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LAB REPORT on COMPUTER NETWORKS LAB

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
(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 NETWORKS LAB” carried out by **DHRUVA S (1BM21CS057)**, who is bonafide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2023. The Lab report has been approved as it satisfies the academic requirements in respect of a **COMPUTER NETWORKS - (22CS4PCCON)** work prescribed for the said degree.

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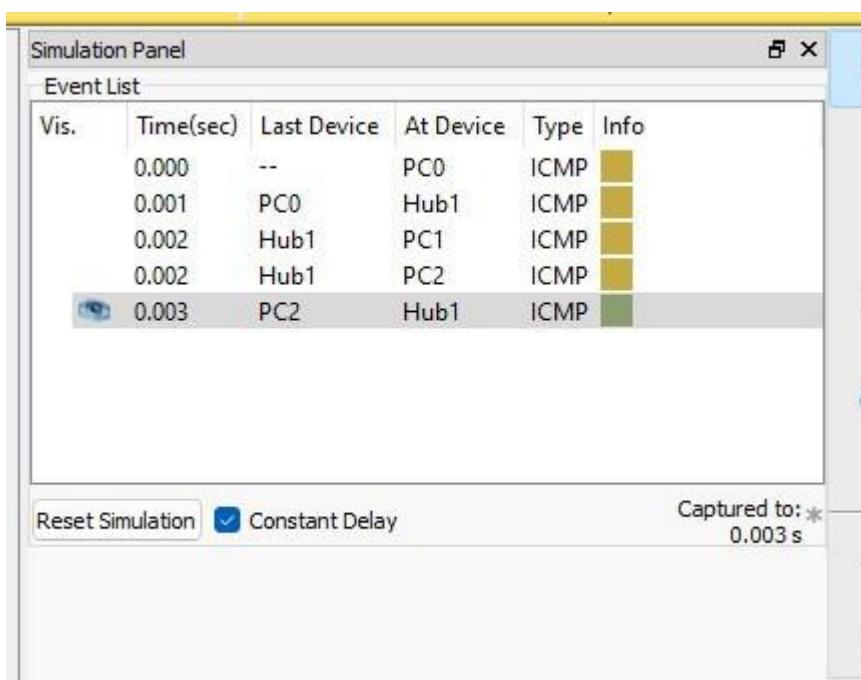
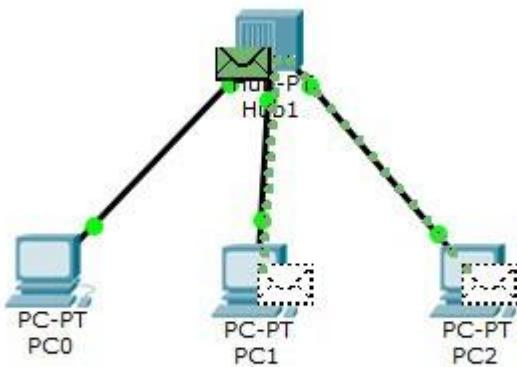
Cycle - 1

Experiment 1

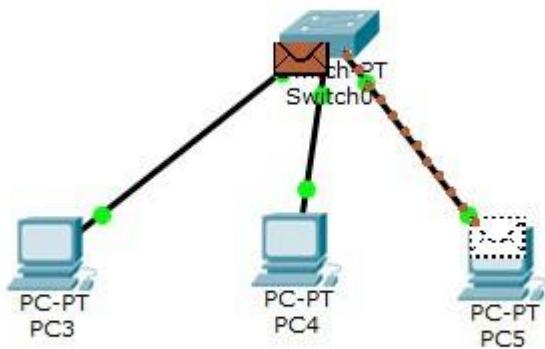
Aim: Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate the ping message.

Topology:

Topology with Hub as connecting Device:



Topology with Switch as connecting Device:

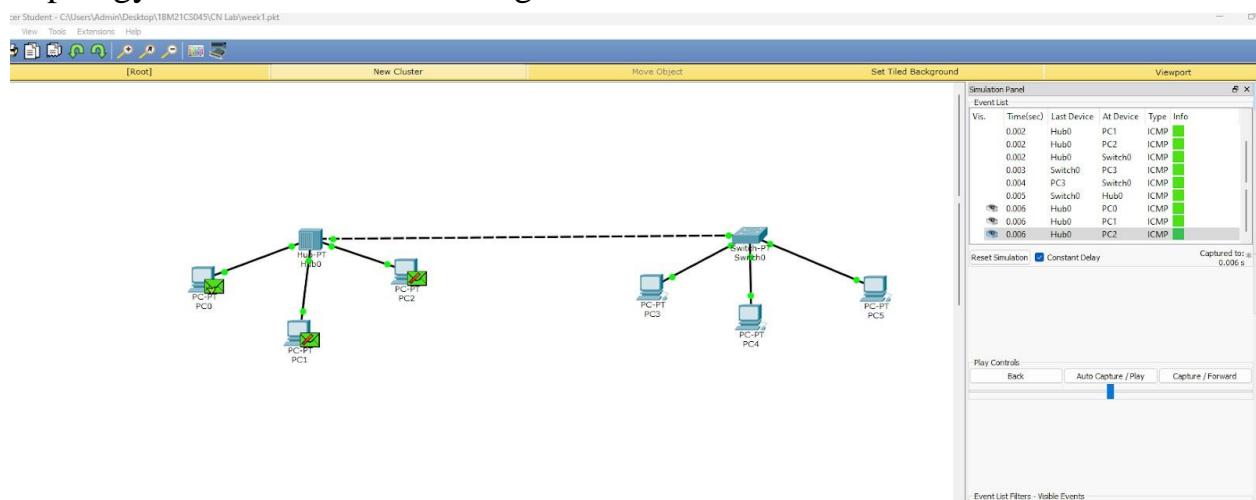


Simulation Panel:

Event List					
Vis.	Time(sec)	Last Device	At Device	Type	Info
	0.000	--	PC3	ICMP	
	0.001	PC3	Switch0	ICMP	
	0.002	Switch0	PC5	ICMP	
	0.003	PC5	Switch0	ICMP	
	0.004	Switch0	PC3	ICMP	
	11.413	--	Switch0	DTP	

Reset Simulation Constant Delay Capturing... *

Topology with Switch and Hub together:



Observation:

Q1 Create a ~~top~~ topology of stimulate sending a simple PDV from source to destination using a simple hub of switch as connecting domains.

classmate

Date _____

Page _____

Hub : Physical layer

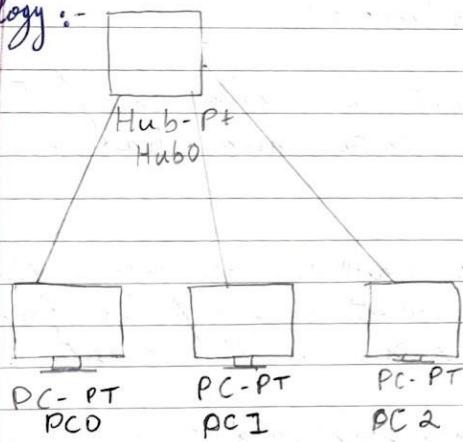
Switch : Data link layer

Hub : unicast - half duplex

Switch : Broadcast - Full duplex

Aim: To create topology & stimulate sending packets (simple PDV) from source to destination using hub.

Topology :-



Hub - PT connected with 3 PCs.

Procedure:

Step 1: Select The network is started by selecting end devices as 3 PC - PTs , i.e generic PC.

Step 2: Select Generic Hub, Hub - PT and place all of them in the workspace.

Step 3: Now, connect ~~as~~ the 3 PCs to the hub using Copper - Straight Through cable. PC0 - Port 0, PC1 - Port 1, PC2 - Port 2.

Step 4: Open the config ^{window} tab of all PCs and set the open FastEthernet0.

Set the IP Address of all the 3 PCs.

b. For ex: 10.0.0.1, 10.0.0.2, 10.0.0.3
respectively.

Step 5: Click on DNS server.

Step 6: Add a simple PDV from PC0 to PC2.

Step 7: In Simulation mode click on Auto Capture, Capture / Play.

Observation : PC0

- PC0 sends 0 packet to Hub0.
- Hub1 sends the packet to both PC1 and PC2
- PC2 accepts the packet and sends acknowledgement to Hub0. PC1 rejects it since it is not addressed to it.
- The acknowledgement packet from Hub0 is

sent to PC0 and PC1. PC0 accepts it and PC1 rejects it.

Ping Output :- 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 = 128

Reply from 10.0.0.2 : bytes = 32 time = 0ms TTL = 128

Reply from 10.0.0.2 : bytes = 32 time = 0ms TTL = 128

Reply from 10.0.0.2 : bytes = 32 time = 0ms TTL = 128

Ping statistics for 10.0.0.2:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 0ms, Average = 0ms

Switch - 3 PCs

Procedure:

Step 1: The network is started by selecting end devices as 3 PC-PTs, ie generic PC.

Step 2: Select Generic switch-PT and place these devices in the workspace.

Step 3: Now, connect the 3 PCs to the switch using copper straight through cable.

Wire PC3 - port 0, PC4 - port 1 in Switch;

PC3 - FastEthernet 0/1, PC4 - FastEthernet 1/1

PC5 - FastEthernet 2/1.

In PC - choose FastEthernet0 connection

Step 4 - Open config window of all PCs and in FastEthernet0, set IP addresses.

PC3 - 10.0.0.4, PC4 - 10.0.0.5

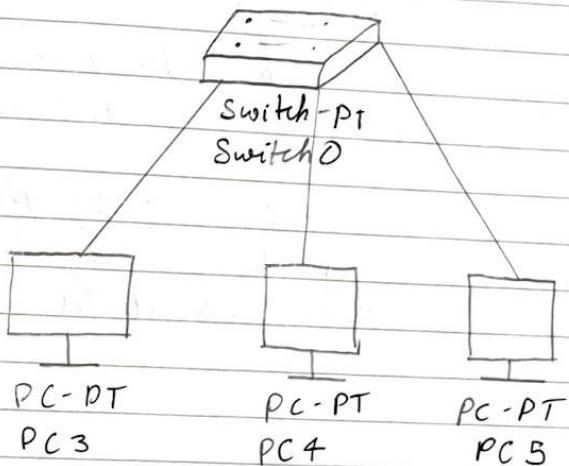
PC5 - 10.0.0.6

Then click on DNS server

Step 3 - Add a simple PDU from PC 3 to PCs.

Step 6: In Simulation mode click on Auto Capture / Play.

Topology.



Ping output in real time mode: In PC 3

PC > ping 10.0.0.6

Pinging 10.0.0.6 with 32 bytes of data :

Reply from 10.0.0.6 : bytes = 32 time = 0ms TTL = 128

Reply from 10.0.0.6 : bytes = 32 time = 0ms TTL = 128

Reply from 10.0.0.6 : bytes = 32 time = 0ms TTL = 128

Reply from 10.0.0.6 : bytes = 32 time = 0ms TTL = 128

Ping statistics for 10.0.0.6:

Repackets : SetSent = 4, Received = 4, Lost = 0 (0% loss),
 Approximate round trip times in milli-seconds:
 Minimum = 0ms, Maximum = 0ms, Average = 0ms.

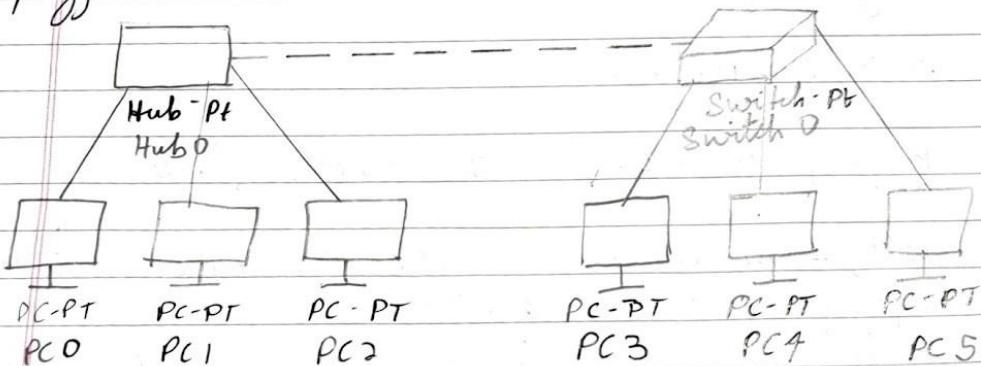
Observation

PC 3 to PC 5

- PC 3 sends a packet to Switch 0.
- Switch 0 sends the packets to all devices (PC 4, PC 5) first time.
- PC 5 accepts and sends acknowledgement.
- Switch sends it to all and PC 3 accepts.
- From next time Switch learns the devices if it sends packets only to correct source devices as it is smart device.

Aim: Connecting Hub and Switch.

Topology:



Procedure

Step 1: Previously obtained hub topology and switch topology are connected using Copper-cross over cable
Port 3-hub to FastEthernet 3/1.

Step 2: Add simple PDU from PC 0 to PC 3.

Ping output

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 = 3ms 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% lost),

Approximate round trip times in milli - seconds :

Minimum = 0ms, Maximum = 3ms, Average = 1ms

Observation : PC 0 to PC 3

→ PC 0 sends PC 0 to packet to Hub 0. #

→ Hub 0 sends the packets to all PC 1, PC 2 and Switch.

→ Switch sends the packets to all PC 3, PC 4, PC 5 at first instance.

→ PC 3 accepts the packet and it is sent

PC0 via Hub 0. But Hub 0 also sends it to PC1 and PC2 as well where it is rejected.

- On the second instance, PC0 sends packet again to Hub 1. It sends to all P1, PC2, PC3, PC4 and Switch. Switch sends to only PC3 as it has already learnt about the device and acknowledgement is sent via Hub 0. Hub 0 sends it to all, where PC0 accepts it and so on.

N.D
5/6/2023

Experiment 2

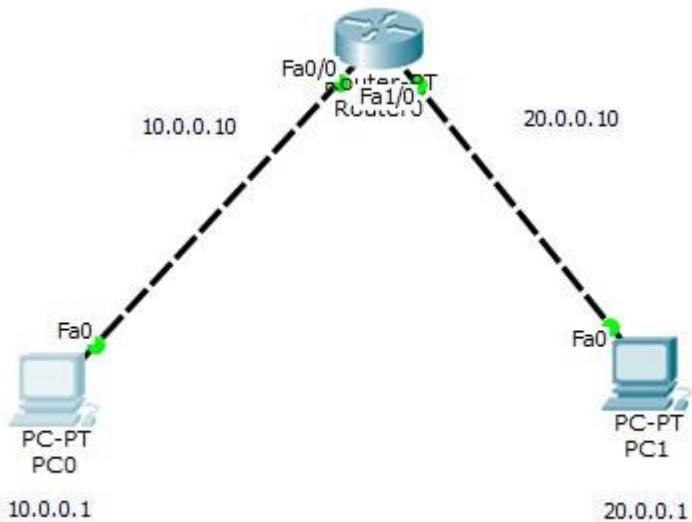
Aim: Configure IP address to routers in packet tracer.

Explore the following messages: ping responses, destination unreachable, request timed out, reply

2A:

Topology:

Topology with 1 router and 2 PCs:



Configuration of Router:

```
Continue with configuration dialog? [yes/no]: n

Press RETURN to get started!

Router>enable
Router#config t
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 shut

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
exit
Router(config)#interface fastethernet1/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

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
exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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, FastEthernet1/0
Router#
```

Ping Output:

```
Command Prompt X
PC>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=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 = 1ms, Average = 0ms

PC>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC>
```

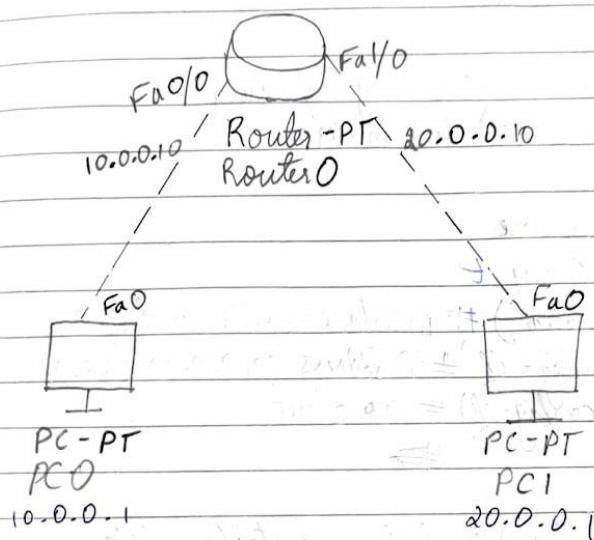
Observation:

22/6/23 Experiment 2.

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

2A) Aim:- Configure using 1 router and 2 PCs.

Topology :-



Procedure :-

- The network is started by selecting end devices PC0 and PC1 as generic PCs.
- Select Generic Router, Router-PT and place all of them in the workspace.
- Now, connect the PCs to the router using

Copper cross-over cable

PC0 → FastEthernet 0 to FastEthernet 0/0

PC1 → FastEthernet 0 to FastEthernet 1/0

→ Setup IP address of the end PC0 devices

PC0 and PC1, by clicking config → FastEthernet0
→ IP address

PC0 → 10.0.0.1

PC1 → 20.0.0.1

→ Configure router by opening Command Line Interface (CLI) in router 0.

Router > enable

Router # config t

Router(config) # interface fastethernet 0/0

Router(config-if) # ip address 10.0.0.10 255.0.0.0

Router(config-if) # no shutdown

#

exit

Router(config) # interface fastethernet 1/0

Router(config-if) # ip address 20.0.0.10 255.0.0.0

Router(config-if) no shutdown

exit

Router(config) # exit

show ip route

C 10.0.0.0/8 is directly connected, FastEthernet 0/0

C 20.0.0.0/8 is directly connected, FastEthernet 1/0

→ Setup the gateway for PC0 and PC1

PC0 : 10.0.0.10

PC1 : 20.0.0.10

Observation :-

→ Green lights appear on the wires when no shut commands are written which indicate that they are ready for data transmission.

Ping Output in PC0 :-

→ When PC1 is pinged for the first time, there is $\approx 5\%$ loss.

→ From next ping, there are no losses.

Ping output in PC0 :-

PC> ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Request timed out.

Reply from 20.0.0.1: bytes = 32 time = 0 ms TTL = 127

Reply from 20.0.0.1: bytes = 32 time = 0 ms TTL = 127

Reply from 20.0.0.1: bytes = 32 time = 0 ms TTL = 127

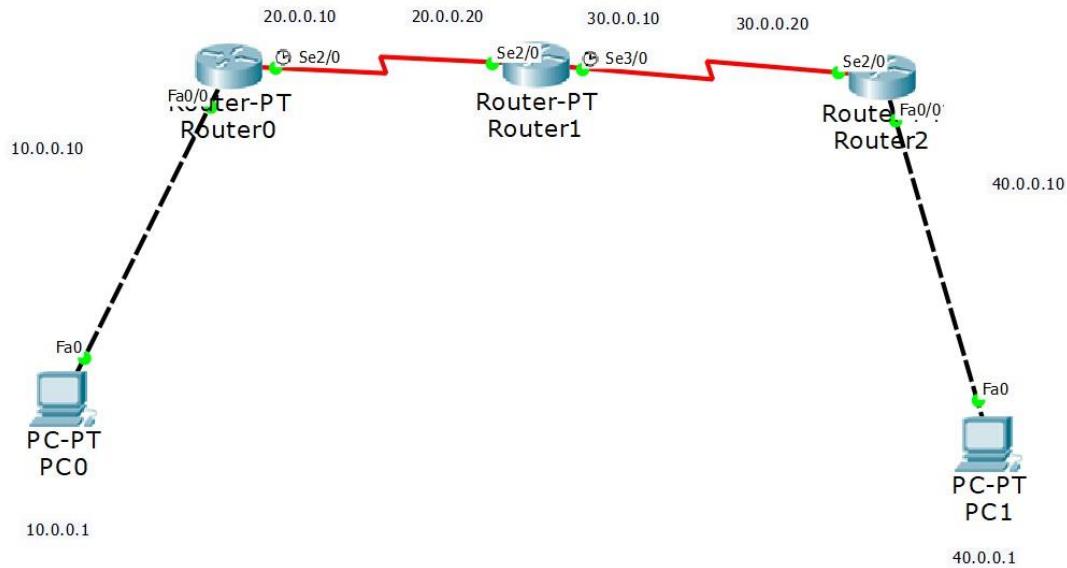
R Ping statistics for 20.0.0.1 :

Packets : Sent = 4, Received = 3, Loss = 1 (25% loss)

Approximate round trip times in milli-seconds:

Minimum = 0 ms, Maximum = 1 ms, Average = 0 ms

2B: Topology:



Configuration of Routers:

```

Router>n
Translating "n"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

Router>enable
Router#config t
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 shut

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
exit
Router(config)#exit
Router#

```

```

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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#

```

Router1

Physical Config CLI

IOS Command Line Interface

```

Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.20 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.10 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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    20.0.0.0/8 is directly connected, Serial2/0
Router#

```

 Router2

Physical Config CLI

IOS Commar

Press RETURN to get started!

```

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 30.0.0.20 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
exit
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 40.0.0.10 255.0.0.0
Router(config-if)#no shut

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
exit
Router(config)#show ip route
^
% Invalid input detected at '^' marker.

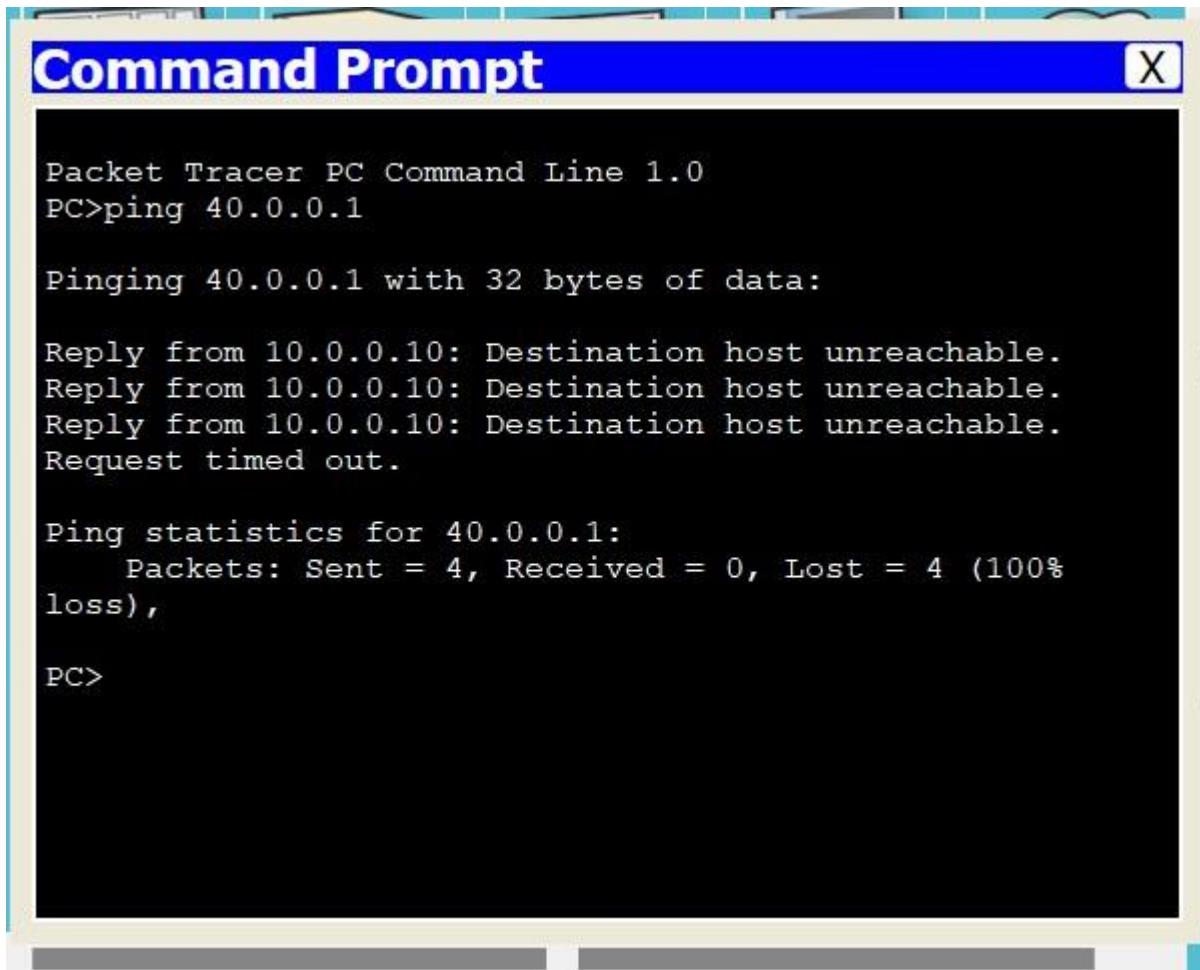
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 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    30.0.0.0/8 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#

```

Ping output before static routing:



Command Prompt X

```
Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 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.
Request timed out.

Ping statistics for 40.0.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>
```

Router 0 :

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#ip route 40.0.0.0 255.0.0.0 20.0.0.20
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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
S    30.0.0.0/8 [1/0] via 20.0.0.20
S    40.0.0.0/8 [1/0] via 20.0.0.20
Router#
```

Router 1:

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.10
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.20
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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

S    10.0.0.0/8 [1/0] via 20.0.0.10
C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
S    40.0.0.0/8 [1/0] via 30.0.0.20
Router#
```

Router 2:

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 30.0.0.10
Router(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.10
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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

S    10.0.0.0/8 [1/0] via 30.0.0.10
S    20.0.0.0/8 [1/0] via 30.0.0.10
C    30.0.0.0/8 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

Ping output after static routing:

```
PC>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=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms 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 = 2ms, Maximum = 2ms, Average = 2ms

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 40.0.0.1: bytes=32 time=35ms TTL=125
Reply from 40.0.0.1: bytes=32 time=4ms TTL=125
Reply from 40.0.0.1: bytes=32 time=27ms TTL=125
Reply from 40.0.0.1: bytes=32 time=13ms TTL=125

Ping statistics for 40.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 35ms, Average = 19ms

PC>
```

Observation :

by clicking config → FastEthernet 0 → IP address.
PC 0 → 10.0.0.1
PC 1 → 10.0.0.1

→ Configure the routers by opening CLI.

In Router 0 :-

```
Router >enable
Router # config t
Router (config) # interface fastethernet 0/0
Router (config-if) # ip address 10.0.0.10 255.0.0.0
Router (config-if) # no shut
exit
Router (config) # interface serial 2/0
Router (config-if) # ip address 20.0.0.10 255.0.0.0
Router (config-if) # no shut.
exit
exit
```

In Router 1 :-

```
Router >enable
Router # config t
Router (config-if) # interface serial 2/0
Router (config-if) # ip address 20.0.0.20 255.0.0.0
Router (config-if) # no shut
Router (config-if) # exit
Router (config) # interface serial 3/0
Router (config-if) # ip address 30.0.0.10 255.0.0.0
Router (config-if) # no shut
exit
exit
```

In Router 2:-

Router > enable

Router # config t

Router(config) # interface serial 2/0

Router(config-if) # ip address 30.0.0.20 255.0.0.0

Router(config-if) # no shut.

exit

Router(config) # interface fastethernet 0/0

Router(config-if) # ip address 40.0.0.10 255.0.0.0

Router(config-if) # no shut

exit

exit

→ Set up Gateway for PC0 of PC1. PC0 : 10.0.0.10

PC1 : 40.0.0.10

IP route table :-

Router 0:-

Router# show ip route

C 10.0.0.0/8 is directly connected, Fast Ethernet 0/0

C 20.0.0.0/8 is directly connected, Serial 2/0

Router 1:-

Router# show ip route

C 20.0.0.0/8 is directly connected, Serial 2/0

C 30.0.0.0/8 is directly connected, Serial 3/0

Router 2:

Router# show ip route

C 30.0.0.0/8 is directly connected, Serial 2/0

C 40.0.0.0/8 is directly connected, Fast Ethernet 0/0

Ping Output : In PC0
PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data :

Reply from 40.0.0.10 : Destination host unreachable

Reply from 40.0.0.10 : Destination host unreachable

Reply from 40.0.0.10 : Destination host unreachable

Ping statistics for 40.0.0.1:

Packets : Sent = 4, Received = 0, Lost = 4 (100% loss)

~~Observation :-~~

→ Green lights appear on the wires when no shut commands are written indicating that they are ready for data transmission.

→ Here, destination host was unreachable as Router 0 has no knowledge about the network 30.0.0.0 and 40.0.0.0 and the packets got stuck. We need to set ip route explicitly.

→ Now configure the Router which does not have info of the other network. Add the network in CLI.

In Router 0 :

"ip route 30.0.0.0 255.0.0.0 20.0.0.20

ip route 40.0.0.0 255.0.0.0 20.0.0.20

Router 1:

```
# ip route 10.0.0.0 255.0.0.0 20.0.0.10
# ip route 40.0.0.0 255.0.0.0 30.0.0.20
```

Router 2:

```
ip route 10.0.0.0 255.0.0.0 30.0.0.10
ip route 20.0.0.0 255.0.0.0 30.0.0.10
```

IP route table now :-

Router 0:

- 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 30.0.0.0/8 [1/0] via 20.0.0.20
- S 40.0.0.0/8 [1/0] ~~via~~ 20.0.0.20

Router 1:

- S 10.0.0.0/8 [1/0] via 20.0.0.10
- C 20.0.0.0/8 is directly connected, Serial 2/0
- C 30.0.0.0/8 is directly connected, Serial 3/0
- S 40.0.0.0/8 [1/0] via 30.0.0.20

Router 2:

- S 10.0.0.0/8 [1/0] via 30.0.0.10
- S 20.0.0.0/8 [1/0] ~~was~~ via 30.0.0.10
- C 30.0.0.0/8 is directly connected, Serial 2/0
- C 40.0.0.0/8 is directly connected, FastEthernet 0/0

Ping Output now:

PC> 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 = 2ms TTL = 125

Reply from 40.0.0.1: bytes = 32 time = 2ms TTL = 125

Reply from 40.0.0.1: bytes = 32 time = 2ms TTL = 125

Ping statistics for 40.0.0.1:

80 Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 2ms, Average = 2ms

→ Now, when PC1 is pinged for the first time, there is 25% loss.

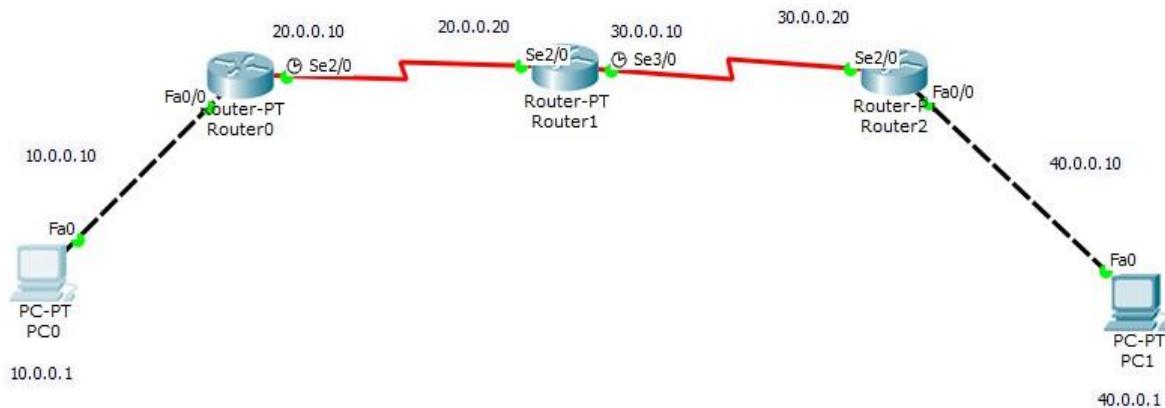
→ From next ping, there are no losses.

~~NIT~~
13/7/2023

Experiment 3

Aim: Configure default route, static route to the Router

Topology:



Configurations:

Roter 0 :

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

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#exit
-

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 20.0.0.20
Router(config)#

```

```

Router>enable
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 20.0.0.20 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 20.0.0.20
Router#

```

Roter 1 :

```

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.20 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
*LINK-5-CHANGED: Interface Serial2/0, changed state to up
exit
Router(config)#
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
interface serial 3/0
^
* Invalid input detected at '^' marker.

Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.10 255.0.0.0
Router(config-if)#no shut

*LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#

```

```

Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.20
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console
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

S    10.0.0.0/8 [1/0] via 20.0.0.10
C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
S    40.0.0.0/8 [1/0] via 30.0.0.20
Router#

```

Roter 2 :

```

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
^
% Invalid input detected at '^' marker.

Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.20 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
exi
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
t
Router(config)#exit

```

Router2

Physical Config CLI

IOS Command Line

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 30.0.0.10
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console
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
```

Ping Output:

```
Command Prompt

Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Request timed out.
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms 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 = 2ms, Maximum = 2ms, Average = 2ms

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

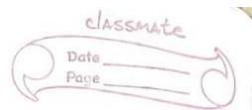
Reply from 40.0.0.1: bytes=32 time=10ms TTL=125
Reply from 40.0.0.1: bytes=32 time=10ms TTL=125
Reply from 40.0.0.1: bytes=32 time=25ms TTL=125
Reply from 40.0.0.1: bytes=32 time=24ms TTL=125

Ping statistics for 40.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 25ms, Average = 17ms

PC>
```

Observation:

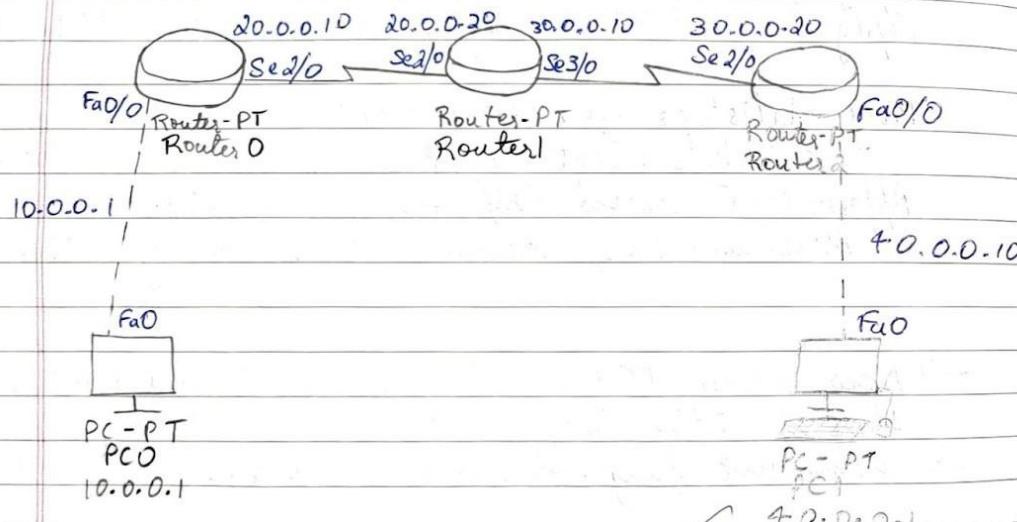
13/7/23



Lab 3 :

Aim: Configure default route, static route to the Router.

Topology:



Procedure

→ Create the same topology as 2B experiment.

→ Setup IP address of PC0 & PC1

$$\text{PC0} \rightarrow 10.0.0.1$$

$$\text{PC1} \rightarrow 40.0.0.1$$

config → Fast ethernet → IP address

→ Config IP address of Router 0, Router1 & Router 2 following steps in 2B experiment.

→ Setup Gateway for PC0 & PC1 :

PC0 : 10.0.0.10

PC1 : 40.0.0.10

→ Setup static routing for Router 0 and Router 1 & Router 2 following steps in 2B experiment

→ For Router 0 and Router 2, we will setup default routing.

Router 0:

Router (config) # ip route 0.0.0.0 0.0.0.0 20.0.0.20

Router # show ip route

C 10.0.0.0/8 is directly connected, FastEthernet0/0

C 20.0.0.0/8 is directly connected,

S* 0.0.0.0/0 [1/0] via 20.0.0.20

Router 2:

Router (config) # ip route 0.0.0.0 0.0.0.0 30.0.0.10

Router # show ip route

C 30.0.0.0/8 is directly connected, Serial 2/0

C 40.0.0.0/8 is directly connected, FastEthernet0/0

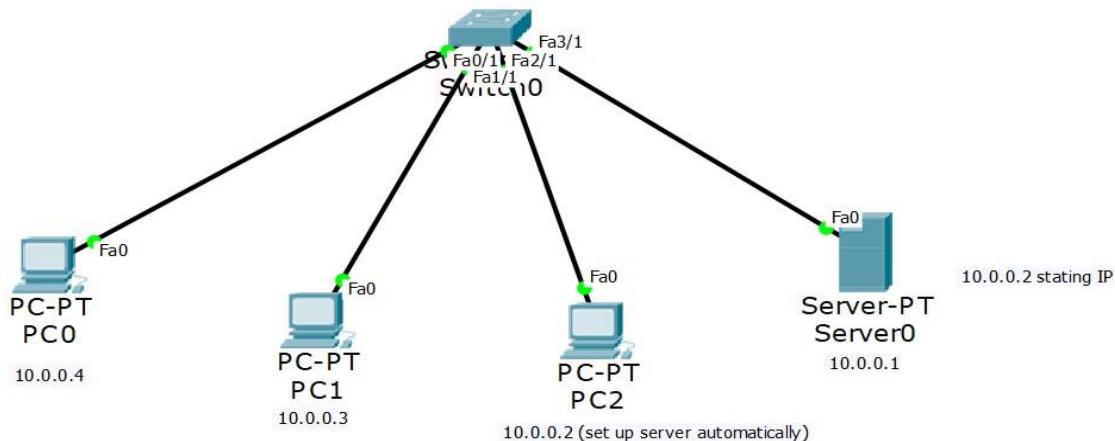
S* 0.0.0.0/0 [1/0] via 30.0.0.10

Experiment 4

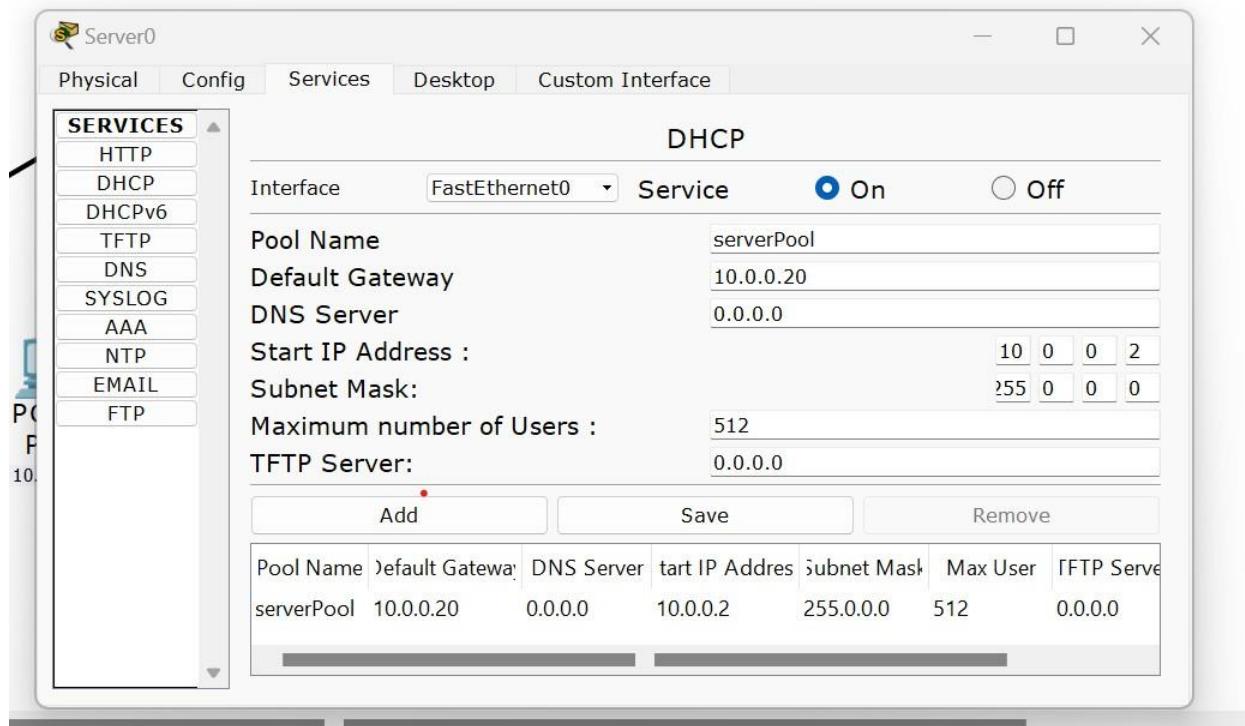
Aim: Configure DHCP within a LAN and outside LAN.

4A: Within a LAN.

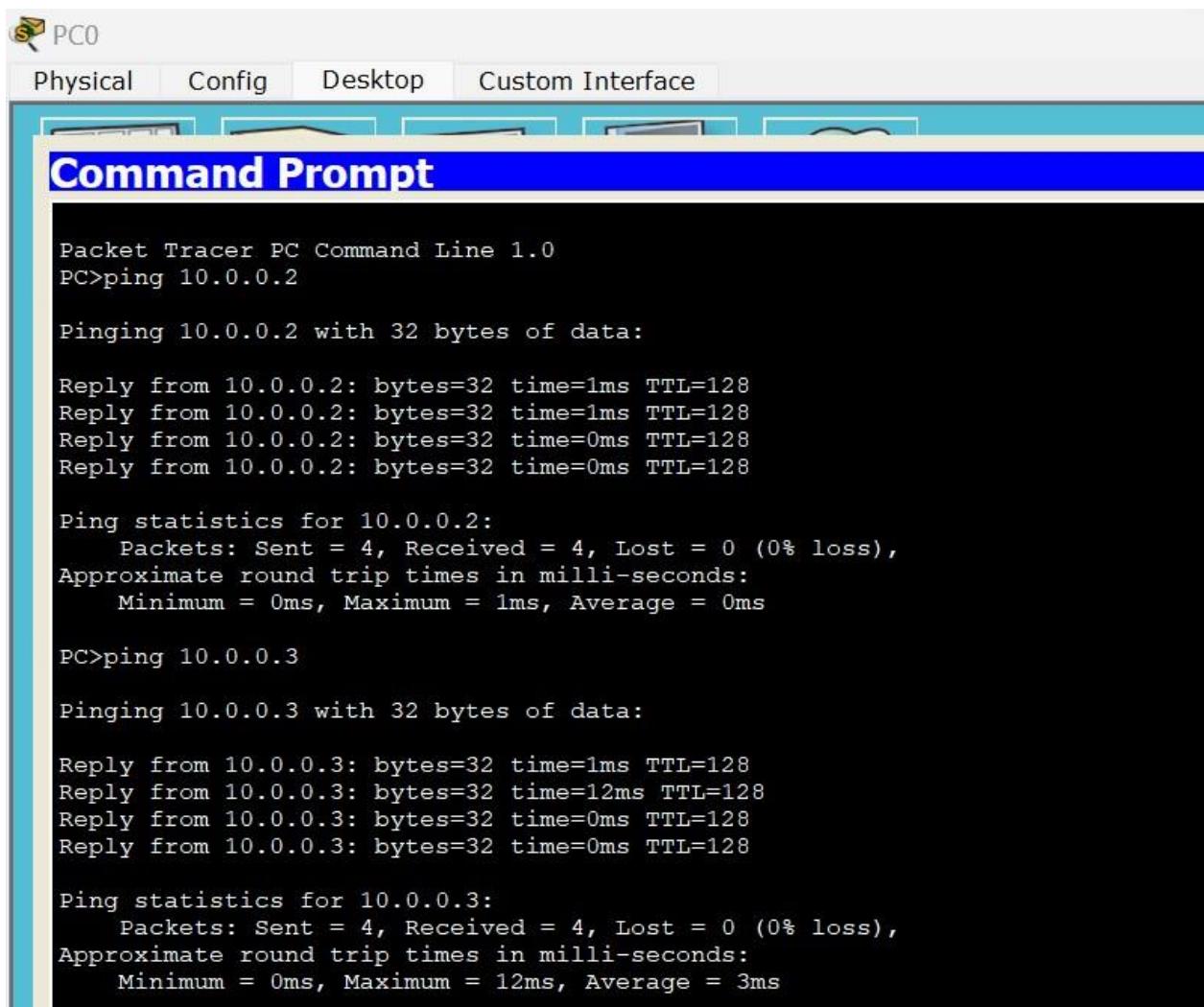
Topology:



Server 0 :



Ping Output :



The screenshot shows a window titled "Command Prompt" from the "Packet Tracer PC Command Line 1.0". The window has tabs at the top: Physical, Config, Desktop, and Custom Interface. Below the tabs is a toolbar with icons for file operations. The main area displays the following command-line session:

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>ping 10.0.0.3

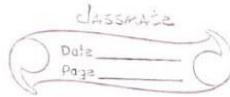
Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=1ms TTL=128
Reply from 10.0.0.3: bytes=32 time=12ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 12ms, Average = 3ms
```

Observation :

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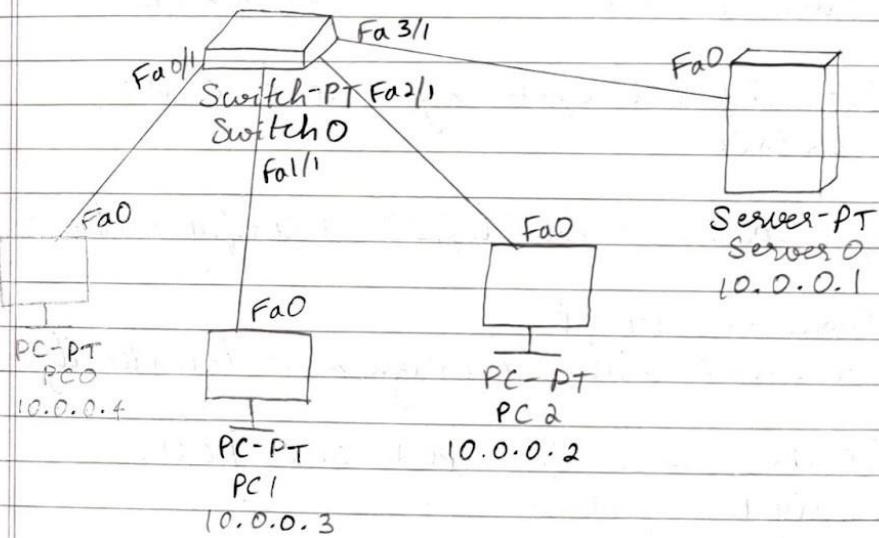


Lab 4:

Aim: Configure DHCP within a LAN and outside LAN.

4 A :-

Topology :



Procedure

1. The network is started by selecting end devices PC-PTS, PC0, PC1 and PC2. Select Server-PT too.

2. Select a generic switch, Switch-PT and place all of them on the workspace.

3. Connect PCs and Server to switch using copper straight-through cable.
4. Set the IP address of server 0
 Desktop → IP configuration → IP Address = 10.0.0.1
 Click on subnet mask.
5. Server 0 → Services → DHCP → On
 Set start IP address as 10.0.0.2
 Subnet Mask : 255.0.0.0
6. Set default Gateway : 10.0.0.20.
 ↴ Save
7. Open PC2, → Desktop → IP Configuration
 Turn on DHCP
 10.0.0.2 will be assigned automatically.
8. Do the same for PC1 and PC0.
 PC1 : 10.0.0.3
 PC0 : 10.0.0.4

Ping Output:
 In PC0

PC > ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes = 32 time = 1ms TTL = 128

Reply from 10.0.0.2 : bytes = 32 time = 1ms TTL = 128

Reply from 10.0.0.2 : bytes = 32 time = 0ms TTL = 128

Reply from 10.0.0.2 : bytes = 32 time = 0ms TTL = 128

Ping statistics for 10.0.0.2 :

Packets : Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli -seconds :

Minimum = 0ms, Maximum = 1ms, Average = 0ms.

Observation :

→ We observe that IP addresses are set automatically to PC0, PC1 and PC2 when we enable DHCP IP configuration.

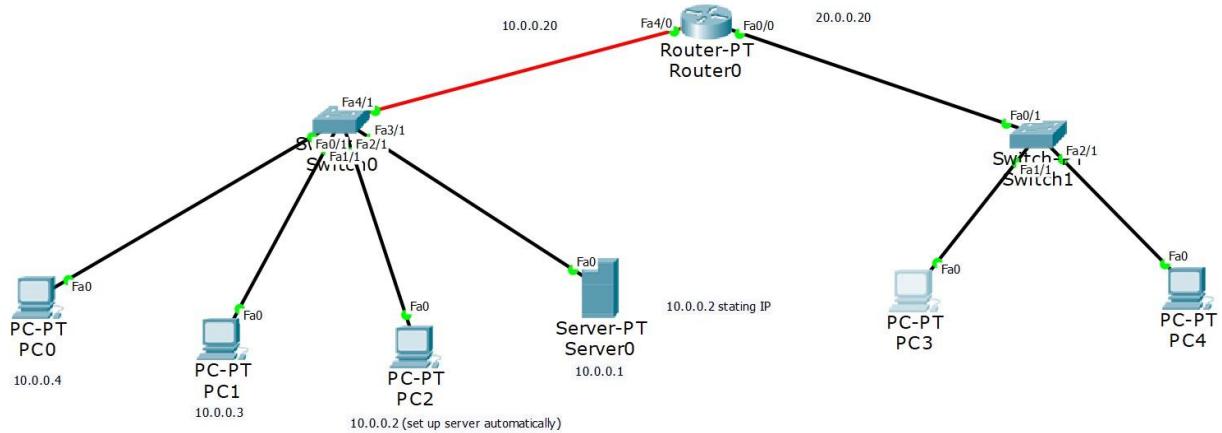
→ This is useful for large networks with 100s of PCs.

→ For all PCs Gateway is automatically set to 10.0.0.20.

27/12/23

4B: Outside a LAN.

Topology:



Configurations :

Server 0 :

Server0

Physical Config Services Desktop Custom Interface

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP

DHCP

Interface	FastEthernet0	Service	On	Off
Pool Name	serverPool			
Default Gateway	10.0.0.20			
DNS Server	0.0.0.0			
Start IP Address :	10 0 0 2			
Subnet Mask:	255 0 0 0			
Maximum number of Users :	512			
TFTP Server:	0.0.0.0			

Add **Save** **Remove**

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server
serverPool1	20.0.0.20	0.0.0.0	20.0.0.2	255.0.0.0	512	0.0.0.0
serverPool	10.0.0.20	0.0.0.0	10.0.0.2	255.0.0.0	512	0.0.0.0

Activate Windows
Go to Settings to activate Windows.

Router 0 :

Router0

Physical Config CLI

IOS Command

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet4/0, changed state to up
exit
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 20.0.0.20 255.0.0.0
Router(config-if)#no shut

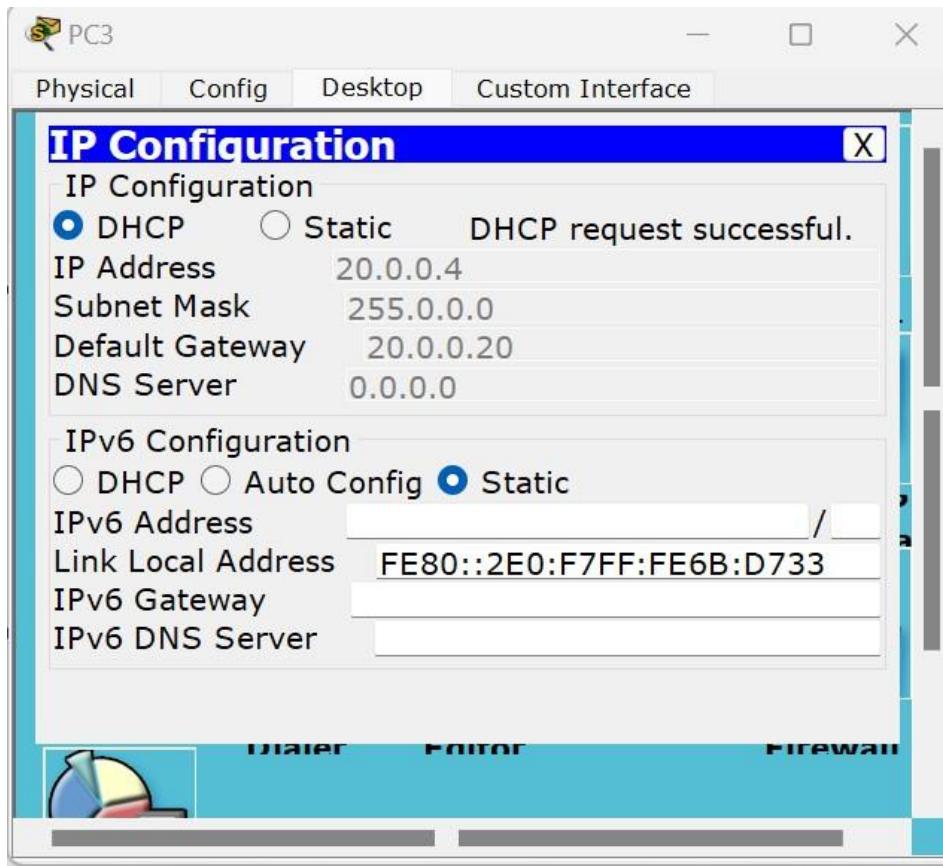
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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, FastEthernet4/0
C    20.0.0.0/8 is directly connected, FastEthernet0/0
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip helper-address 10.0.0.1
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#exit
```

Automation IP is assigned in the PCs by Server 0 via DHCP:



Ping Output :

```
PC>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes=32 time=1ms TTL=127
Reply from 20.0.0.2: bytes=32 time=0ms TTL=127
Reply from 20.0.0.2: bytes=32 time=0ms TTL=127
Reply from 20.0.0.2: bytes=32 time=0ms TTL=127

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

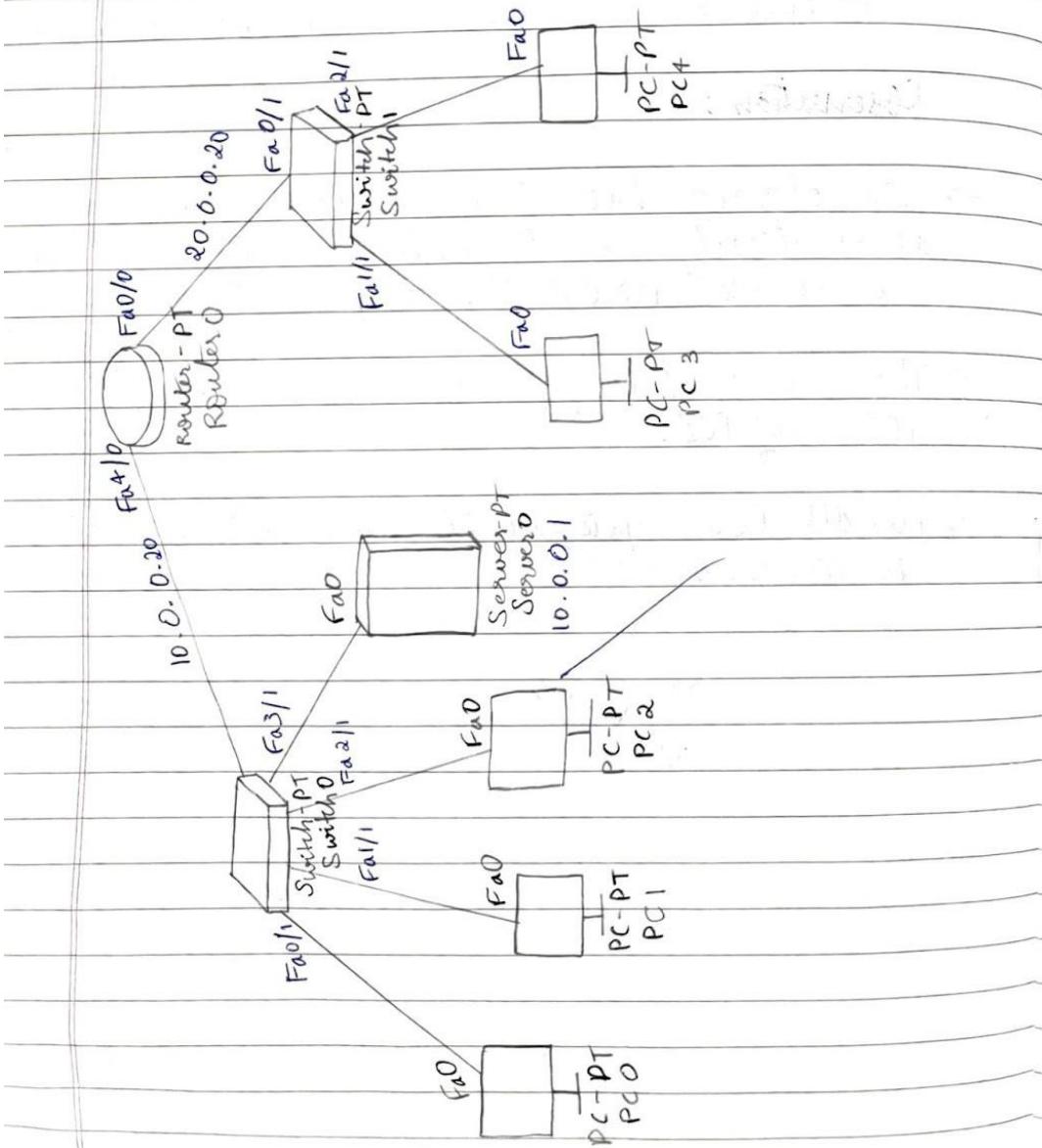
Observation :

Date _____
Page _____

4B: (Continuation of 4A)

Aim: Configure DHCP and outside LAN.

Topology:



Procedure :-

1. To the topology created in 4A, connect a Router 0 using copper straight through wire.

2. To a Switch 1, connect 2 PCs, PC0 and PC1.

3. Connect the step 2 topology to Router 0.

4. In Router 0, open CLI.
Set IP addresses for interfaces.

Fa 4/0 : 10.0.0.20

Fa 0/0 : 20.0.0.20

5. In Router 0,
~~interface fastethernet 0/0~~
Router (config-if) # ip helper-address 10.0.0.1
Router (Config-if) # no shutdown

6. In Server 0,
→ Config → Settings → Gateway: 10.0.0.20

7. In Server 0,
→ Services → DHCP → Pool Name: serverPool1
Set Default Gateway : 20.0.0.20

Start IP Address : 20.0.0.2

Subnet Mask : 255.0.0.0

↳ Add.



8. PC 3

↳ Desktop ↳ IP Configuration ↳ DHCP
20.0.0.2 set automatically for PC 3

PC 4

20.0.0.3 set automatically.

Ping Output
in PC 0

PC > ping 20.0.0.2

pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes = 32 time = 1ms TTL = 127

Reply from 20.0.0.2: bytes = 32 time = 0ms TTL = 127

Reply from 20.0.0.2: bytes = 32 time = 0ms TTL = 127

Reply from 20.0.0.2: bytes = 32 time = 0ms TTL = 127

Observation:

→ IP address is set Automo

Ping statistics for 20.0.0.2:

 Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

 Approximate round trip times in milli-seconds:

 Minimum = 0ms, Maximum = 1ms, Average = 0ms

Observation :

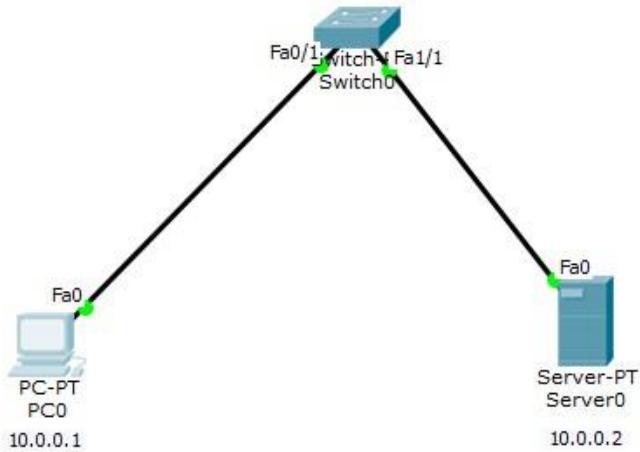
- IP addresses are set automatically on PC 3 & PC 4 by Server 0.
- PC 3 : 20.0.0.2
- PC 4 : 20.0.0.3
- We can successfully ping PC 3 from PC 0 with no loss.

M
12/7/2023

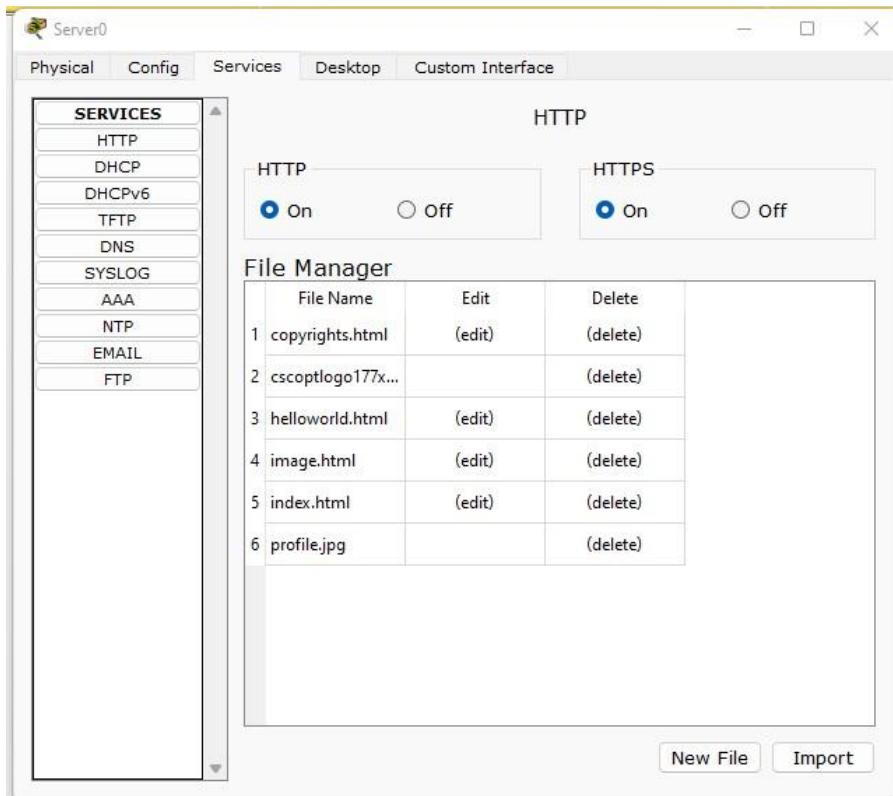
Experiment 5

Aim : Configure Web Server, DNS within a

LAN Topology:



Server 0 :



Website:



Code:

A screenshot of a server configuration interface titled "Server0". The top navigation bar includes tabs for Physical, Config, Services, Desktop, and Custom Interface. The "Services" tab is selected, showing a list of services: HTTP, DHCP, DHCPv6, TFTP, DNS, SYSLOG, AAA, NTP, EMAIL, and FTP. The main content area shows the file "index.html" with the following code:

```
<html>
<body style="font-size: 20px">
<center><font size='+2' color='blue'><h1>DEEKSHA S </h1></font></center>
<h2><hr>USN : 1BM21CS048 </h2>
<h3><hr>Contact Information : </h3>
<p>Email : deeksha.cs21@bmsce.ac.in <br>
Phone No : +91 8317401655 <br>
<br> 
<br>
<br>

I am currently a student at BMS College of Engineering, Basavanagudi, <br>
pursuing BE in Computer Science Engineering.
<br>
<h3>Skills</h3>
<ul>
<li>Java</li>
<li>C,C++</li>
<li>SQL</li>
<li>Git</li>
</ul>

<a href='helloworld.html'>A small page</a>

<br><a href='copyrights.html'>Copyrights</a>
<br><a href='image.html'>Image page</a>
<br><a href='cscptlogo177x111.jpg'>Image</a></p>
</body>
</html>
```

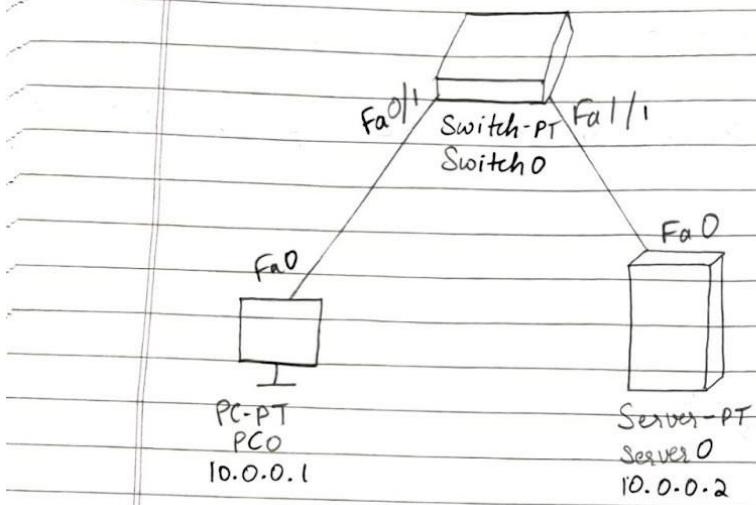
Observation :

20/7/23

Aim:

Lab 5: Configure Web Server, DNS within a LAN

Topology:



Procedure :

- The Network is started by selecting end devices PC-PT and Server-PT.
- Select Switch-PT and add all of them in the workspace.
- Connect PC0 and Server0 to Switch-0 using copper straight-Through cable.
- Set IP address for PC0 and Server0
Config → Fastethernet → IP address

PC0 : 10.0.0.1

PE Server0 : 10.0.0.2

- Open desktop in PC → Desktop → Web Browser
In URL, type 10.0.0.2 and click Go.
You can see Cisco Packet Tracer website.
- In Server0, → Services → HTTP, then
edit index.html.
Code the HTML & CSS and create your CV.
Output :-
- In PC0 → Desktop → Web browser → URL
type 10.0.0.2.
The created CV will be visible.
- In Server0, → Services → DNS → Add
Name : deeksha
Address : 10.0.0.2
Click on add.

Observations :-

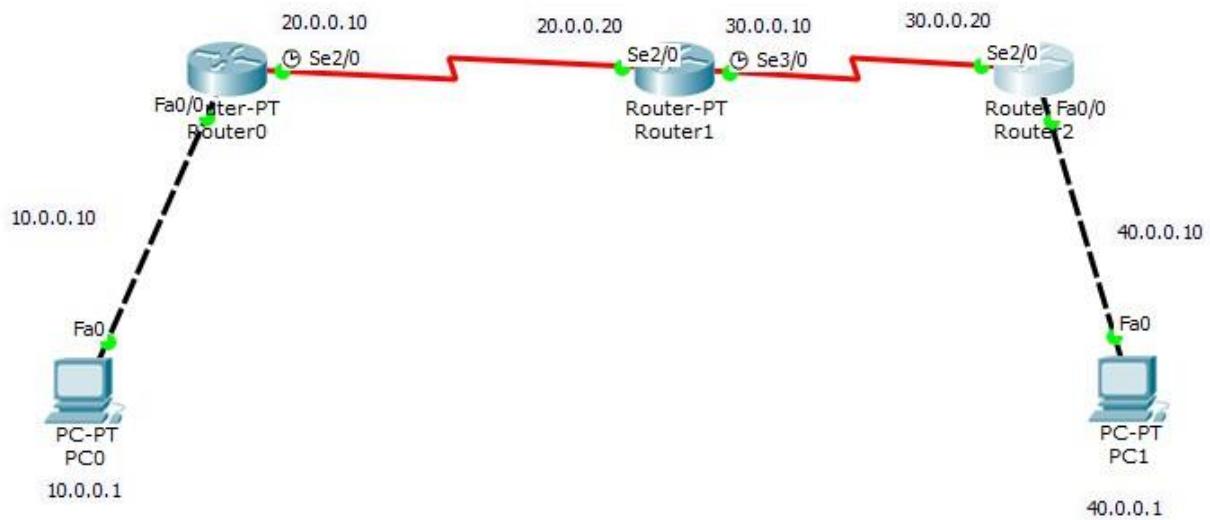
- In PC0 → Desktop → Web browser → URL
When we type the domain name "deeksha"
the website created in Server0 opens.

N
24/7/2023

Experiment 6

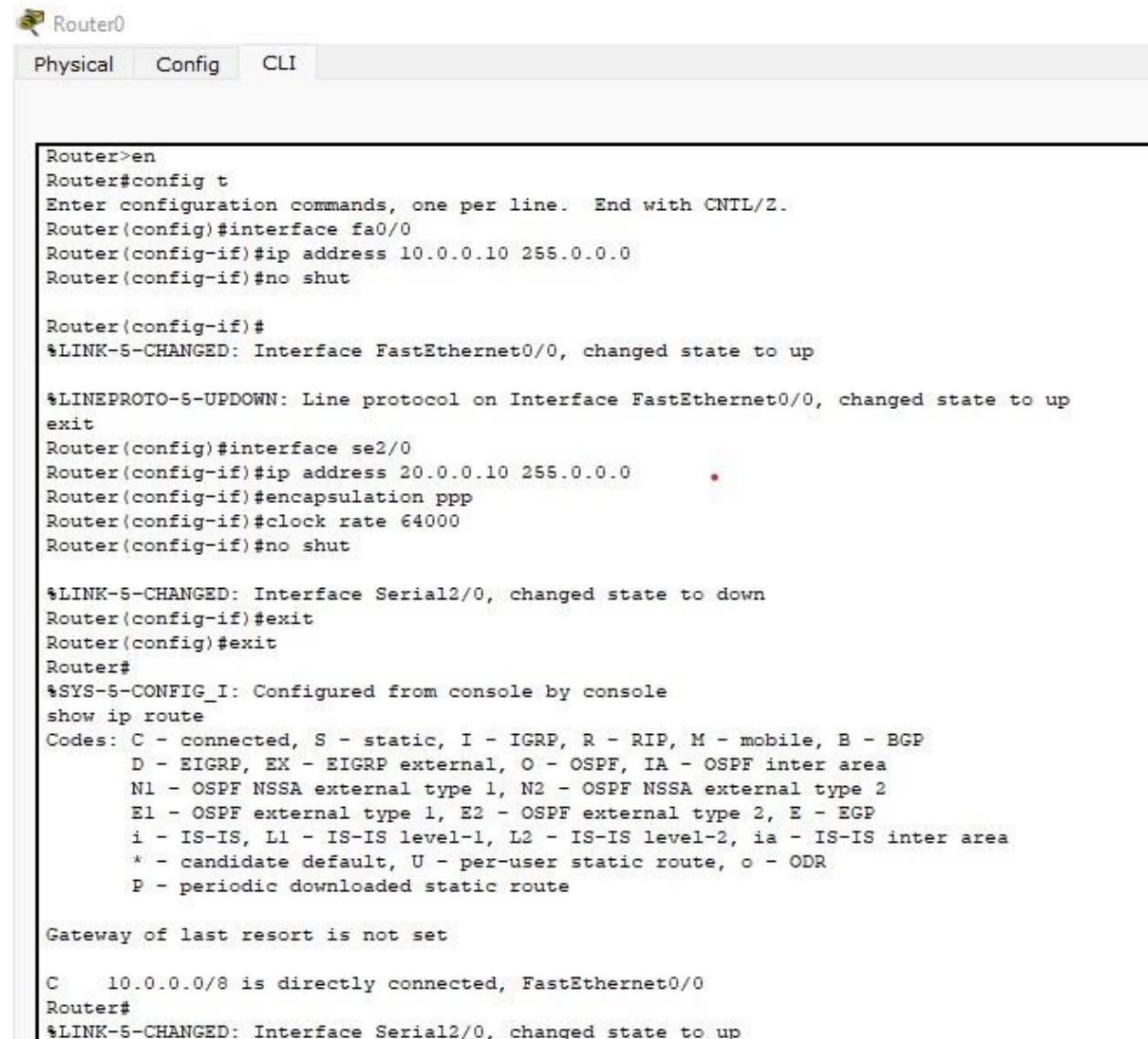
Aim: Configure RIP routing Protocol in Routers.

Topology:



Configuration:

Router 0 :



```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

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
exit
Router(config)#interface se2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shut

*LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console
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
Router#
*LINK-5-CHANGED: Interface Serial2/0, changed state to up
```

Router 1 :



The screenshot shows a Cisco router interface configuration. The top bar has tabs for Physical, Config, and CLI, with Config selected. The main area displays the following configuration commands:

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface se2/0
Router(config-if)#ip address 20.0.0.20 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
exit
Router(config)#interface se3/0
Router(config-if)#ip address 30.0.0.10 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shut

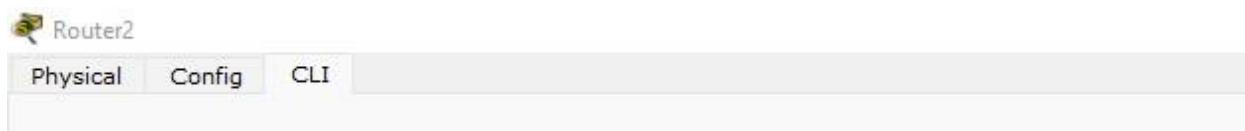
%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#show ip route
^
% Invalid input detected at '^' marker.

Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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

      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.0.0.0/8 is directly connected, Serial2/0
C        20.0.0.10/32 is directly connected, Serial2/0
Router#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
```

Router 2 :



```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface se2/0
Router(config-if)#ip address 30.0.0.20 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
exit
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config)#interface fa0/0
Router(config-if)#ip address 40.0.0.10 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
exit
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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

      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        30.0.0.0/8 is directly connected, Serial2/0
C        30.0.0.10/32 is directly connected, Serial2/0
C        40.0.0.0/8 is directly connected, FastEthernet0/0
```

RIP routing:

Router 0:

```
Router#  
*LINK-5-CHANGED: Interface Serial2/0, changed state to up  
  
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up  
config t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#router rip  
Router(config-router)#network 10.0.0.0  
Router(config-router)#network 20.0.0.0  
Router(config-router)#exit  
Router(config)#exit  
Router#  
*SYS-5-CONFIG_I: Configured from console by console  
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  
      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks  
C        20.0.0.0/8 is directly connected, Serial2/0  
C        20.0.0.20/32 is directly connected, Serial2/0  
R    30.0.0.0/8 [120/1] via 20.0.0.20, 00:00:18, Serial2/0  
R    40.0.0.0/8 [120/2] via 20.0.0.20, 00:00:18, Serial2/0  
Router#
```

Router 1:

```
Router#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 20.0.0.0
Router(config-router)#network 30.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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

R    10.0.0.0/8 [120/1] via 20.0.0.10, 00:00:20, Serial2/0
      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      20.0.0.0/8 is directly connected, Serial2/0
C      20.0.0.10/32 is directly connected, Serial2/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      30.0.0.0/8 is directly connected, Serial3/0
C      30.0.0.20/32 is directly connected, Serial3/0
R    40.0.0.0/8 [120/1] via 30.0.0.20, 00:00:19, Serial3/0
Router#
```

Router 2:

```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#network 30.0.0.0
^
% Invalid input detected at '^' marker.

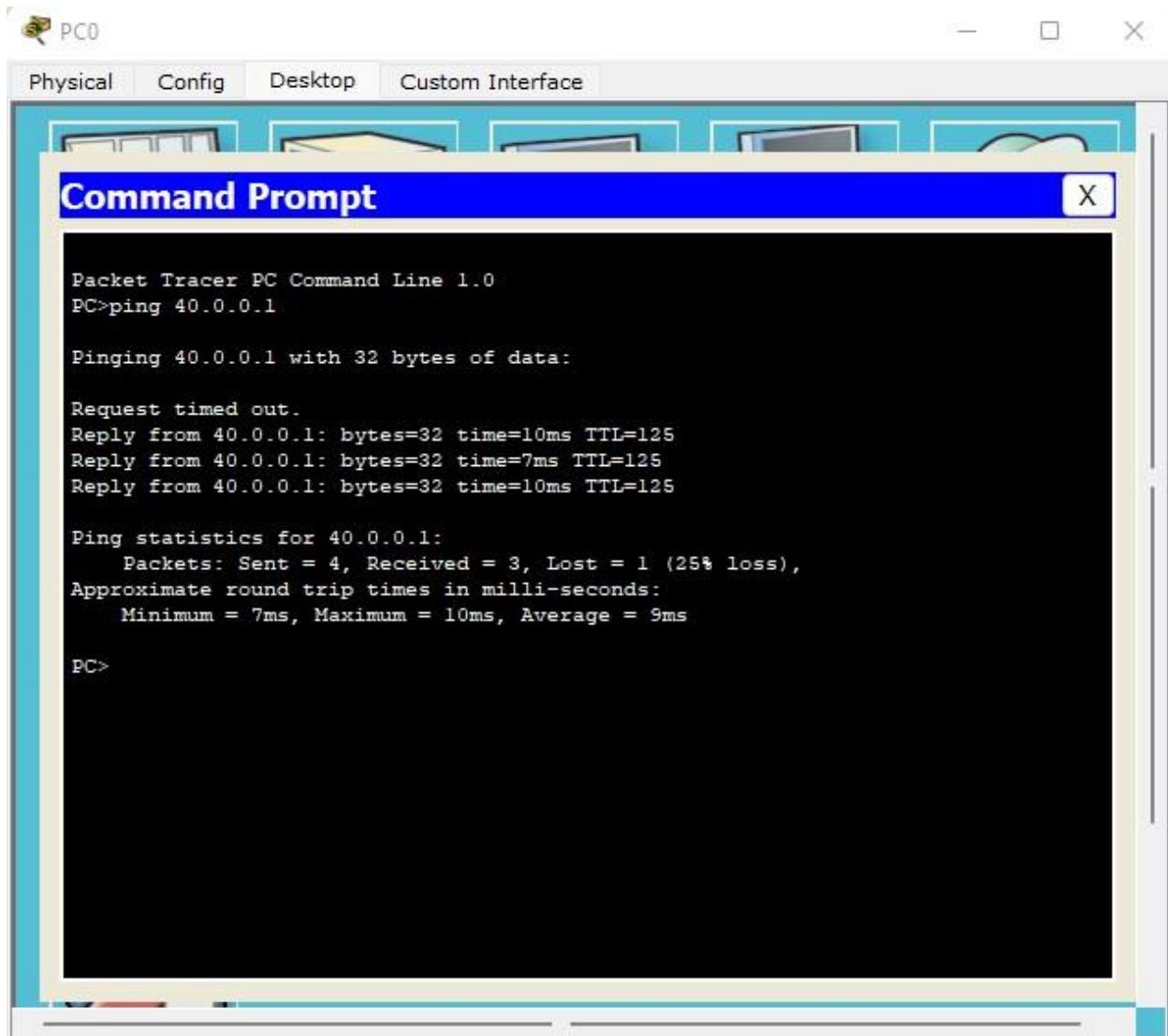
Router(config)#router rip
Router(config-router)#network 30.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      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

R    10.0.0.0/8 [120/2] via 30.0.0.10, 00:00:14, Serial2/0
R    20.0.0.0/8 [120/1] via 30.0.0.10, 00:00:14, Serial2/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      30.0.0.0/8 is directly connected, Serial2/0
C      30.0.0.10/32 is directly connected, Serial2/0
C      40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

Ping Outputs:

P0:



PC0

Physical Config Desktop Custom Interface

Command Prompt X

```
Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.1

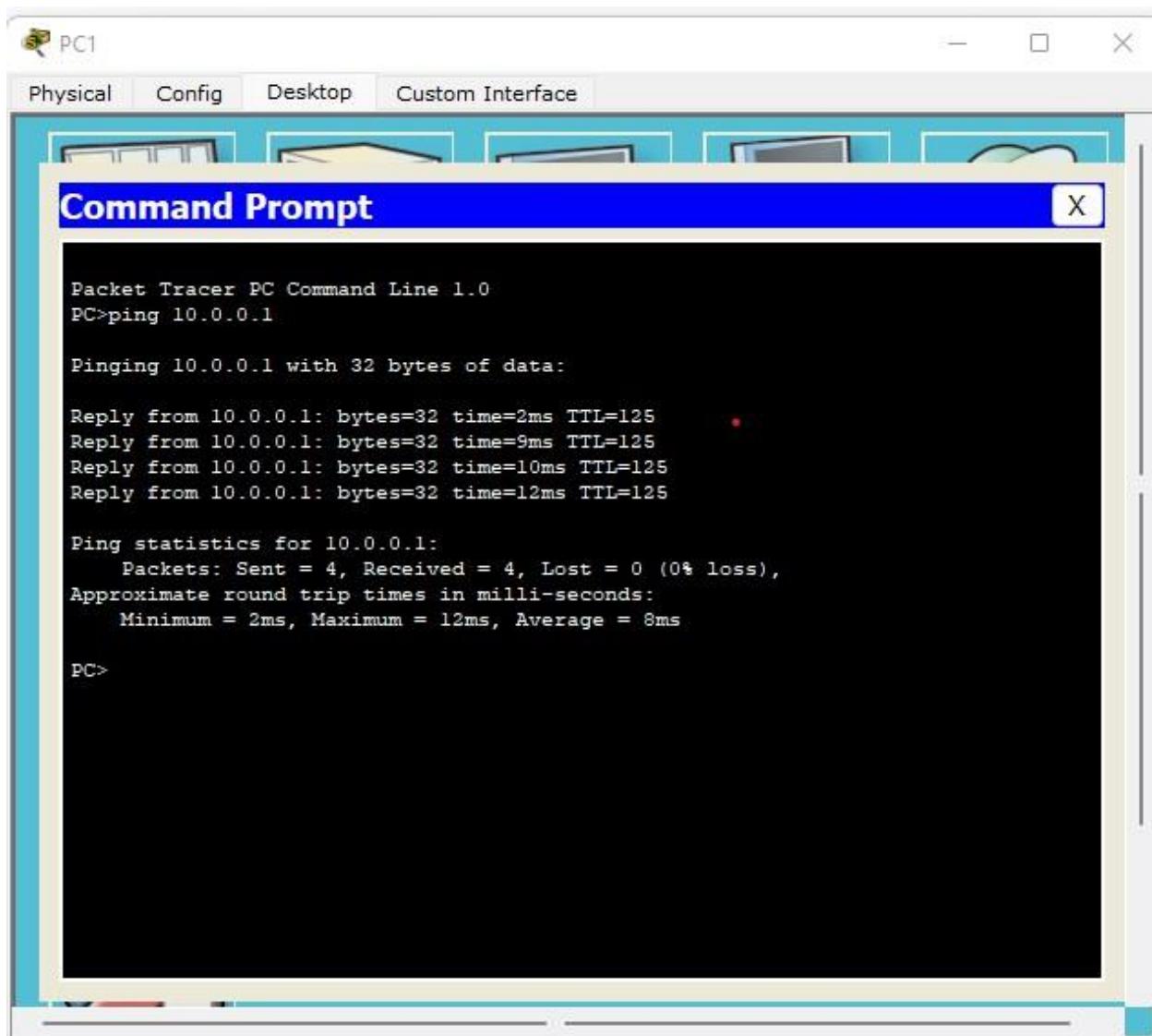
Pinging 40.0.0.1 with 32 bytes of data:

Request timed out.
Reply from 40.0.0.1: bytes=32 time=10ms TTL=125
Reply from 40.0.0.1: bytes=32 time=7ms 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 = 7ms, Maximum = 10ms, Average = 9ms

PC>
```

P1:

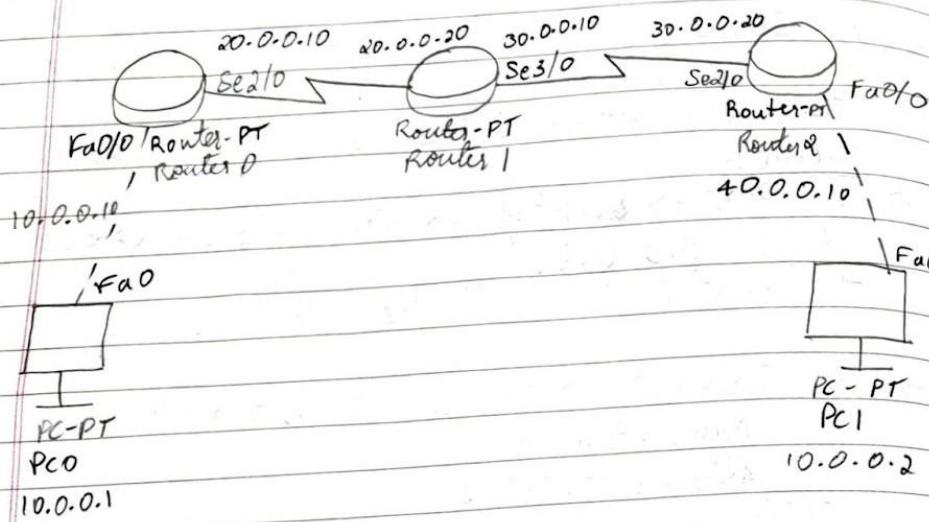


Observation :

20/1/23.

Aim: Lab 6: Configure RIP routing Protocol in Router.

Topology:-



Procedure:

→ Repeat the topology in 4B experiment.

→ Set IP address of PC0 & PC1
PC0 : 10.0.0.1
PC1 : 10.0.0.2

→ Set Gateway for PC0 & PC1
PC0 : 10.0.0.10 PC1 : ~~10.0.0.20~~ 40.0.0.10

→ Set IP addresses of routers' interfaces using previous procedure.

Now:

Router 0:

```
Router(config)# interface serial 2/0
config-if# encapsulation ppp
Router(config-if)# clock rate 64000
no shut
exit
```

Router 1:

```
interface serial 2/0
encapsulation ppp
no shut
exit
interface se 3/0
encapsulation ppp
clock rate 64000
no shut
exit
```

Router 2:

```
interface se 2/0
encapsulation ppp
no shut
exit
interface fa 0/0
no shut
exit
```

Router D:-

```
Router(config) # router rip  
Router(config-router) # network 10.0.0.0  
Router(config-router) # network 20.0.0.0  
exit:  
exit
```

Router 1:-

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

Router 2:-

```
Router(config) # router rip  
Router(config-router) # network 30.0.0.0  
Router(config-router) # network 40.0.0.0  
Router(config-router) # exit  
exit
```

IP routing :-

We see that in each Router C indicates direct connection.

We see that RIP connection is established in each Router

Ping Output :-

PC > 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 = 7ms 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 = 7ms, Maximum = 10ms, Average = 9ms

Observation :-

→ Through RIP, routing is established in the network.

→ First packet is lost as we have seen before.

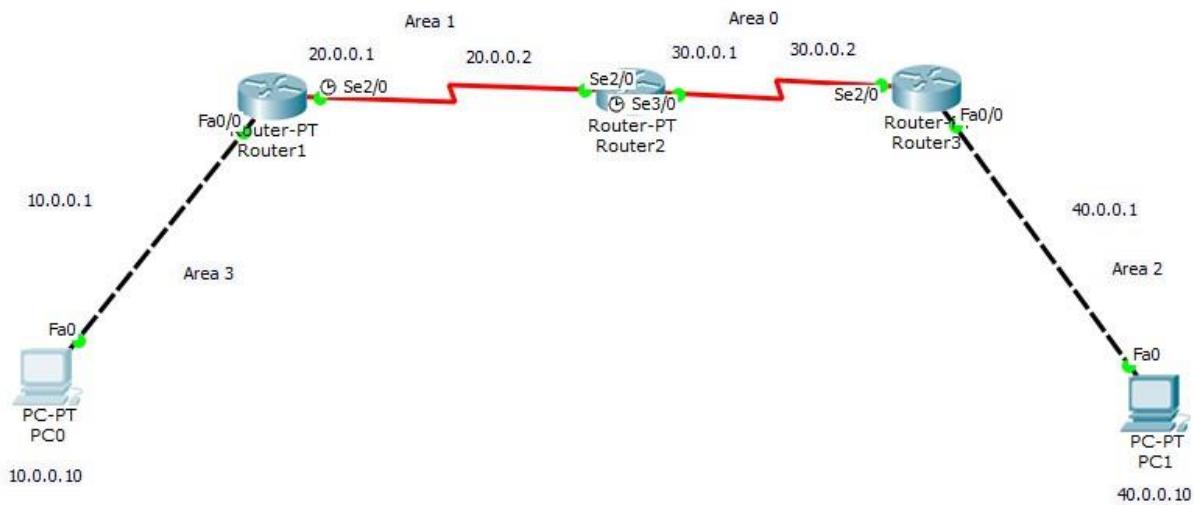
→ Then, remaining packets are transmitted successfully.

21/12/2023

Experiment 7

Aim : Configure OSPF routing protocol.

Topology:



Configurations:

Router 1 :



Router1

Physical Config CLI

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip add 10.0.0.1 255.0.0.0
Router(config-if)#no shut

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
exit
Router(config)#interface se2/0
Router(config-if)#ip add 20.0.0.1 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface se2/0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down
clock rate 64000
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

%LINK-5-CHANGED: Interface Serial2/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down

%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config)#router ospf 1
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 3
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#exit
Router(config)#
00:18:07: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading !

Router(config)#interface se2/0
Router(config-if)#interface loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Router(config-if)#ip address 172.16.1.252 255.255.0.0
Router(config-if)#no shut
```

```

Router(config)#interface se2/0
Router(config-if)#interface loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Router(config-if)#ip address 172.16.1.252 255.255.0.0
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#router ospf 1
Router(config-router)#area 1 virtual-link 2.2.2.2
Router(config-router)#exit
Router(config)#
00:24:20: *OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on OSPF_VL0 from LOADING to FULL, Loading Done
exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
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
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      20.0.0.0/8 is directly connected, Serial2/0
C      20.0.0.2/32 is directly connected, Serial2/0
O     30.0.0.0/8 [110/128] via 20.0.0.2, 00:00:54, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:00:54, Serial2/0
C    172.16.0.0/16 is directly connected, Loopback0
Router#

```

Router 2 :



Router2

Physical Config CLI

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface se2/0
Router(config-if)#ip add 20.0.0.2
% Incomplete command.
Router(config-if)#ip add 20.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
exit
Router(config)#ip add 20.0.0.2
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, chang
Router(config)#interface se3/0
Router(config-if)#ip add 30.0.0.1 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down
interface se2/0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
no shut
Router(config-if)#exit
Router(config)#interface se3/0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to down
clock rate 640000
Unknown clock rate
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

Router(config)#router ospf
% Incomplete command.
Router(config)#router ospf 1
Router(config-router)#router-id 2.2.2.2
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
00:18:05: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#
00:19:20: %OSPF-5-ADJCHG: Process 1, Nbr 40.0.0.1 on Serial3/0 from LOADING to FULL, Loading Done
```

Router2

Physical Config CLI

IOS Command Line Interface

```

Router(config)#interface se3/0
Router(config-if)#interface loopback 0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
is add 172.16.1.263 255.255.0.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface Serial13/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial13/0, changed state to down

00:23:22: *OSPF-5-ADJCHG: Process 1, Nbr 40.0.0.1 on Serial13/0 from FULL to DOWN, Neighbor Down: Interface down or detached

%LINK-5-CHANGED: Interface Serial13/0, changed state to up

Router(config-if)#exit
Router#
$SYS-5-CONFIG_I: Configured from console by console

00:23:41: *OSPF-5-ADJCHG: Process 1, Nbr 40.0.0.1 on Serial13/0 from LOADING to FULL, Loading Done

Router#
00:23:43: *OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not found from 20.0.0.2, Serial2/0
config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#
00:23:53: *OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not found from 20.0.0.2, Serial2/0

Router(config-router)#area 1 virtual-link
00:24:03: *OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not found from 20.0.0.2, Serial2/0
1.1.1.1
Router(config-router)#
Router#
$SYS-5-CONFIG_I: Configured from console by console

Router#
00:24:18: *OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on OSPF_VL0 from LOADING to FULL, Loading Done

% Ambiguous command: "c"
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

  20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.0.0.0/8 is directly connected, Serial2/0
C        20.0.0.1/32 is directly connected, Serial2/0
  30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

```

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#area 1 virtual-link 1.1.1.1
Router(config-router)#exit
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console
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

O IA 10.0.0.0/8 [110/65] via 20.0.0.1, 00:00:34, Serial2/0
  20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    20.0.0.0/8 is directly connected, Serial2/0
C    20.0.0.1/32 is directly connected, Serial2/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      30.0.0.0/8 is directly connected, Serial3/0
C      30.0.0.2/32 is directly connected, Serial3/0
O IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:01:24, Serial3/0
C    172.16.0.0/16 is directly connected, Loopback0
Router#
```

Router 3 :

Router3

Physical Config CLI

IOS Commar

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip add 40.0.0.1 255.0.0.0
Router(config-if)#no shut

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
exit
Router(config)#interface se2/0
Router(config-if)#ip add 30.0.0.2 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
*LINK-5-CHANGED: Interface Serial2/0, changed state to up
exit
Router(config)#
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down

Router(config)#interface se2/0
Router(config-if)#encapsulation ppp
Router(config-if)#
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
no shut
Router(config-if)#exit
Router(config)#router ospf 1
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#
00:18:56: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading Done

Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#interface se2/0
Router(config-if)#interface loopback 0

Router(config-if)#
*LINK-5-CHANGED: Interface Loopback0, changed state to up

*LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
ip add 172.16.1.254 255.255.0.0
Router(config-if)#no shut
Router(config-if)#
*LINK-5-CHANGED: Interface Serial2/0, changed state to down

*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to down

00:22:58: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from FULL to DOWN, Neighbor Down: Interface down or detached
*LINK-5-CHANGED: Interface Serial2/0, changed state to up

*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

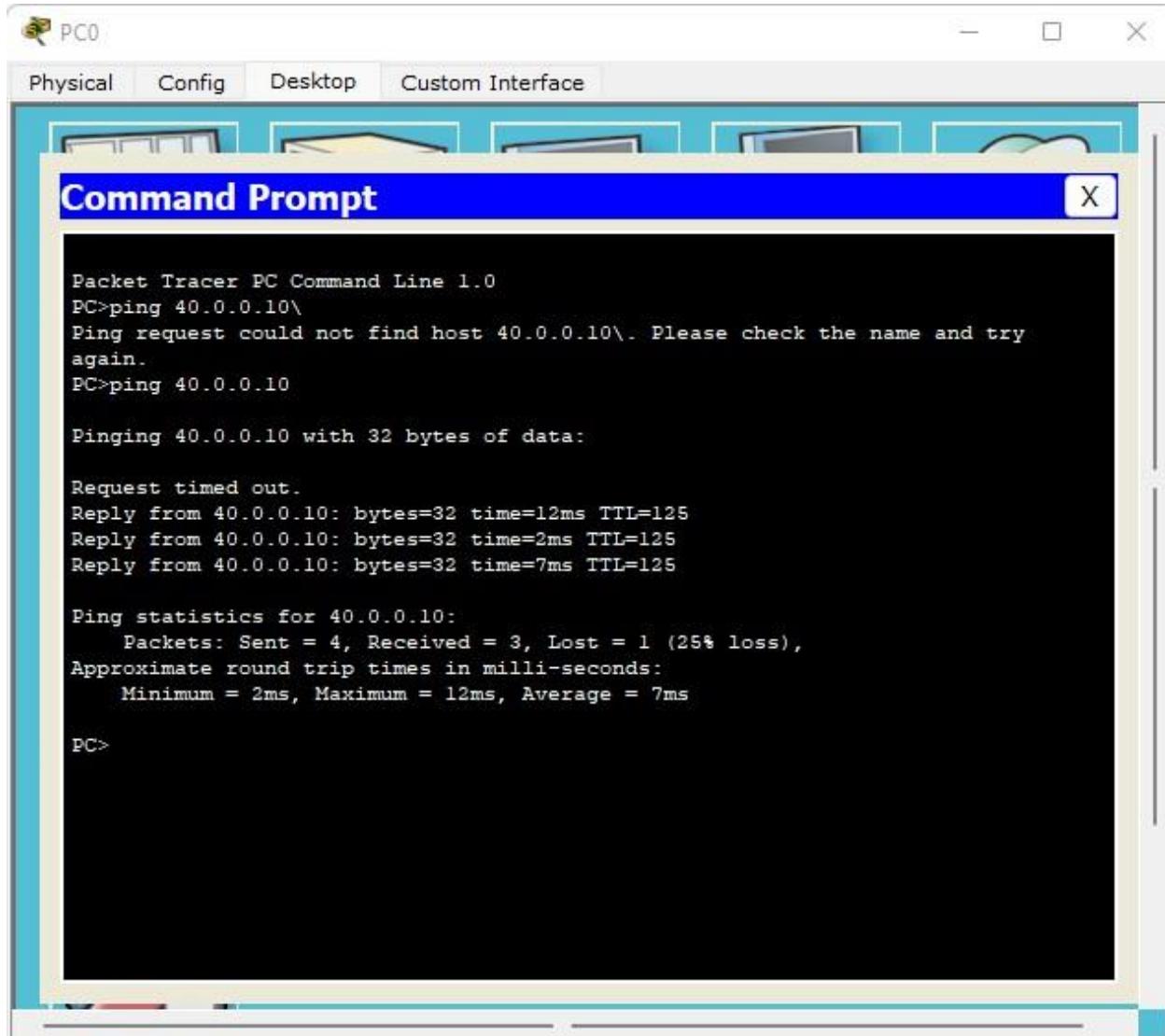
00:23:18: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading Done

Router(config-if)#exit
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console
```

```
Router#  
%SYS-5-CONFIG_I: Configured from console by console  
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  
  
O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:05:53, Serial2/0  
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:06:30, Serial2/0  
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks  
C      30.0.0.0/8 is directly connected, Serial2/0  
C      30.0.0.1/32 is directly connected, Serial2/0  
C      40.0.0.0/8 is directly connected, FastEthernet0/0  
C      172.16.0.0/16 is directly connected, Loopback0  
Router#
```

Ping Output:

P0:



The screenshot shows a Windows Command Prompt window titled "Command Prompt". The window is part of a software interface with tabs for "Physical", "Config", "Desktop", and "Custom Interface". The main area displays the following output from the "Packet Tracer PC Command Line 1.0":

```
Packet Tracer PC Command Line 1.0
PC>ping 40.0.0.10\
Ping request could not find host 40.0.0.10\. Please check the name and try
again.
PC>ping 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of data:

Request timed out.
Reply from 40.0.0.10: bytes=32 time=12ms TTL=125
Reply from 40.0.0.10: bytes=32 time=2ms TTL=125
Reply from 40.0.0.10: bytes=32 time=7ms TTL=125

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 12ms, Average = 7ms

PC>
```

Observation :

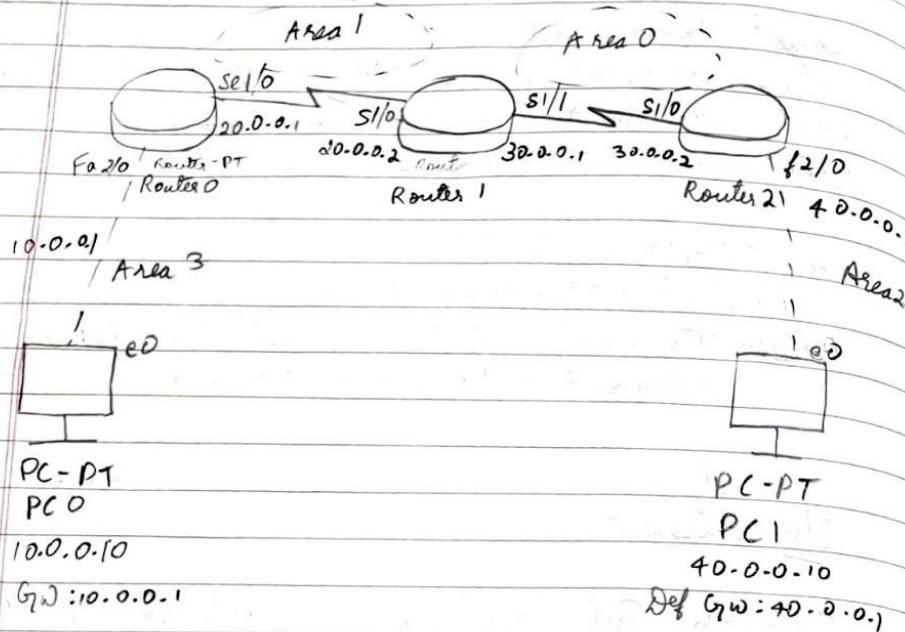
27/7/23

CLASSMATE
Date _____
Page _____

Lab 7

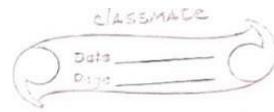
Aim : Configure OSPF routing Protocol

Topology :-



Procedure.

- 1 → Configure the PCs with IP address and Gateway according to topology seen above.
- 2 → Configure each of the Routers according to the IP address in topology.
- 3 → Encapsulation ppp and clock ~~so~~ rate need to be set as done in RIP Protocol experiment



4 → Now, Re Enable ip routing by configuring ospf routing protocol in all routers

In Router R1,

R1(config)# router ospf 1

R1(config-router)# router-id 1.1.1.1

R1(config-router)# network 10.0.0.0 0.255.255.255 area 3

R1(config-router)# network 20.0.0.0 0.255.255.255 area 1

exit

In Router R2,

R2(config)# router ospf 1

R2(config-router)# router-id 2.2.2.2

R2(config-router)# network 20.0.0.0 0.255.255.255 area 1

R2(config-router)# network 30.0.0.0 0.255.255.255 area 0

R2(config-router)# exit

In Router R3,

R3(config)# router ospf 1

R3(config-router)# router-id 3.3.3.3

R3(config-router)# network 30.0.0.0 0.255.255.255 area 0

R3(config-router)# network 40.0.0.0 0.255.255.255 area 2

R3(config-router)# exit

5 → Loopback

In R1, R1(config)# interface s1/0

R1(config-if)# interface loopback 0

R1(config-if)# ip address 172.16.1.252 255.255.0.0

R1(config-if)# no shut

In R2, R2(config)# interface s1/1
R2(config-if)# interface loopback 0
R2(config-if)# ip address 172.16.1.253 255.255.255.0.0
R2(config-if)# no shutdown

In R3,
R2(config)# interface s1/0|R2(config-if)# interface loopback 0
R2(config-if)# ip address 172.16.1.254 255.255.255.0.0
R2(config-if)#
R2(config-if)# no shutdown

6 → Virtual Links

In Router R1

R1(config)# router ospf 1
R1(config-router)# area 1 virtual-link 2.2.2.2

In Router R2,

R2(config)# router ospf 1
R2(config-router)# area 1 virtual-link 1.1.1.1
R2(config-router)# exit

Ping Output

ping > 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of data:
Request timed out

Reply from 40.0.0.10: bytes=32 time=13ms TTL=125

Reply from 40.0.0.10: bytes=32 time=2ms TTL=125



reply from 40.0.0.10 : bytes=32 time=10ms TTL=125

Ping statistics for 40.0.0.10

Packets: sent=4, received=3, lost=1 (25% loss)

Approximate round trip in milliseconds:

Minimum=2ms, Maximum=13ms, Average=12.5ms

Observation

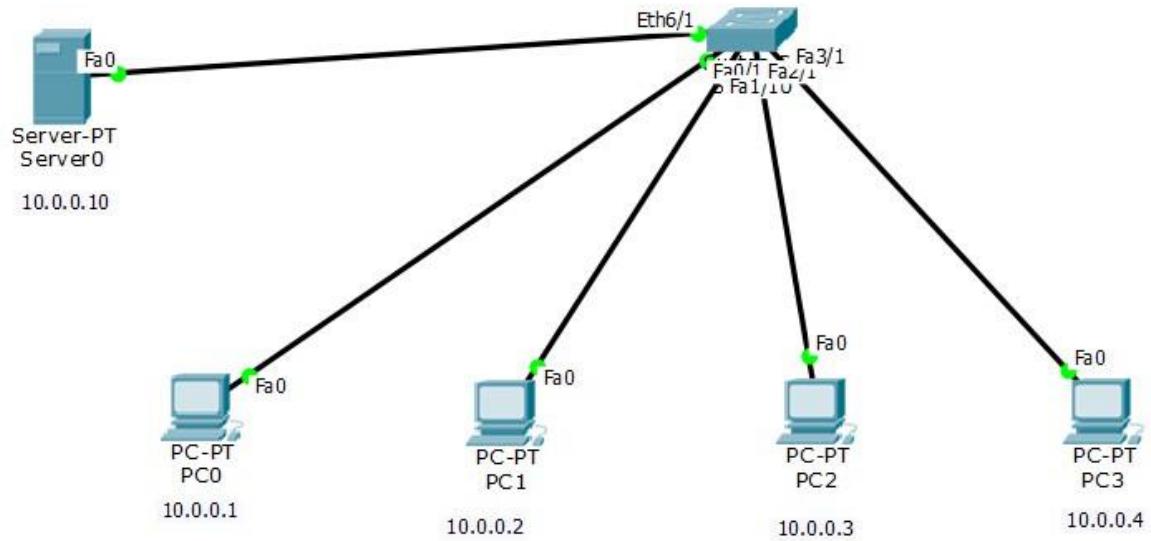
OSPF protocol is used to find the best path for packets as they pass through a set of connected networks.

NL
9/15/2023

Experiment 8

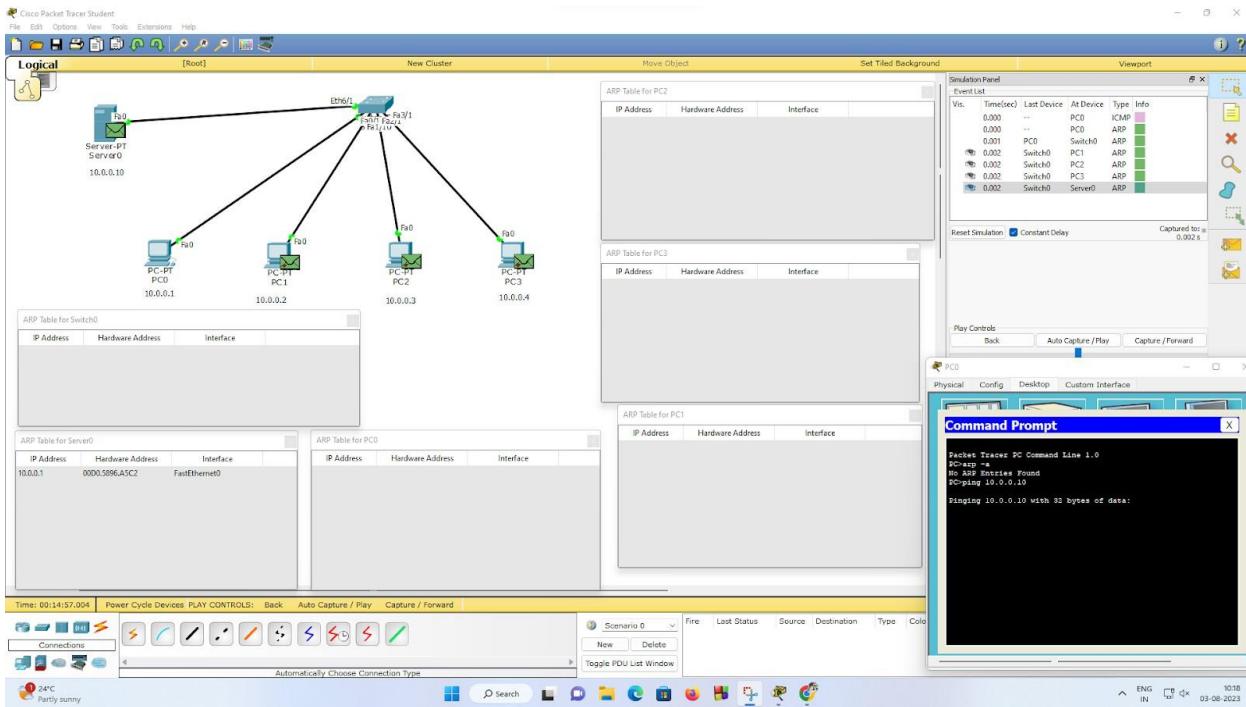
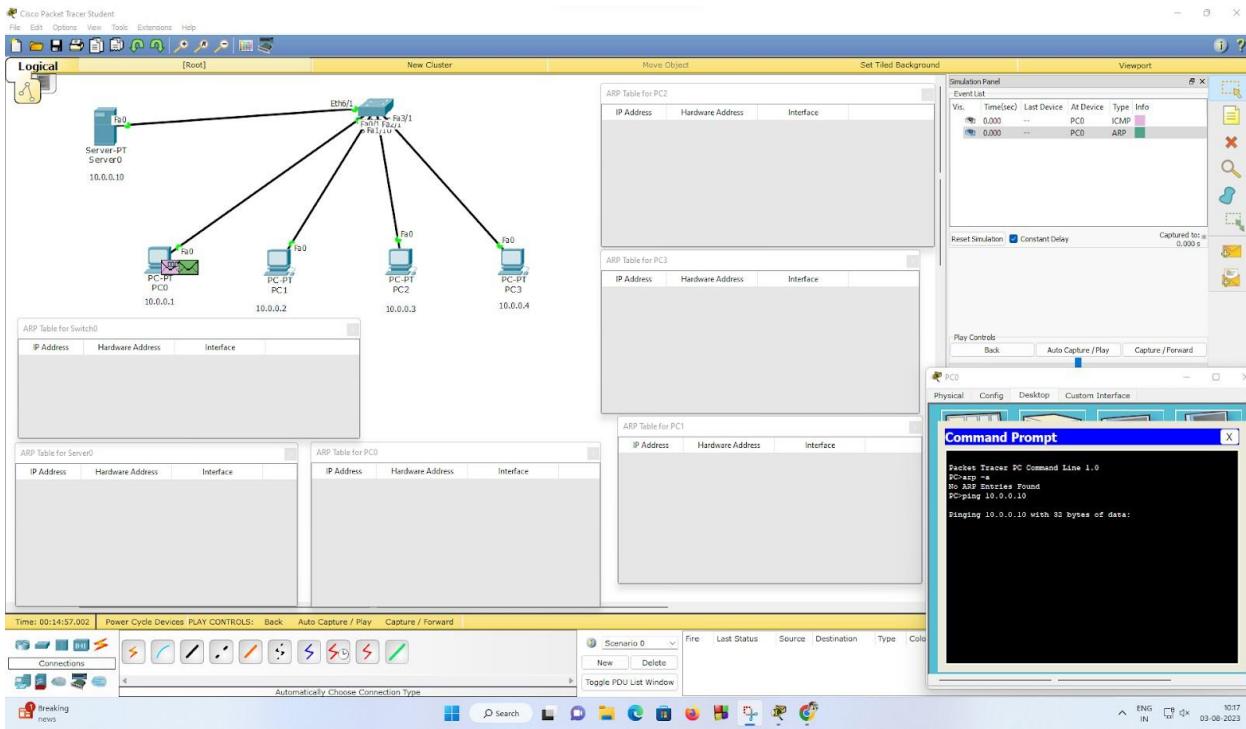
Aim : To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)

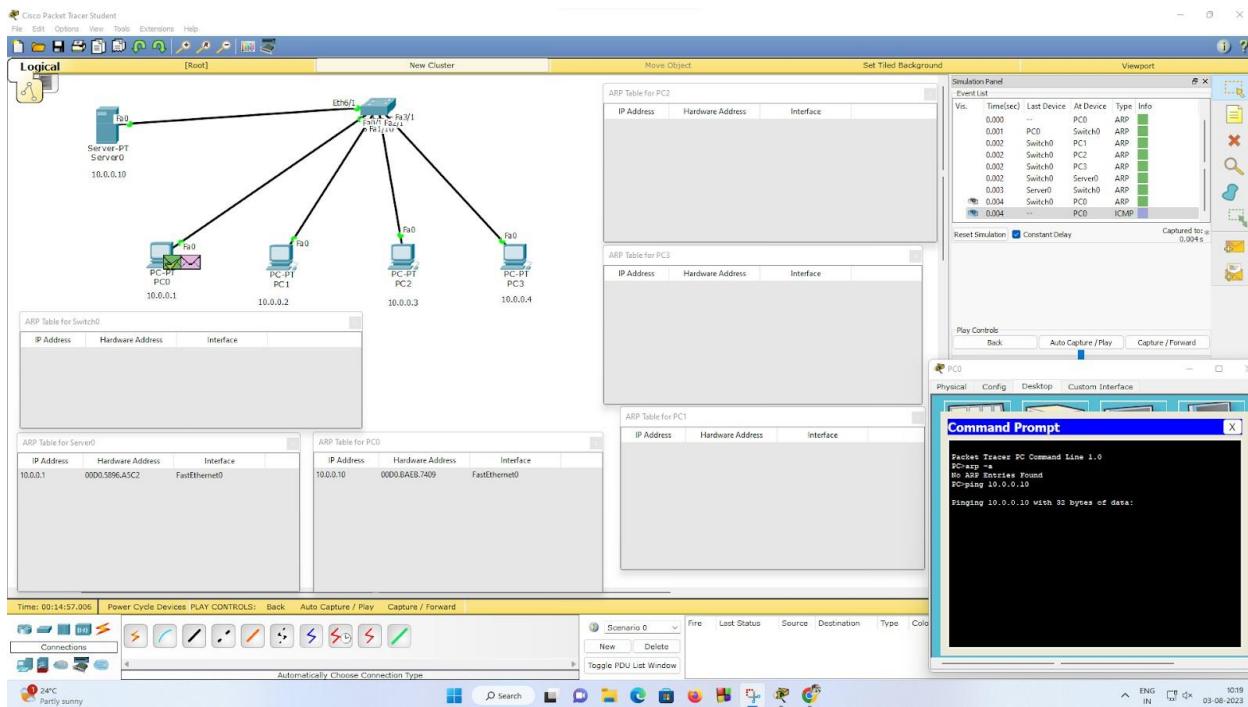
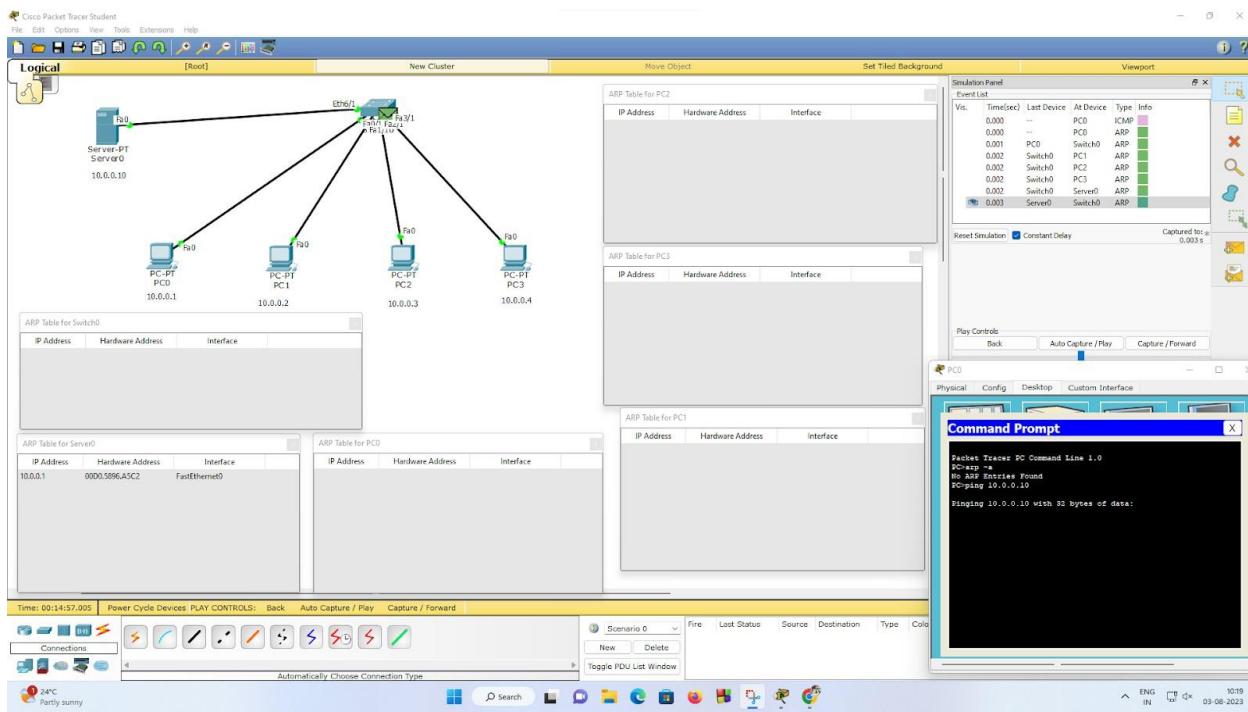
Topology:

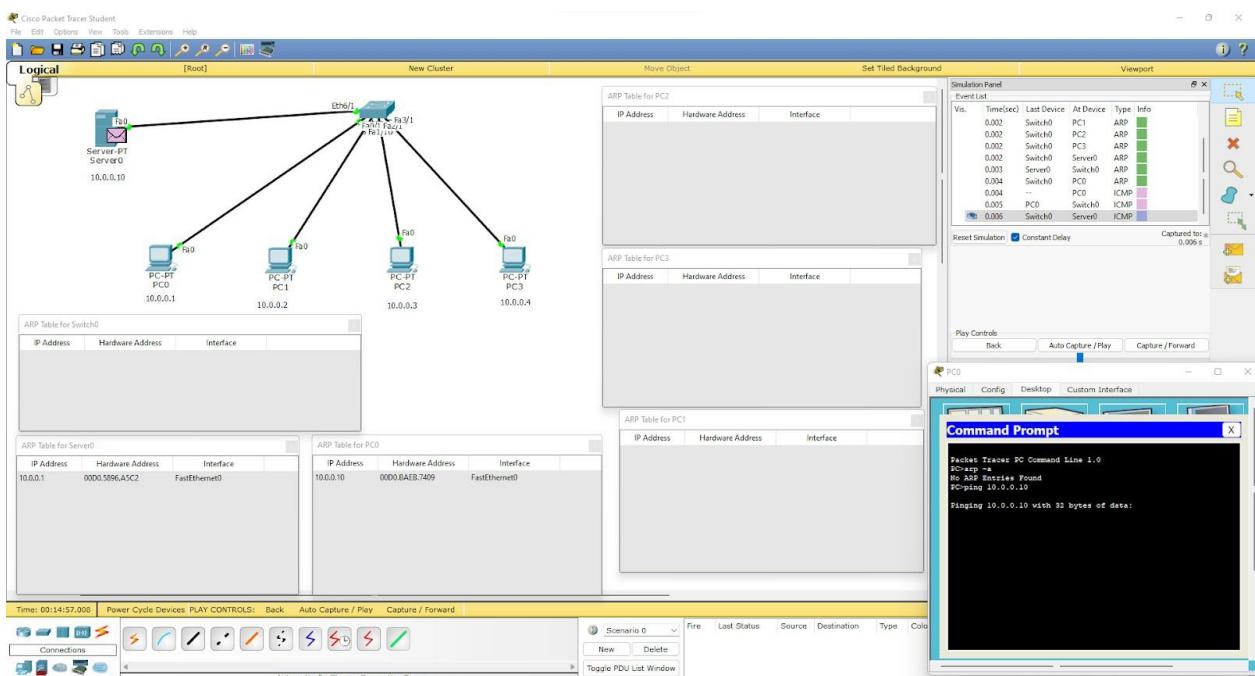
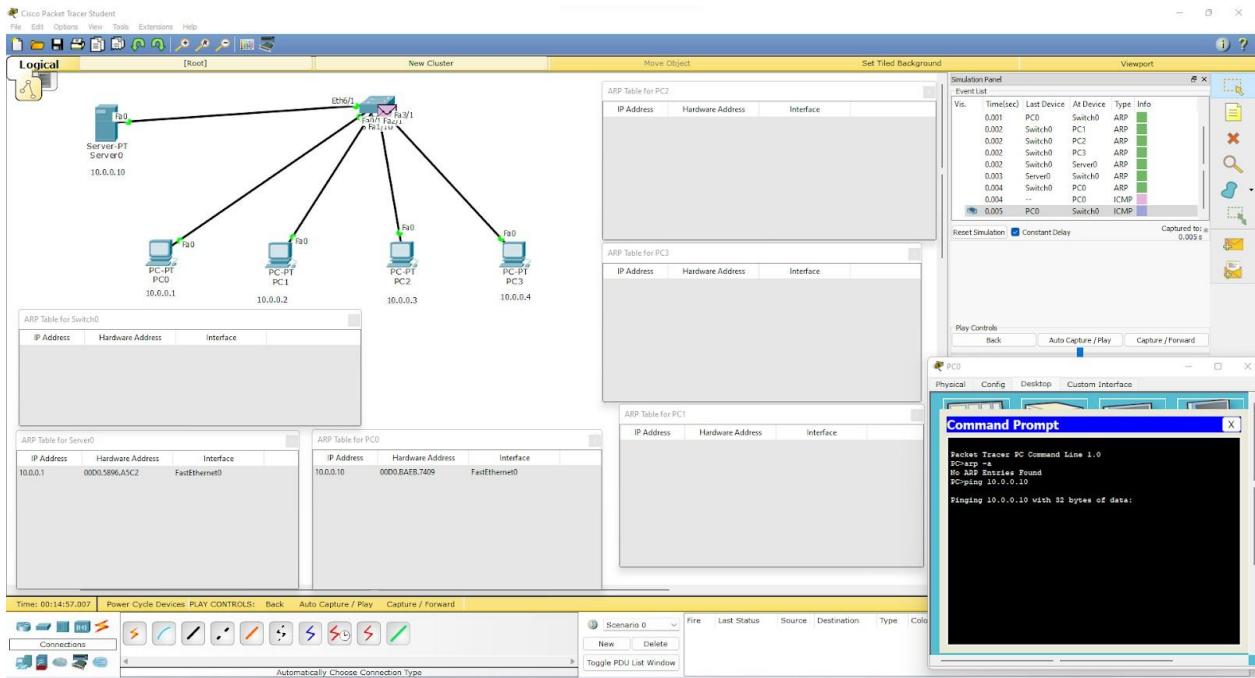


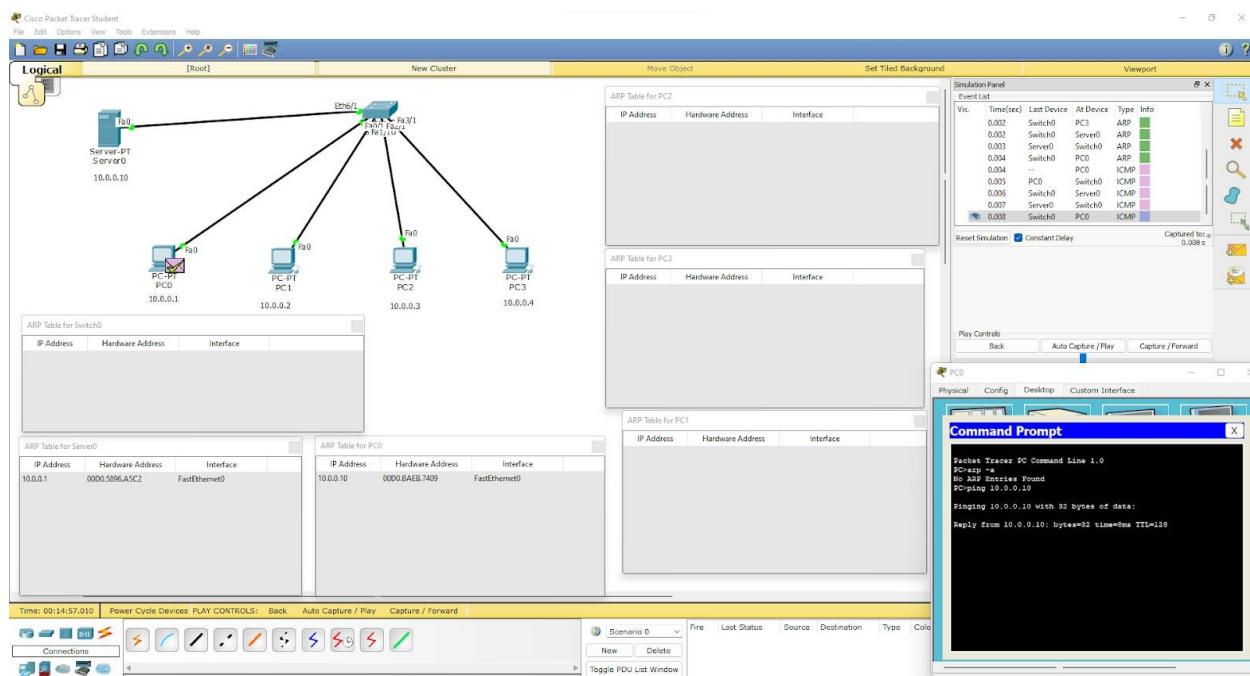
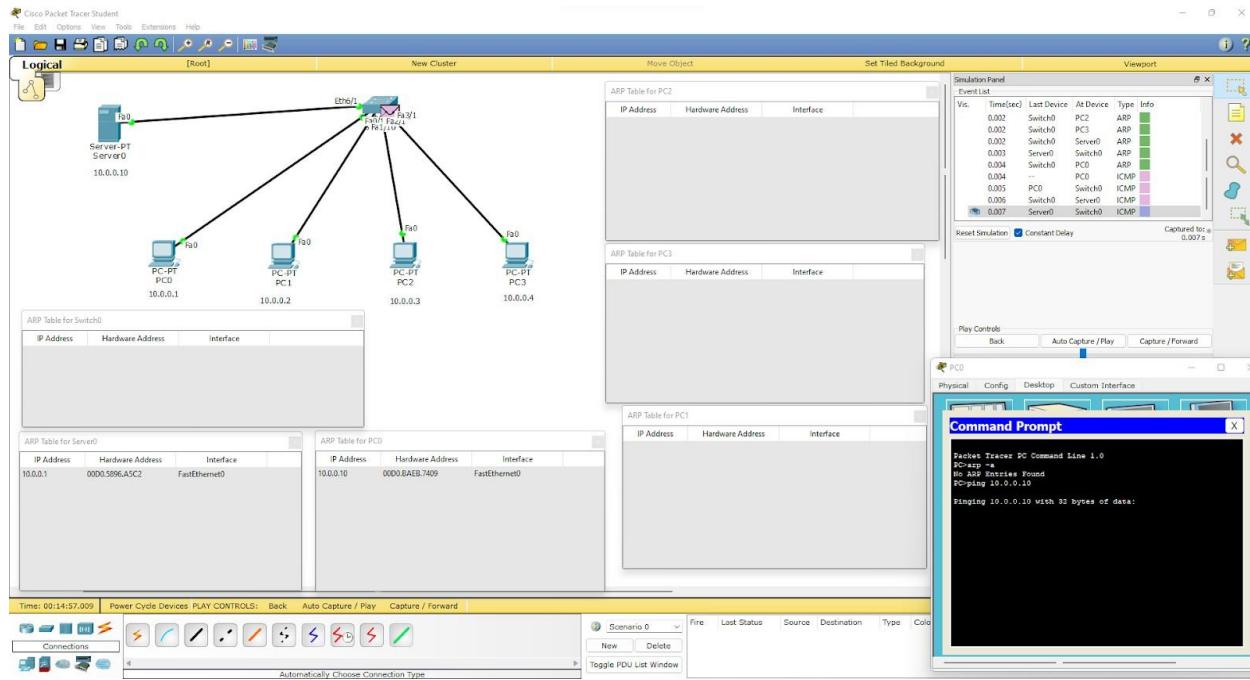
ARP Tables while pinging :

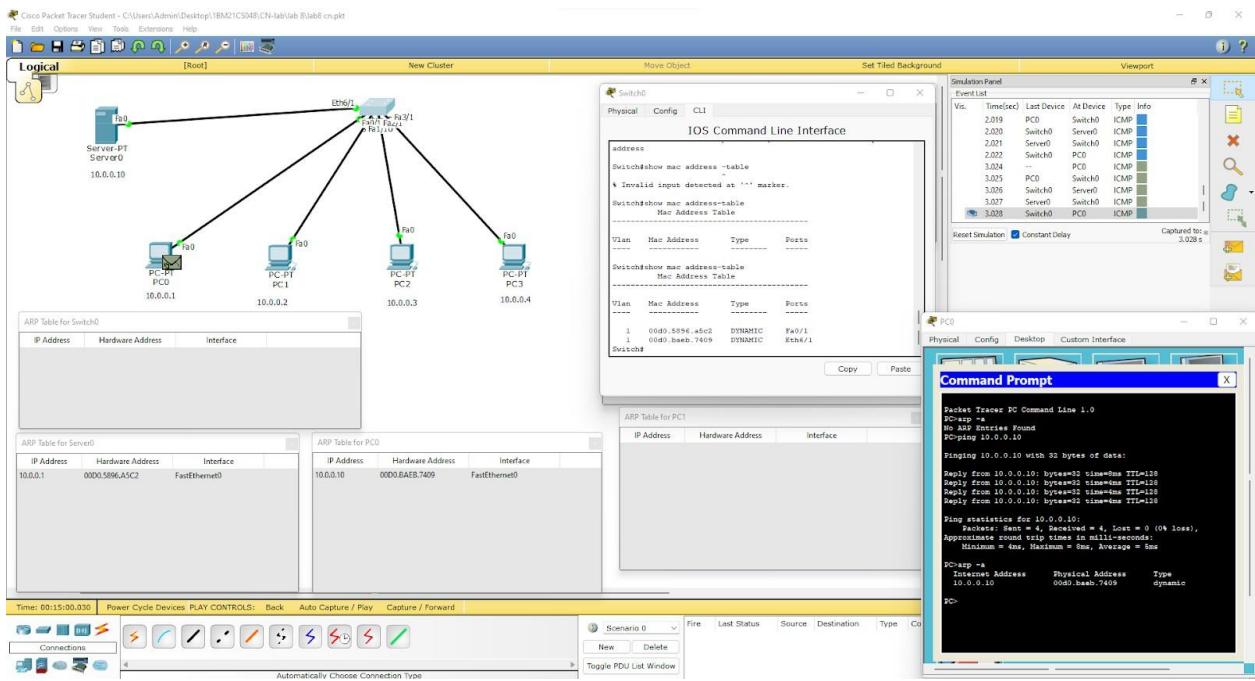
Ping from PC0 to Server0:



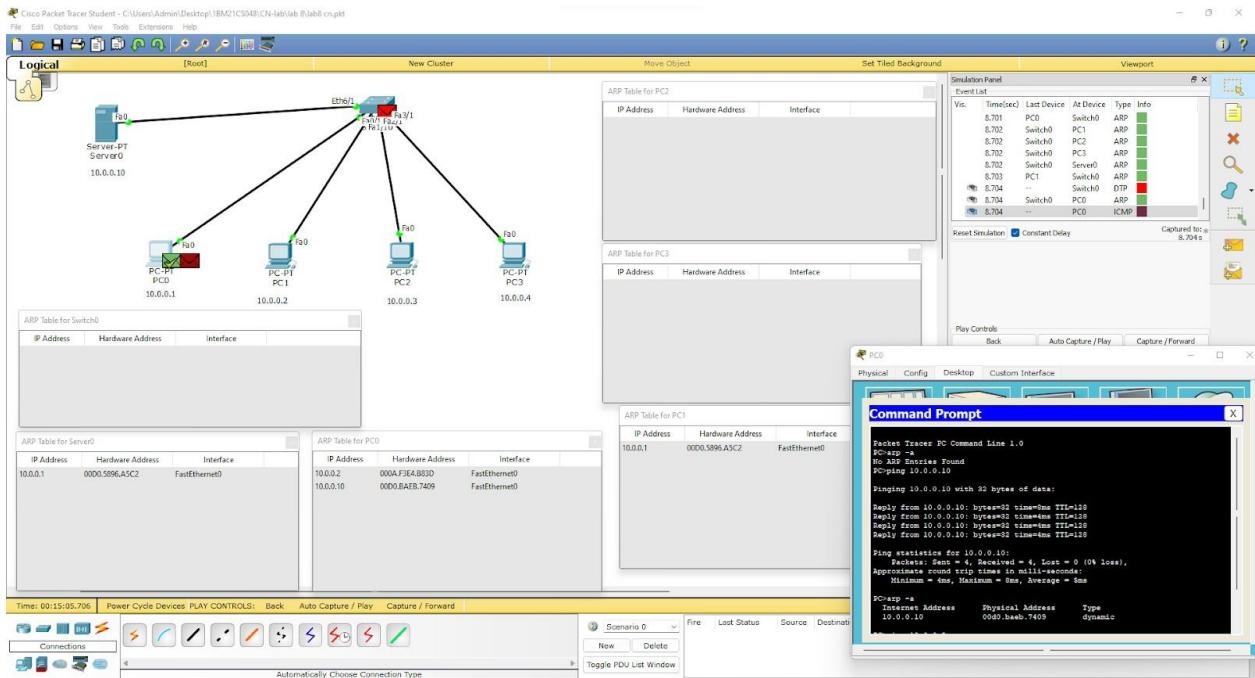


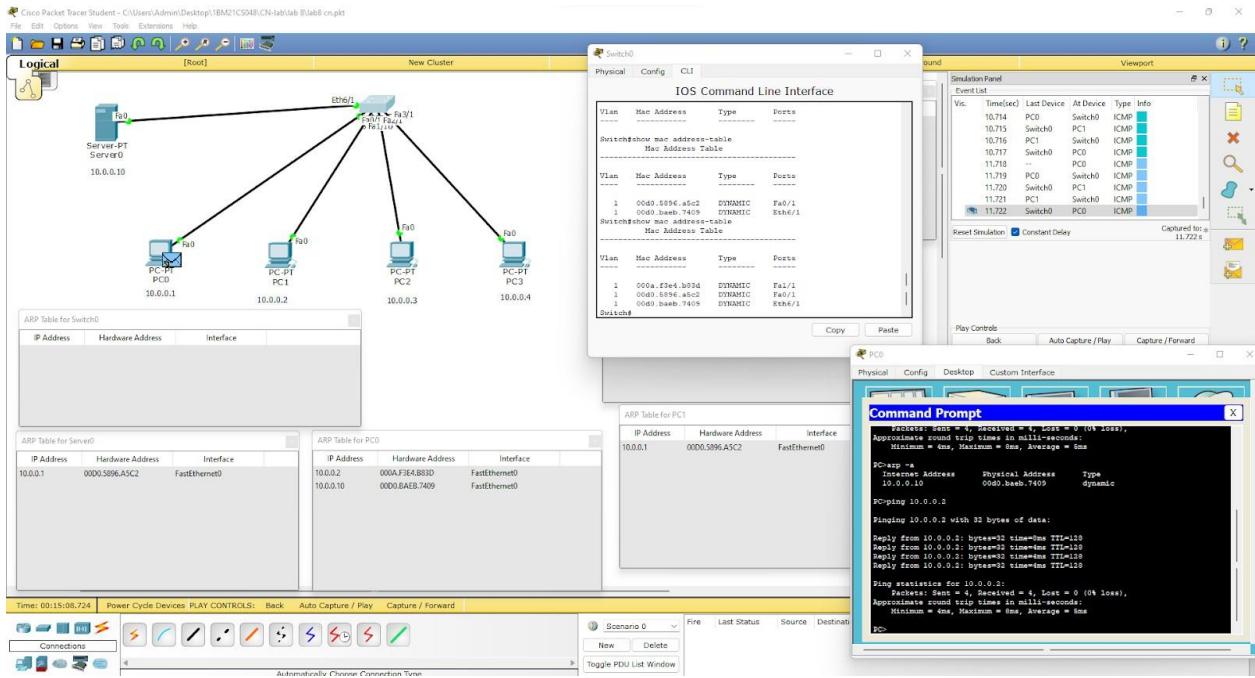




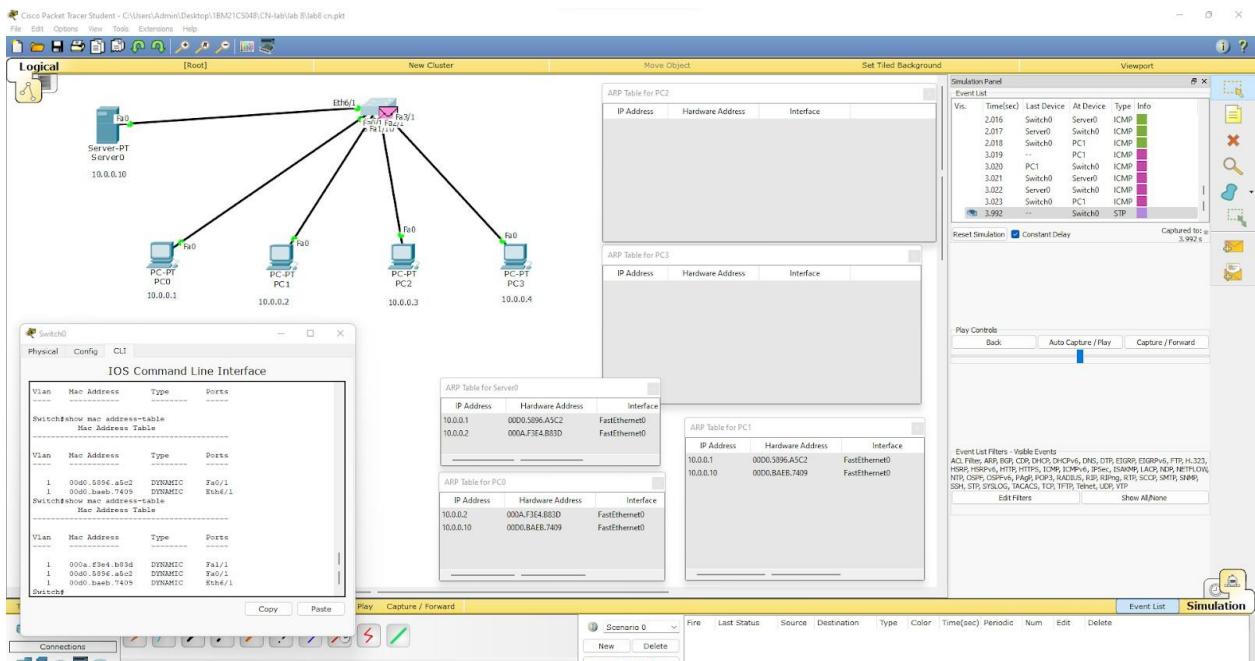


Ping from PC0 to PC1:





Final ARP Tables after pinging:



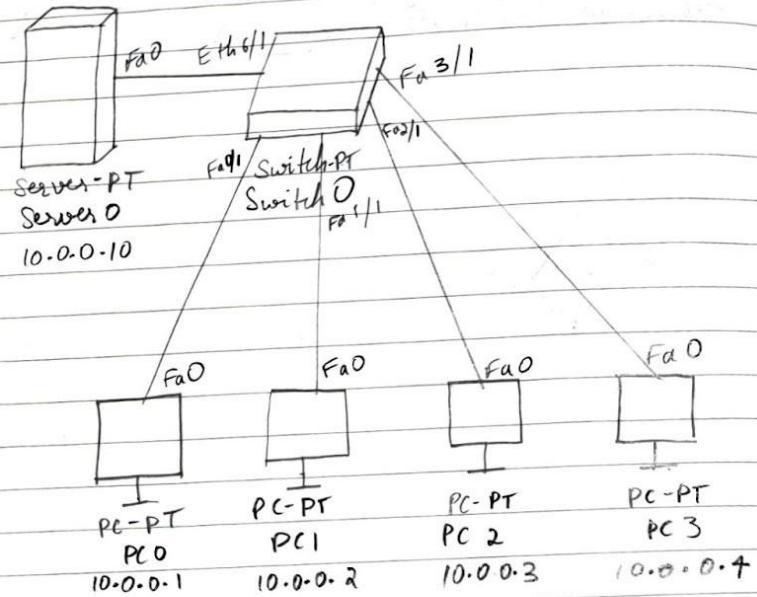
Observation:

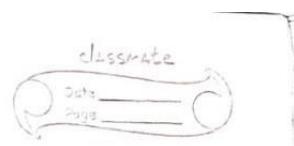
3/8/23

Lab 8:

Aim: To construct simple LAN and understand the concept and operation of address resolution protocol (ARP)

Topology:





Procedure.

1) Create a topology of 4 PCs and a server and a switch as shown in the diagram.

2) Set IP address of all devices as shown in the topology.

3) Use inspect tool to click on devices to open ARP tables of each device.

4) In command prompt of PC0, write arp -a to see arp table.

O/P: No ARP Entries Found as no pinging done yet.

5) In CLI of switch, enter

Switch >enable

Show MAC

Show mac address-table

Now, mac address table is empty.

6) Go to Simulation mode.

Ping the server from PC0

Click on capture button in simulation panel to go step by step. ~~change~~

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28/2/2017

E Ping Output :-

PC > arp -a
No ARP Entries found.

PC > ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Reply from 10.0.0.10 : bytes=32 time=8ms TTL=128

Reply from 10.0.0.10 : bytes=32 time=8ms TTL=128

Reply from 10.0.0.10 : bytes=32 time=4ms TTL=128

Reply from 10.0.0.10 : bytes=32 time=4ms TTL=128

Ping statistics for 10.0.0.10:

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss)

Approximate round trip times in milli-seconds:
Minimum = 4ms, Maximum = 8ms, Average = 5ms

PC > arp -a

Internet Address	Physical Address	Type
10.0.0.10	00:00:ba:ab:74:09	dynamic

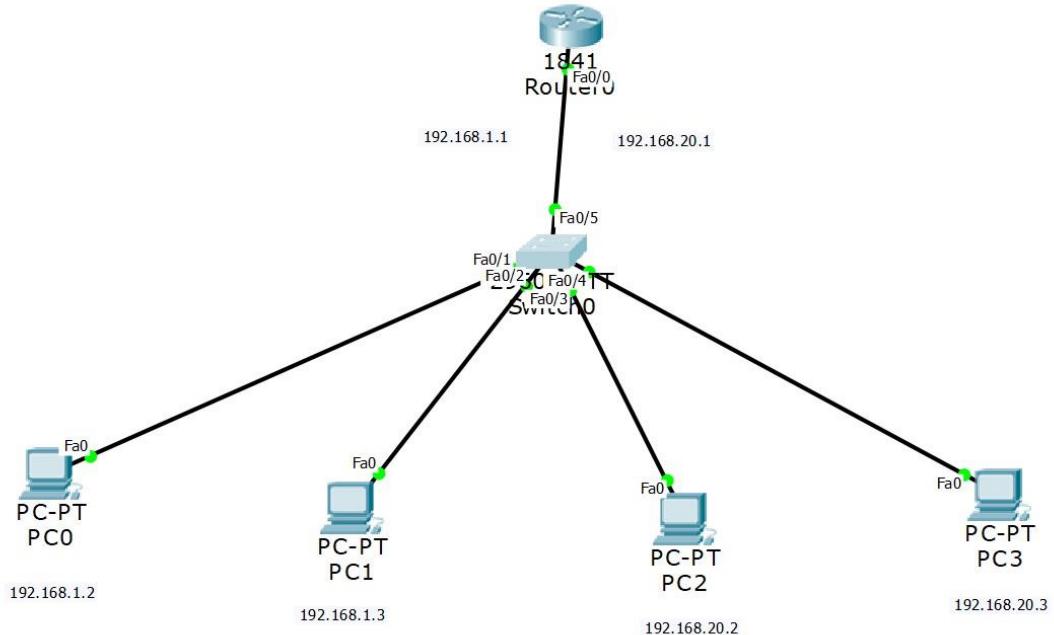
Observation:

- We can see mac address-table of switch in CLI
- We can observe that, when we ping and click on capture on simulation panel, ARP request is broadcasted and ARP reply is unicasted.
- Then ICMP packets are sent.
- As and when capture is clicked, ARP table is updated accordingly for PC and server.

Experiment 9

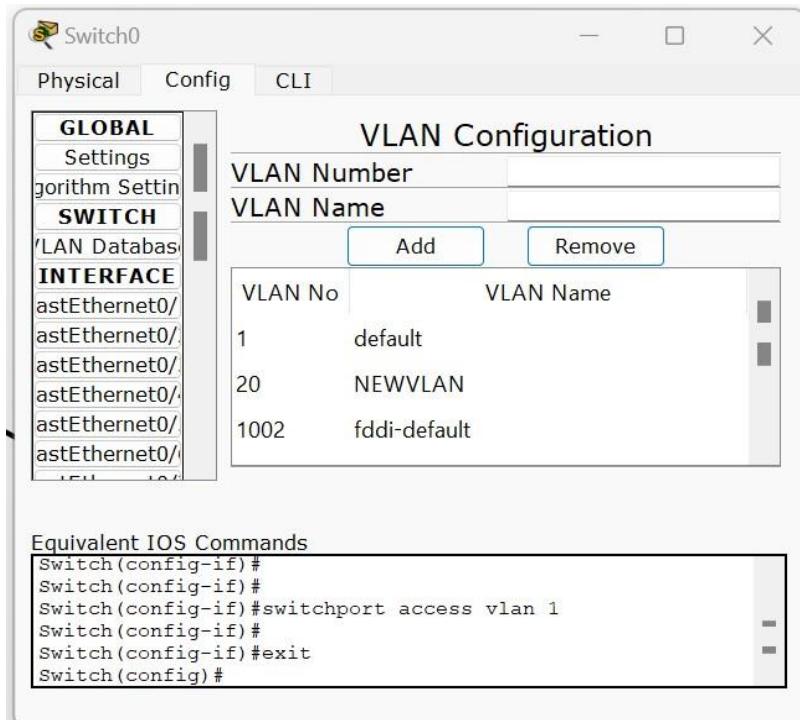
Aim : To construct a VLAN and make the PC's communicate among a VLAN

Topology:

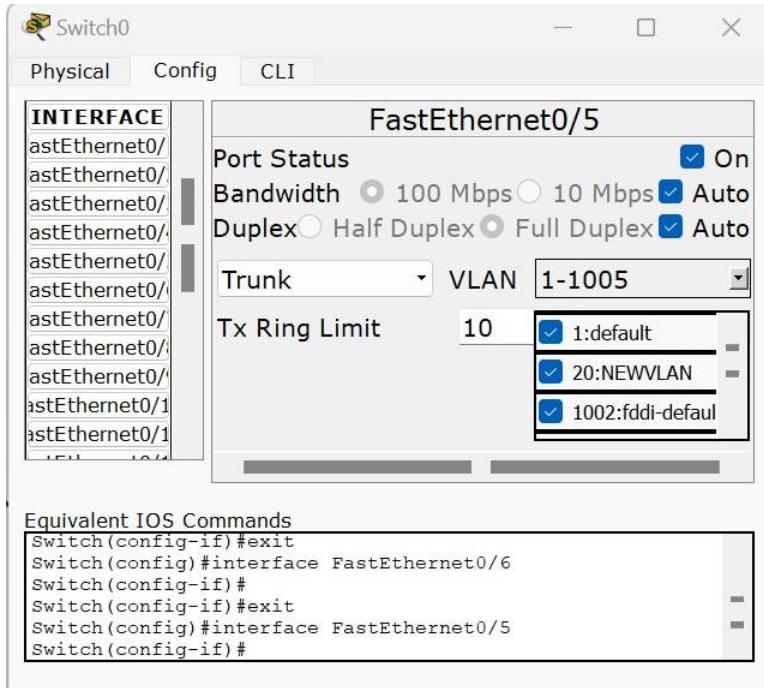


Configurations:

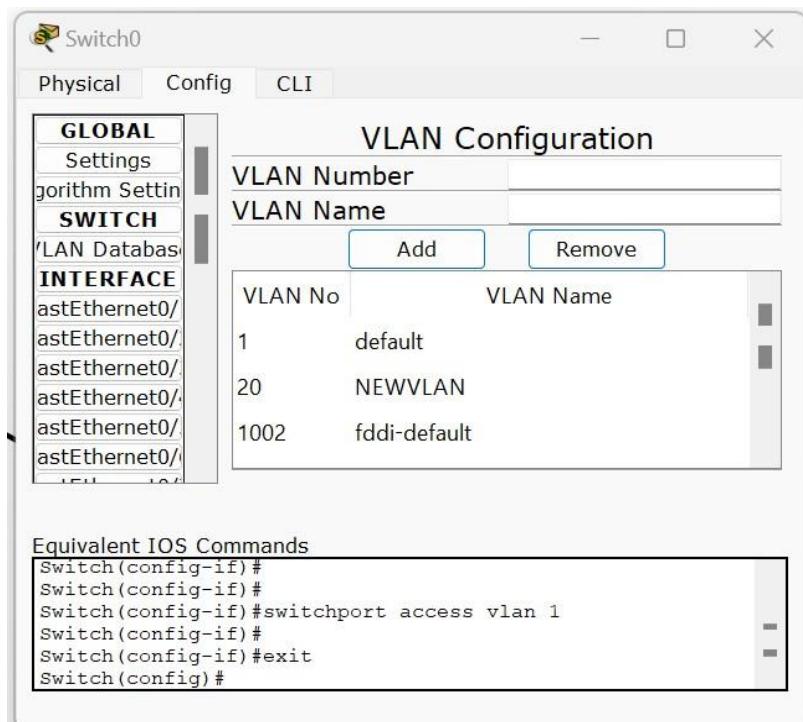
Switch VLAN Database:



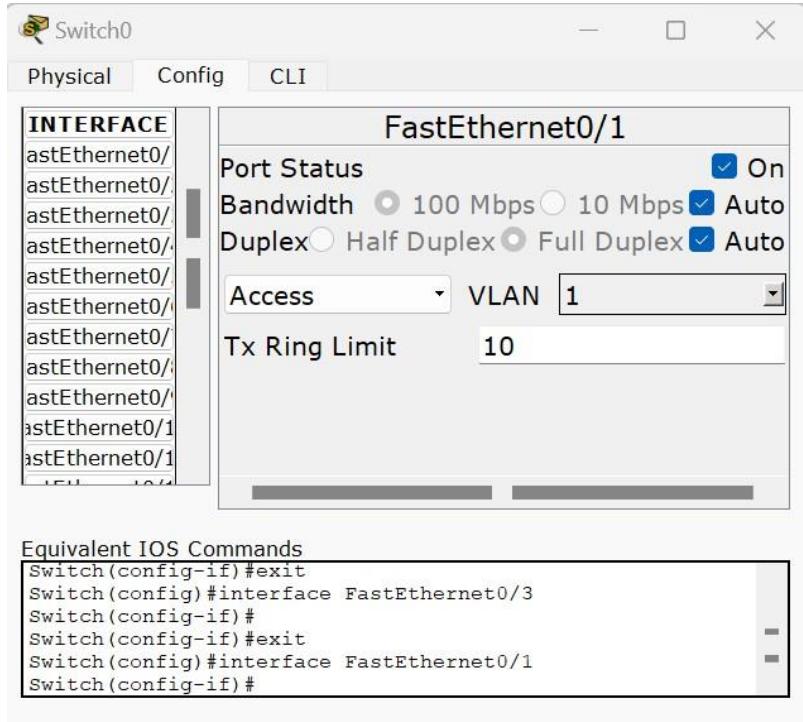
Switch FastEthernet0/5



Switch FastEthernet0/3 and FastEthernet0/4



Switch FastEthernet0/1 and FastEthernet0/2



Router 0 :

VLAN DataBase:

Router0		Physical	Config	CLI		
		VLAN Configuration				
GLOBAL						
Settings						
Algorithm Settings						
ROUTING						
Static						
RIP						
SWITCHING						
VLAN Database						
INTERFACE						
FastEthernet0/0						
FastEthernet0/1						
		VLAN Number				
		VLAN Name				
		VLAN No	Add	Remove		
			VLAN Name			
		1 default				
		20 NEWVLAN				
		1002 fddi-default				
		1003 token-ring-default				
		1004 fddinet-default				
		1005 trnet-default				
Equivalent IOS Commands						
<pre>%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up exit Router(config)#int fa 0/0.1 Router(config-subif)# %LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up Router(config-subif)#encapsulation dot1q 20 Router(config-subif)#ip address 192.168.20.1 255.255.255.0 Router(config-subif)#no shut Router(config-subif)#exit Router(config)# Router(config)#exit Router#vlan database % Warning: It is recommended to configure VLAN from config mode, as VLAN database mode is being deprecated. Please consult user documentation for configuring VTP/VLAN in config mode. Router(vlan)# %SYS-5-CONFIG_I: Configured from console by console</pre>						

Router 0 :

CLI:



Router0

Physical Config CLI

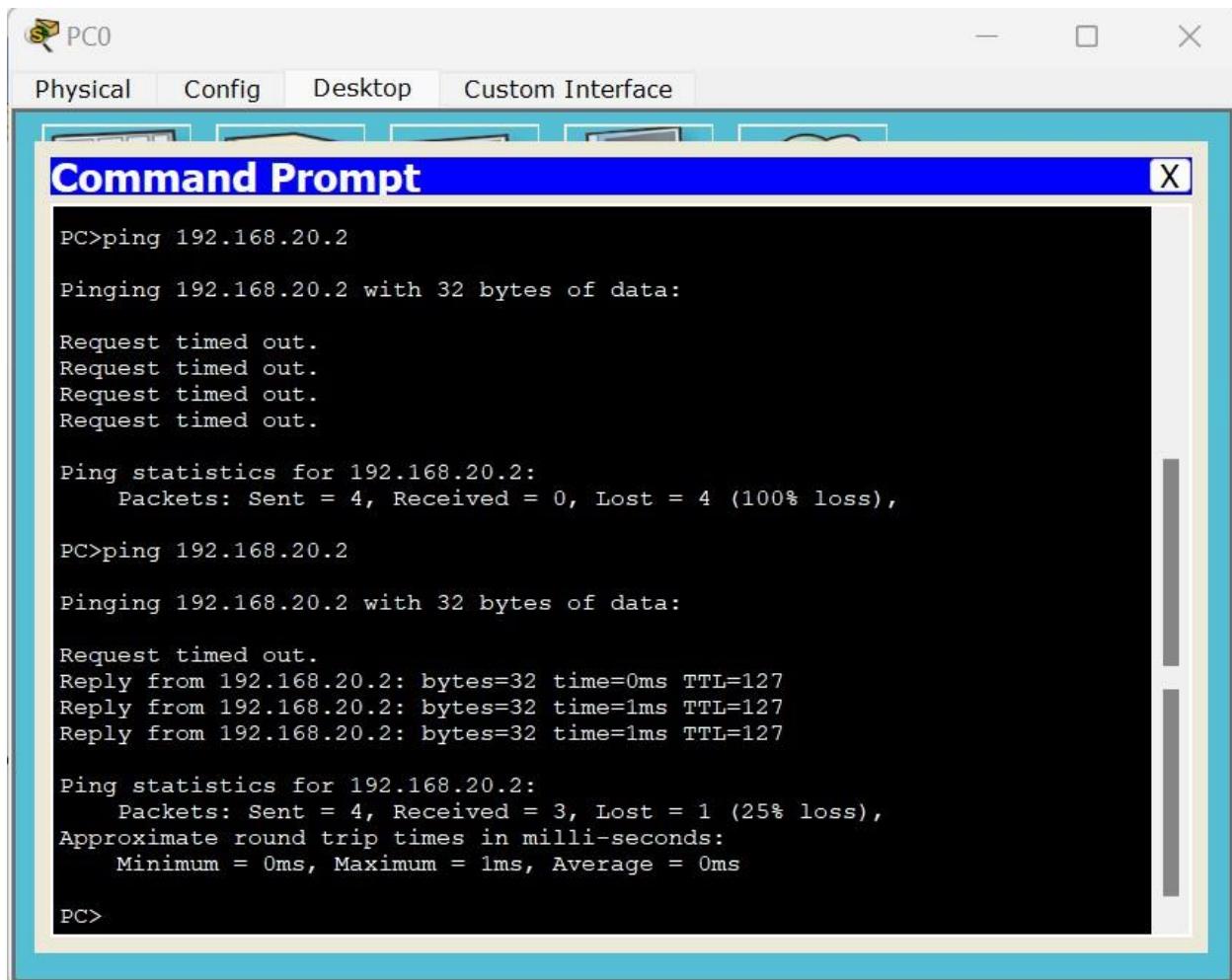
IOS Commar

```
--- System Configuration Dialog ---  
Continue with configuration dialog? [yes/no]: n  
  
Press RETURN to get started!  
  
Router>enable  
Router#vlan database  
% Warning: It is recommended to configure VLAN from config mode,  
as VLAN database mode is being deprecated. Please consult user  
documentation for configuring VTP/VLAN in config mode.  
  
Router(vlan)#vlan 20 name NEWVLAN  
VLAN 20 modified:  
    Name: NEWVLAN  
Router(vlan)#exit  
APPLY completed.  
Exiting...  
Router#config t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#int fa0/5  
%Invalid interface type and number  
Router(config)#int fa0/0  
Router(config-if)#ip address 192.168.1.1 255.255.255.0  
Router(config-if)#no shut  
  
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  
exit  
Router(config)#int fa 0/0.1  
Router(config-subif)#  
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up  
  
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up  
  
Router(config-subif)#encapsulation dot1q 20  
Router(config-subif)#ip address 192.168.20.1 255.255.255.0  
Router(config-subif)#no shut  
Router(config-subif)#exit  
Router(config)#+
```

Ping Outputs:

P0:

Before and after VLAN configuration was successful.



The screenshot shows a Windows-style Command Prompt window titled "Command Prompt". The window has a blue header bar with the title and a standard window control bar at the top right. Below the title bar is a toolbar with several icons. The main area of the window is a black text console. It displays two separate ping operations. The first operation, "PC>ping 192.168.20.2", shows four failed attempts ("Request timed out") and statistics indicating 100% loss. The second operation, "PC>ping 192.168.20.2", shows three successful replies from the target IP address (bytes=32, time=0ms to 1ms, TTL=127) and statistics indicating 25% loss. The command prompt ends with "PC>".

```
PC>ping 192.168.20.2
Pinging 192.168.20.2 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.20.2:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>ping 192.168.20.2
Pinging 192.168.20.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.20.2: bytes=32 time=0ms TTL=127
Reply from 192.168.20.2: bytes=32 time=1ms TTL=127
Reply from 192.168.20.2: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.20.2:
  Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
  Minimum = 0ms, Maximum = 1ms, Average = 0ms
PC>
```

Observation:

CLASSTIME _____

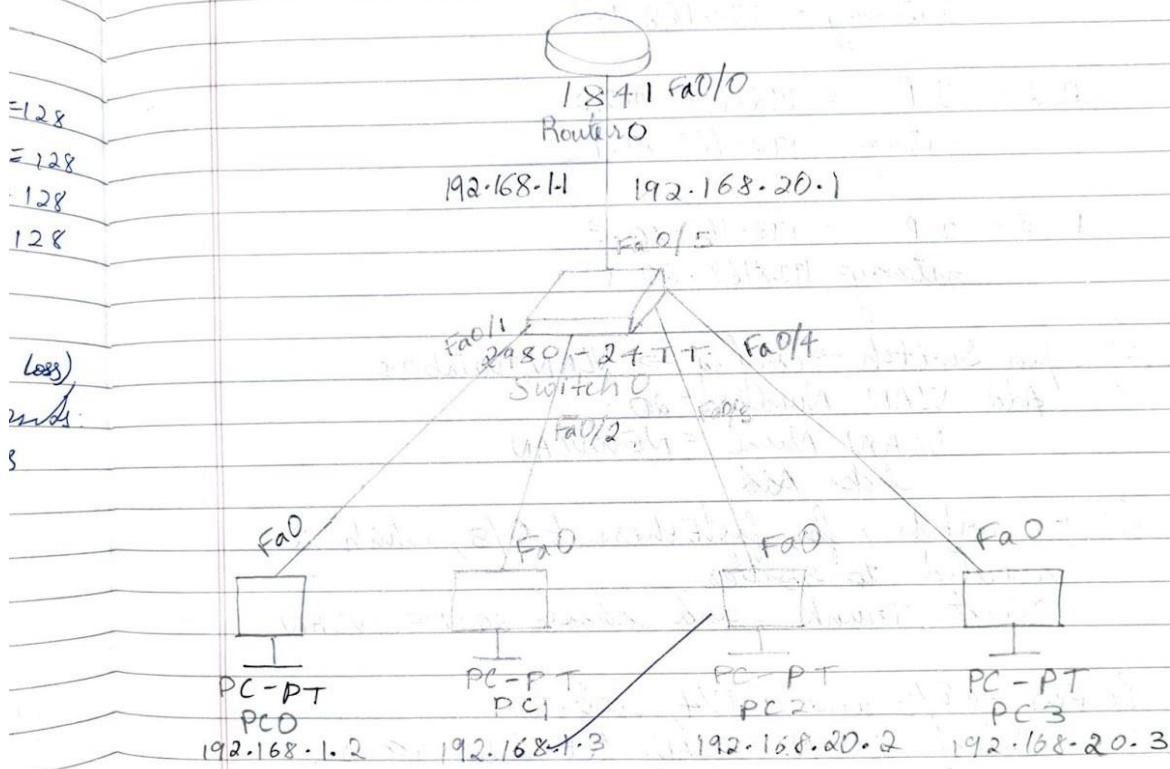
Date _____

Page _____

Lab 9

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

Topology:



Procedure:

- 1) Create the topology as shown using 1841 Router and 2980 Switch. Connect 4 PCs to them as shown using copper straight through cable.
- 2) We use class C addressing here.

3) Set IP addresses and Gateways for PCs.

PC 0 : IP = 192.168.1.2
Gateway = 192.168.1.1

PC 1 : IP = 192.168.1.3
Gateway = 192.168.1.1

PC 2 : IP = 192.168.20.2
Gateway = 192.168.20.1

PC 3 : IP = 192.168.20.3
Gateway = 192.168.20.1

4) Open Switch \rightarrow Config \rightarrow VLAN Database
Add VLAN Number = 20
VLAN Name = NEWVLAN
Click Add

5) In Switch, for fastEthernet 0/3, which is connected to router,
Select Trunk, and choose 20:NEWVLAN

6) For Fa0/3 and Fa0/4, select
Select 20:NEWVLAN. Let it be Access.
For Fa0/1 and Fa0/2, leave it as it is.

7) Open Router \rightarrow Config \rightarrow VLAN Database
Add VLAN Number : 20
VLAN Name : NEWVLAN

8) In Router 0 CLI :

Router > en

Router#(vlan) # exit

Router#Config t

Router(config) # int fa0/0

Router(config) # ip address 192.168.1.1 255.255.255.0

Router(config-if) # no shut

Router(config-if) # exit

Router(config) # int fa 0/0.1

Router(config-subif) # encapsulation dot1q 20

Router(config-subif) # ip address 192.168.20.1 255.255.255.0

Router(config-subif) # no shut

Router(config-subif) # exit

Router(config) # exit

N
16/8/2023

Ping Output :-

PC > ping 192.168.20.2

Pinging 192.168.20.2 with 32 bytes of data :

Request timed out.

Reply from 192.168.20.2 : bytes = 32 time = 0ms TTL = 127

Reply from 192.168.20.2 : bytes = 32 time = 1ms TTL = 127

Reply from 192.168.20.2 : bytes = 32 time = 1ms TTL = 127

Ping statistics for 192.168.20.2 :

Packets : Sent = 4 , Received = 3 , Lost = 1 (25% loss),

Approximate round trip times in milliseconds :

Minimum = 0ms , Maximum = 1ms , Average = 0ms.

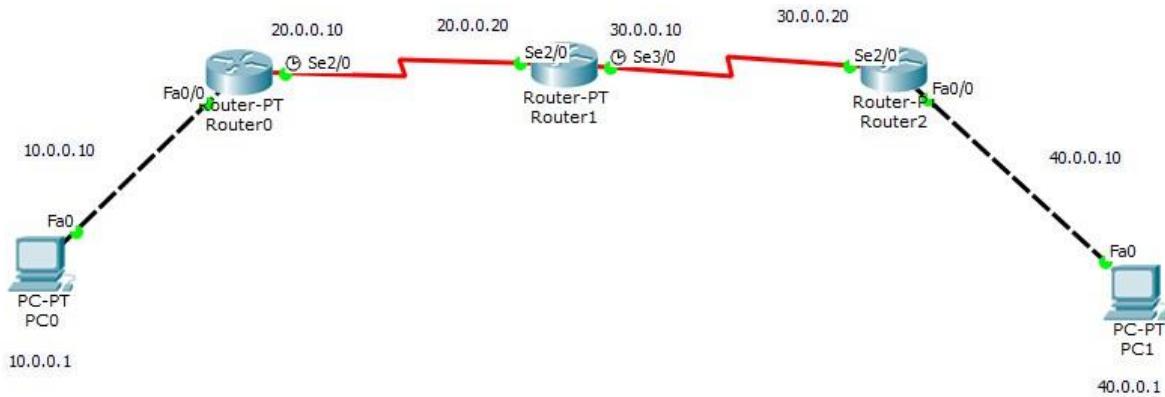
Observation :-

- We can observe that ^{after} VLAN is configured we can successfully ping PC2 (192.168.20.2) from PC0 (192.168.1.2).
- PC2 and PC3 are grouped together and communication among them is done via VLAN.
- 192.168.20.1 is a subinterface of the Router.

Experiment 10

Aim : Demonstrate the TTL/ Life of a Packet

Topology :



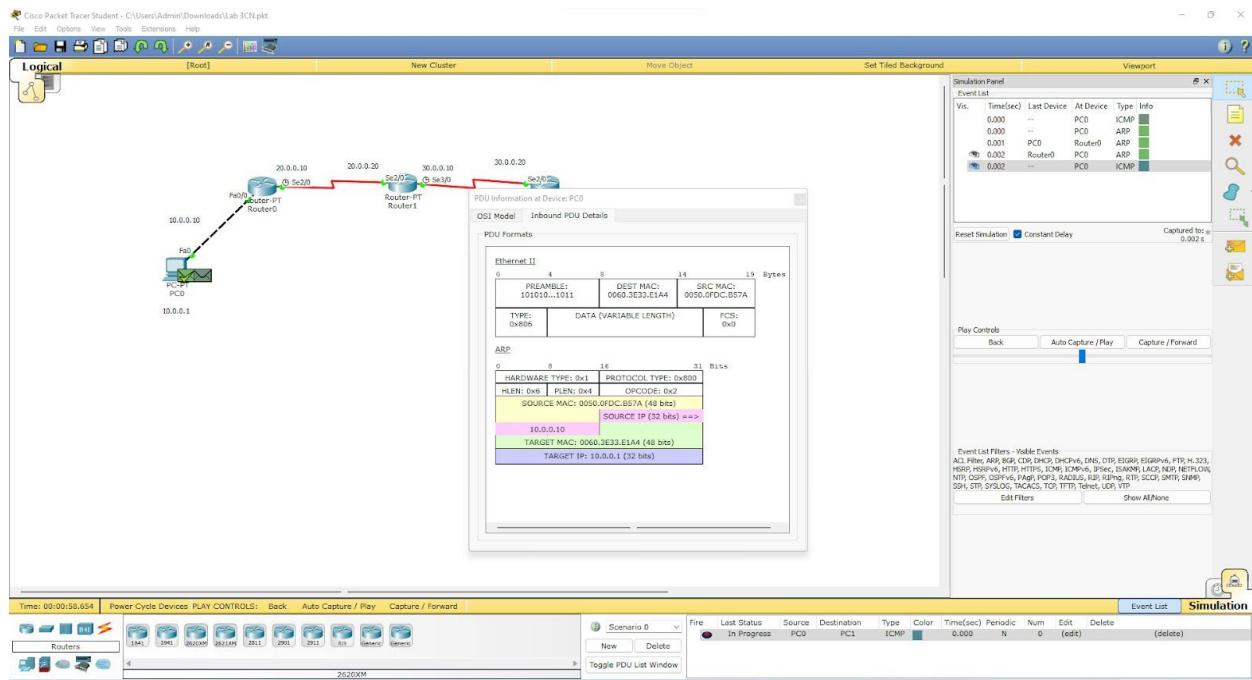
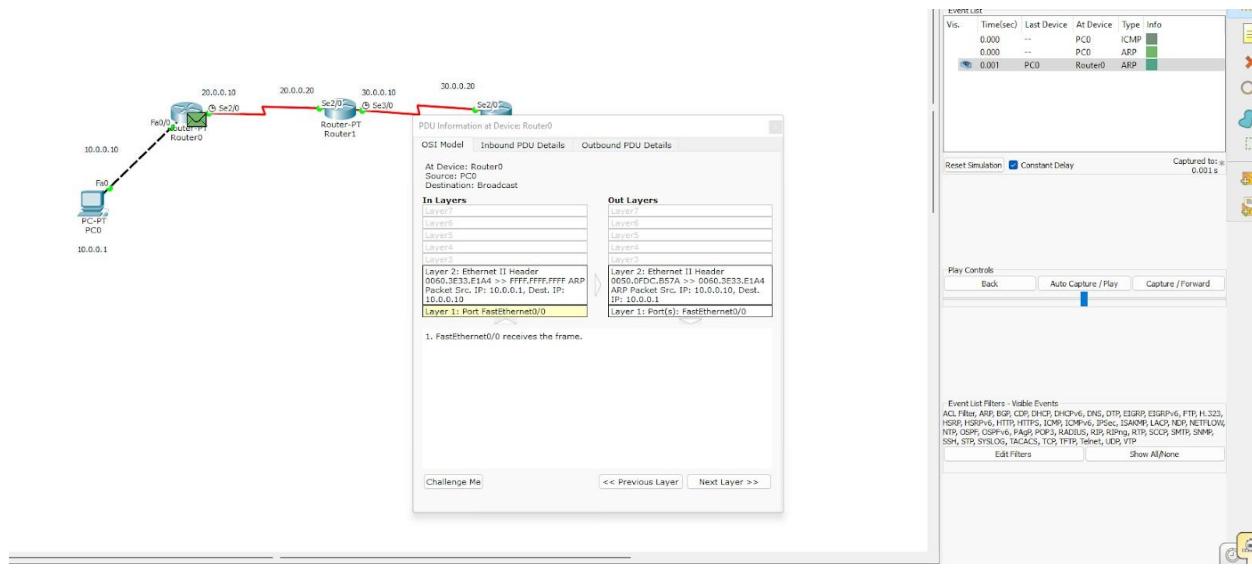
Configurations :

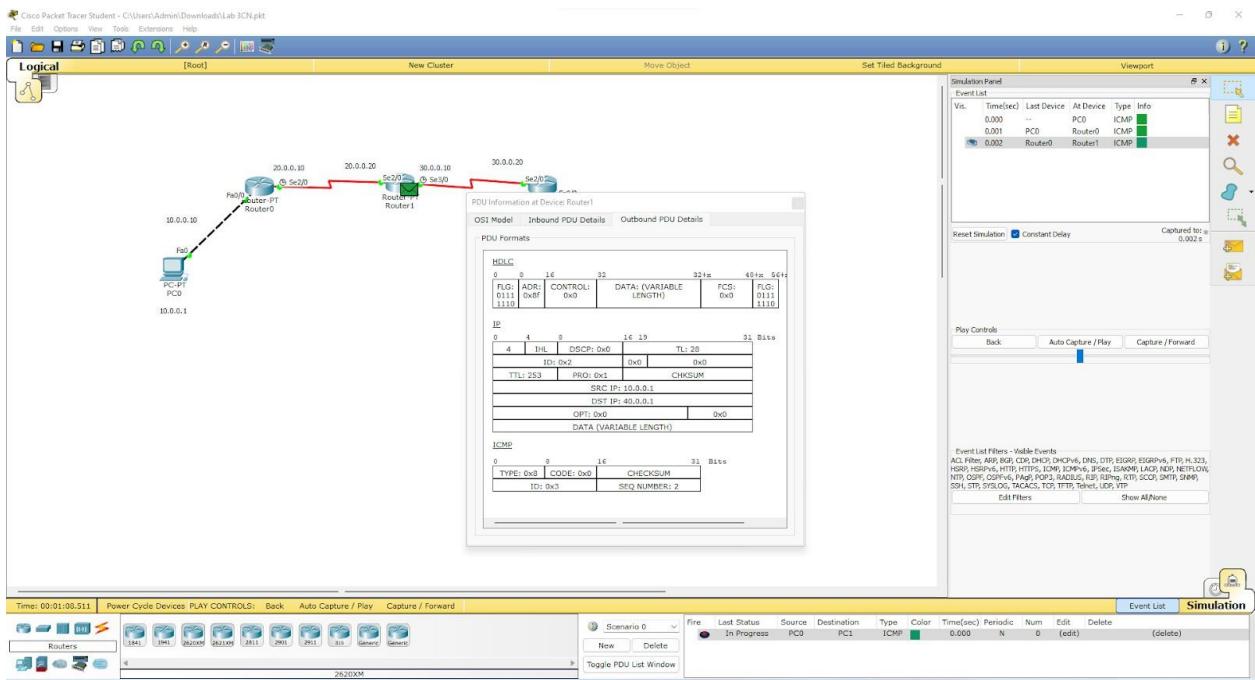
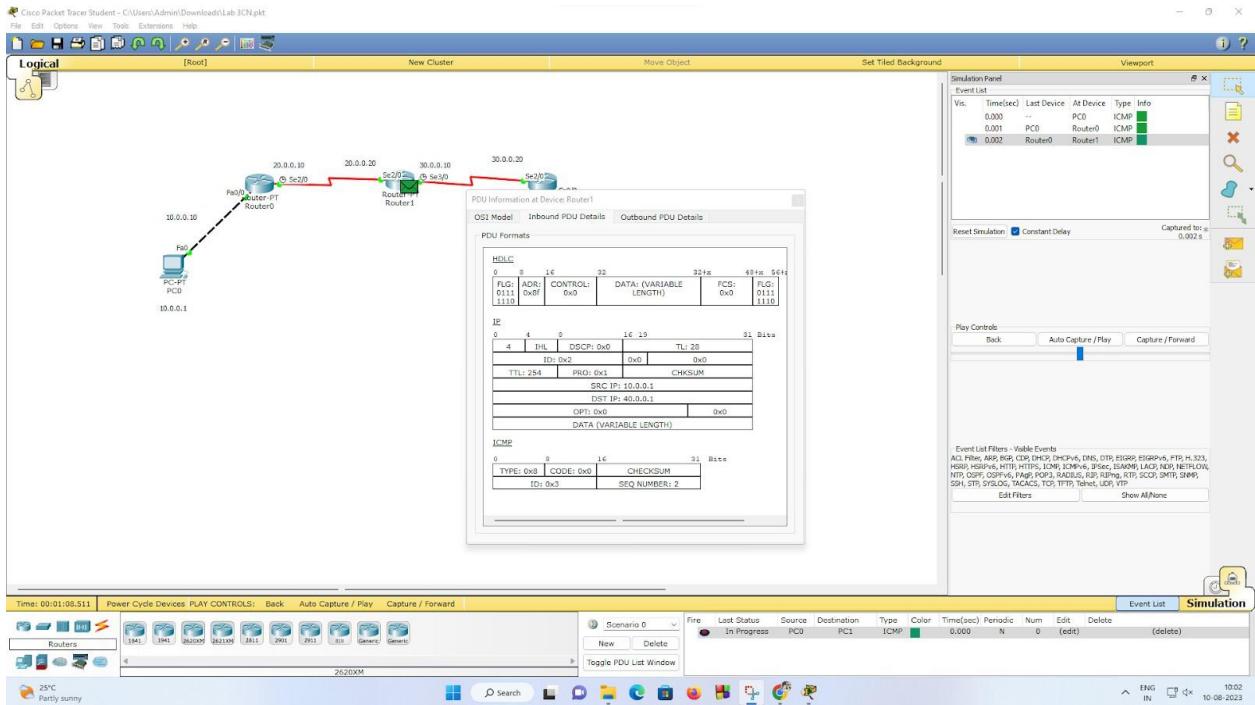
Configure the devices as per static / default / dynamic routing.

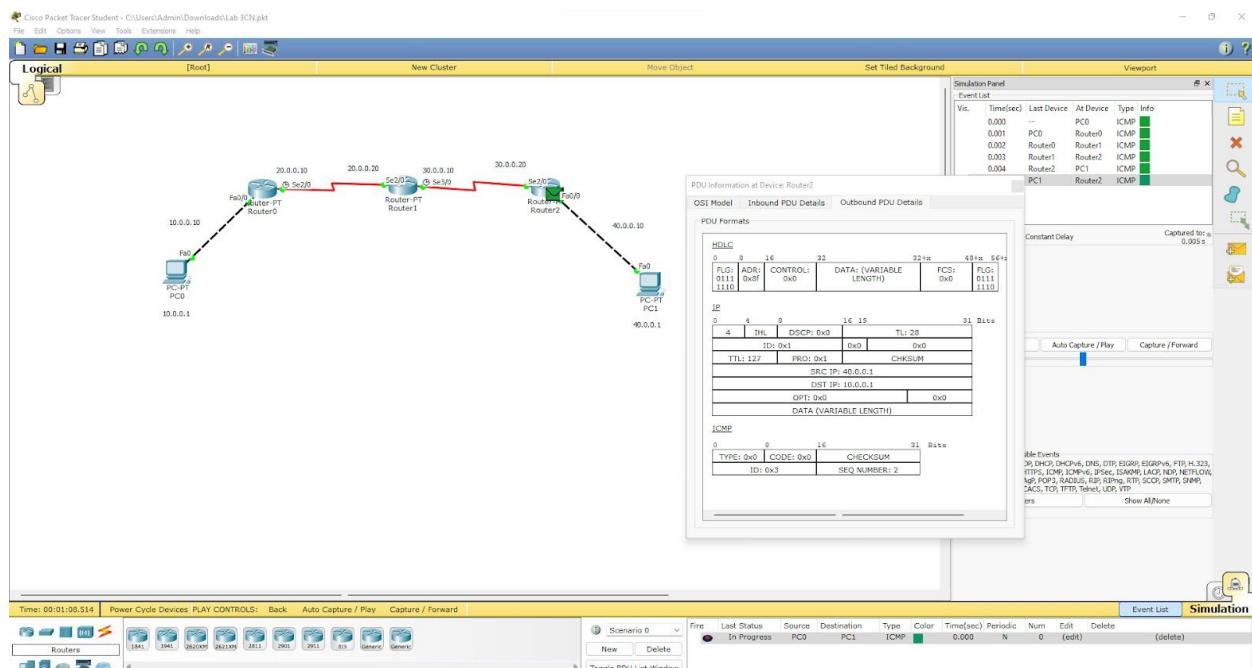
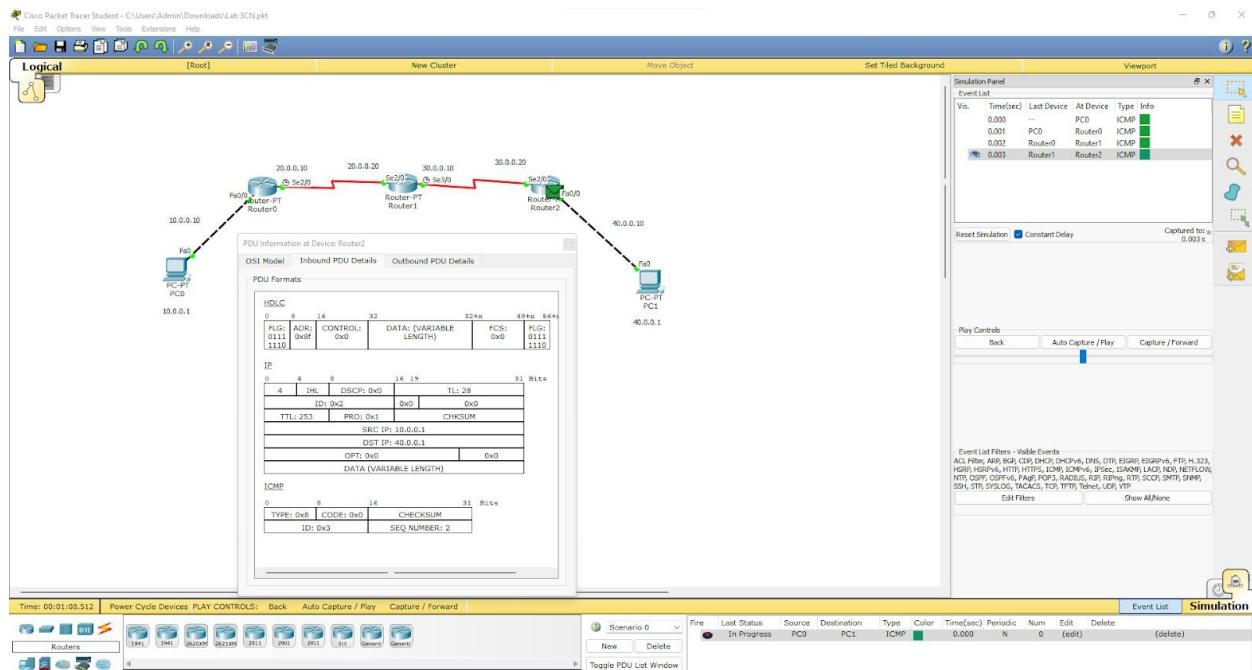
Above is done using static routing.

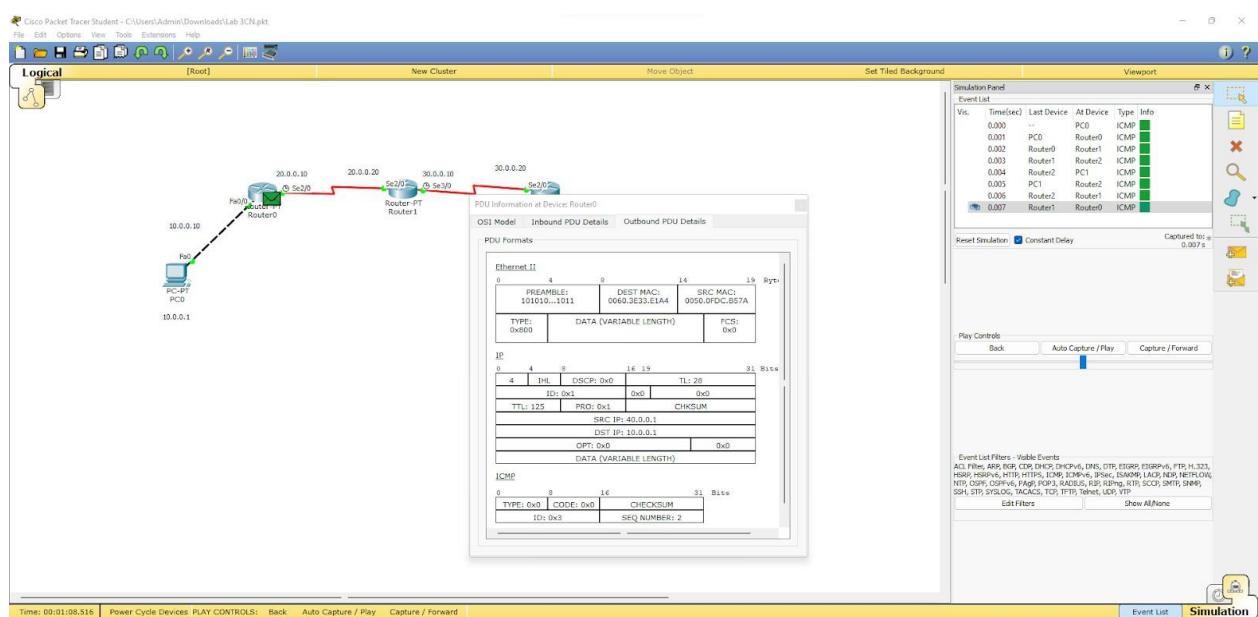
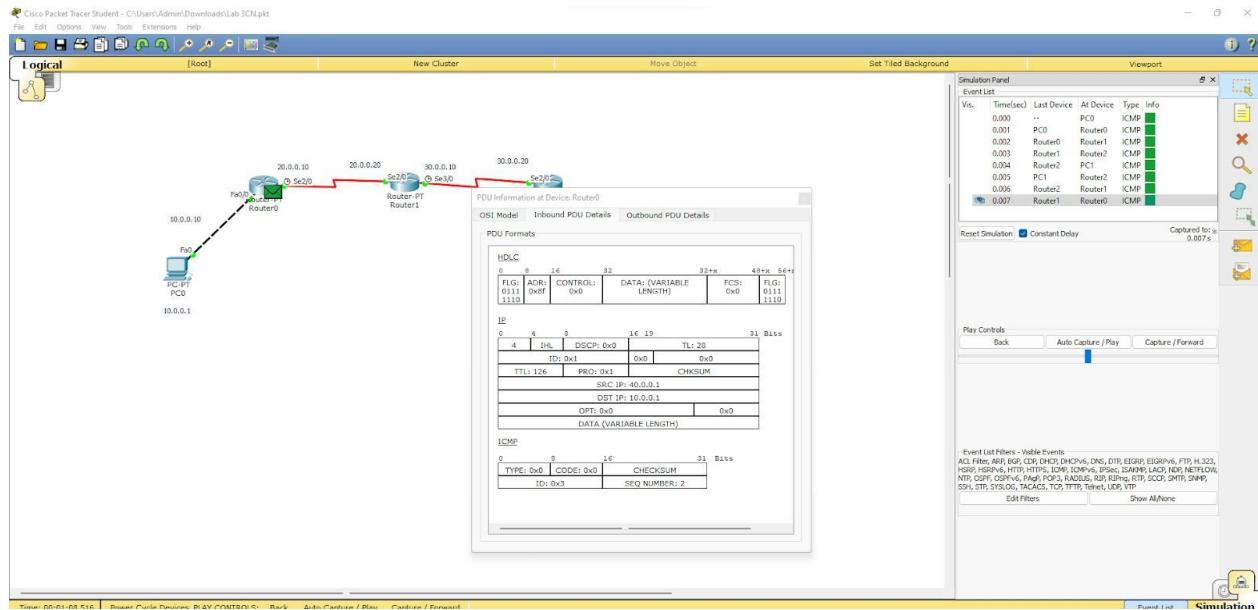
Output and PDU Details:

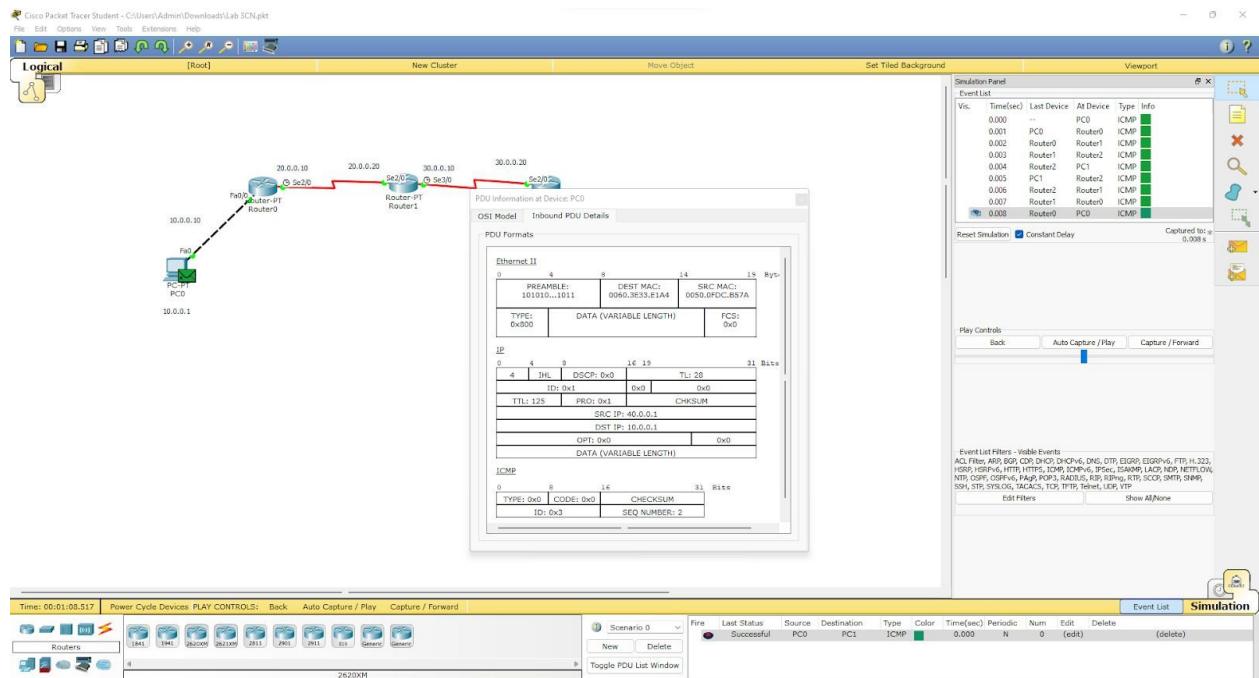
Simple PDU sent from PC0 to PC1 in simulation mode.



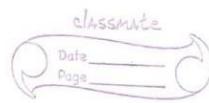








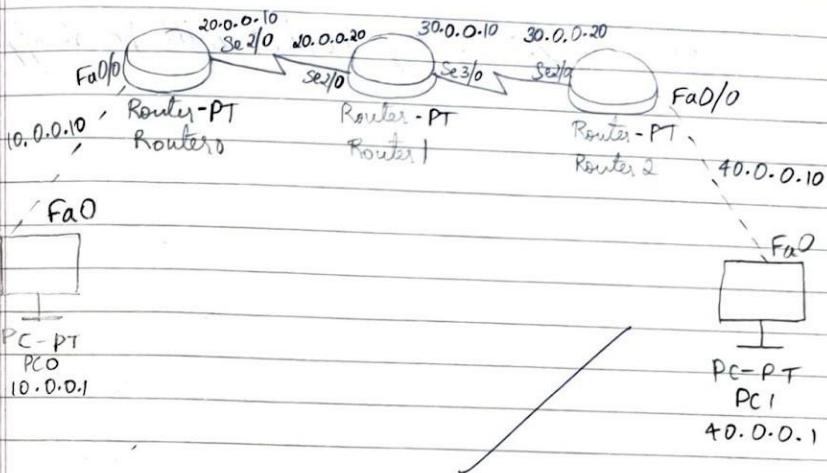
Observation :



Lab 10

Aim: Demonstrate the TTL / life of a Packet.

Topology:



Procedure:

- 1) Create the topology as shown and configure the PCs and routers as shown above static routing done. We can do any type.
- 2) In simulation mode, send a packet from PC0 to PC1. Simple PDU sent.
- 3) Click on capture / Forward button on Simulation panel step by step.
- 4) At each step click on the packet to view the Inbound PDU details and Outbound PDU details.

Observations:-

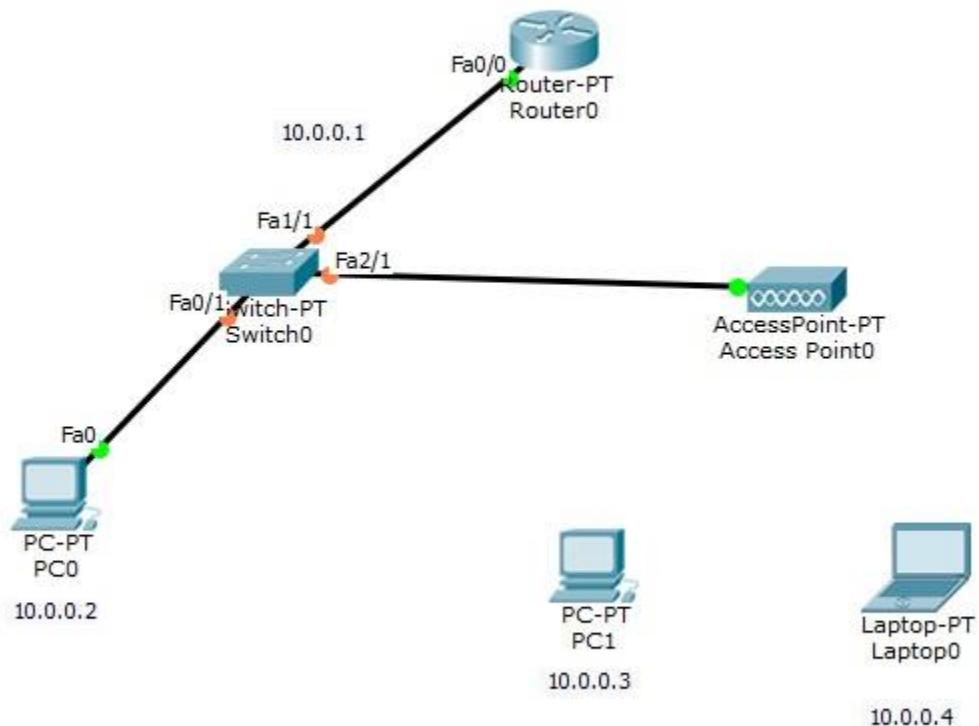
- We can observe that there is a difference of 1 in TTL when the packet crosses every router.
- If TTL becomes 0, packet will be dropped.

11/10/2021

Experiment 11

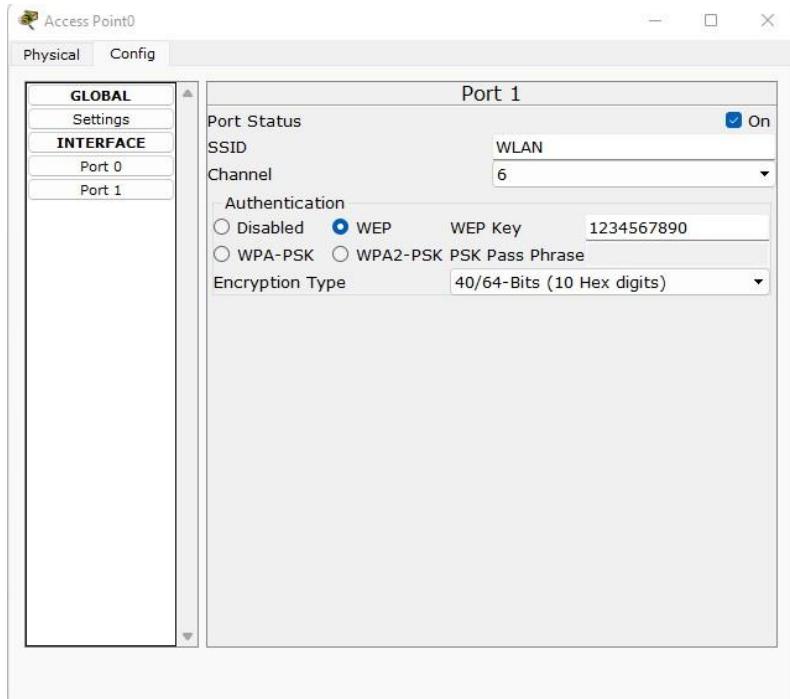
Aim : To construct a WLAN and make the nodes communicate wirelessly

Topology:

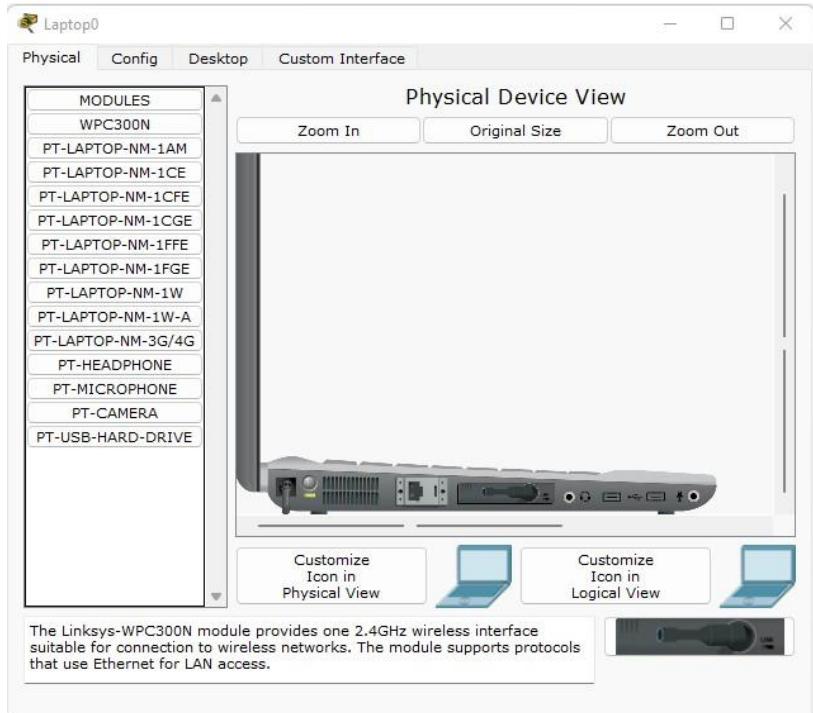


Configurations:

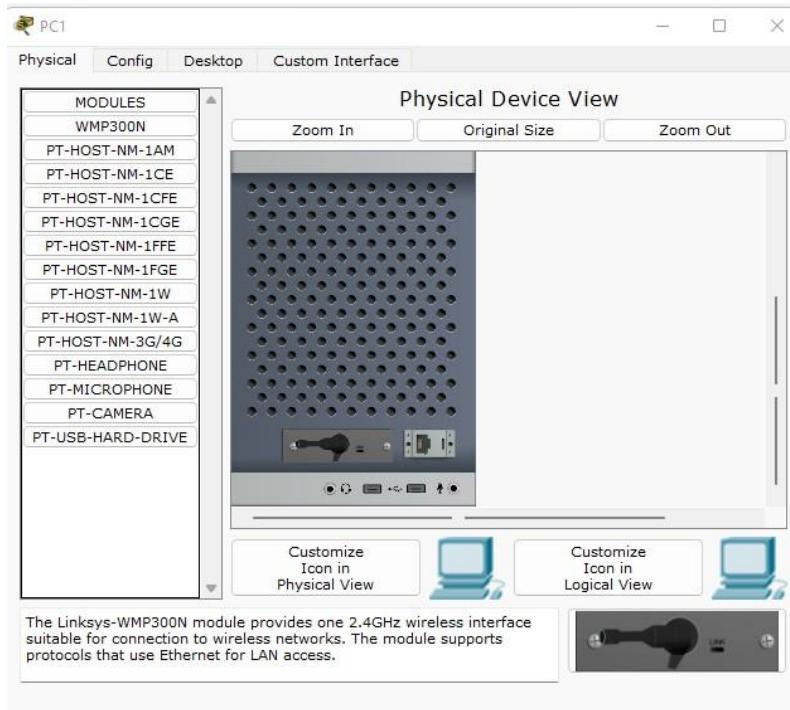
Access Point0:



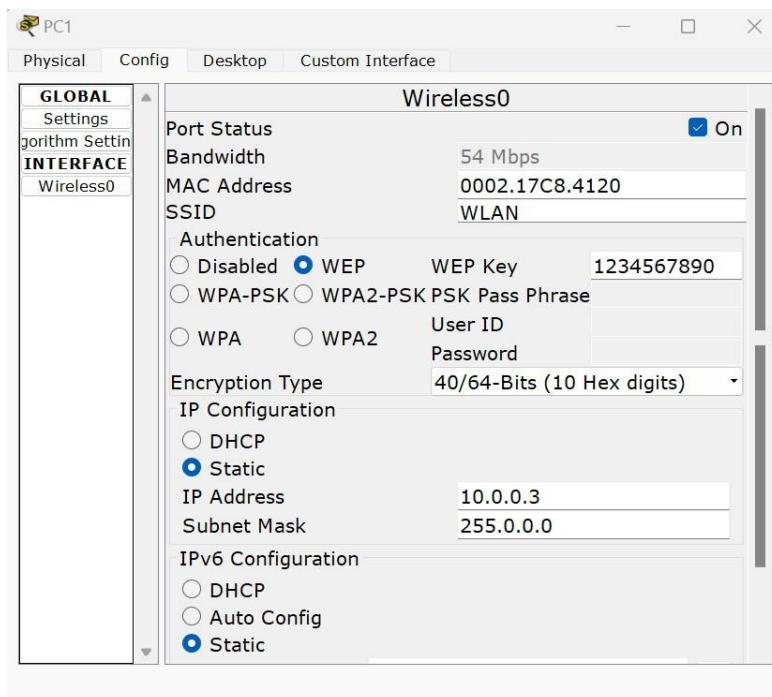
Laptop0 Physical port change:



PC0 Physical port change:



PC0 and Laptop0 Wireless configuration:



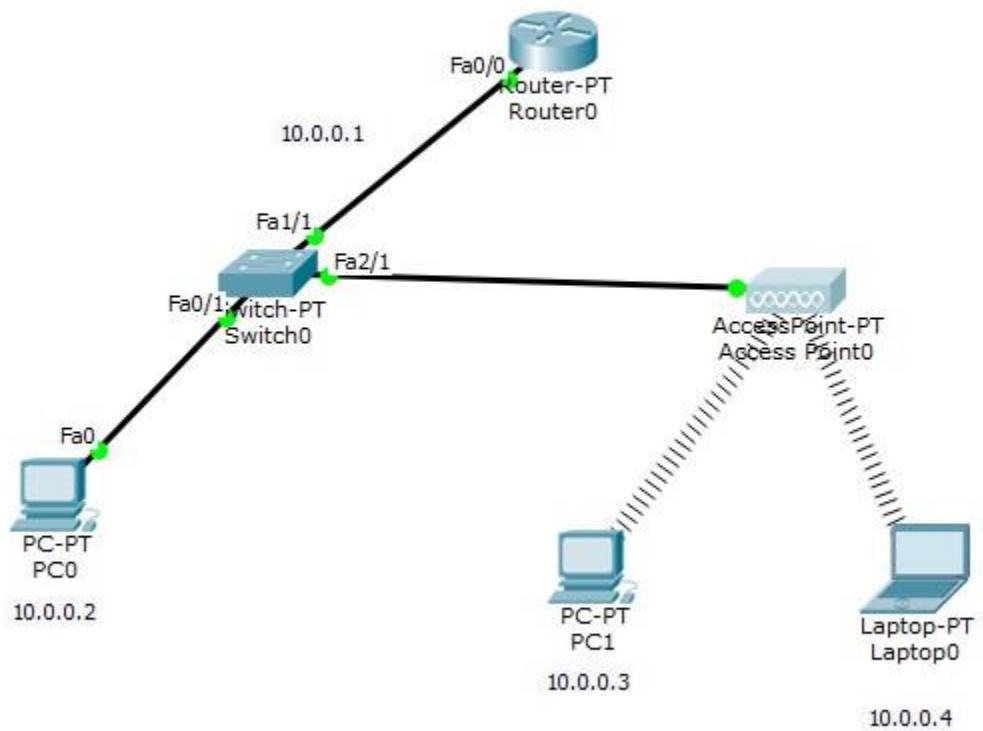
Router 0 CLI:

The screenshot shows a window titled "IOS Command Line Interface" for "Router0". The window has tabs for "Physical", "Config", and "CLI", with "CLI" selected. The main area displays the following text:

```
Bridging software.  
X.25 software, Version 3.0.0.  
4 FastEthernet/IEEE 802.3 interface(s)  
2 Low-speed serial(sync/async) network interface(s)  
32K bytes of non-volatile configuration memory.  
63488K bytes of ATA CompactFlash (Read/Write)  
  
--- System Configuration Dialog ---  
Continue with configuration dialog? [yes/no]: no  
  
Press RETURN to get started!  
  
Router>en  
Router#config t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#interface fa0/0  
Router(config-if)#ip address 10.0.0.1 255.0.0.0  
Router(config-if)#no shut  
  
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
```

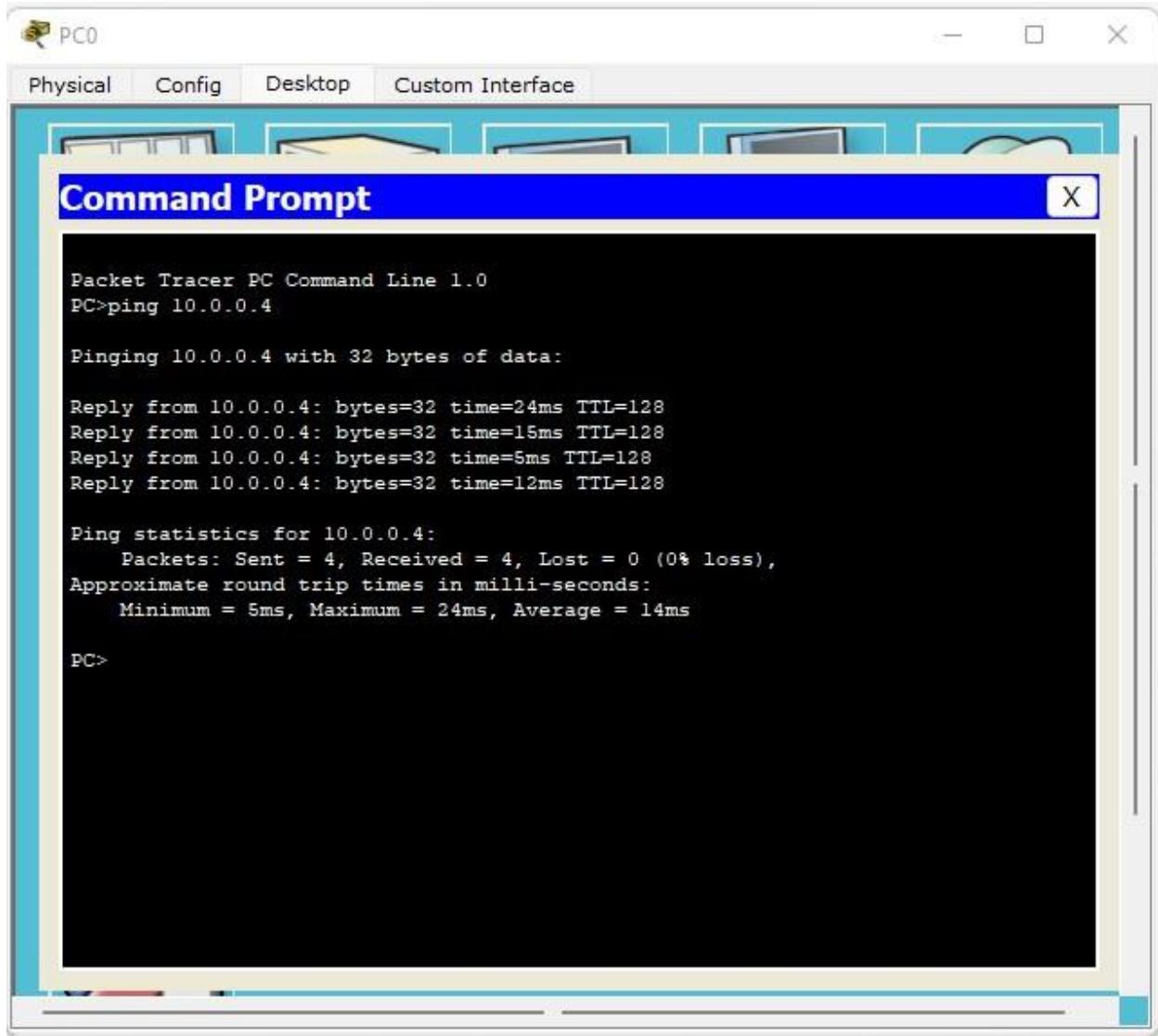
At the bottom right of the main window are "Copy" and "Paste" buttons.

Final Topology:



Ping Output :

PC0 to Laptop0 :



PC0

Physical Config Desktop Custom Interface

Command Prompt X

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.4

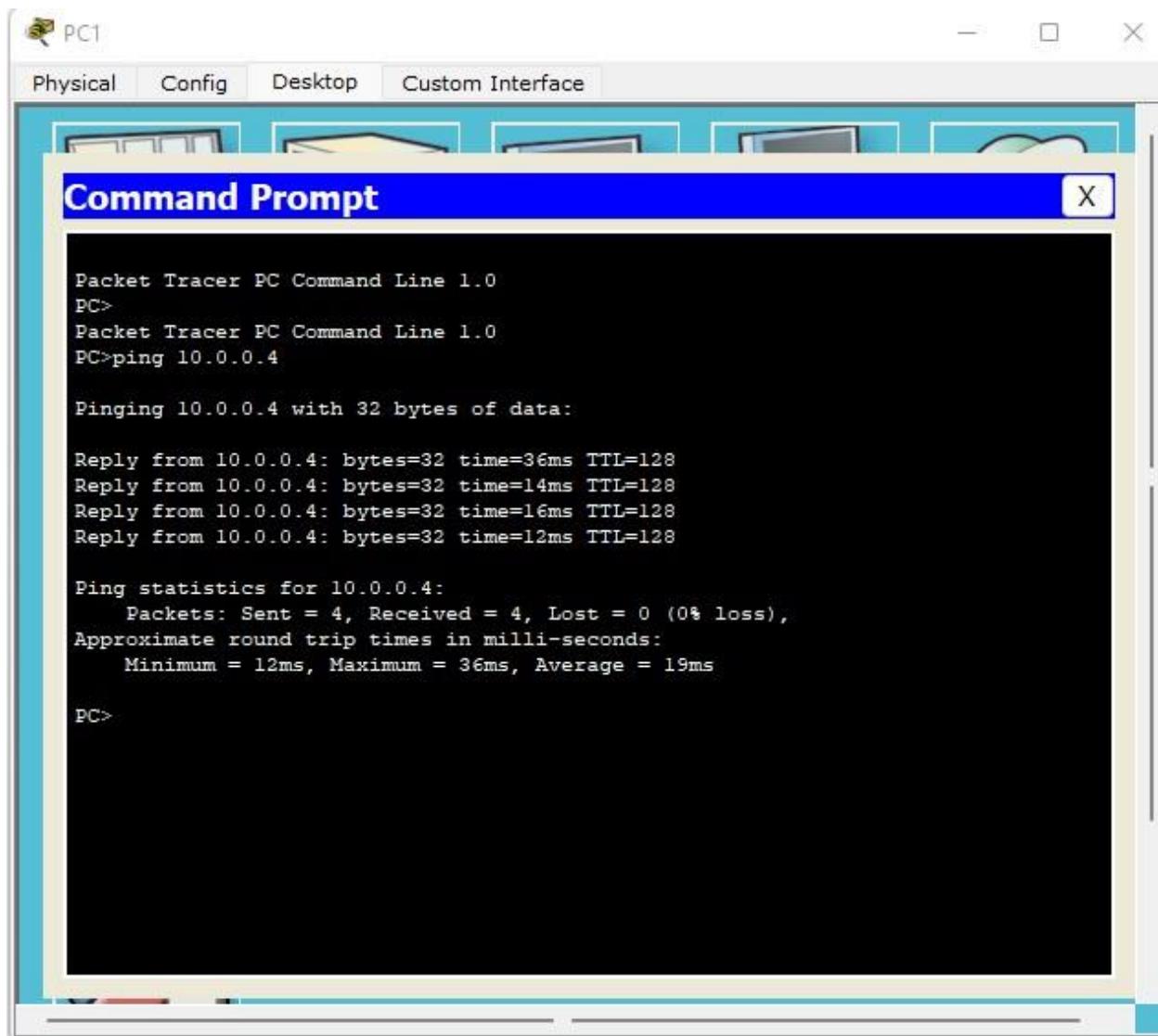
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=24ms TTL=128
Reply from 10.0.0.4: bytes=32 time=15ms TTL=128
Reply from 10.0.0.4: bytes=32 time=5ms TTL=128
Reply from 10.0.0.4: bytes=32 time=12ms 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 = 5ms, Maximum = 24ms, Average = 14ms

PC>
```

PC1 to Laptop0 :



The screenshot shows a Cisco Packet Tracer interface. At the top, there's a menu bar with tabs: Physical, Config, Desktop, and Custom Interface. Below the menu is a toolbar with icons for different functions. A main window titled "Command Prompt" is open, showing the output of a ping command from PC1 to Laptop0. The output is as follows:

```
Packet Tracer PC Command Line 1.0
PC>
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.4

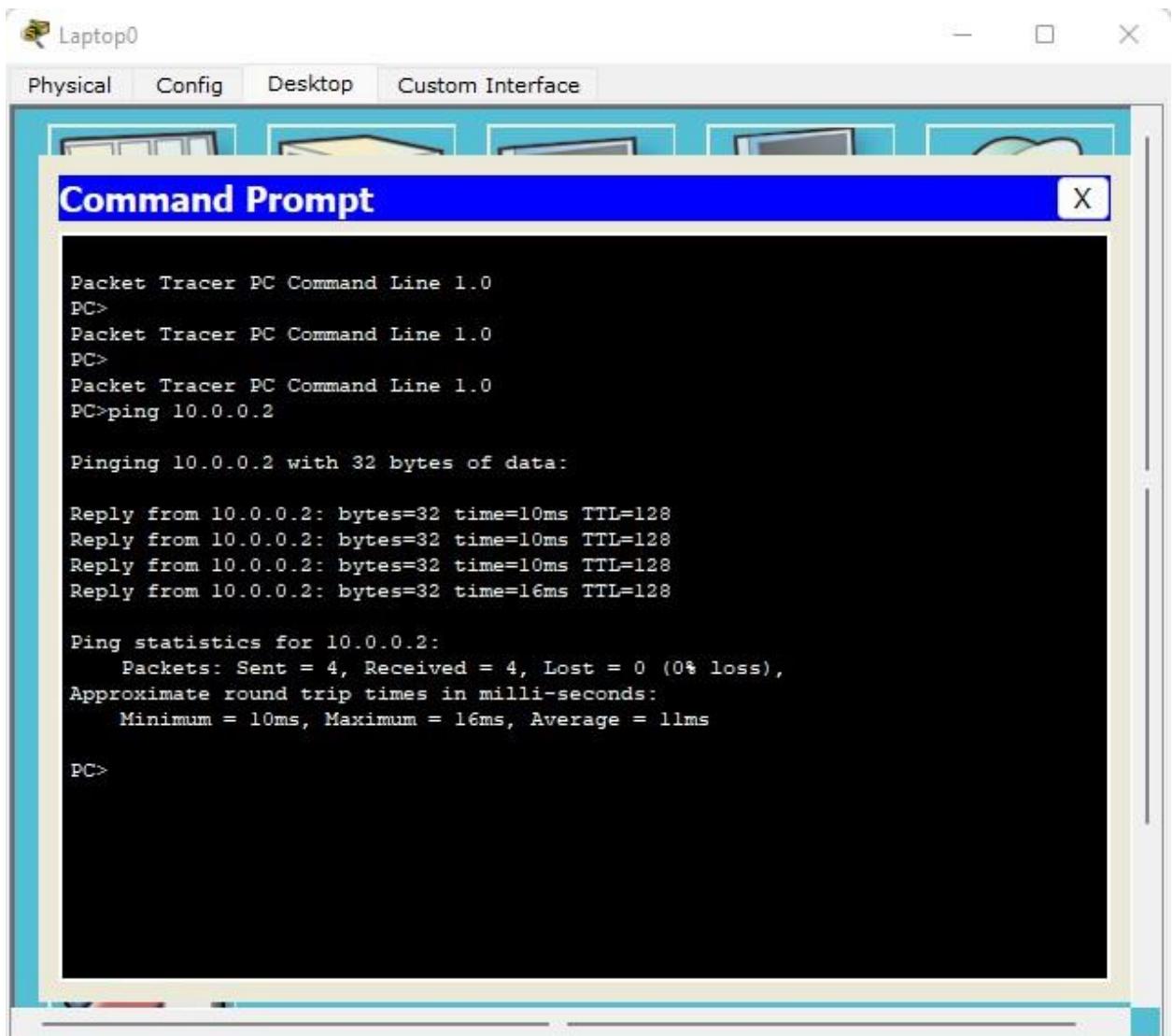
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=36ms TTL=128
Reply from 10.0.0.4: bytes=32 time=14ms TTL=128
Reply from 10.0.0.4: bytes=32 time=16ms TTL=128
Reply from 10.0.0.4: bytes=32 time=12ms 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 = 12ms, Maximum = 36ms, Average = 19ms

PC>
```

Laptop0 to PC0:



The screenshot shows a Cisco Packet Tracer interface with a window titled "Command Prompt". The window contains the following text output from a PC command line:

```
Packet Tracer PC Command Line 1.0
PC>
Packet Tracer PC Command Line 1.0
PC>
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2

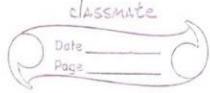
Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=10ms TTL=128
Reply from 10.0.0.2: bytes=32 time=10ms TTL=128
Reply from 10.0.0.2: bytes=32 time=10ms TTL=128
Reply from 10.0.0.2: bytes=32 time=16ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 16ms, Average = 11ms

PC>
```

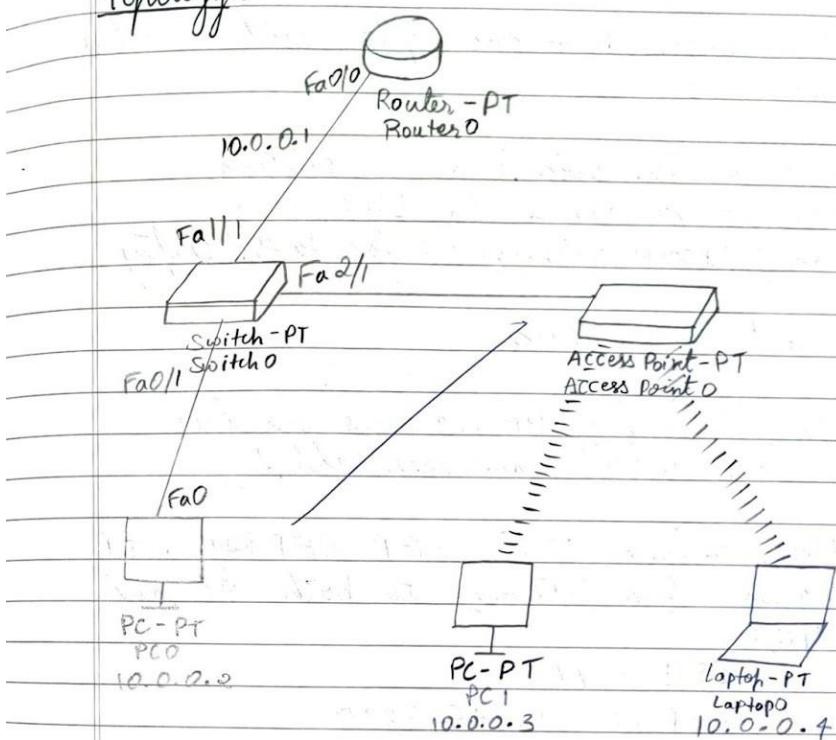
Observation :



Lab 11

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

Topology :



Procedure :-

- 1) Create the topology as shown above.
- 2) Configure PC 3
IP address : 10.0.0.2
G
- 3) Configure Router 0 . set fastethernet 0/0 as 10.0.0.1 in usual method.

4) Configure the Access Point 1 → Port 1 in Config

→ SSID = WLAN

Select WEP and give any 10 digit hex
= 1234567890

5) To Configure PC4 and Laptop with Wireless standards.

- Switch off the device. Drag the existing PT-HOST-NM-1AM to the LHS.
- Drag WMP300N wireless interface to the empty port.
- Switch On the device.

6) In the config tab, a new wireless interface would have been added.

7) Now, configure SSID, WEP, WEP Key, IP address and Gateway to both PC and Laptop.

SSID = WLAN

WEP key = 1234567890

Gateway = 10.0.0.1

Ping Output: (In PC0)

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=24ms TTL=128

Reply from 10.0.0.4 : bytes=32 time = 15ms TTL=128
 Reply from 10.0.0.4 : bytes=32 time = 5ms TTL=128
 Reply from 10.0.0.4 : bytes=32 time = 12ms 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 = 5ms, Maximum = 24ms, Average = 14ms.

Observation :-

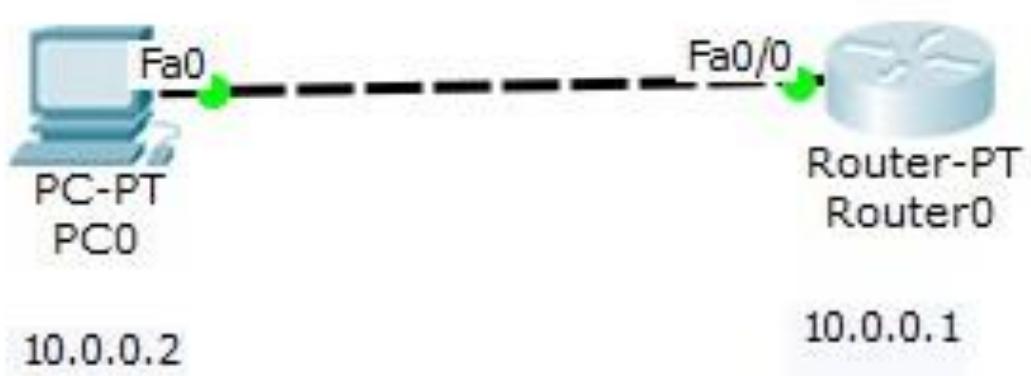
- We can ping from every device to every other device successfully.
- Thus we observe that the wireless connection is successful.
- In the final topology, we observe stripped lines from access point to PC+ and Laptop/D indicating the establishment of wireless connection.

16/8/2017

Experiment 12

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

Topology:



Configuration:

Router 0 CLI:

```
Router>en
Router#cong t
^
% Invalid input detected at '^' marker.

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname rl
rl(config)#enable secret p1
rl(config)#interface fa0/0
rl(config-if)#ip address 10.0.0.1 255.0.0.0
rl(config-if)#no shut

rl(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

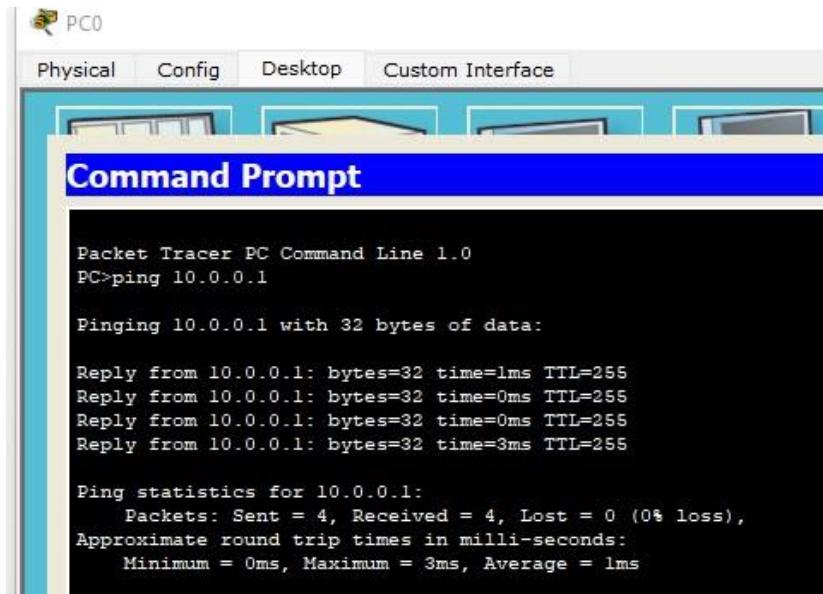
rl(config-if)#line vty 0 5
rl(config-line)#login
% Login disabled on line 132, until 'password' is set
% Login disabled on line 133, until 'password' is set
% Login disabled on line 134, until 'password' is set
% Login disabled on line 135, until 'password' is set
% Login disabled on line 136, until 'password' is set
% Login disabled on line 137, until 'password' is set
rl(config-line)#password p0
rl(config-line)#
rl(config-line)#exit
rl(config)#exit
rl#
%SYS-5-CONFIG_I: Configured from console by console

rl#wr
Building configuration...
[OK]
rl#
```

Copy Paste

Ping Output:

PC0 to Router:



PC0

Physical Config Desktop Custom Interface

Command Prompt

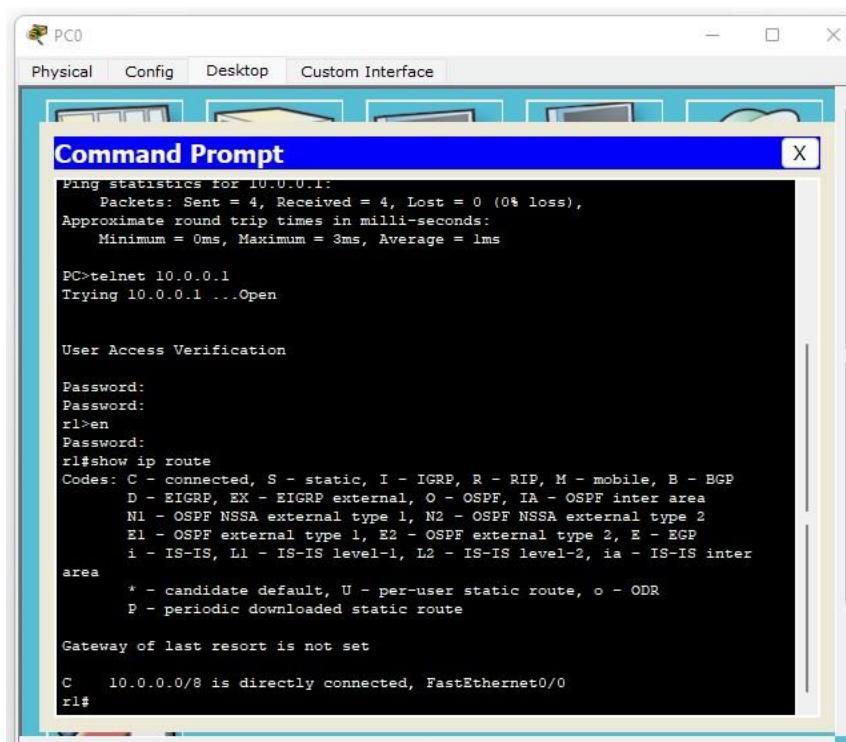
```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=1ms TTL=255
Reply from 10.0.0.1: bytes=32 time=0ms TTL=255
Reply from 10.0.0.1: bytes=32 time=0ms TTL=255
Reply from 10.0.0.1: bytes=32 time=3ms TTL=255

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms
```

Accessing the router in server room from a PC in IT office:



PC0

Physical Config Desktop Custom Interface

Command Prompt

```
Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 1ms

PC>telnet 10.0.0.1
Trying 10.0.0.1 ...Open

User Access Verification

Password:
Password:
rl>en
Password:
rl#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
rl#
```

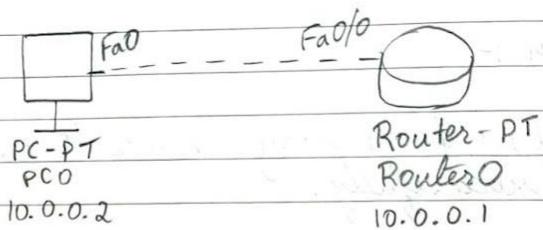
Observation :

CLASSmate
Date _____
Page _____

Lab 12

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

Topology :-



Procedure :-

- 1) Create the topology as shown above.
Wire used - Copper cross over.

- 2) Configure the PC
IP address = 10.0.0.2
Gateway = 10.0.0.1

- 3) In Router0 CLI

```
Router > en
Router # config t
Router (config)# hostname r1
r1(config) # enable secret p1
r1(config) # int fa0/0
r1(config-if)# ip address 10.0.0.1 255.0.0.0
```

21(config-if)# no shut
21(config-if)# line vty 0 5 -- for 6 users

21(config-line)# login
21(config-line)# password p0
21(config-line)# exit
21(config)# exit

21# wr

Building Configuration ...

Ping Output and Command prompt of PC O

We can successfully Ping 10.0.0.1 from PC O.

In PC O command prompt :-

PC > telnet 10.0.0.1

Trying 10.0.0.1 ... Open

User Access verification

Password : p0 -> won't be visible on screen

21> en

Password : p1

21# show ip route

C 10.0.0.0/8 is directly connected, FastEthernet0

Observation :-

- We can observe that the admin in PC is able to run commands as run in router CLI and see the result from the PC.
- Thus, with help of TELNET, we access the router in server room from a PC.

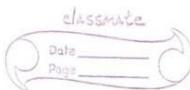
N.D
4/8/2027

Cycle - 2

Experiment 13

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

CYCLE II



1 Write a program for error detecting code using CRC-CC.

```
#include <stdio.h>
#include <string.h>
```

```
void binary_XOR (char *result, const char *a,
                  const char *b)
```

{
 for (int i=0; i<16; i++)
 result[i] = (a[i] == b[i]) ? '0': '1';

```
    result[16] = '0';
```

3

```
void CRC (const char *data, int length, char
          *checksum)
```

{
 char CRC[17];
 for (int i=0; i<16; i++)
 CRC[i] = '0';

```
    CRC[16] = '0';  
    for (int i=0; i<length; i++)
```

{
 for (int j=0; j<8; j++)

```
        char msb = CRC[0];  
        for (int k=0; k<16; k++)
```

```
            CRC[k] = CRC[k+1];
```

```
crc[15] = '0';
if (msb = '1')
    {
```

```
    char temp[17];
    binary XOR(temp, crc, "1000100000010001");
}
```

```
strcpy(crc, temp);
```

```
}
```

```
crc[15] = [data[i] = "1" ? '1' : '0'];
}
```

```
strcpy(checksum, crc);
}
```

```
void main()
```

```
{
```

```
char data[100];
```

```
printf("Enter data in binary : ");
```

```
scanf("%s", data);
```

```
int dataLength = strlen(data);
```

```
char checksum[17];
```

```
calculateCRC(data, dataLength, checksum);
```

```
char receivedChecksum[17];
```

```
printf("Enter received CRC : ");
```

```
scanf("%s", receivedChecksum);
```

```
if (strcmp(receivedChecksum, checksum) == 0)
```

```
    printf("Data is error-free \n");
```

```
else
```

```
    printf("Data contains errors. \n");
```

return 0;
3

Output:

Enter data in binary : 1100101011100100 ,
Calculated CRC : 1110100101110001
Entered received CRC = 1110100101110001
Data is error free .

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21/8/2023

Program:

```
#include <stdio.h>
#include <string.h>

// CRC-CCITT polynomial: x^16 + x^12 + x^5 + 1 (0x1021)
#define CRC_POLY 0x1021

// Function to perform bitwise XOR on binary strings
void binaryXOR(char *result, const char *a, const char *b) {
    for (int i = 0; i < 16; i++) {
        result[i] = (a[i] == b[i]) ? '0' : '1';
    }
    result[16] = '\0';
}

// Function to calculate CRC-CCITT checksum
void calculateCRC(const char *data, int length, char *checksum) {
    char crc[17];
    for (int i = 0; i < 16; i++) {
        crc[i] = '0';
    }
    crc[16] = '\0';

    for (int i = 0; i < length; i++) {
        for (int j = 0; j < 8; j++) {
            char msb = crc[0];
            for (int k = 0; k < 16; k++) {
                crc[k] = crc[k + 1];
            }
            crc[15] = '0';

            if (msb == '1') {
                char temp[17];
                binaryXOR(temp, crc, "10001000000100001"); // CRC_POLY in binary
                strcpy(crc, temp);
            }
            crc[15] = (data[i] == '1') ? '1' : '0';
        }
    }
}
```

```
strcpy(checksum, crc);
}

void main() {
    char data[100]; // Replace with your actual data
    printf("Enter data in binary: ");
    scanf("%s", data);

    int dataLength = strlen(data);
    char checksum[17];
    calculateCRC(data, dataLength, checksum);

    printf("Calculated CRC: %s\n", checksum);

    // Simulating error by changing a bit
    // data[2] ^= 0x01; // Uncomment this line to introduce an error

    // Verify the received data char
    receivedChecksum[17];
    printf("Enter received CRC: ");
    scanf("%s", receivedChecksum);

    if (strcmp(receivedChecksum, checksum) == 0)
        printf("Data is error-free.\n");
    else
        printf("Data contains errors.\n");
}
```

Output :

```
[@] "C:\Users\HP\Desktop\BMSCI" X + | v
Enter data in binary: 11001010111001001
Calculated CRC: 1110100101110001
Enter received CRC: 1110100101110001
Data is error-free.

Process returned 0 (0x0) execution time : 38.006 s
Press any key to continue.
```

Experiment 14

Aim : Write a program for congestion control using Leaky bucket algorithm.

2. Write a program for congestion using Leaky bucket algorithm.

```
#include <stdio.h>
```

```
void main ()  
{
```

```
    int psize, bsize, outgoing, emptySpace, choice;  
    printf ("Enter the Bucket size = ");  
    scanf ("%d", &bsize);  
    emptySpace = bsize;  
    printf ("Enter the outgoing rate = ");  
    scanf ("%d", &outgoing);
```

```
    while (1)  
{
```

```
        printf ("\nEnter the packet size = ");  
        scanf ("%d", &psize);
```

```
        if (psize < bsize & psize <= emptySpace)
```

```
            emptySpace = emptySpace - psize;
```

```
            printf ("The Packet of size %d is added  
            and in the bucket \n", psize);
```

```
            emptySpace += outgoing;
```

```
y
```

```
else
```

```
    printf ("The Packet of size %d is dropped  
    due to lack of space in the bucket \n");
```

```
    printf ("\nEnter 1 to Continue or 0 to stop : ");
```

```
scanf ("%d", &choice);
```

```
if (choice == 0)
```

```
break;
```

```
y
```

```
y
```

Output:-

Enter the bucket size : 5000

Enter the outgoing rate : 200

Enter the packet size : 300

The packet of size 300 is added and in the bucket

Enter 1 to continue or 0 to stop : 1

Enter the packet size : 2000

The packet of size 2000 is added and in the bucket.

Enter 1 to continue or 0 to stop : 1

Enter the packet size : 1500

The packet of size 1500 is dropped due to lack
of space in the bucket.

Enter 1 to continue or 0 to stop : 1

Enter the packet size : 100

The packet of size 100 is added and in the bucket.

Program:

```
#include<stdio.h>

void main()
{
    int psiz,bsize,outgoing,emptyspace,choice;
    printf("Enter the Bucket size = ");
    scanf("%d",&bsize);
    emptyspace=bsize;
    printf("Enter the outgoing rate = ");
    scanf("%d",&outgoing);
    while(1)
    {
        printf("\nEnter the packet size = ");
        scanf("%d",&psiz);

        if(psiz<bsize&&psiz<=emptyspace)
        {
            emptyspace=emptyspace-psiz;
            printf("The Packet of size %d is added and in the bucket \n",psiz);
            emptyspace+=outgoing;
        }

        else
        {
            printf("The Packet of size %d is dropped due to lack of space in the bucket\n");
        }

        printf("\nEnter 1 to Continue or 0 to Stop: ");
        scanf("%d",&choice);
        if(choice==0)
            break;
    }
}
```

Output :

```
C:\ "C:\Users\HP\Downloads\Bur" X + ▾  
Enter the Bucket size = 5000  
Enter the outgoing rate = 200  
  
Enter the packet size = 3000  
The Packet of size 3000 is added and in the bucket  
  
Enter 1 to Continue or 0 to Stop: 1  
  
Enter the packet size = 2000  
The Packet of size 2000 is added and in the bucket  
  
Enter 1 to Continue or 0 to Stop: 1  
  
Enter the packet size = 1500  
The Packet of size 6422296 is dropped due to lack of space in the bucket  
.  
Enter 1 to Continue or 0 to Stop: 1  
  
Enter the packet size = 100  
The Packet of size 100 is added and in the bucket  
  
Enter 1 to Continue or 0 to Stop: 0  
  
Process returned 0 (0x0) execution time : 33.269 s  
Press any key to continue.
```

Experiment 15

Aim : 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.

3. 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 .

ServerTCP.py

```
from socket import *
serverName = "127.0.0.1" → loopback address
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind((serverName, serverPort))
serverSocket.listen(1)
while 1:
    print ("The server is ready to receive")
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()
    file = open(sentence, "r")
    l = file.read(1024)
    connectionSocket.send(l.encode())
    print ('Sent Contents of ' + sentence)
    file.close()
    connectionSocket.close()
```

ClientTCP.py

```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
```

```
clientSocket = socket (AF_INET, SOCK_STREAM)
clientSocket.connect ((serverName, serverPort))
sentence = input ("\\n Enter file name: ")
```

```
clientSocket.send (sentence.encode ())
fileContent = clientSocket.recv (1024).decode ()
print ('\\n From Server: \\n')
print (fileContent)
clientSocket.close ()
```

Procedure:

- Create 2 IDLE instances and write client as and server files.
- Run server first and then the client.

Output:-

Server Instance :-

The server is ready to receive

Client Instance :-

Enter file name: ServerTCP.py

From Server :

the contents of ServerTCP.py is displayed here



Server Instance:-

The server is ready to receive

Sent contents of Server TCP.py

The server is ready to receive.

Program:

ServerTCP.py: from
socket import *
serverName="127.0.0.1"
serverPort=12000
serverSocket=socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while 1:
 print("The serve is ready to receive")
 connectionSocket,addr = serverSocket.accept()
 sentence=connectionSocket.recv(1024).decode()

 file=open(sentence,"r")
 l=file.read(1024)

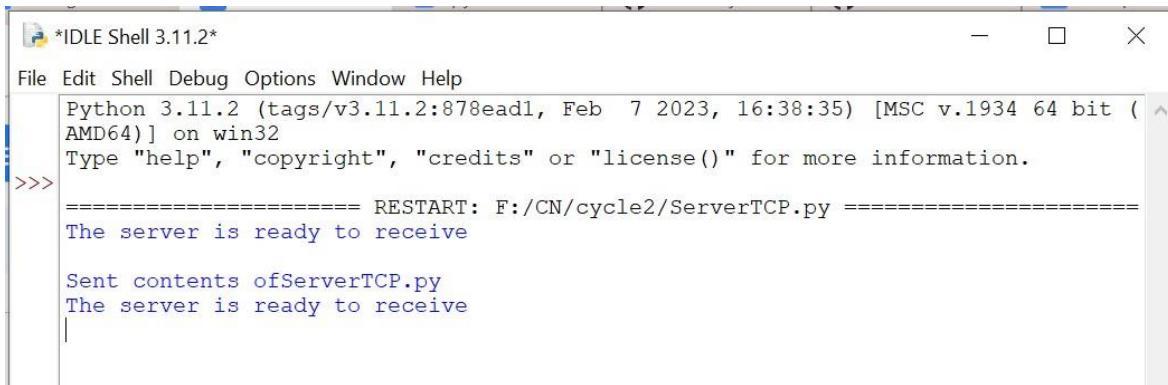
 connectionSocket.send(l.encode())
 print('\nSent contents of'+sentence)
 file.close()
 connectionSocket.close()

ClientTCP.py: from
socket import *
serverName='127.0.0.1'
serverPort=12000
clientSocket=socket(AF_INET,SOCK_STREAM)
clientSocket.connect((serverName,serverPort))
sentence=input("\nEnter file name: ")

clientSocket.send(sentence.encode())
filecontents=clientSocket.recv(1024).decode()
print('\nFrom Server:\n')
print(filecontents)
clientSocket.close()

Output :

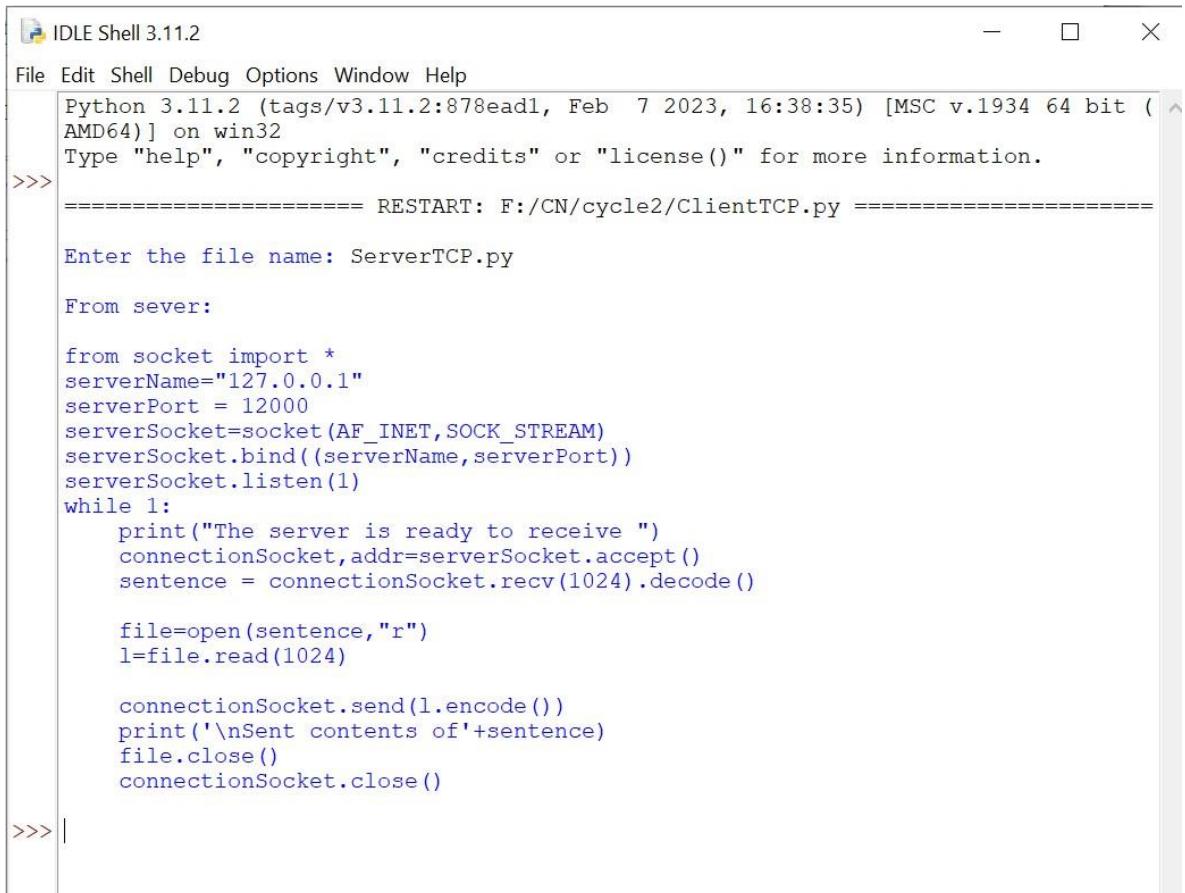
Server instance:



```
*IDLE Shell 3.11.2*
File Edit Shell Debug Options Window Help
Python 3.11.2 (tags/v3.11.2:878ead1, Feb  7 2023, 16:38:35) [MSC v.1934 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> ===== RESTART: F:/CN/cycle2/ServerTCP.py =====
The server is ready to receive

Sent contents of ServerTCP.py
The server is ready to receive
```

Client instance:



```
IDLE Shell 3.11.2
File Edit Shell Debug Options Window Help
Python 3.11.2 (tags/v3.11.2:878ead1, Feb  7 2023, 16:38:35) [MSC v.1934 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> ===== RESTART: F:/CN/cycle2/ClientTCP.py =====
Enter the file name: ServerTCP.py
From sever:

from socket import *
serverName="127.0.0.1"
serverPort = 12000
serverSocket=socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while 1:
    print("The server is ready to receive ")
    connectionSocket,addr=serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

    file=open(sentence,"r")
    l=file.read(1024)

    connectionSocket.send(l.encode())
    print('\nSent contents of'+sentence)
    file.close()
    connectionSocket.close()

>>> |
```

Experiment 16

Aim : 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.

4. 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.

ServerUDP.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)
```

```
sentence = sentence.decode("utf-8")
```

```
file = open(sentence, "r")
```

```
com = file.read(2048)
```

```
serverSocket.sendto(bytes(com, "utf-8"), clientAddress)
```

```
print("\nSent contents of ; end = ' ')
```

```
print(sentence)
```

```
file.close()
```



ClientUDP.py

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

```
sentence = input (" \n Enter file name : ")
```

client

```
clientSocket.sendto (bytes (sentence, "utf-8"),
                     (serverName, serverPort))
```

```
filecontents, serverAddress = clientSocket.recvfrom
(2048)
```

```
print ('\n Reply from Server : \n')
print (filecontents.decode ("utf-8"))
```

```
clientSocket.close()
clientSocket.close()
```

Output :

Server Instance :-

The server is ready to receive

Client Instance :-

Enter file name : ServerUDP.py

Program:

ServerUDP.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)
    sentence=sentence.decode("utf-8")
    file=open(sentence,"r")
    con=file.read(2048)

    serverSocket.sendto(bytes(con,"utf-8"),clientAddress)

    print("\nSent contents of",end="")
    print(sentence)
    file.close()
```

ClientUDP.py: from

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

sentence=input("\nEnter file name: ")

clientSocket.sendto(bytes(sentence,"utf-8"),(serverName,serverPort))

filecontents,serverAddress = clientSocket.recvfrom(2048)
print("\nReply from Server:\n")
print (filecontents.decode("utf-8"))
clientSocket.close()
clientSocket.close()
```

Output :

Server instance :

```
Python 3.6.7 Shell*
File Edit Shell Debug Options Window Help
Python 3.6.7 (v3.6.7:6ec5cf24b7, Oct 20 2018, 13:35:33) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: D:\AUG_DEC 2021\CN\LAB\cycle 3\ServerUDP.py ====
The server is ready to receive

Sent contents of ServerUDP.py
The server is ready to receive
```

Client instance :

```
Python 3.6.7 Shell
File Edit Shell Debug Options Window Help
Python 3.6.7 (v3.6.7:6ec5cf24b7, Oct 20 2018, 13:35:33) [MSC v.1900 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: D:\AUG_DEC 2021\CN\LAB\cycle 3\ClientUDP.py =====

Enter file name: ServerUDP.py

Reply from Server:
from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))

while 1:
    print ("The server is ready to receive")
    sentence, clientAddress = serverSocket.recvfrom(2048)
    sentence = sentence.decode("utf-8")
    file=open(sentence,"r")
    l=file.read(2048)

    serverSocket.sendto(bytes(l,"utf-8"),clientAddress)

    print ('\nSent contents of ', end = ' ')
    print (sentence)
#   for i in sentence:
#       print (str(i), end = '')
    file.close()

>>>
```

Experiment 17

Aim : Tool Exploration -Wireshark.

Wireshark

- Wireshark, a powerful open-source network protocol analyzer, or packet analyzer.
- It is used for network troubleshooting, analysis, software and communications protocol development and education.
- It is used to track packets so that each one is filtered to meet our specific needs.
It is also used by network security engineers to examine security problems.

Functionality of Wireshark :-

- It lets the user put network interface controllers that support promiscuous mode into that mode, so they can see all the traffic visible on that interface.
- **Packet capture and filtering:**
Primary function of wireshark lies in capturing network packets from various interfaces. Its flexible filtering options enable users to capture specific types of traffic based on protocol, source/destination addresses and even keywords within packet payloads.
- **Real time Analysis:**
Wireshark's real time monitoring capability is invaluable for observing ongoing network activities.

- This feature helps in detecting sudden traffic spikes, unusual protocol behaviour, and unauthorized network usage.
- Protocol Analysis: It decrypts encrypted protocols offering insights into secure communication method.
- Packet Reconstruction: Allows reassembling of fragmented packets.
- Statistical Information: Presents statistical analysis of captured data.
- Color-coded visualization: Employs color-coded packets to indicate various aspects such as error.
- Customizable Display: This tool offers a customizable interface where users can choose which fields to display & how to arrange them.

Procedure:

- 1) In the 1st window, select ethernet.
- 2) Filters TCP or any required protocol.
- 3) Click on it, new window opens.
- 4) Dropdown: Transmission Control Protocol.

Scr Port: 62148, Dst Port: 443, Seq: 2,
Ack: 65, Len: 6

5) This is available in the previous window
in the left split of screen.

6) Clicking on dropdown of it, clicking on any of
them highlights its counterpart in
right split side of screen.

7) In cmd, type > ipconfig

RES

Result:-

Windows IP configuration

Ethernet adapter Ethernet:

Connection-specific DNS suffix:

Link-local IPv4 Address . . . : fe80::he78:f6a9:
ed25:e329:b3

IPv4 Address . . . : 10.129.2.83

Subnet Mask . . . : 255.255.0.0

Default-Gateway . . . : 10.127.0.11