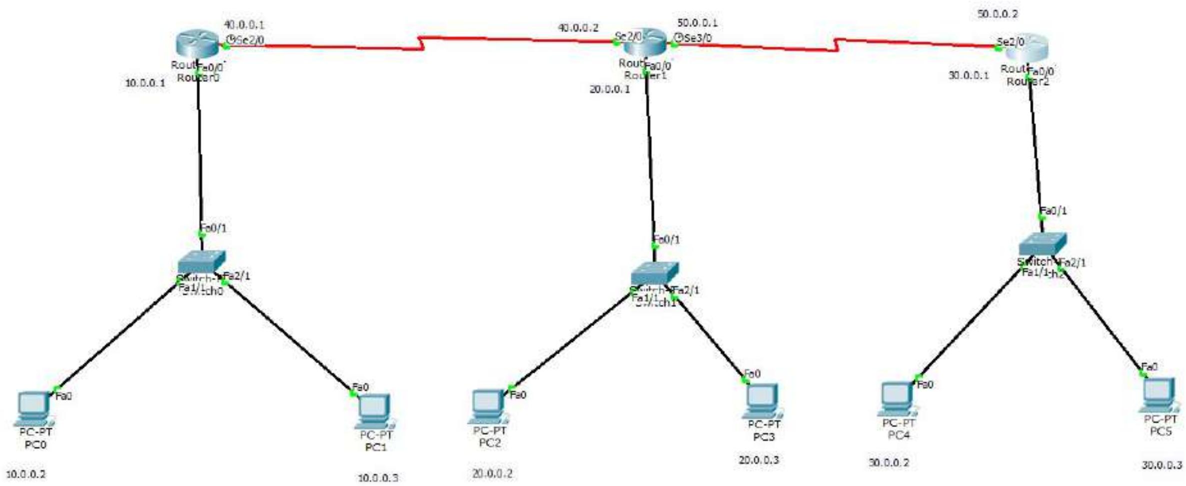
Output:
Show ip route
C 10.0.0.0/8 is directly connected. Fastethernet 0/0
R 20.0.0.0/8 [120/1] via 40.0.0.2, 00:00:11, serial 2/0
R 30.0.0.0/8 [120/2] via 40.0.0.2, 00:00:11, serial 2/0
C 40.0.0.0/8 is directly connected, serial 2/0
R 50.0.0.0/8 via 40.0.0.2, 00:00:11, serial 2/0

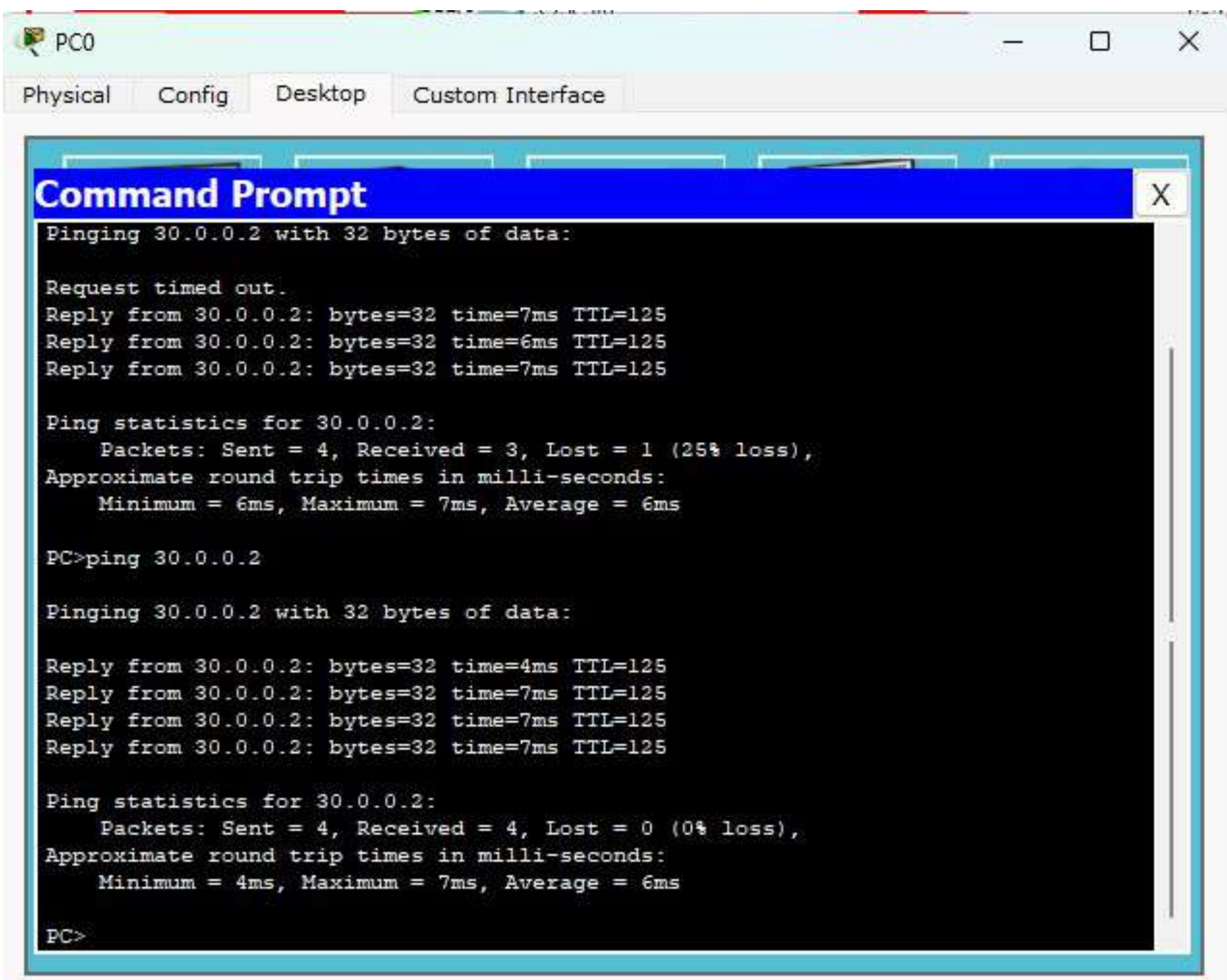
ping 30.0.0.2
ping 30.0.0.2 with 32 bytes of data

Reply from 30.0.0.2 bytes = 32 time = 10ms TTL=125
Reply from 30.0.0.2 bytes = 32 time = 2ms TTL=125
Reply from 30.0.0.2 bytes = 32 time = 12ms TTL=125
Reply from 30.0.0.2 bytes = 32 time = 2ms TTL=125

ping statistics for 30.0.0.2
Packets: sent = 4, Received = 4, Lost = 0 (0% loss)

Screen Shots:





Program 7

Aim: Demonstrate the TTL/ Life of a Packet .

Topology , Procedure and Observation:

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Aim: Demonstrate TTL/life of packet.

Procedure:

1) Go to simulation mode
2) Send a packet from 1 pc to another
3) Observe the TTL in the inbound details while the packet is getting transformed

Observation

When the packet passes Router 0
inbound PDU details
TTL = 255 ms
Outbound PDU details
TTL = 254 ms

With R1
Inbound = 254 ms
Outbound = 253 ms

R2
Inbound = 253 ms
Outbound = 252 ms

Hence, we can ~~observe~~ see TTL decreases as it passes through each of router

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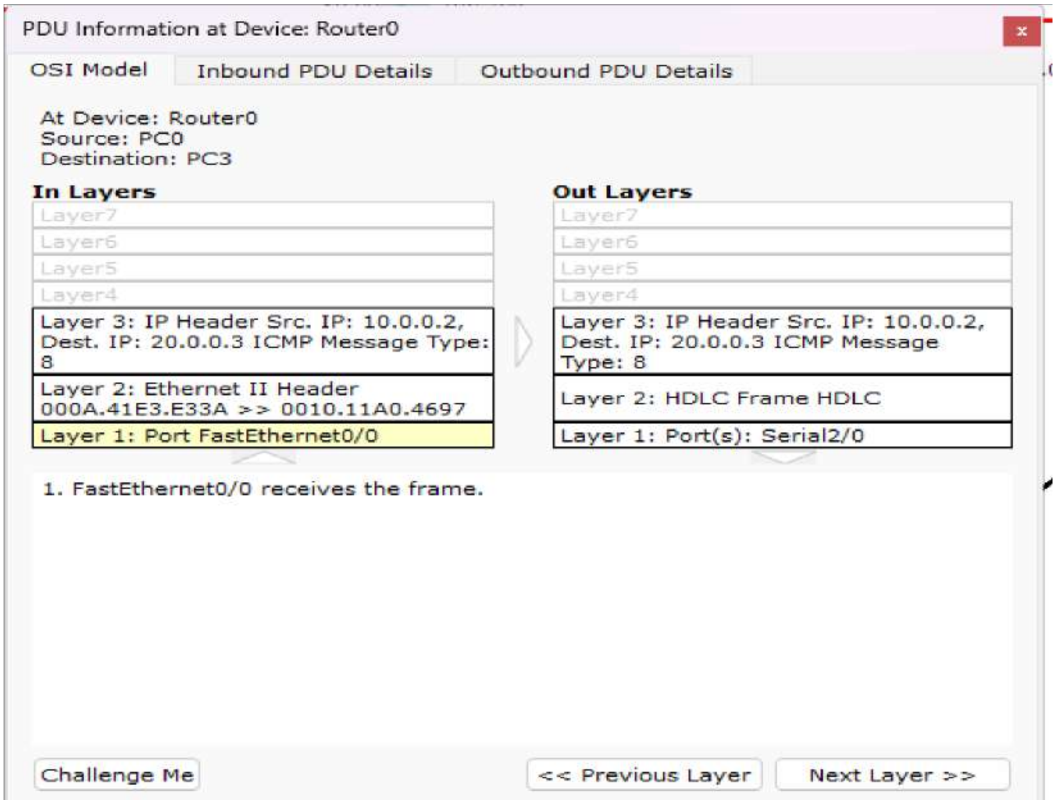
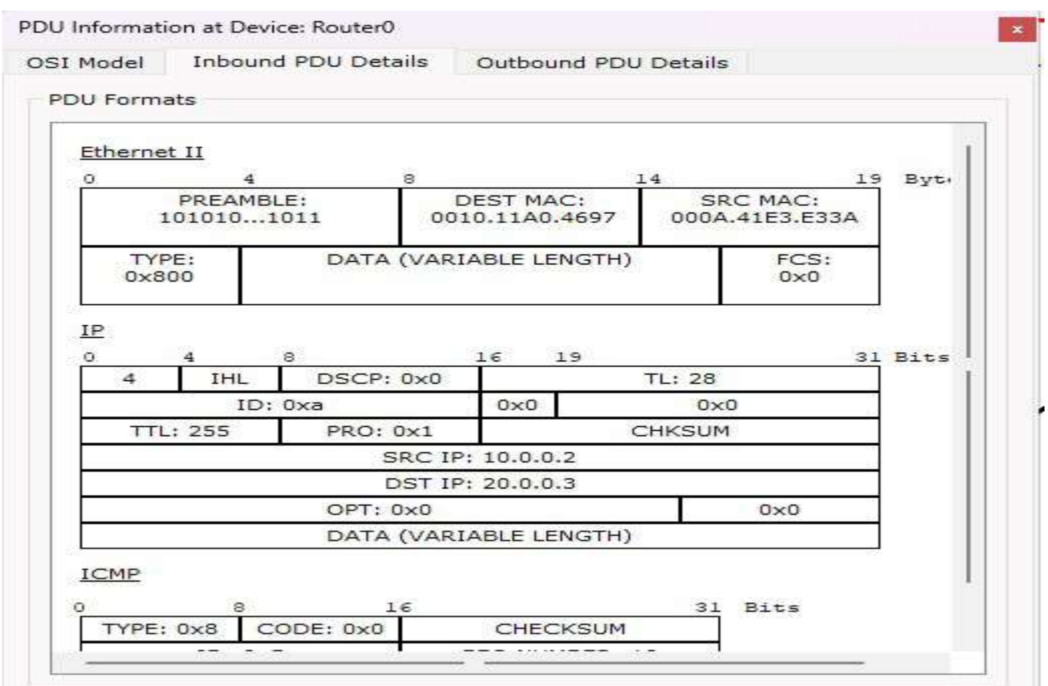
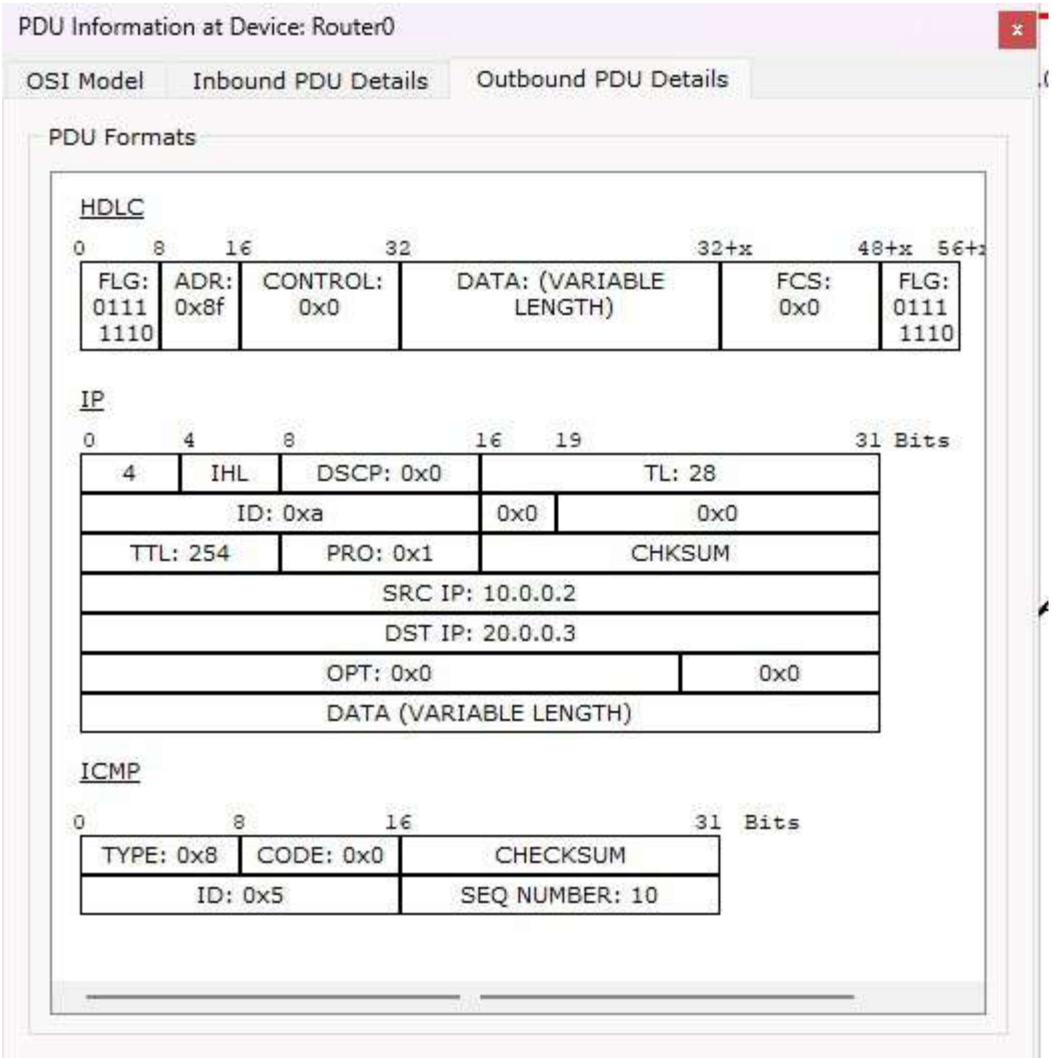
Screen Shots:






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:

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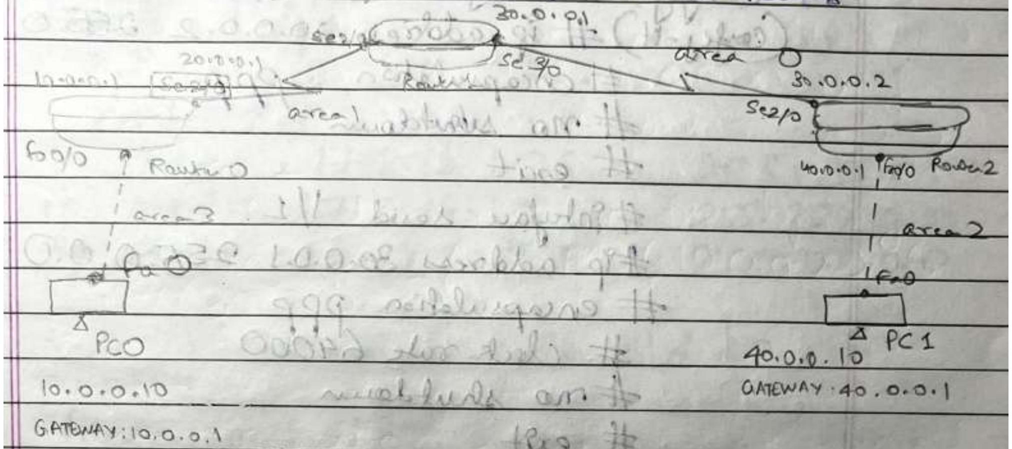
Aim- Configure OSPF routing protocol in routers



Topology - 2 pcs are connected to respective routers with 10.0.0.10 & 40.0.0.10 and each router is connected to each

Procedure -

Router0

R (config) # interface fastethernet 0/0
(config-if) # ip address 10.0.0.1 255.0.0.0
no shutdown
exit
interface serial 1/0
ip address 20.0.0.1 255.0.0.0
encapsulation ppp
clock rate 64000
no shutdown
exit

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2\. In Router R1
R1 (config)# interface serial 1/0
(config-if) # ip address 20.0.0.2 255.0.0.0
\# encapsulation PPP
\# no shutdown
\# exit
\# interface serial 1/1
\# ip address 30.0.0.1 255.0.0.0
\# encapsulation PPP
\# clock rate 64000
\# no shutdown
\# exit

3\. In Router R2
(config)# interface serial 1/0
(config-if)# ip address 30.0.0.2 255.0.0.0
\# encapsulation PPP
\# no shutdown
\# exit
\# interface fastethernet 2/0
\# ip address 40.0.0.1 255.0.0.0
\# no shutdown
\# exit

• In Router R0
10.0.0.8 is directly connected fastethernet 0/0
20.0.0.18 is directly connected serial 2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2
00:04:23 serial 2/0
O IA 30.0./8 [110/128] via 20.0.0.2
00:07:29. serial 2/0
Similarly for R2 & R3

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Configure Loopback
Interface Loopback 0
ip add - 255.255.0.0
exit

: ip add 172.16.1.252 255.255.0.0

2 ip add 172.16.1.253 255.255.0.0

3 ip add 172.16.1.254 258.255.0.0

Create a virtual link b/w R1 & R2

In R1 Router ospf 1
area 1 virtual-link 2.2.2.2

n R2 router ospf 2
area 1 virtual-link 1.1.1.1
exit

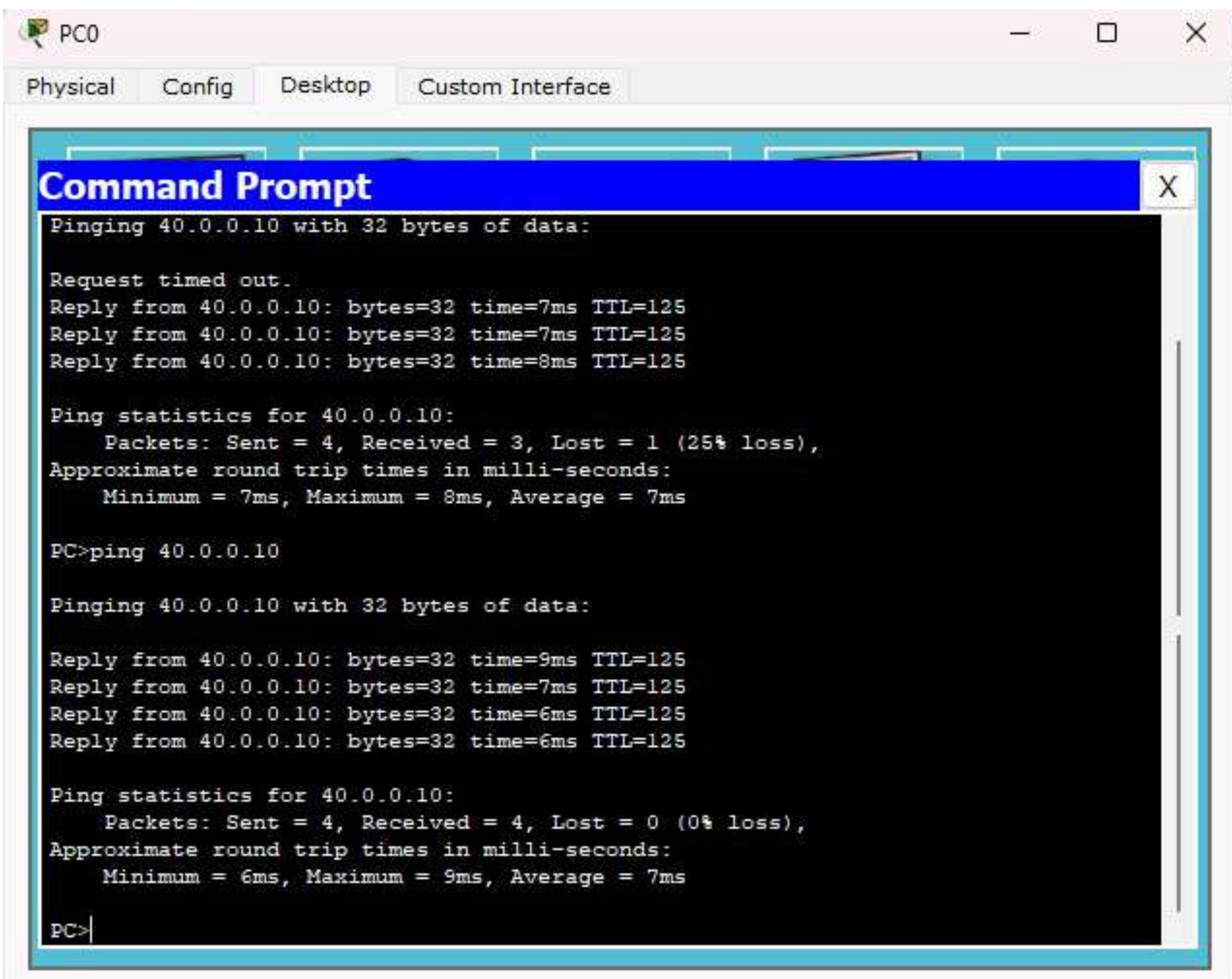
ing ping 40.0.0.10

Reply from 40.0.0.10 : bytes = 32 time = 7ms
TTL = 125

ping statistics for 40.0.0.10

Packet : Sent = 4, Received = 4, Lost = 0
min = 6ms, max = 9ms avg = 7ms

Screen Shots:



Program 9
Aim: Configure Web Server, DNS within a LAN.

Topology , Procedure and Observation:

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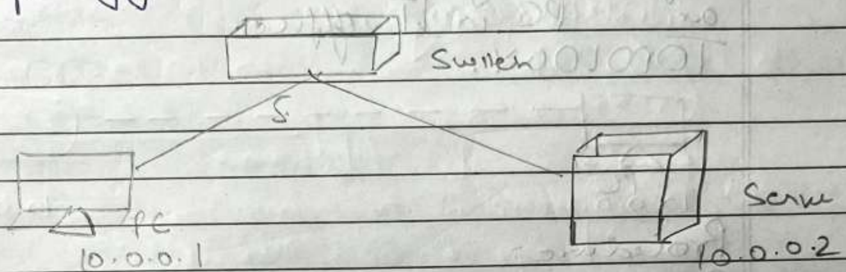
Lab-11
DNS

Aim: Configure Web server, DNS within a LAN

Topology -



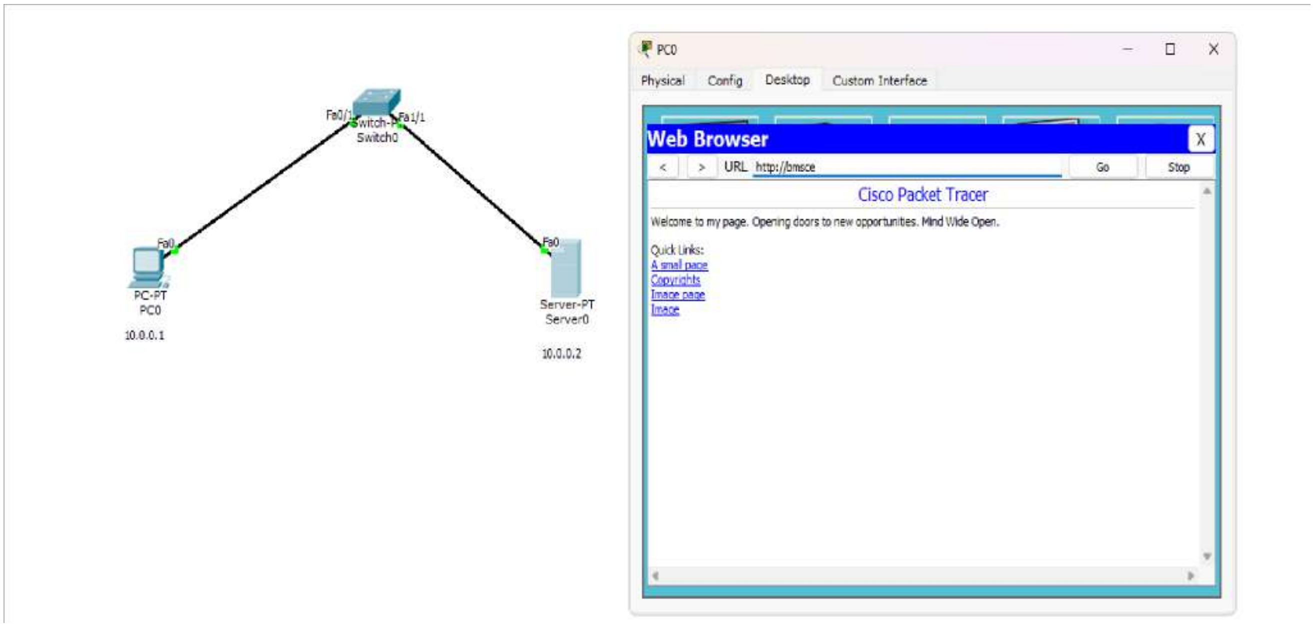
Procedure:

1) Set up the LAN as per topology mentioned above & configure the devices
2) Go to server → Service → DNS
Name: bmsce [Domain name]
Address: 10.0.0.2
Add the mapping of domain name to address
3) Go to pc → config → Global → Setting →
DNS service: 10.0.0.2
[the Server that provides the DNS mapping]
4) Go to PC → Desktop → Web Browser
Type the URL: http://bmsce

Observation:

1) The webpages hosted by the server were visible on the browser.
2) The DNS was successful in mapping domain name to IPaddr
3) DNS server is a server that contains a Domain name: IP mapping to which the end devices send requests to map the name to IPaddress.

Screen Shots:



Program 10

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

Topology , Procedure and Observation:

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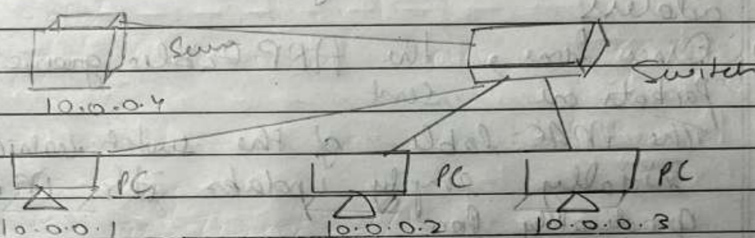
Lab- 10

ARP

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

TOPOLOGY :



Procedure :

1) Create the topology as shown above
2) Configure the PCs and the server.
3) Click on Inspect mode (Q), then click on the end device and open the ARP tables.
4) Send a data packet from any end device say server to other end device say 10.0.0.3 PC.
5) Open simulation mode to capture each step of data transfer.

Observations:

1) The ARP tables of all end devices are initially empty.
2) When the data packet from server arrives at the switch, since the source MAC address is unknown, it sends a broadcast message to all devices.

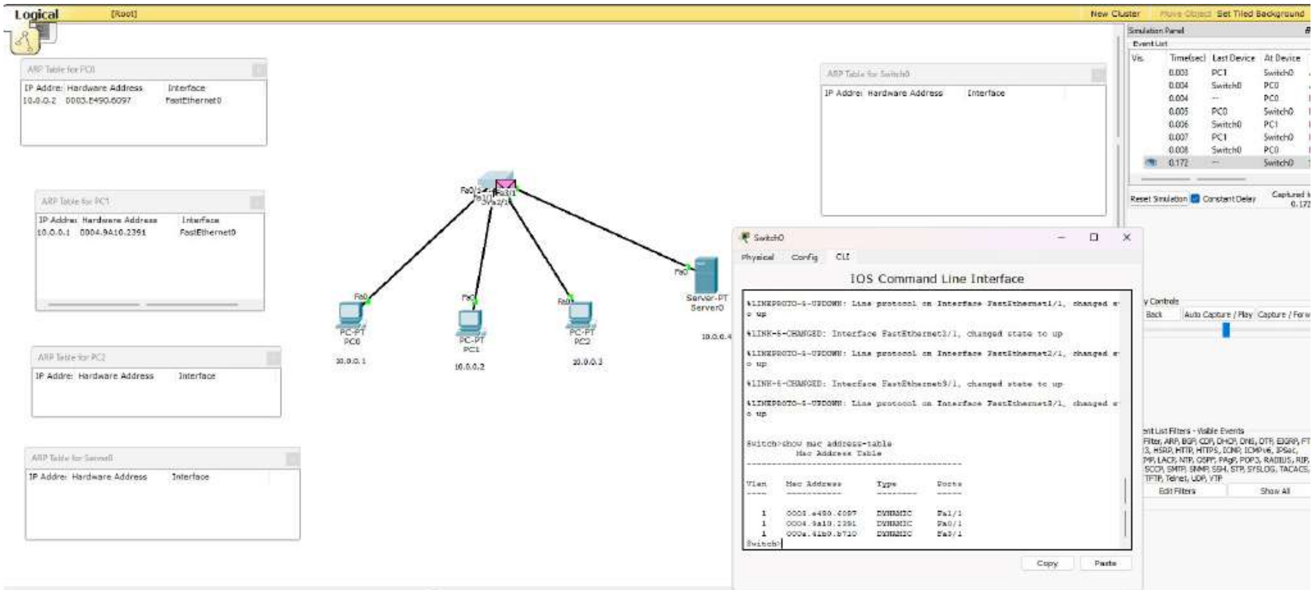
3) The device with the IP address present in the destination address of the data packet responds to the message.
4) The server and the PC update their ARP tables matching IP addresses to MAC address
5) Over time, the ARP tables grow as data packets are sent.
6) The MAC table of the switch which was initially empty updates it's MAC tables gradually too.

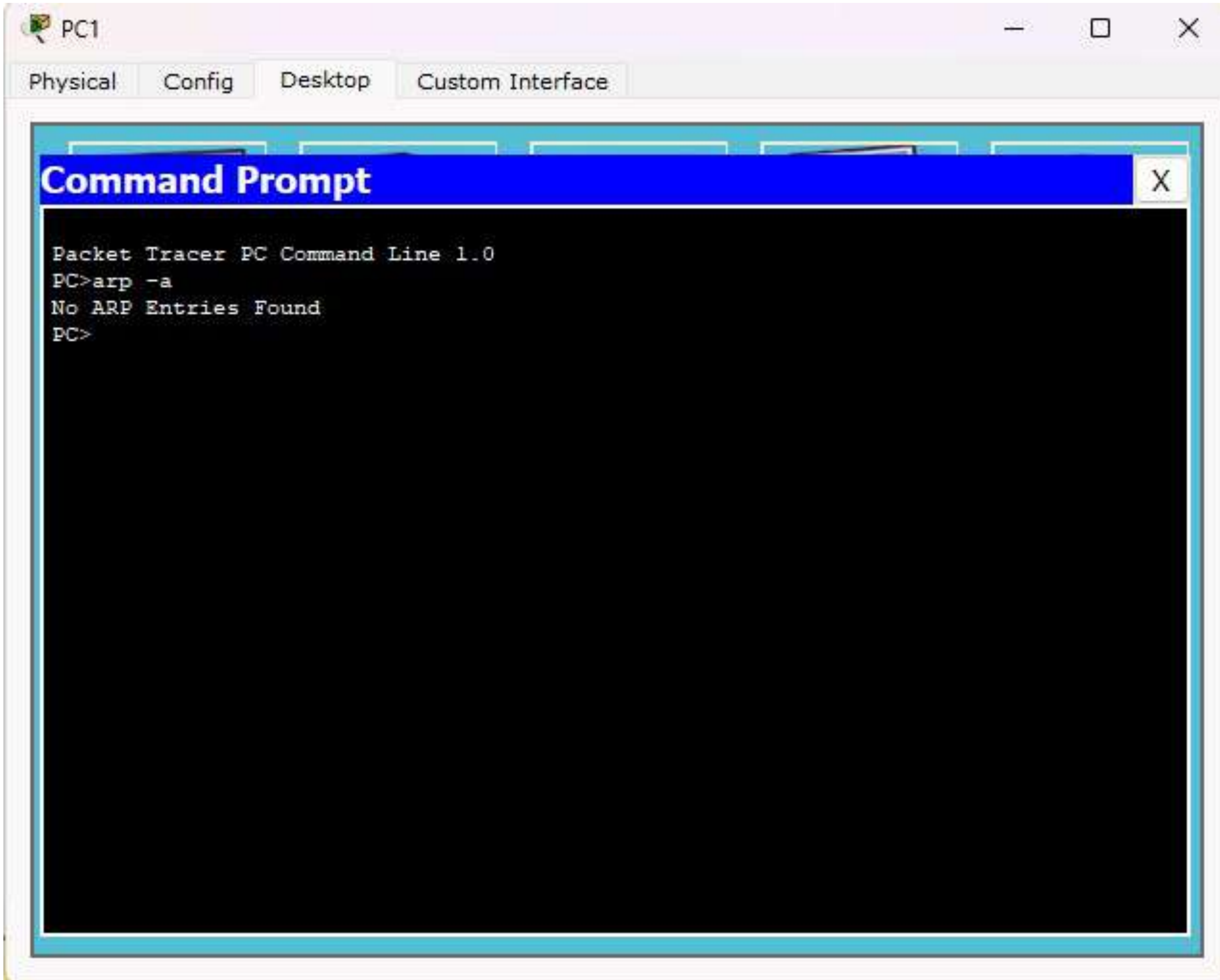
ARP table for 10.0.0.4: [X]

IP address	Hardware Address	Interface
10.0.0.3	0001.C726.47ES	Fastethernet 0

7) Similarly other ARP tables are updated

Screen Shots:

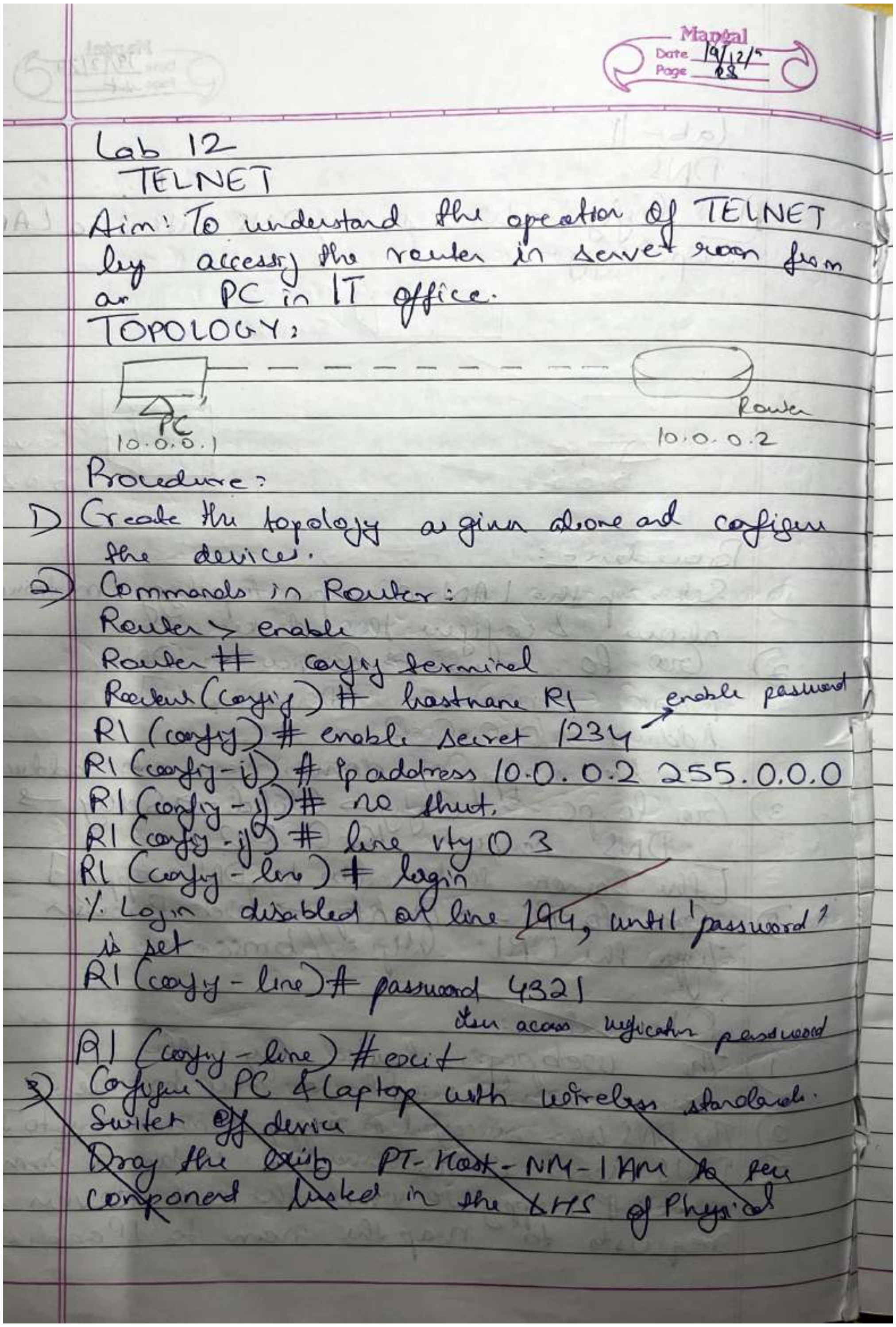



PC1
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
PC>arp -a
No ARP Entries Found
PC>

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:



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Lab 12
TELNET
Aim: To understand the operation of TELNET by accessing the router in server room from an PC in IT office.
TOPOLOGY:

Procedure:
1) Create the topology as given above and configure the devices.
2) Commands in Router:
Router> enable
Router# config terminal
Router(config)# hostname R1
R1 (config)# enable secret 1234 ← enable password
R1 (config-if)# ip address 10.0.0.2 255.0.0.0
R1 (config-if)# no shut.
R1 (config-if)# line vty 0 3
R1 (config-line)# login
% Login disabled on line 194, until 'password' is set
R1 (config-line)# password 4321
then access verification password
R1 (config-line)# exit
~~3) Configure PC & laptop with wireless standards. Switch off device. Drag the existing PT-Host-NM-1AM to the component listed in the LHS of Physical~~

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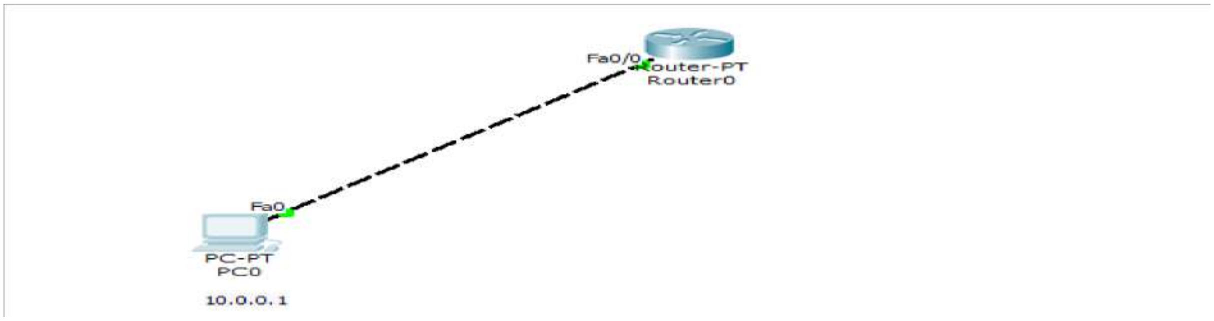
R1 (config) # exit
R1 # wr
Building configuration ...!
[OK]
Note: vty 03: first form vertical terminal lines for telnet access.
3) In PC: command prompt
- first try ping to see if devices are connected
PC > telnet 10.0.0.2
Trying 10.0.0.2 ... Open
User access Verification
Password: 4321
Password: 4321
R1 > enable
Password: 1234
R1 # show ip route
C 10.0.0.0/8 is directly connected, fast ethernet 0/0

R1 #
~~Observations~~:
1) The admin in PC is able to run commands as run in router CLI and see the results from PC.
2) Telnet allows users to establish a remote session with another device like router, over a TCP/IP network.
3) Using Telnet, we can access and control the remote device's CLI as if you were physically connected to it.

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:

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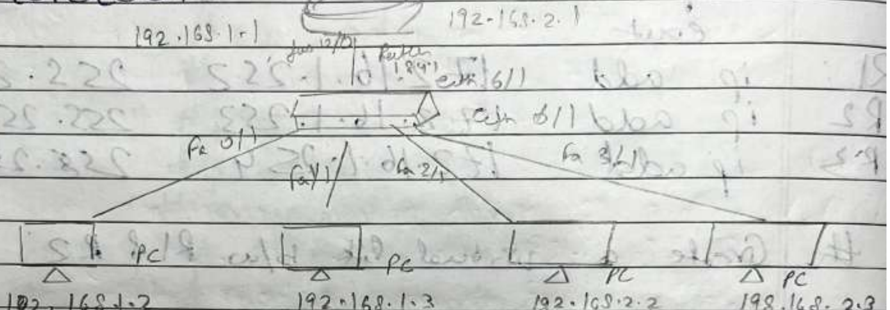
Lab-9

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

TOPOLOGY:



PROCEDURE:

1) Place a 1841 router, a switch and 4 PCs
2) Connect the 4 PCs to the switch via fastethernet.
3) Since only 4 fastethernet ports are available on the switch, we have to add an ethernet port.
4) Switch of the power button of switch
Add the ethernet port to the switch
Switch on the power button
Connect the router to the switch via ethernet 6/1
5) In the switch, go to config tab and select VLAN database
Give VLAN number say 2
Give VLAN name say 'cse1se'
Add it to the database

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) Select the switch
Go to config
Go to ethernet 6/1 @ ie connected to router
Make it the trunk

) Configure the PCs as shown in topology

3) Select switch:
Go to config
Go to fastethernet 2/1
Set VLAN number as 2 i.e 'cseise'
Similarly set VLAN 2 for fastethernet 3/1 interface.

9) Configure the Router
Router (config) # interface fastethernet 0/0
Router (config-if) # ip address 192.168.1.1
255.255.255.0
Router (config-if)# no shut
Router (config-if) # exit
Now to configure the router's VLAN interface
Router (config)# interface fastethernet 0/0.1
Router (config-subif)# encapsulation dot 1q 2
Router (config-subif)# ip address 192.168.2.1
255.255.255.0
Router (config-subif) # no shut
Router (config-subif) # exit

0) Ping devices within the same VLAN and to devices of different VLAN

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OBSERVATIONS:

1.] When devices are pinged within same VLAN:
- Pinging 192.168.1.3 from 192.168.1.2
- The data packet doesnt go to the router.
- The switch forwards the packet without the need of the Router.

2.] When a device pings a device of another VLAN
- Pinging 192.168.2.3 from 192.168.1.2
- The data packet's journey is as follow:

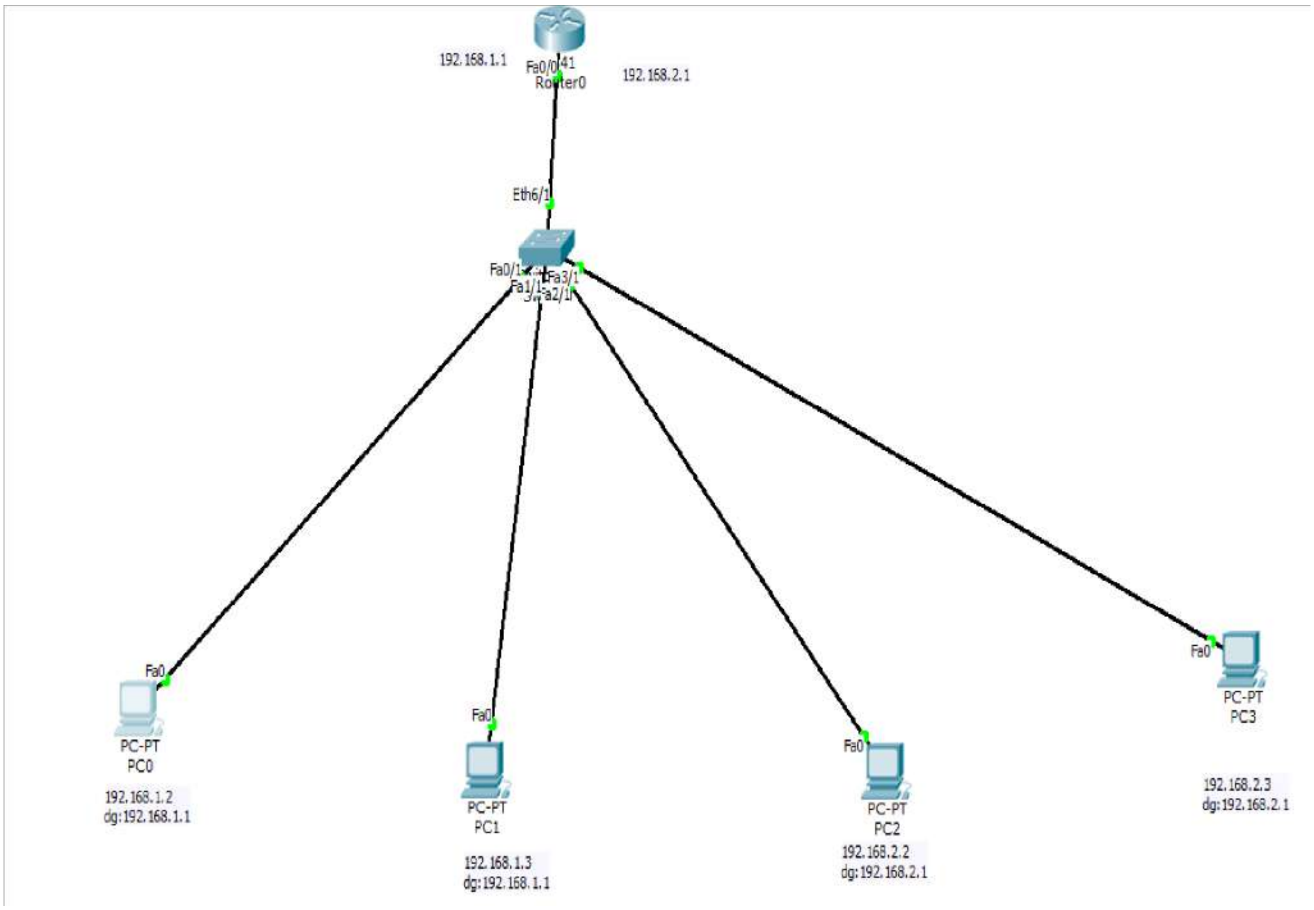
192.168.1.2 ⟶ Switch ⟶ Router
↓
192.168.2.3 ⟵ Switch

3.) VLANs divide a single switch into multiple logical switches
Devices in one VLAN cannot directly communicate with devices in another VLAN without a router

4) Traffic Isolation:
Each VLAN maintains its own broadcast domain
Broadcasts sent by devices in one VLAN do not reach devices in another VLAN

5) VLAN trunking allows switches to forward frames from different VLANs over a single link called trunk.
This is done by adding an additional header information called tag to the ethernet frame - VLAN tagging

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:

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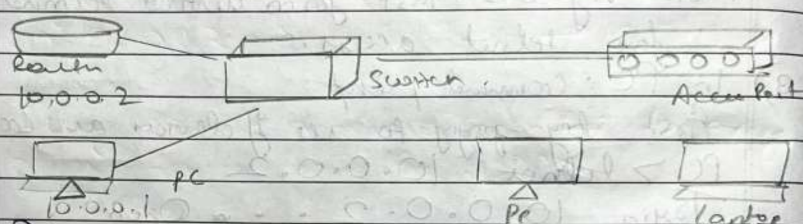
Lab -13

WLAN

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

INITIAL TOPOLOGY -



Procedure:

1) Create the topology as given above and configure the devices.
2) Configure Access point:
   Click accesspoint → Config → Port 1:
   SSID : bmsce
   Select ◉ WEP
   Set Key: 1234567890
3) Configure PC & Laptop with wireless standards.
   - Switch off device
   - Drag the existing PT-HOST-NM-1AM to the component listed in the LHS of Physical
   - Drag WMP300N wireless interface to the empty ~~slot~~ port.
   - Switch on the device.
4) In the config tab, a new wireless interface was added
5) Configure the device by entering SSID, WEP, WEP Key, IP address and Gateway

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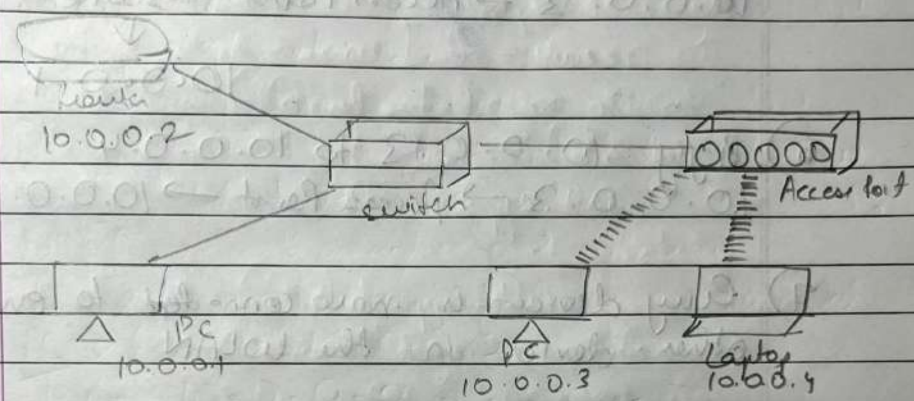
Topology after Wireless Configuration:



6) Ping from every device to every other device to check for connection

Observations:

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

2) Access Point:
Creates bridge between wired & wireless devices
SSID broadcasting: announces the wireless network's name (SSID) to allow devices to connect using WEP, WPA or WPA2.

3) WMP300N wireless interface:
Wireless network adapter that enables devices to communicate with access point using wireless signals

4) Pinging: 10.0.0.1 to 10.0.0.3:

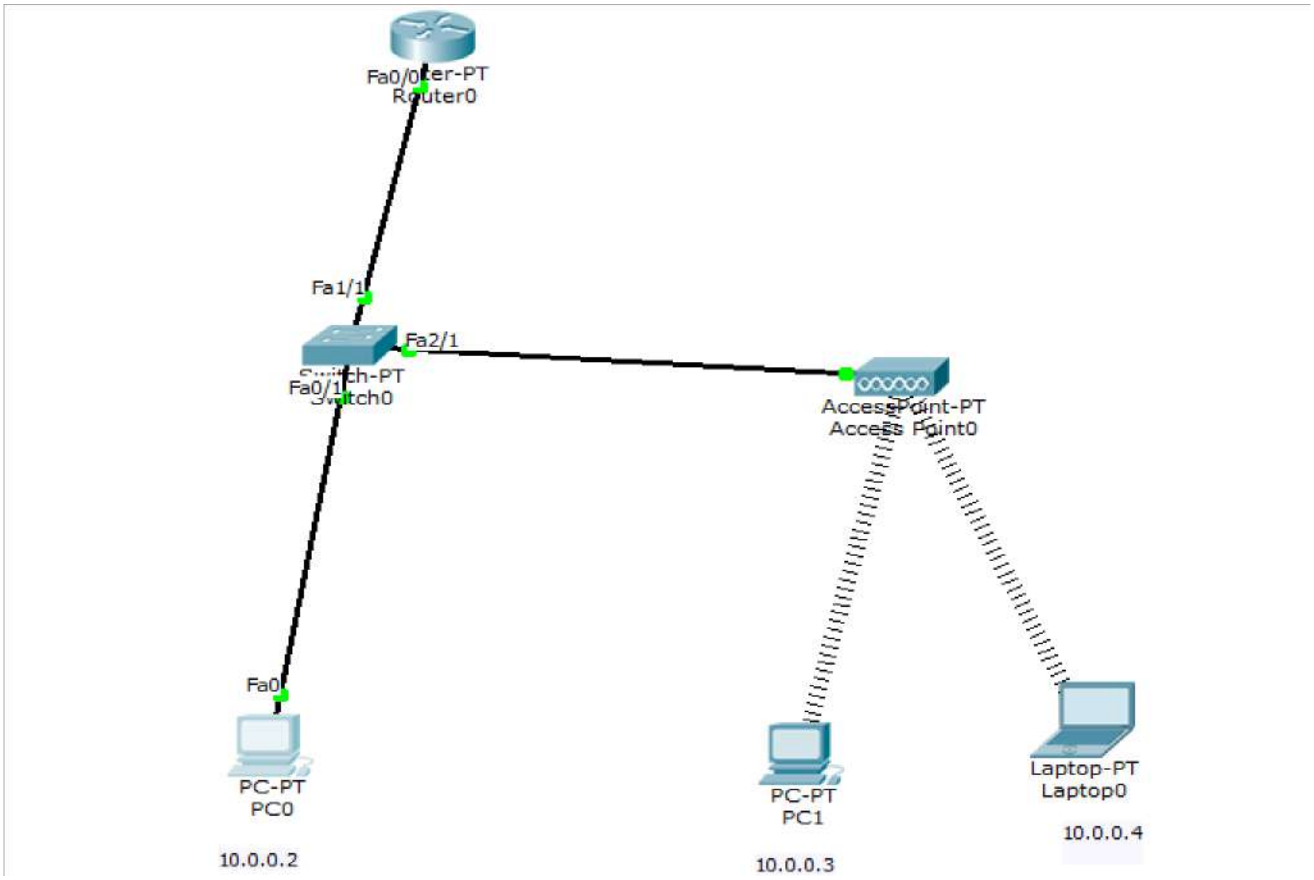
10.0.0.1 → Switch → Access Point → 10.0.0.3
This is after the ARP tables are updated after broadcasting

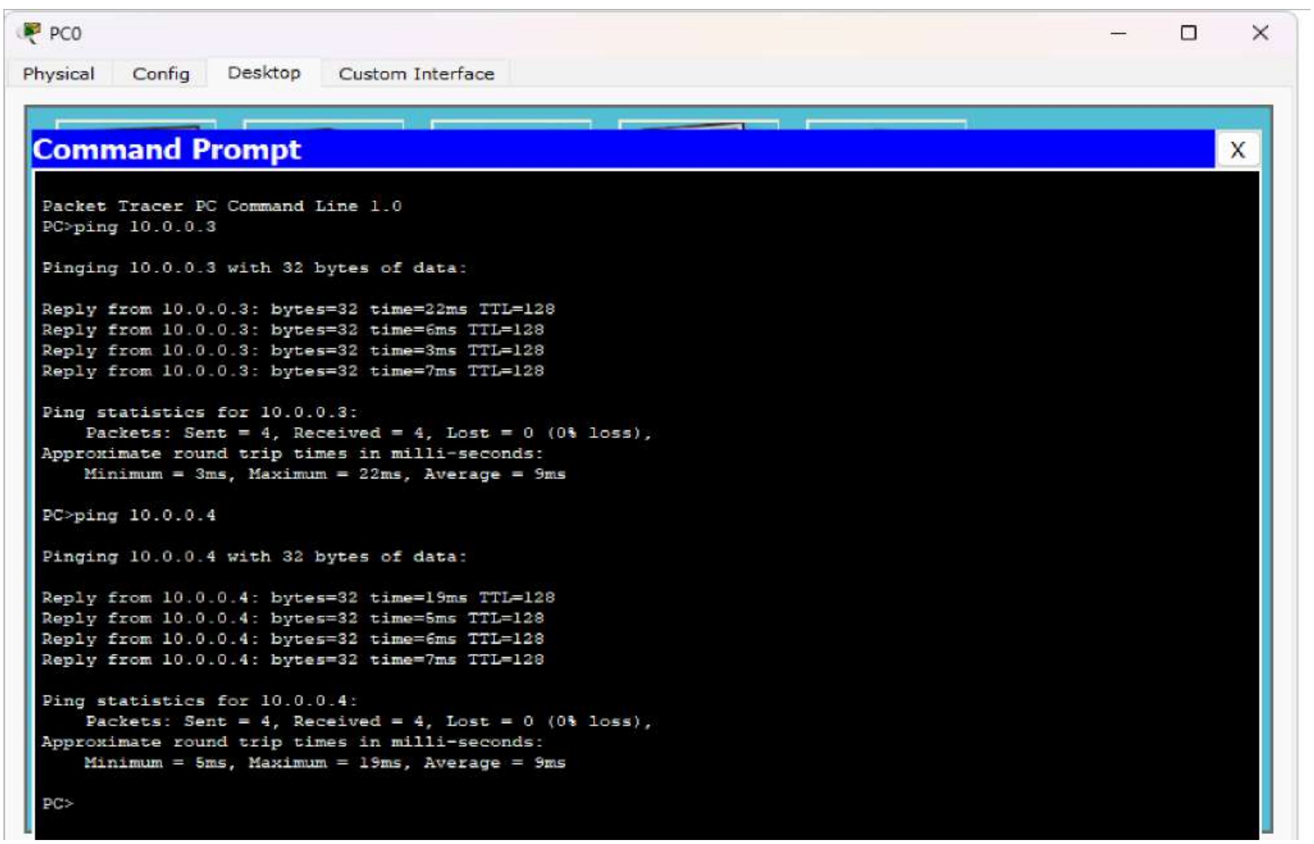
5) Pinging : 10.0.0.3 to 10.0.0.1
10.0.0.3 → Access Point → Switch → 10.0.0.1

6) Piging : 10.0.0.3 to 10.0.0.4
10.0.0.3 → Access Point → 10.0.0.4

7) Every device is now connected to every other device in the WLAN

Screen Shots:





PART-B

Program 14

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

Code :

```
3) CRC

def crc (data, gp)
    paddeddata = data + '0' * (len(gp) - 1)
    checkvalue = paddeddata [: len (gp)]

    for _ in range (len(data)):
        if checkvalue [0] == '1':
            checkvalue = xor (checkvalue, gp)
        checkvalue = checkvalue[1:] + (paddeddata[len(gp) + _]
                     if len(gp) + _ < len (paddeddata) else '0')

    return checkvalue[1:]


def xor(a,b):
    return ''.join('0' if x==y else '1' for x, y in zip (a,b))


def main():
    data = input("Enter data:")
    genpoly = input(" enter generator poly:")
    crc_value = crc (data, genpoly)
    print(crc (data, genpoly), : crc )
    transmitteddata = data + crc_value
    print ("Transmitted data:" transmitteddata)
    receiveddata = input ("Enter received data:")
    remainder = crc (receiveddata, genpoly)
    print ("No error" if remainder=='0'* (len(genpoly)-1) else "Error detected")
```

```
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 :

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Lab

Leaky Bucket

```
Storage = 0
no_of_queries = 4
bucket_size = 10
input_pkt_size = 4

Output_pkt_size = 1
for i in range (0, no_of_queries):
    size_left = bucket_size - storage
    if input_pkt_size <= size_left:
        Storage += input_pkt_size
    else:
    print ("Packet loss =", input_pkt_size)
    print (f"Buffer size = {storage} out of bucket
              size = {bucket_size}")
    storage = output_pkt_size
```

~~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

```
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:

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* Using TCP/IP sockets, write a client server program to make client sending the file name and server to send back content of requested file if present.

Solution:

Client.py:

```
from socket = import*
serverName = "127.0.0.1"
serverPort = 12000
Client Socket = socket (AF_INET, SOCK_STREAM)
client Socket. connect= ((serverName. serverPort))
sentence = input ("Enter file name")
clientsocket. send (sentence. encode ( ) )
file contents= client Socket. recv (1024). decode()
print ('from server:' , file contents)
Client Socket. close ( )
```

Server.py:

```
from socket import *
serverName = "127.0.0.1"
serverPort = 12000
serverSocket = socket (AF_INET, SOCK_STREAM)
serversocket.bind ((serverName, server Port))
server Socket. listen (1)
print ("The server is ready to recieve")
while 1:
  connection Socket , addr = serverSocket. accept()
  sentence = Connection.socket. recv (1024). decode
```

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```
file = open( sentence, "r" )
l = file.read (1024)
connectionSocket.send(l.encode())
file.close()
ConnectionSocket.close()
```

Output:

Server

The server is ready to receive

Client

Enter File Name: hello.txt
From server: hello world

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:

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* Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the content of the requested file if present

Client UDP.py

```
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()
```

Server UDP.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.recvfrom(2048)
    file = open(sentence, "r")
    l = file.read(2048)
```

```
Servursocket.sendto(bytes(l, "Utf-8"), clientAddress)
print("Sent back to client", l)
file.close()
```

* Output

Server
The server is ready to receive
Sent back to client : hello world

Client
Enter file Name : hello.txt
From server : hello world

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WIRESHARK

Wireshark

It is a powerful used network protocol analyzer, It allows you to capture and inspect data packets travelling over a network in realtime, making it a crucial tool for studying computer networks, troubleshooting n/w issues and understanding protocols.

Features:

1. Packet capture: captures live n/w traffic from various interface (eg. WiFi)

2. Protocol analysis: supports 100's of protocols like TCP, UDP.

3. Filtering: isolate specific packets.

4. Visualization: display pkt detail with hierarchical layers

Use cases:

1. Network Troubleshooting:
   - Diagnosing slow network speed.
   - Identifying bottle necks or misconfiguration.

2. Security analysis:
   - detecting malicious traffic or intrusion.

3. Protocol Study:
   - understanding pkt structures & communication flow.

Common Filters:

- http: show only HTTP traffic
- tcp. port == 80 : show traffic on TCP port 80
- ip. addr == 192.168.1.1 : show pkt to or from a single specific IP address.
- UDP : show only UDP traffic.