

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



LAB RECORD

Computer Network Lab (23CS5PCCON)

Submitted by

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in partial fulfilment for the award of the degree of

**BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING**



**B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
BENGALURU-560019
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B.M.S. College of Engineering

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled “Computer Network (23CS5PCCON)” carried out by **Shuvam Rajbanshi (1BM22CS275)**, who is Bonafide student of **B.M.S. College of Engineering**. It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements of the above-mentioned subject and the work prescribed for the said degree.

Megha J Assistant Professor Department of CSE, BMSCE	Dr. Kavitha Sooda Professor & HOD Department of CSE, BMSCE
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Index-Cycle-I

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Github Link:

https://github.com/SHREYASONI28/CNLAB_1BM22CS268

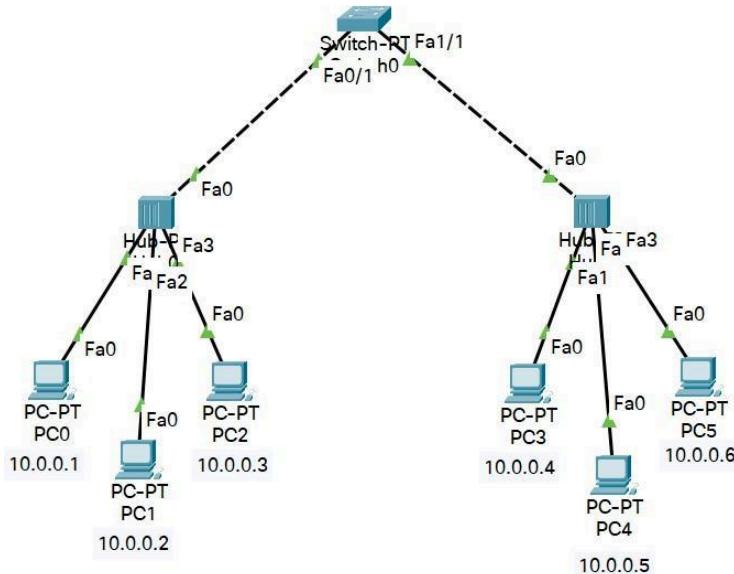
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3	20/12/2024	Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.	79
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Cycle-I

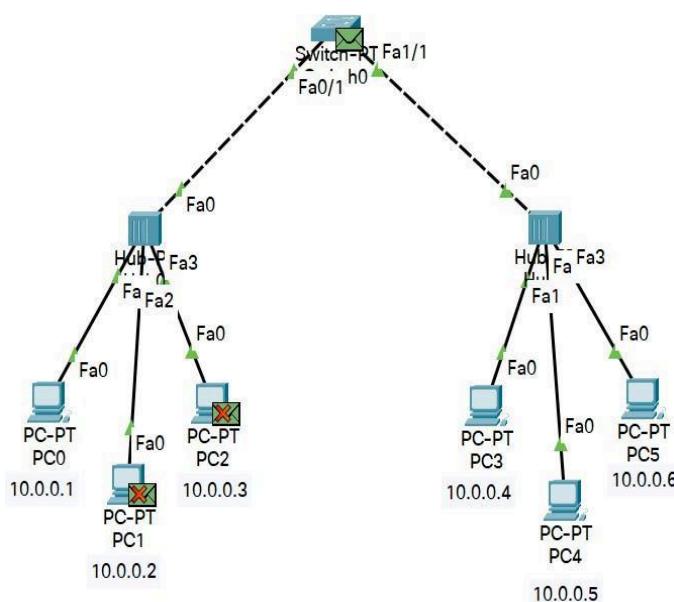
Program 1

- i. Create a topology involving multiple hubs and a switch connecting them to simulate with simple PDU.
- ii. Procedure along with the topology

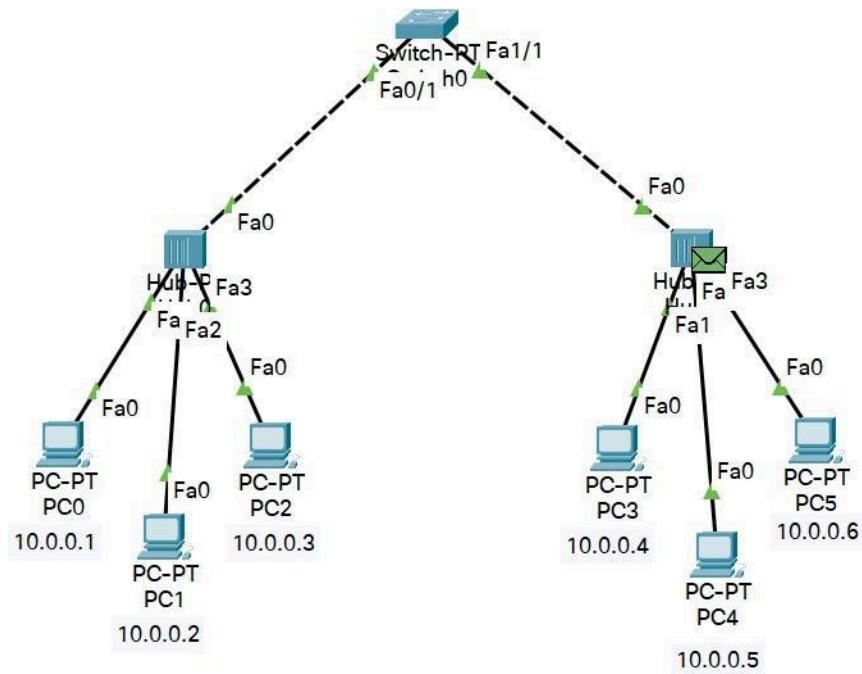


- iii. Screen shots/ output

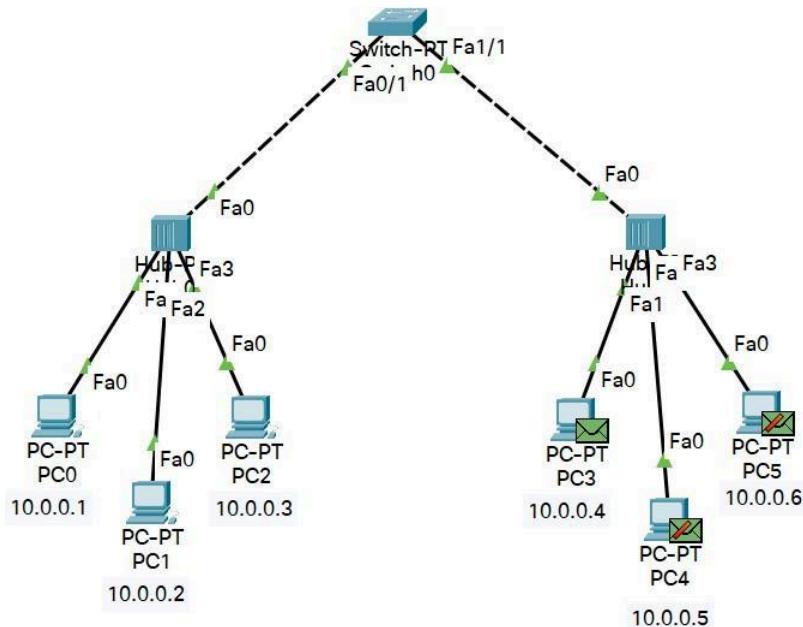
Hub behaviour at sending end



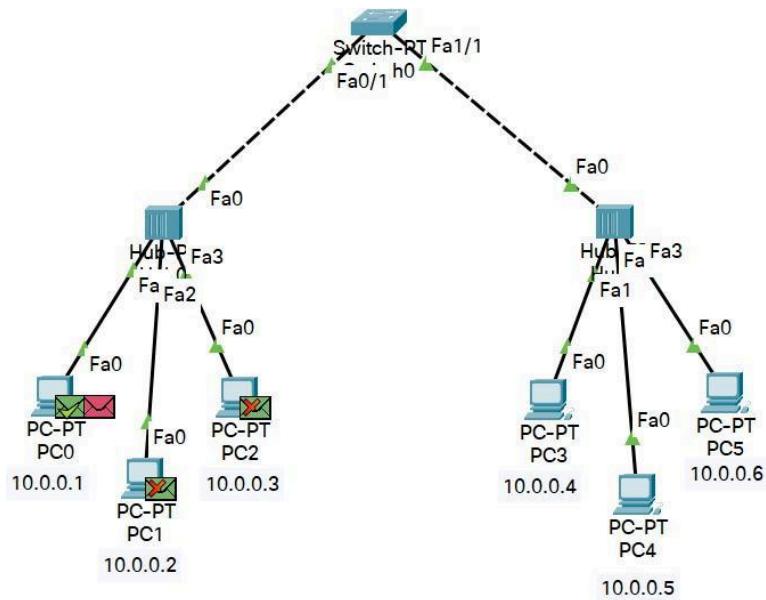
Switch behaviour



Hub behaviour at receiving end



Hub behaviour when back to sender



Ping command to connectivity

A screenshot of a Windows Command Prompt window titled "PC0". The window shows the output of a ping command from PC0 to PC4. The output is as follows:

```
Packet Tracer PC Command Line 1.0
C:\>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<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time=<1ms TTL=128
Reply from 10.0.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

iv. Observation

PAGE NO :
DATE : 09-01-24

LAB - 2

Q. Create a topology involving multiple hubs and a switch connecting them to simulate a simple PDV.

1. Set up 6 generic end devices and setup the IP address for all of them (10.0.0.1)

2. Set up 2 hubs and connect them to a single switch using copper cross-over wire

3. Connect all the end devices to its respective Hub using a copper straight wire.

4. Select the ports for copper cross-over wire.

5. Send a message from PC 0 to PC 5 via Hub D

Last Status: Successful
Source : PC 0

Command Prompt:

PC > ping 10.0.0.2

Pinging with 32 bytes of data:

Reply from 10.0.0.2 : bytes = 32 time = 2ms TTL = 128
" " time = 1ms "
" " time = 4ms "
" " time = 2ms "

Ping statistics for 10.0.0.2:

packets : sent = 4 , Received = 4 , Lost = 0

6. Send a message from PC0 to PC3 via
Hub 0 to Switch 0 to Hub 1

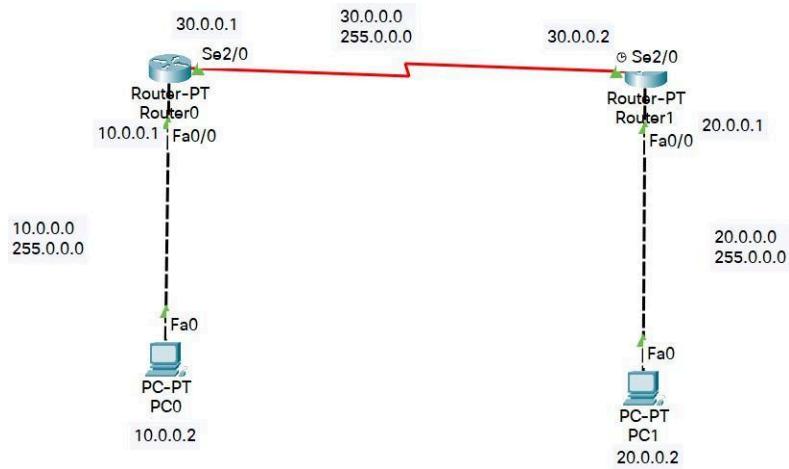
Last status: successful

source : 100

Destination : PC3

Program 2

- i. Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.
- ii. Procedure along with the topology



- iii. Screen shots/ output

Router0 configuration

```
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 shutdown

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

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

Router(config-if)#exit
Router(config)#interface Se2/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shutdown

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

Ctrl+F6 to exit CLI focus

Top

Router1 configuration

```
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 20.0.0.1 255.0.0.0
Router(config-if)#no shutdown

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

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

Router(config-if)#exit
Router(config)#interface Se2/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#no shutdown

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
```

Ip route command in Router0

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.2
Router(config)#

```

Ip route command in Router1

```
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 30.0.0.1
Router(config)#

```

Destination host Unreachable (Before establishing network Fully)

PC1

Physical Config Desktop Programming

Command Prompt X

```
Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 20.0.0.1: Destination host unreachable.

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Request Timed Out

PC2

Physical Config Desktop Programming

Command Prompt X

```
Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

Reply from Destination

PC0

Physical Config Desktop Programming

Command Prompt X

```

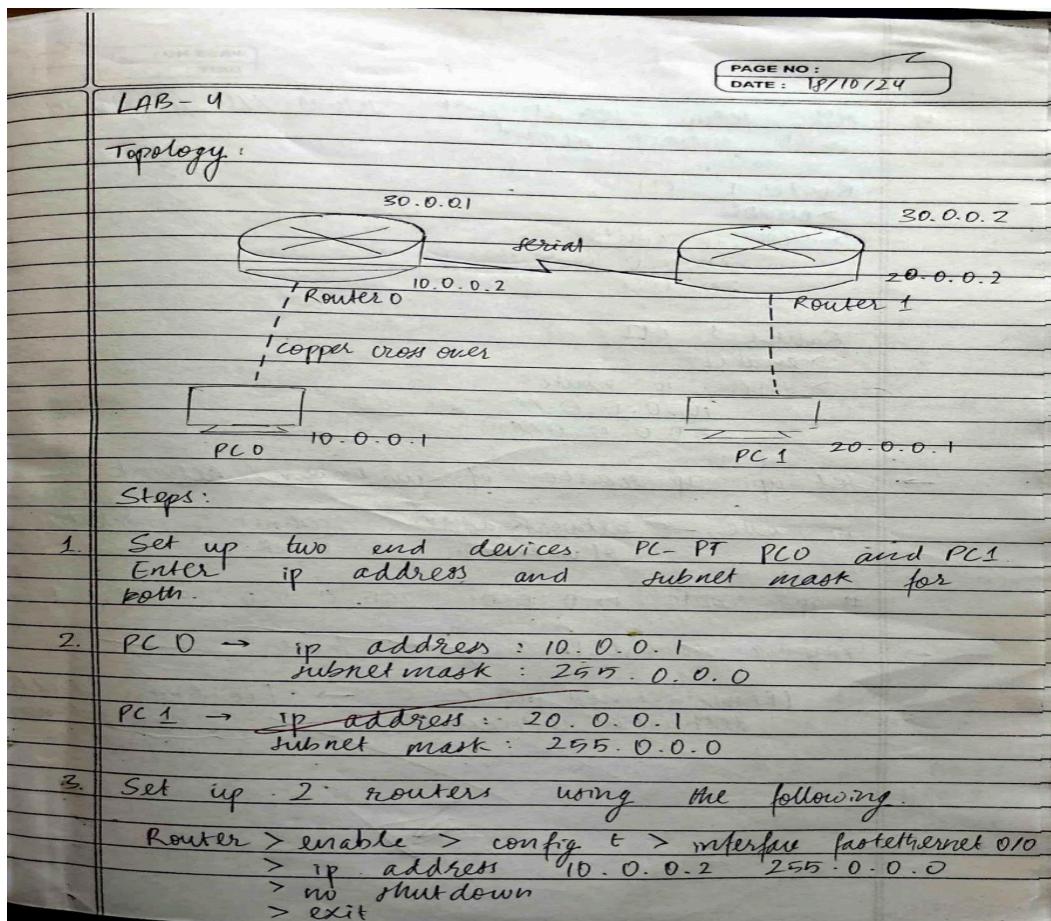
Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes=32 time=1ms TTL=126
Reply from 20.0.0.2: bytes=32 time=18ms TTL=126
Reply from 20.0.0.2: bytes=32 time=1ms TTL=126
Reply from 20.0.0.2: bytes=32 time=1ms TTL=126

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 18ms, Average = 5ms
  
```

iv. Observation



u. Also setup serial port serial 2/0 ip address and subnet mask.

Router 0 CLI:

> enable

> show ip route:

20.0.0.0/8

30.0.0.0/8

Router 1 CLI:

> enable

> show ip route:

10.0.0.0/8

30.0.0.0/8

→ Set up ip route of unknown network

ip route → network addr subnet interface
of unknown mask

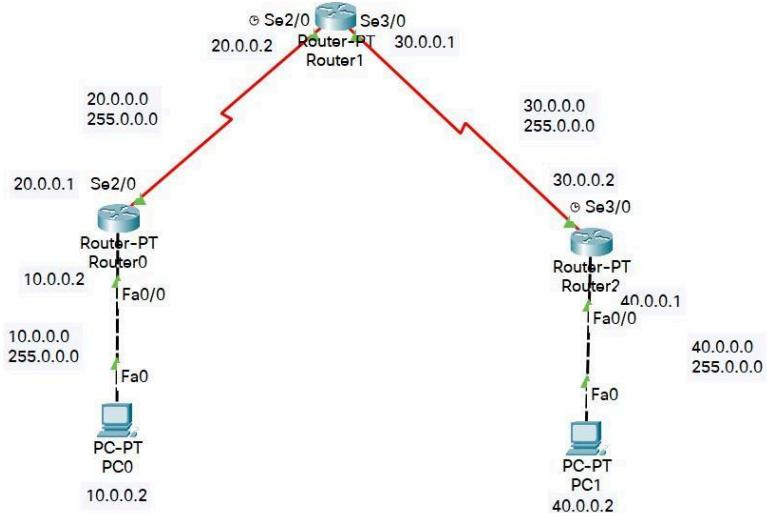
ip route 10.0.0.0 255.0.0.0 30.0.0.1

→ Pinging 20.0.0.1 using 32 bytes:-

(Request timed out / destination unreachable) → Configure IP address and gateway property.

Program 3

- i. Configure default route, static route to the router
- ii. Procedure along with the topology



- iii. Screen
Router0 configuration

```
Router0
Physical Config CLI
IOS Command Line Interface
Would you like to enter the initial configuration dialog? [yes/no]: n
Press RETURN to get started!

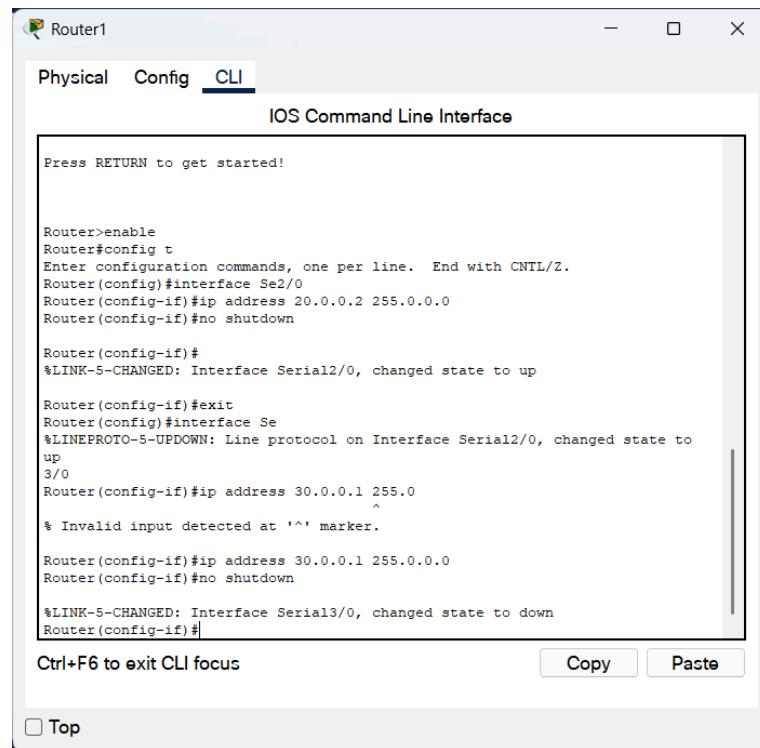
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Fa0/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
$LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up
$IP-4-DUPADDR: Duplicate address 10.0.0.2 on FastEthernet0/0, sourced by
000C.CFC2.65B0

Router(config-if)#exit
Router(config)#interface Se2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#no shutdown

$LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#
Ctrl+F6 to exit CLI focus           Copy   Paste
 Top
```

Router1 configuration



The screenshot shows the Cisco IOS Command Line Interface (CLI) for Router1. The window title is "Router1". The tab bar at the top has three tabs: "Physical", "Config", and "CLI", with "CLI" being the active tab. The main area is titled "IOS Command Line Interface". It displays the following configuration commands:

```
Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Se2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#no shutdown

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

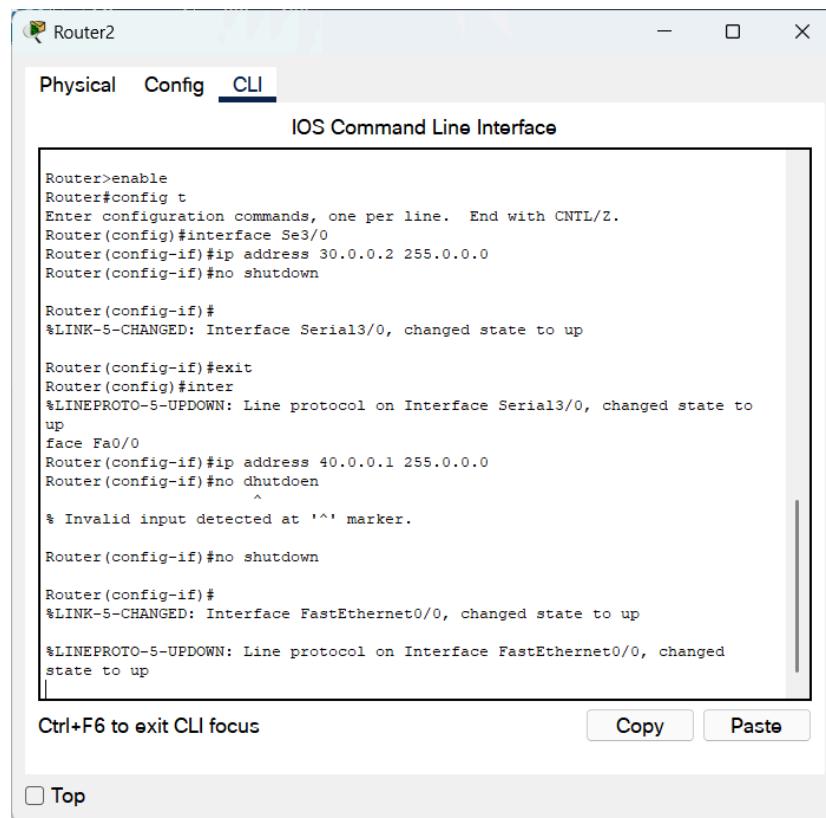
Router(config-if)#exit
Router(config)#interface Se
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to
up
3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
^
% Invalid input detected at '^' marker.

Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
Ctrl+F6 to exit CLI focus
```

At the bottom right of the main window are "Copy" and "Paste" buttons. At the bottom left is a checkbox labeled "Top".

Router2 configuration



The screenshot shows the Cisco IOS Command Line Interface (CLI) for Router2. The window title is "Router2". The tab bar at the top has three tabs: "Physical", "Config", and "CLI", with "CLI" being the active tab. The main area is titled "IOS Command Line Interface". It displays the following configuration commands:

```
Press RETURN to get started!

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Se3/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#no shutdown

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

Router(config-if)#exit
Router(config)#inter
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to
up
face Fa0/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#no shutdown
^
% Invalid input detected at '^' marker.

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
Ctrl+F6 to exit CLI focus
```

At the bottom right of the main window are "Copy" and "Paste" buttons. At the bottom left is a checkbox labeled "Top".

Static Routing:

Router0

Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 30.0.0.0 255.0.0.0 20.0.0.2
Router(config)#ip route 40.0.0.0 255.0.0.0 20.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is 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 20.0.0.2
S 40.0.0.0/8 [1/0] via 20.0.0.2

Router#

Ctrl+F6 to exit CLI focus

Top

Router1

Router#
%SYS-5-CONFIG_I: Configured from console by console

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 20.0.0.1
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

S 10.0.0.0/8 [1/0] via 20.0.0.1
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 30.0.0.2

Router#

Ctrl+F6 to exit CLI focus

Top

Router2

Router2

Physical Config CLI

IOS Command Line Interface

```
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 30.0.0.1
Router(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.1
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

S   10.0.0.0/8 [1/0] via 30.0.0.1
S   20.0.0.0/8 [1/0] via 30.0.0.1
C   30.0.0.0/8 is directly connected, Serial3/0
C   40.0.0.0/8 is directly connected, FastEthernet0/0

Router#
```

Ctrl+F6 to exit CLI focus

Top

Dynamic Routing:

Route0

Router0

Physical Config CLI

IOS Command Line Interface

```
S   30.0.0.0/8 [1/0] via 20.0.0.2
S   40.0.0.0/8 [1/0] via 20.0.0.2

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 20.0.0.2
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is 20.0.0.2 to network 0.0.0.0

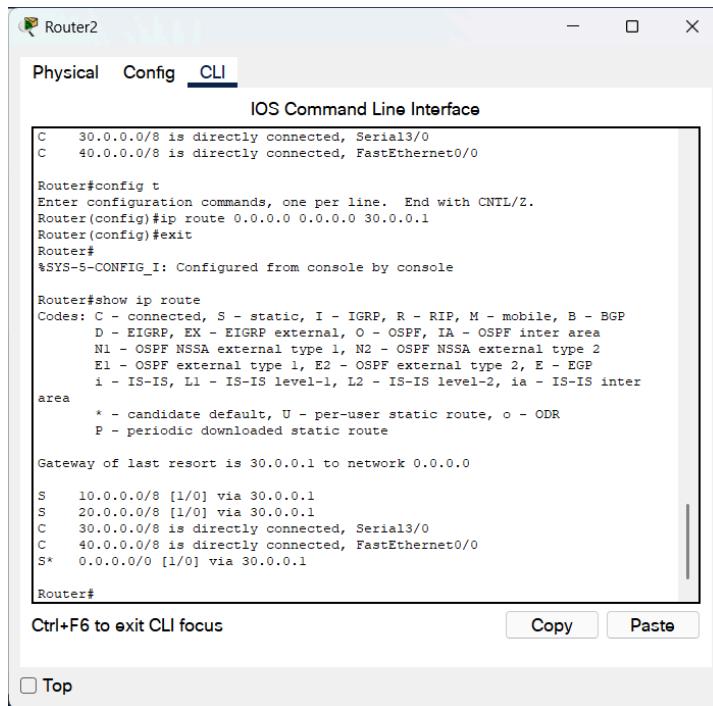
C   10.0.0.0/8 is directly connected, FastEthernet0/0
C   20.0.0.0/8 is directly connected, Serial2/0
S   30.0.0.0/8 [1/0] via 20.0.0.2
S   40.0.0.0/8 [1/0] via 20.0.0.2
S*  0.0.0.0/0 [1/0] via 20.0.0.2

Router#
```

Ctrl+F6 to exit CLI focus

Top

Router2



The screenshot shows the Router2 CLI interface. The title bar says "Router2". The menu bar has "Physical", "Config", and "CLI" (which is selected). The main window is titled "IOS Command Line Interface". It displays the following output:

```
C 30.0.0.0/8 is directly connected, Serial3/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0

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 30.0.0.1
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is 30.0.0.1 to network 0.0.0.0

S 10.0.0.0/8 [1/0] via 30.0.0.1
S 20.0.0.0/8 [1/0] via 30.0.0.1
C 30.0.0.0/8 is directly connected, Serial3/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0
S* 0.0.0.0/0 [1/0] via 30.0.0.1

Router#
```

At the bottom of the window, there are "Copy" and "Paste" buttons, and a "Top" checkbox.

Pinging:

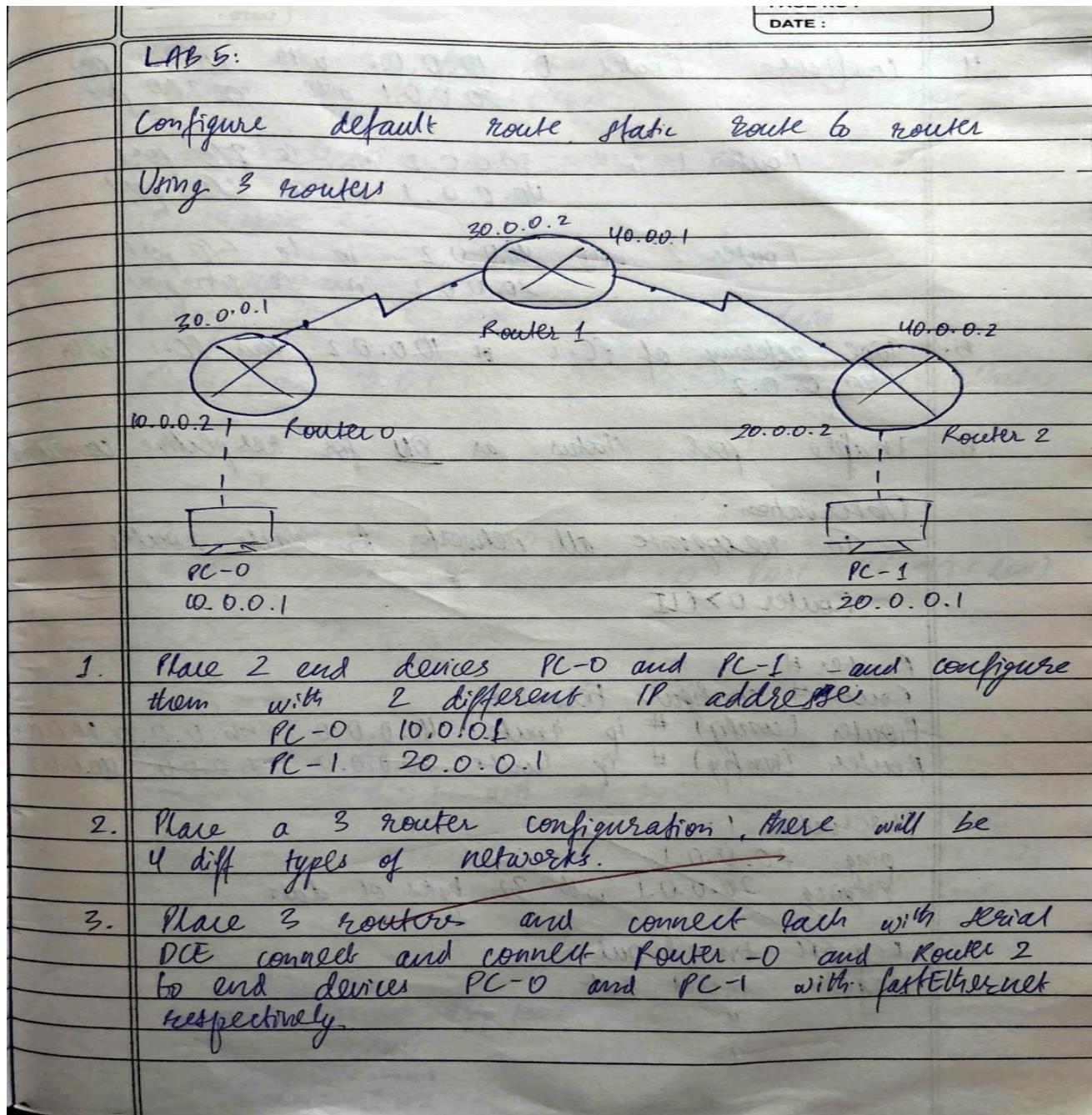
```
C:\>ping 40.0.0.2

Pinging 40.0.0.2 with 32 bytes of data:

Reply from 40.0.0.2: bytes=32 time=21ms TTL=125
Reply from 40.0.0.2: bytes=32 time=17ms TTL=125
Reply from 40.0.0.2: bytes=32 time=25ms TTL=125
Reply from 40.0.0.2: bytes=32 time=2ms TTL=125

Ping statistics for 40.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 25ms, Average = 16ms
```

iv. Observation



4. Configure Router 0 10.0.0.2 with Fa 0/0
20.0.0.1 with Se 2/0 port

Router 1 with 30.0.0.2 in Se 8/0 port
40.0.0.1 in Se 2/0 port

Router 2 with 40.0.0.2 in Se 5/0 port
20.0.0.2 in Se 0/0 port

5. Type gateway of PLC-0 as 10.0.0.2 and PLC-1 with 20.0.0.2

6. Enable port status as ON for respective connection

Observation:

To recognise all network for each router

Router 0 > CLI

Router #

Router # configure terminal

Router (config) # ip route 40.0.0.0 255.0.0.0 20.0.0.1

Router (config) # ip route 20.0.0.0 255.0.0.0 40.0.0.2

Observation 1:

ping 20.0.0.1

Requesting 20.0.0.1 with 32 bytes of data

Request time out

Request timed out

"

"

Ping Statistics for 10.0.0.1
Packets sent = 4, received = 0 i. Lost = 4 (100% loss)

Reason : Gateway not configured.

Observation 2:

Ping 20-0-0-1

Pinging 20.0.0.1 with 32 bytes of data

Reply from 10.0.0.1 : Destination host unreachable

" " "

Ping Statistics for 20.0.0.1

Packets : sent = 4 received = 0 Cost = 4(100% loss)

Reason = No ip route

Observation 2:

Page 20-0.01

ping my 20.0.0.1 with 32 bytes of data

~~Reply from 20.0.0.1 bytes = 32 time = 2ms TTL = 125~~

$$\text{time} = 9\text{ms}$$

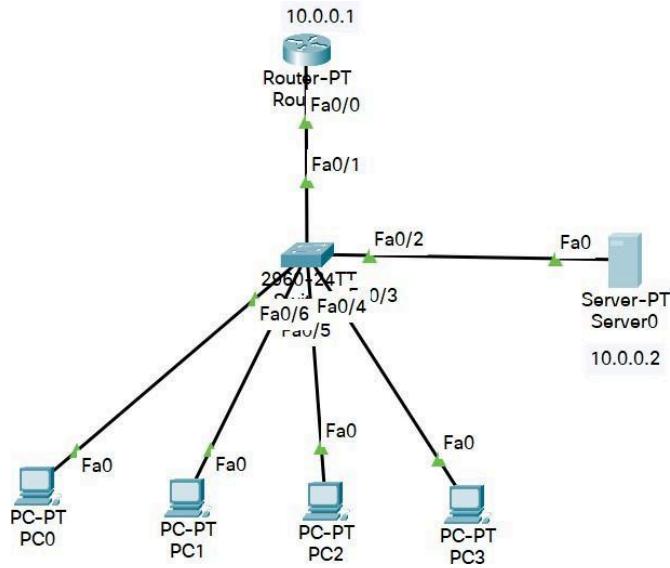
Approx round trip time in ms:

Minimum $> 2 \mu\text{m}$

Maximum = 13ms
Average = 6ms

Program 4

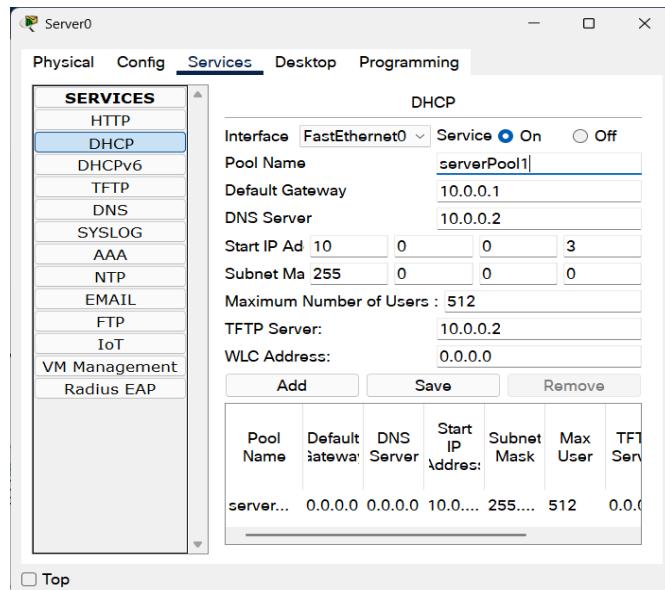
- i. Configure DHCP within a LAN and outside LAN.
- ii. Procedure along with the topology



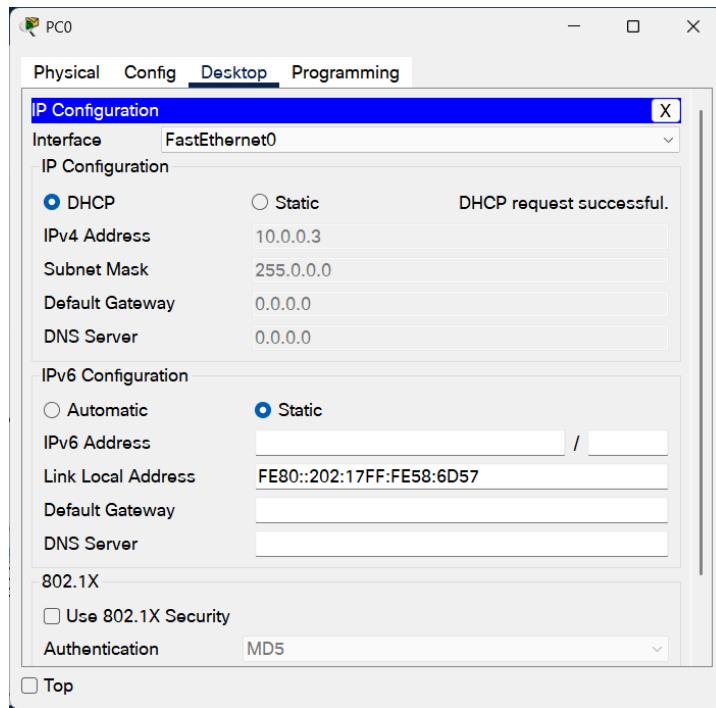
- iii. Screen shots/ output

DHCP Within LAN

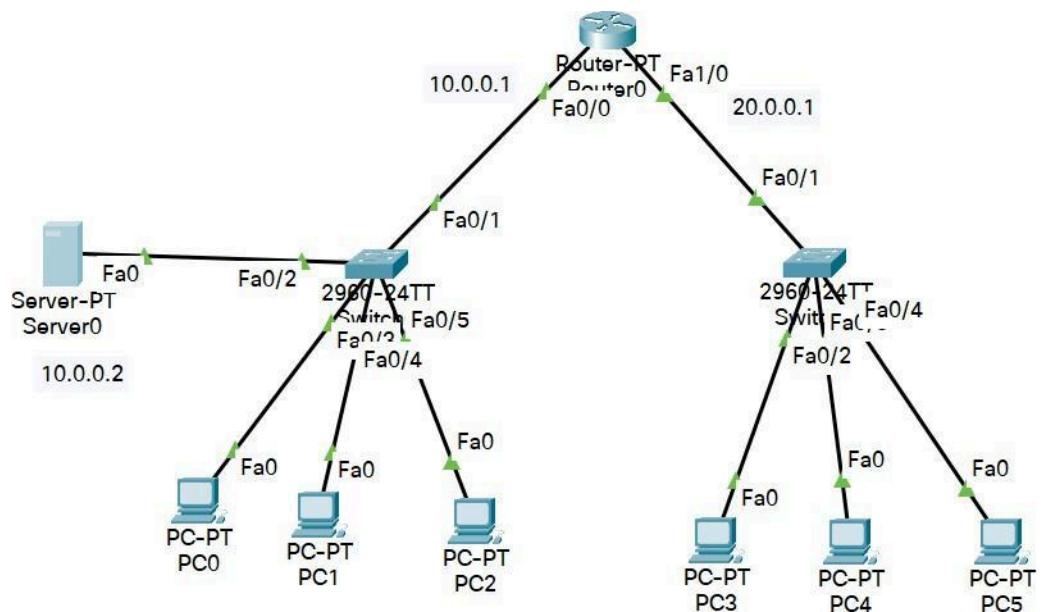
DHCP Configuration



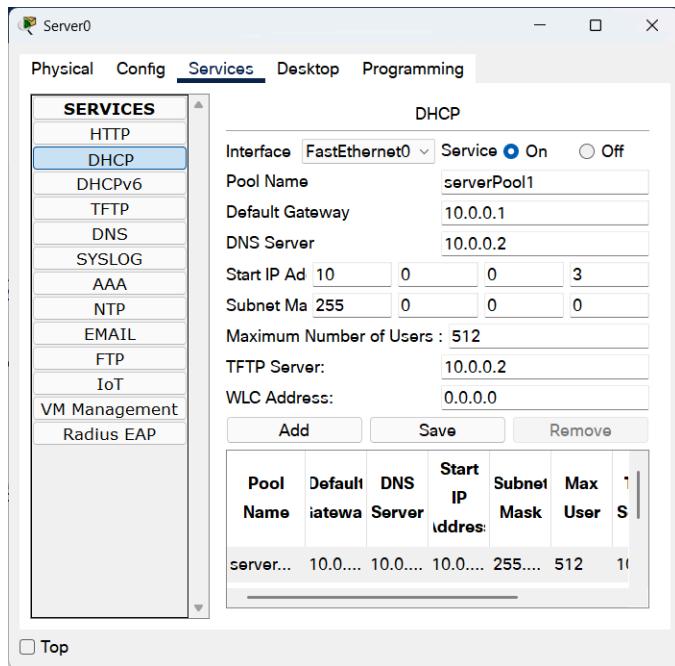
PC settings



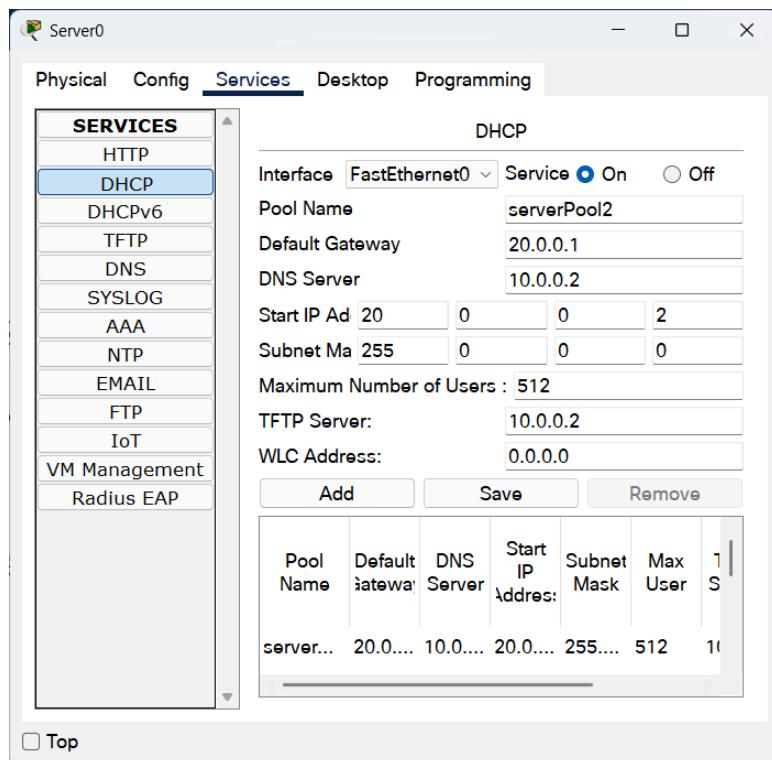
DHCP outside LAN:



DHCP configuration for inside LAN



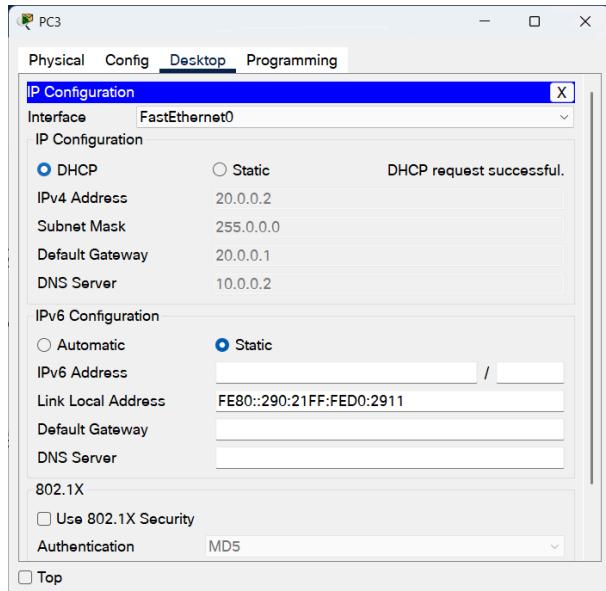
DHCP configuration for outside LAN



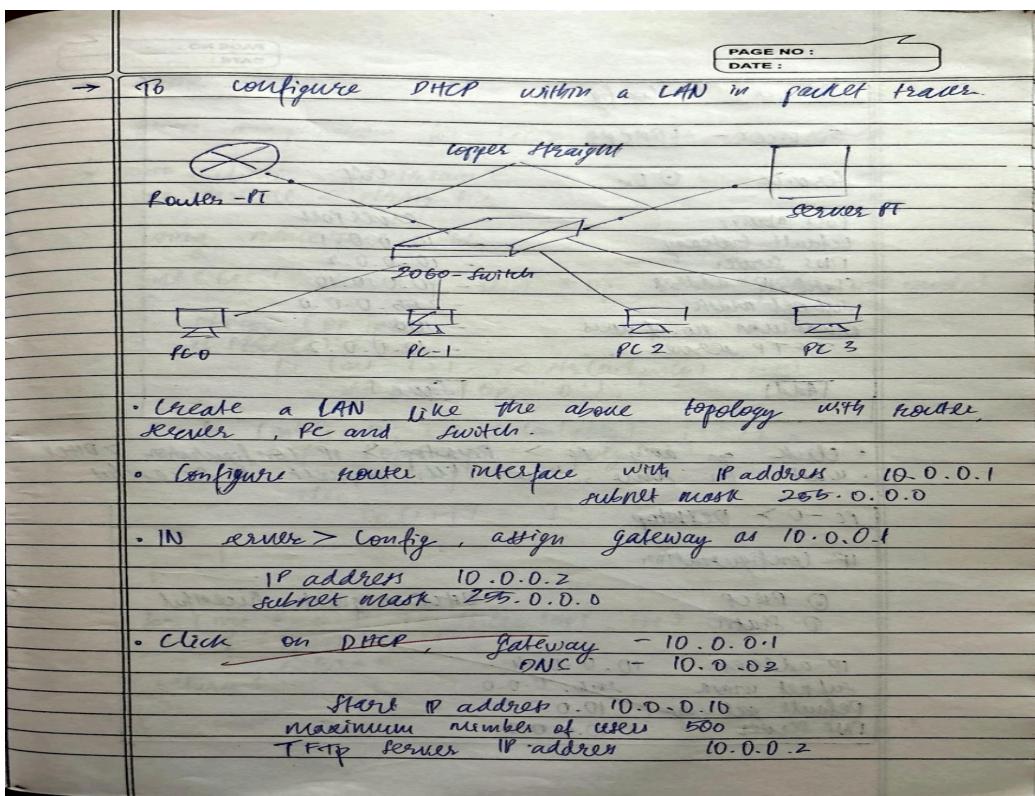
Ip helper command in Router

```
Router(config-if)#exit  
Router(config)#interface Fa1/0  
Router(config-if)#ip helper-address 10.0.0.2  
Router(config-if)#{}
```

PC setting in another network



iv. Observation

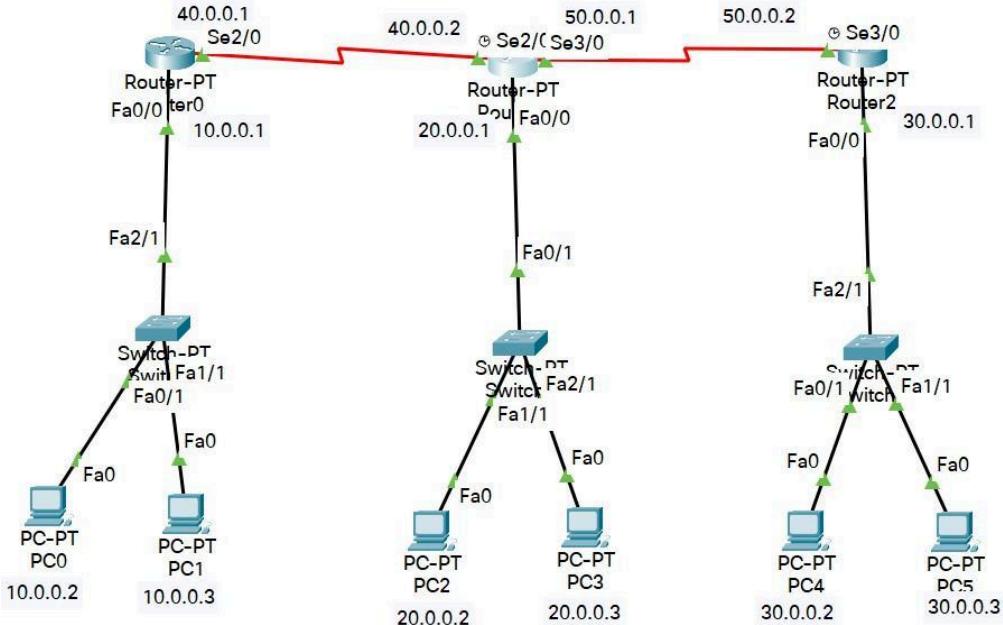


PAGE NO :
DATE :

server 0 > Config	
Services - [DHCP]	
Service	<input checked="" type="radio"/> On <input type="radio"/> Off
Port Name	- server Port
Default Gateway	- 10.0.0.1
DNS Server	- 10.0.0.2
Start IP address	- 10.0.0.10
Subnet mask	- 255.0.0.0
Maximum no. of users	- 100
TFTP server	- 10.0.0.2
[Add]	[Save]
<ul style="list-style-type: none"> Click on any PC > Desktop > IP Configuration > DHCP. Wait for some time till request is successful. 	
PC - 0 > Desktop	
IP Configuration	
<input checked="" type="radio"/> DHCP	DHCP request successful
<input type="radio"/> Static	
IP address	10.0.0.14
Subnet mask	255.0.0.0
Default gateway	10.0.0.1
DNS server	10.0.0.2

Program 5

- i. Configure RIP routing Protocol in Routers
- ii. Procedure along with the topology



- iii. Screen shots/ output

Router0

```
Router#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 40.0.0.0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    40.0.0.0/8 is directly connected, Serial2/0
```

Router1

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 40.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

R    10.0.0.0/8 [120/1] via 40.0.0.1, 00:00:08, Serial2/0
C    20.0.0.0/8 is directly connected, FastEthernet0/0
R    30.0.0.0/8 [120/1] via 50.0.0.2, 00:00:10, Serial3/0
C    40.0.0.0/8 is directly connected, Serial2/0
C    50.0.0.0/8 is directly connected, Serial3/0
```

Router2

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#network 30.0.0.0
Router(config-router)#network 50.0.0.0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

R    10.0.0.0/8 [120/2] via 50.0.0.1, 00:00:28, Serial3/0
R    20.0.0.0/8 [120/1] via 50.0.0.1, 00:00:28, Serial3/0
C    30.0.0.0/8 is directly connected, FastEthernet0/0
R    40.0.0.0/8 [120/1] via 50.0.0.1, 00:00:28, Serial3/0
C    50.0.0.0/8 is directly connected, Serial3/0
```

Pinging:

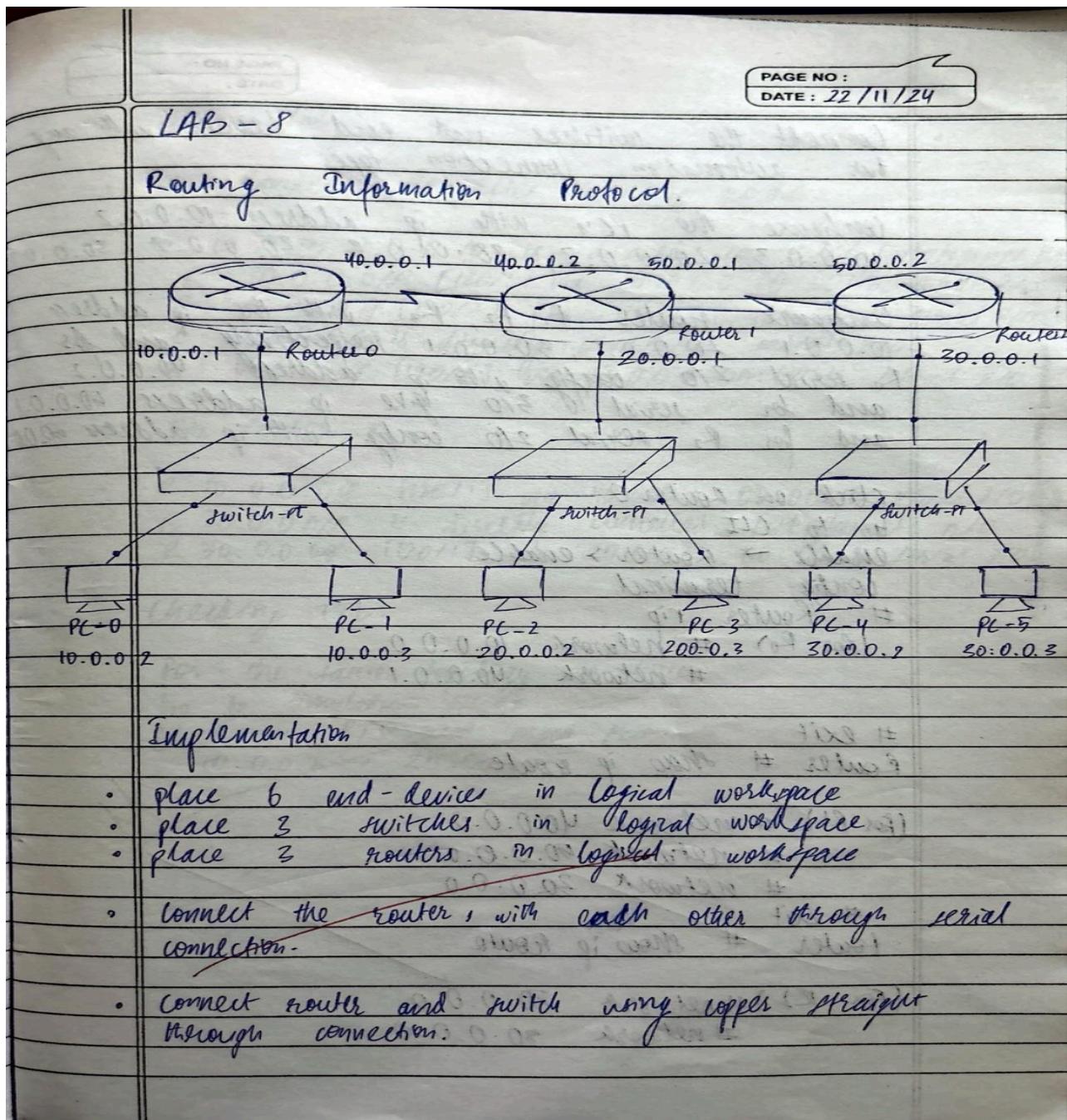
```
Packet Tracer PC Command Line 1.0
C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.2: bytes=32 time=9ms TTL=126
Reply from 20.0.0.2: bytes=32 time=1ms TTL=126
Reply from 20.0.0.2: bytes=32 time=9ms TTL=126

Ping statistics for 20.0.0.2:
  Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
  Minimum = 1ms, Maximum = 9ms, Average = 6ms
```

iv. Observation



• Connect the switches and end devices with any two automation connection type.

Configure the PC's with ip address 10.0.0.2, 10.0.0.3, 20.0.0.2, 20.0.0.3, 30.0.0.2, 30.0.0.3

Configure router R₁, R₂, R₃ with the ip address 10.0.0.1, 20.0.0.1, 30.0.0.1 respectively and for R₁ serial 2/0 config with ip address 40.0.0.2 and for serial 1/0 give ip address 60.0.0.0 and for R₂ serial 2/0 config with ip address 80.0.0.1

Click on Router 0

Go to CLI

enable → Router > enable

config terminal

Router rip

(for R0) # network 10.0.0.0

network 40.0.0.1

exit

Router # show ip route

(for R1) # network 40.0.0.0

network 90.0.0.0

network 30.0.0.0

exit

Router # show ip route

(for R2) # network 50.0.0.0

network 30.0.0.0

→ Observations:

• for Router R₀ after show ip route

- C: 10.0.0.0 IP is directly connected, fast ethernet 0/0
- R: 20.0.0.0/8 [120/1] via 40.0.0.0, 00:00:16, serial 2/0
- R: 30.0.0.0/8 [120/2] via 40.0.0.0, 00:00:16, serial 2/0
- C: 40.0.0.0/8 is directly connected serial 2/0
- R: 90.0.0.0/8 [120/1] via 40.0.0.2, 00:00:16, serial 2/0

→ for Router R₁

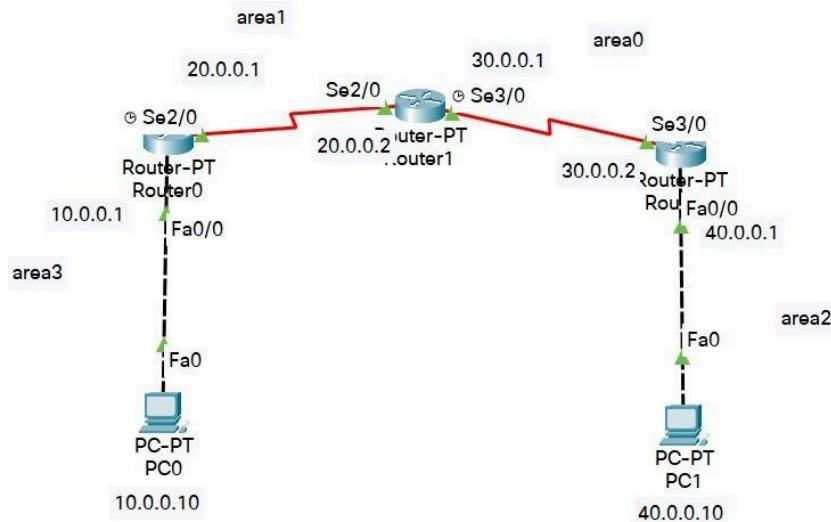
- R 10.0.0.0/8 [120/1] via 40.0.0.1, 00:00:16, serial 2/0
- C 20.0.0.0/8 is directly connected, fast ethernet 0/0
- R 30.0.0.0/8 [120/1] via 40.0.0.2, 00:00:16, serial 2/0.

Checking TTL:

For the same topology as above
~~no to simulation mode~~
~~Click on PTO and send from~~
~~10.0.0.2 → 30.0.0.3~~

Program 6

- i. Configure OSPF routing protocol
- ii. Procedure along with the topology



- iii. Screen shots/ output

Encapsulation:

Router0

```
Router>enable
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 shutdown

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

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

Router(config-if)#exit
Router(config)#interface Se2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown

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

```

Router1

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Se2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shutdown

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

Router(config-if)#exit
Router(config)#interface Se3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
^
% Invalid input detected at '^' marker.

Router(config-if)#no shutdown
```

Router2

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface Fa0/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#no shutdown

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up
%IP-4-DUPADDR: Duplicate address 40.0.0.1 on FastEthernet0/0, sourced by
000D.BDDA.0123

Router(config-if)#exit
Router(config)#interface Se3/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shutdown

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
```

OSPF Routing Protocol

Router0

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
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)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#sho
00:27:19: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading Done
w 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  IA 30.0.0.0/8 [110/128] via 20.0.0.2, 00:00:02, Serial2/0
O  IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:00:02, Serial2/0
```

Router1

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
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 30.0.0.0 0.255.255.255 area 0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

00:26:21: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial3/0 from LOADING to FULL, Loading Done
00:27:18: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to FULL, Loading Done

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
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, 00:02:00, Serial3/0
```

Router2

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
00:26:19: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to FULL, Loading Done

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

O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:02:45, Serial3/0
  30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.1/32 is directly connected, Serial3/0
C       40.0.0.0/8 is directly connected, FastEthernet0/0
```

Configure Loopback address

Router0

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#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 shutdown
```

Router1

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#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 172.16.1.253 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#

```

Router2

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#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 172.16.1.254 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#+
```

Create Virtual Link

Router0

```
Router>enable
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 2.2.2.2
Router(config-router)#+
```

Router1

```
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
01:11:01: %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

01:11:11: %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)#route
01:11:21: %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
r ospf 1
Router(config-router)#
01:11:31: %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 v
01:11:41: %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
virtual-link 1.1.1.1
Router(config-router)#
01:11:56: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on OSPF_VL0 from LOADING to
FULL, Loading Done
```

Pinging

```
C:>ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
Reply from 40.0.0.10: bytes=32 time=24ms TTL=125
Reply from 40.0.0.10: bytes=32 time=18ms TTL=125
Reply from 40.0.0.10: bytes=32 time=18ms TTL=125
Reply from 40.0.0.10: bytes=32 time=20ms TTL=125

Ping statistics for 40.0.0.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 18ms, Maximum = 24ms, Average = 20ms
```

iv. Observation

PAGE NO :
DATE : 29/11/24

LAB - 9

How to configure OSPF Routing protocol & connect Area

Topology :

Router: Configure fastethernet 0/0 → 10.0.0.1 for serial interface.

R1 (config) # Interface serial 1/0
R1 (config-if) # IP address 20.0.0.1 255.0.0.0
R1 (config-if) # encapsulation ppp
R1 (config-if) # clock rate 6400
R1 (config-if) # no shutdown
R1 (config-if) # exit

Router R2: Configure fastethernet 0/0 → 40.0.0.1
For serial interface, configure IP 30.0.0.2, encapsulation
PPP.
→ no clock rate

Router 2 : configure serial 0/0 → IP 20.0.0.2 encapsulation
Configure serial 0/0 → IP 20.0.0.1 , encapsulation PPP
clock rate 6400

* Configure OSPF Routing Protocol

Router R1:

R1 (config) # router ospf 1

R1 (config-router) # router-id 1.1.1.1

```
R1 (config - router) # network 10.0.0.0 255.255.255.0 area 3
```

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

R1: (configure - router) # exit.

Rather R2:

Router (config) # router ospf 1

~~Router (conf)~~ # router-id 2.2.2.2

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

" where is (name) area

Router 3

Router (config)# router ospf 1

Router (with -router# router-id 8.3.38)

Router (ren ") # network 30.0.0.0 0.255.255.255 area 0

Configure loopback address:

R1:

```
Router (config) # interface loopback 0  
Router (config-if) # ip add 172.16.1.252 255.255.0.0  
Router (config-if) # no shutdown
```

R2:

```
Router (config) # interface loopback 0  
Router (config-if) # ip add 172.16.1.254 255.255.0.0  
Router (config-if) # no shutdown
```

R1:

```
Router # show ip route  
c 10.0.0.0/8 is directly connected fastEthernet 0/0  
    20.0.0.0/8 via directly variable subnetted, 2 subnets, 2  
    c 20.0.0.0/8 is directly connected serial 2/0  
    c 20.0.0.0/8 is directly connected serial 4/0  
        50.0.0.0/8 [110/128] via 20.0.0.2, 00:11:11  
            serial 4/0  
    IA 40.0.0.0/8 [110/128] via 20.0.0.2, 00:11:11  
        serial 2/0.  
c 172.16.0.0/16 is directly connected loopback 0
```

R1:

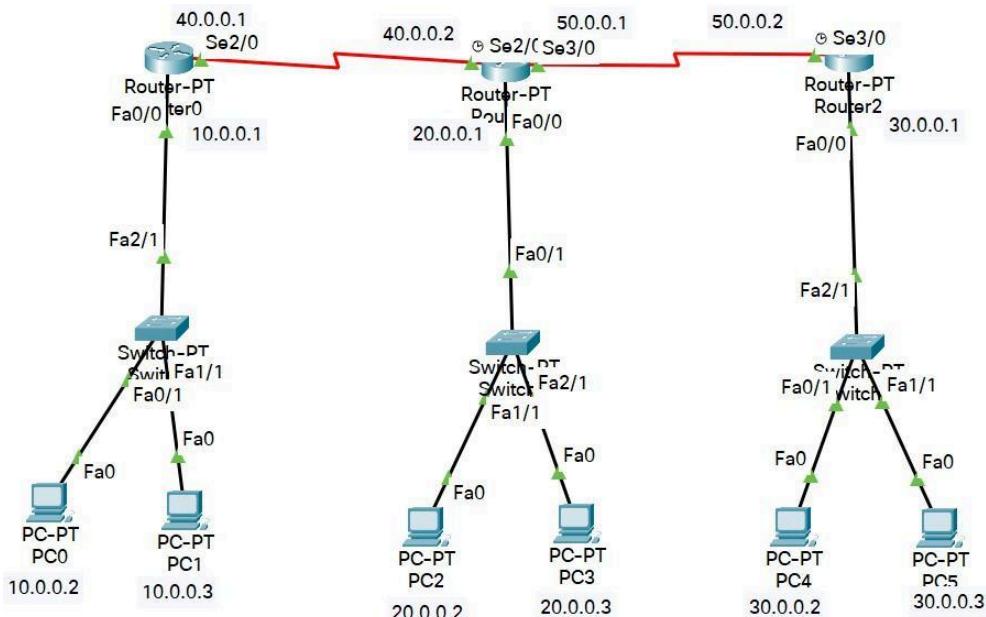
```
Router (config) # router ospf 1  
Router (config-router) # area 0 virtual link 2.2.2.2
```

R2:

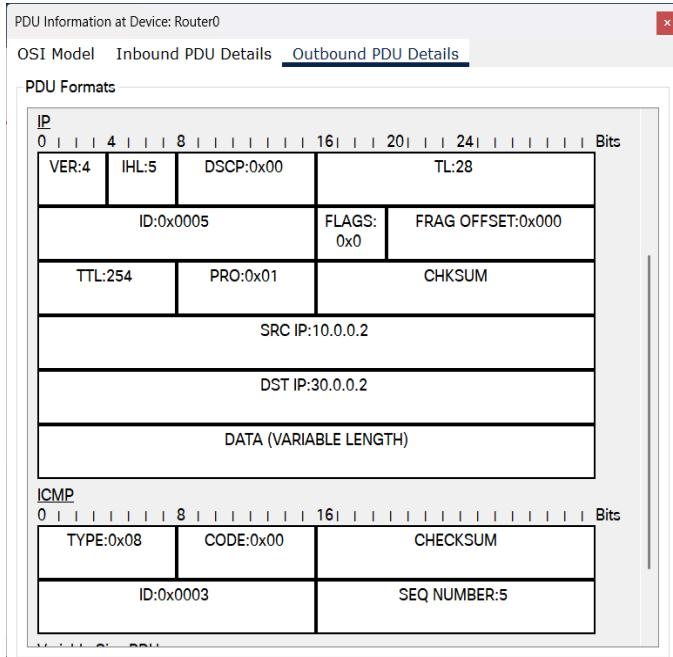
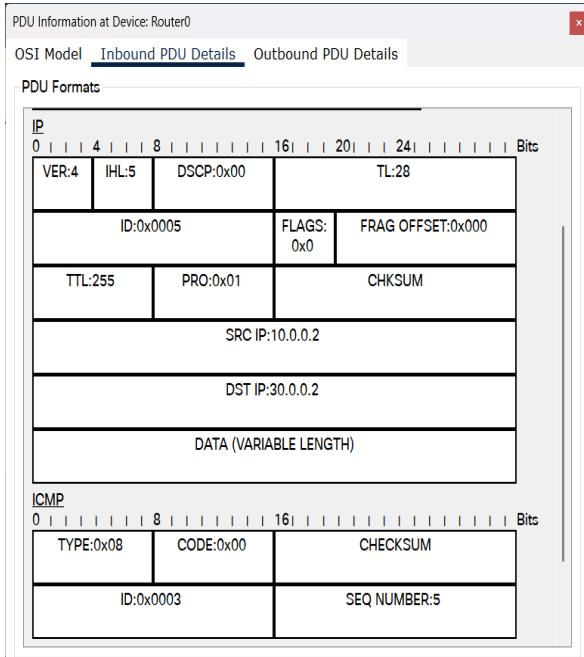
```
Router (config) # router ospf 1  
Router (config-router) # area 1 virtual link 1.1.1.1
```

Program 7

- Demonstrate the TTL/ Life of a Packet
- Procedure along with the topology



- Screen shots/ output
- Packet at Router0



Packet at Router1

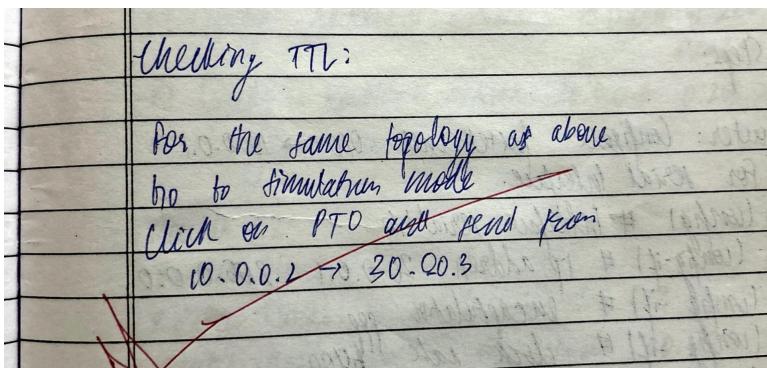
PDU Information at Device: Router1											
OSI Model		Inbound PDU Details			Outbound PDU Details						
PDU Formats											
IP											
0		4	8	16	20	24					
VER:4	IHL:5	DSCP:0x00			TL:28						
ID:0x0005		FLAGS: 0x0	FRAG OFFSET:0x000								
TTL:254	PRO:0x01		CHKSUM								
SRC IP:10.0.0.2											
DST IP:30.0.0.2											
DATA (VARIABLE LENGTH)											
ICMP											
0	4	8	16								
TYPE:0x08	CODE:0x00		CHECKSUM								
ID:0x0003			SEQ NUMBER:5								

PDU Information at Device: Router1											
OSI Model		Inbound PDU Details			Outbound PDU Details						
PDU Formats											
IP											
0		4	8	16	20	24					
VER:4	IHL:5	DSCP:0x00			TL:28						
ID:0x0005		FLAGS: 0x0	FRAG OFFSET:0x000								
TTL:253	PRO:0x01		CHKSUM								
SRC IP:10.0.0.2											
DST IP:30.0.0.2											
DATA (VARIABLE LENGTH)											
ICMP											
0	4	8	16								
TYPE:0x08	CODE:0x00		CHECKSUM								
ID:0x0003			SEQ NUMBER:5								

Packet at Router2

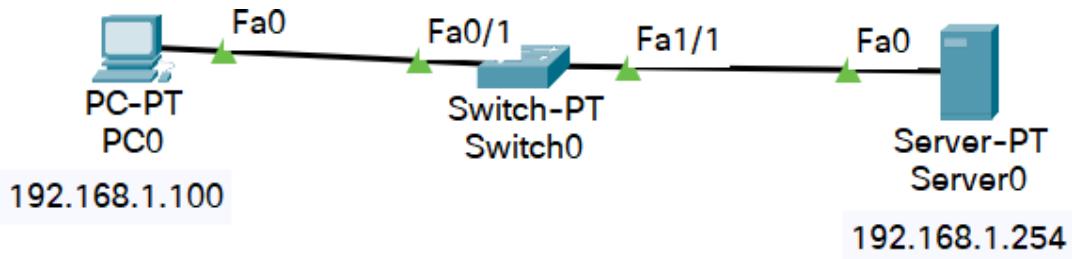
PDU Information at Device: Router2											
OSI Model		Inbound PDU Details			Outbound PDU Details						
PDU Formats											
IP											
0		4	8	16	20	24					
VER:4	IHL:5	DSCP:0x00			TL:28						
ID:0x0005		FLAGS: 0x0	FRAG OFFSET:0x000								
TTL:253	PRO:0x01		CHKSUM								
SRC IP:10.0.0.2											
DST IP:30.0.0.2											
DATA (VARIABLE LENGTH)											
ICMP											
0	4	8	16								
TYPE:0x08	CODE:0x00		CHECKSUM								
ID:0x0003			SEQ NUMBER:5								

iv. Observation



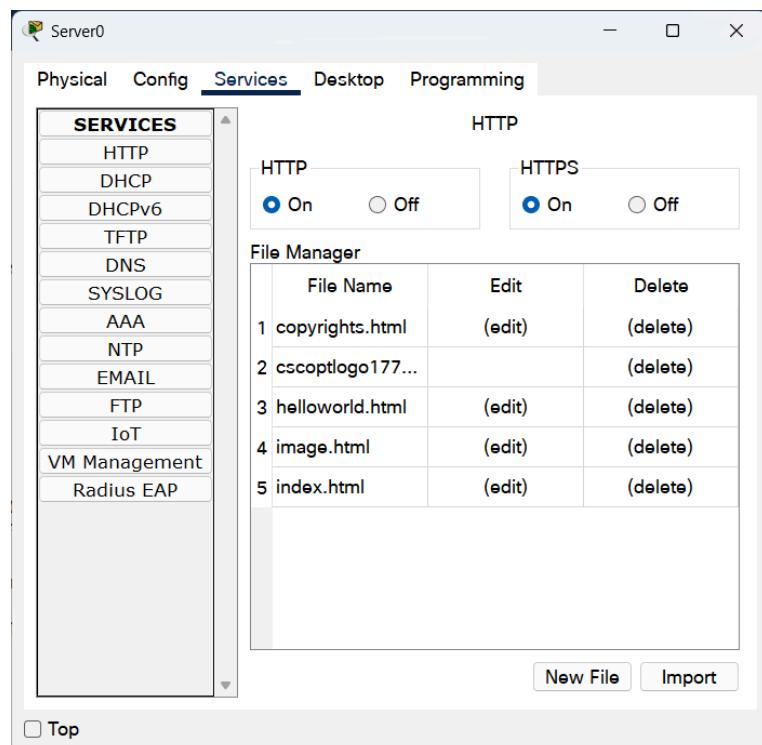
Program 8

- i. Configure Web Server, DNS within a LAN.
- ii. Procedure along with the topology

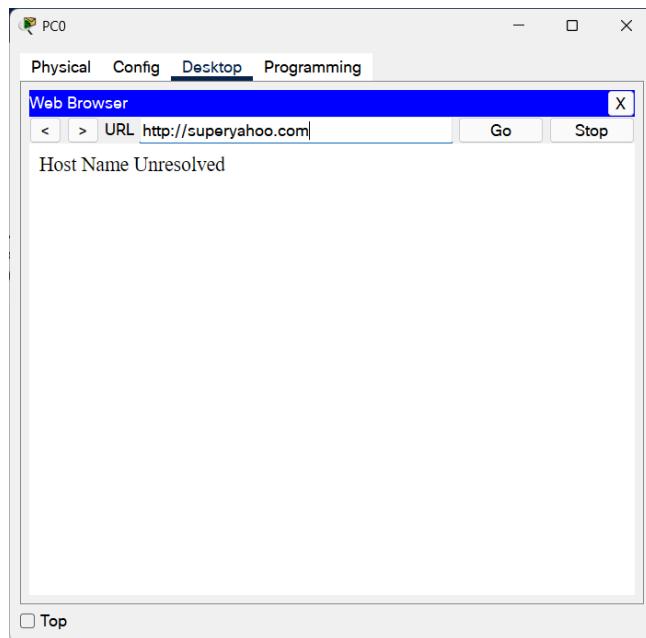
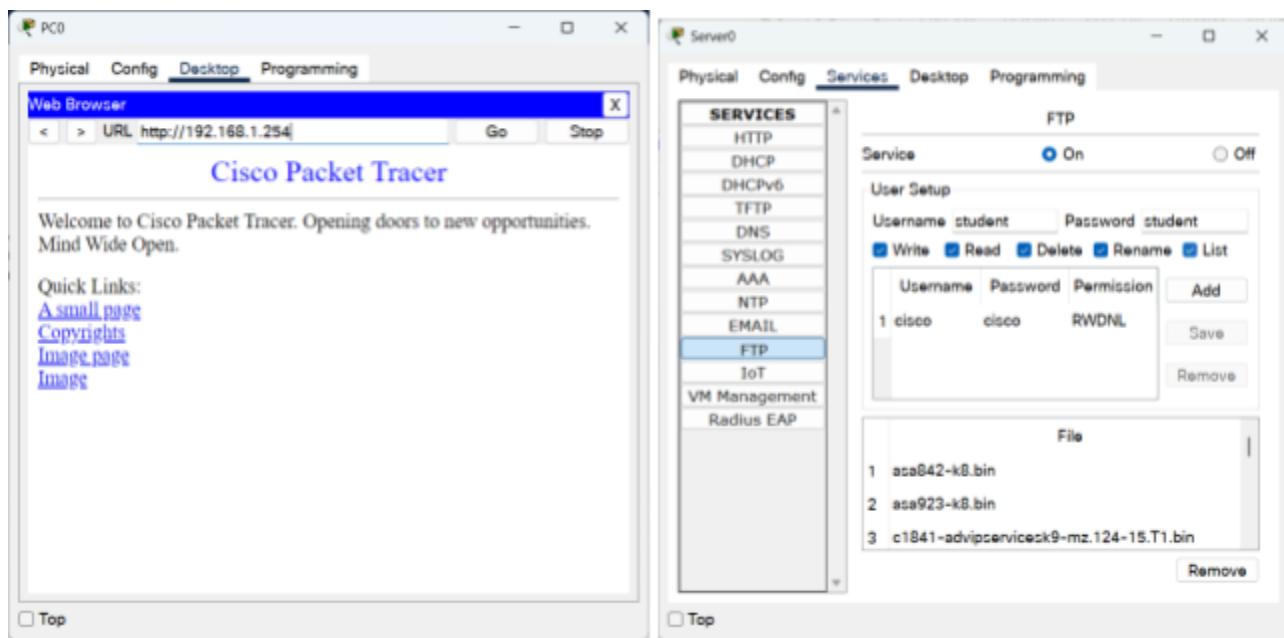


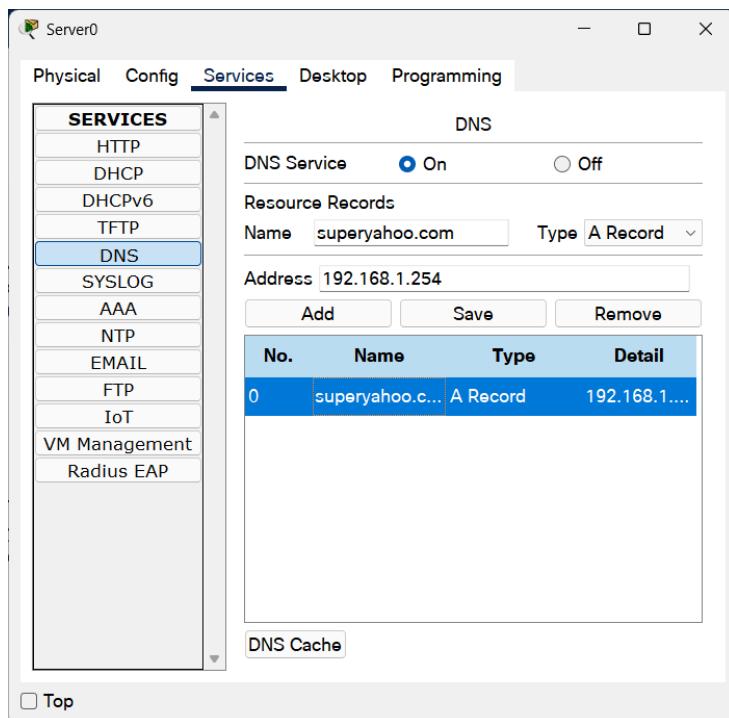
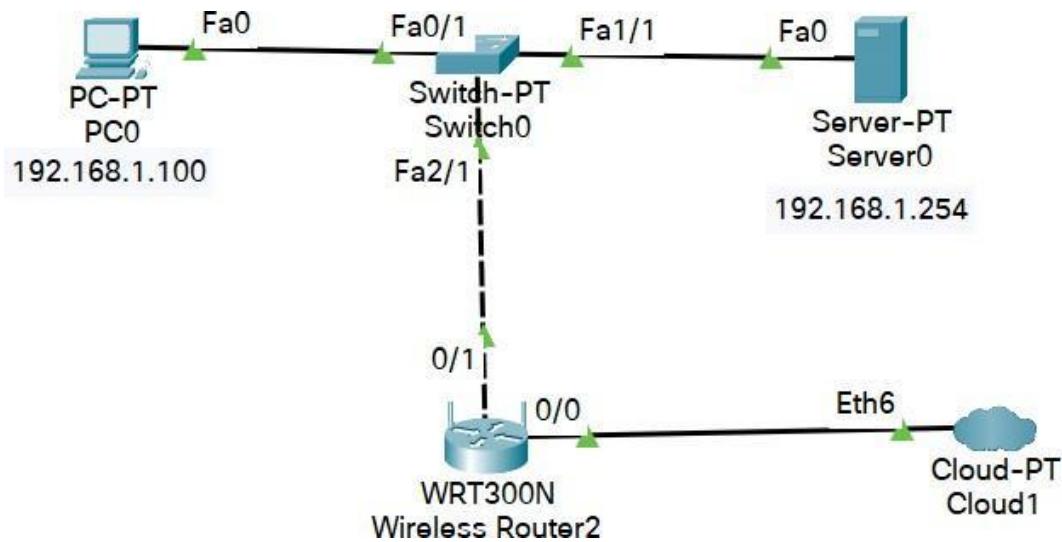
- iii. Screen shots/ output

Server's services

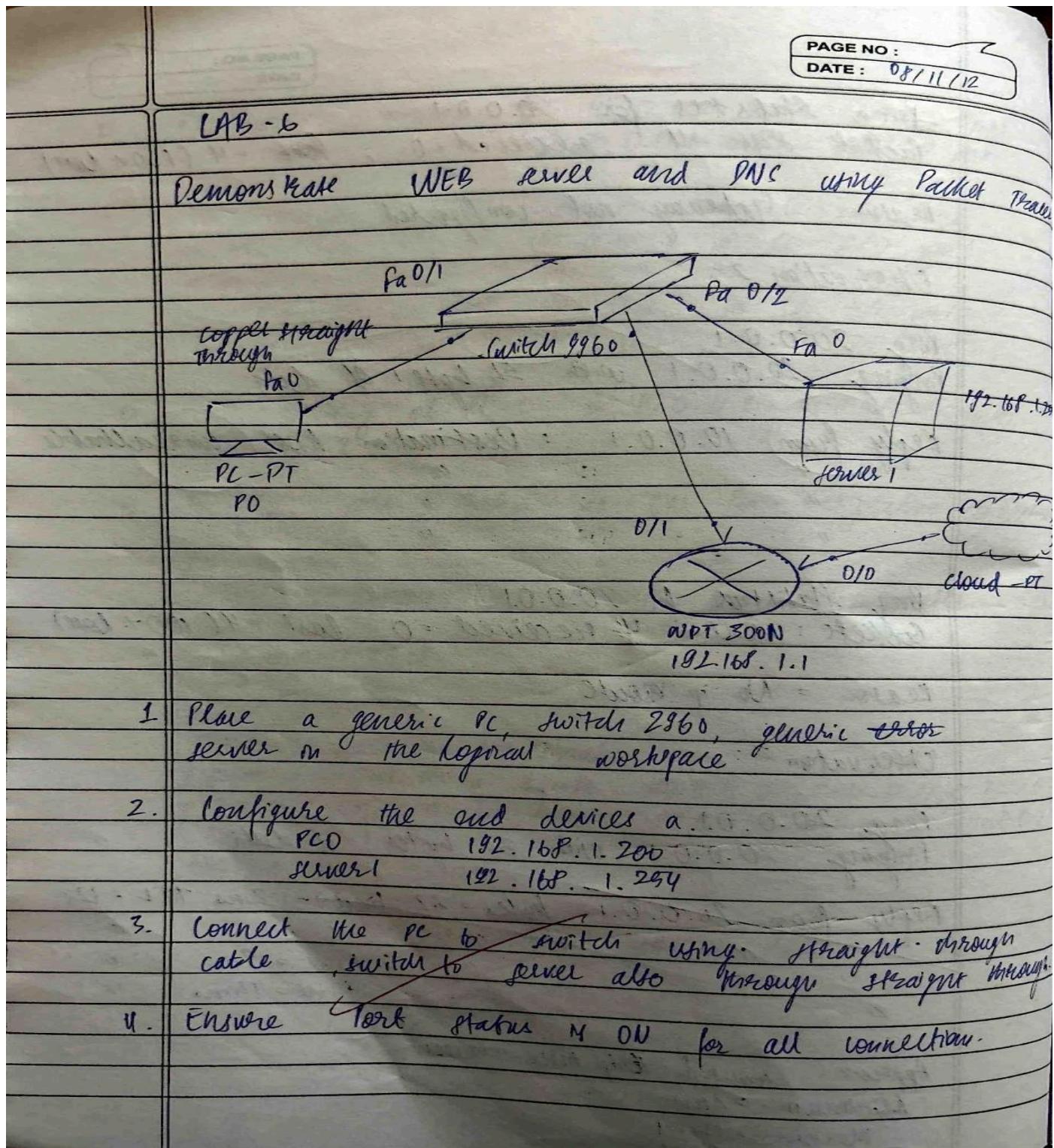


PC's Web Browser





iv. Observation



• Ping from PC to server (to ensure successful connection)

PC > ping 192.168.1.254

Reply from 192.168.1.254: bytes = 32 time=0ms TTL=128,

"

"

"

// Web browser service in server.

server > config tab > services > HTTP > status: ON

To test web browser,

PC > web browser > URL: 192.168.1.254

Web browser

URL: http:// 192.168.1.254

Cisco Packet Tracer:

Welcome to Cisco Packet Tracer!

Quick Links:

2 Connections including wireless router and internet

Wireless router: 192.168.1.1

In Router > Configure

Change IP address from 192.168.0.1 → 192.168.1.1

To check for successful connection, ping from PC to router.

PC > ping 192.168.1.1

• Configure the default gateway of PC as 192.168.1.1

// To view a different website called super.yahoo.com

⇒ Setup a [DNS server]

Server > Services > HTTP

Change the html code as required for index.html

DNS > services : ON

192.168.1.254

Config

DNS

DNS services : ON

Name : superyahoo.com

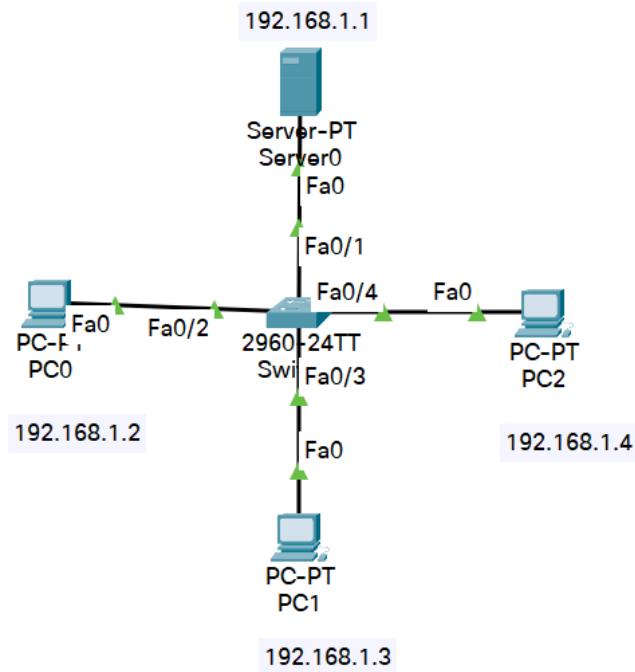
[Add]

1. superyahoo.com A Record - 192.168.1.254

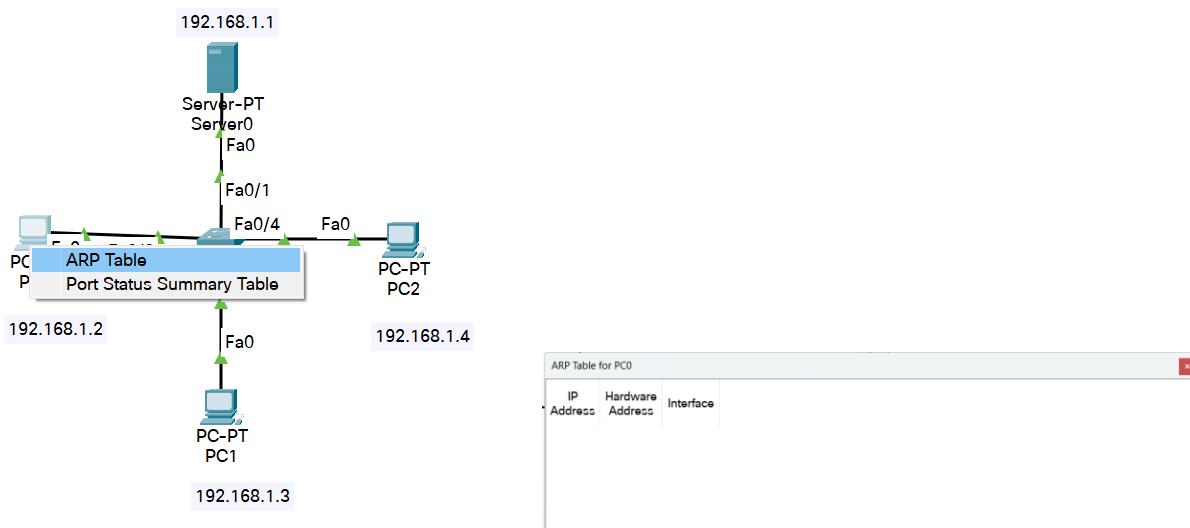
• Go to PC > IP configuration

Program 9

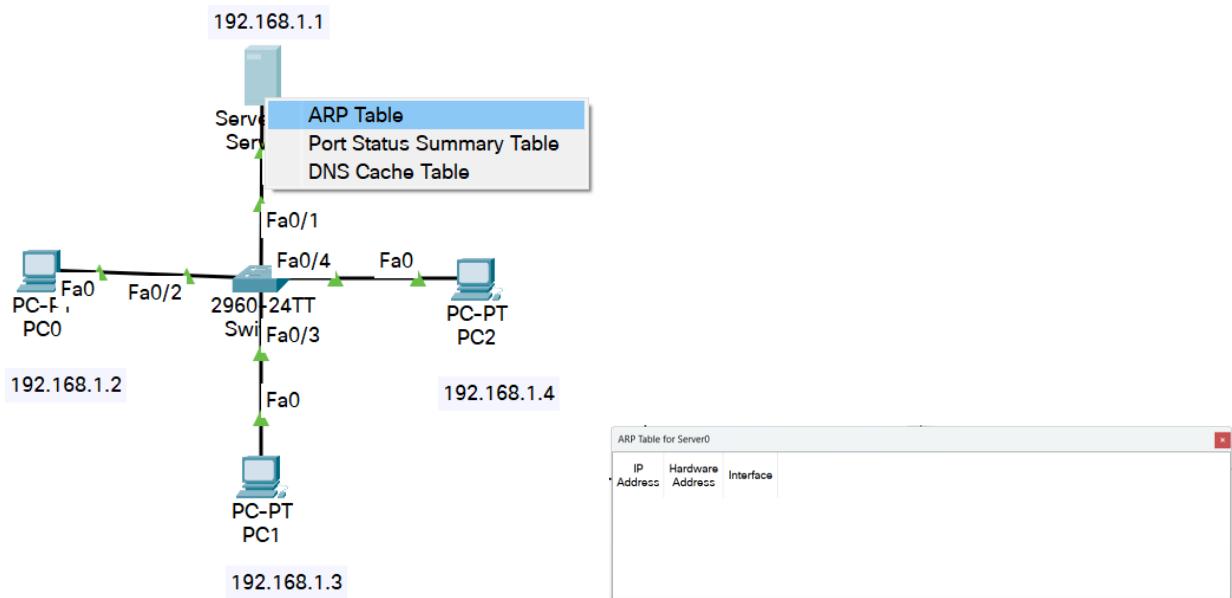
- i. To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)
- ii. Procedure along with the topology



- iii. Screen shots/ output
ARP Table of PC



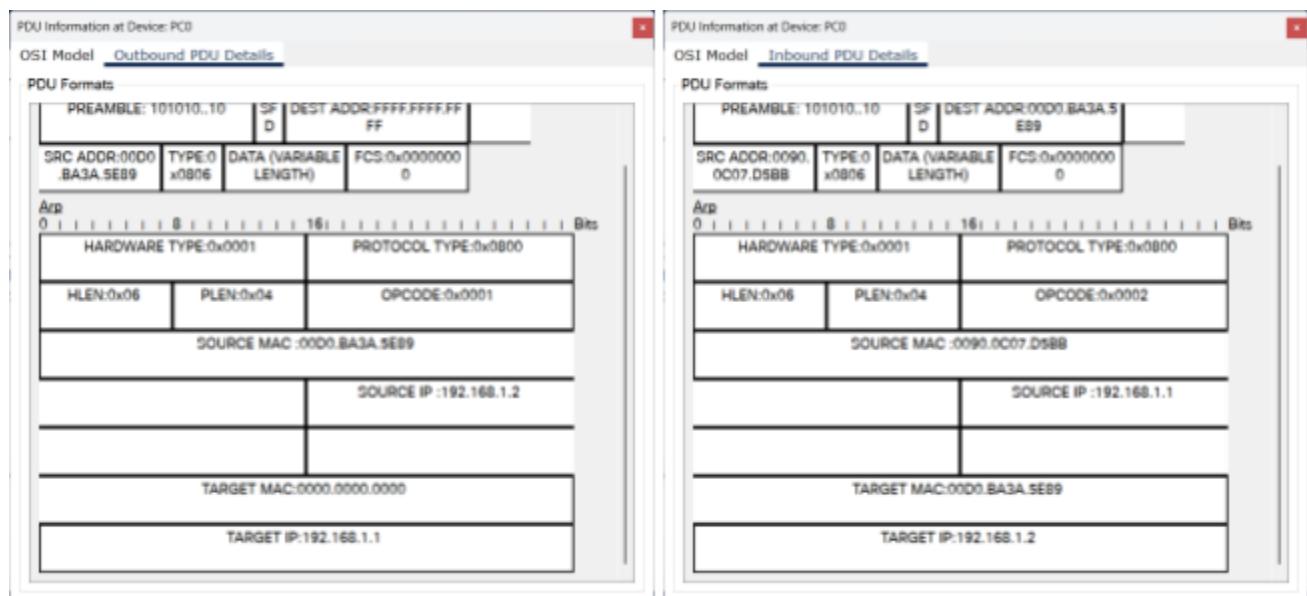
ARP Table of Server



Command at PC

```
Packet Tracer PC Command Line 1.0
C:\>arp -a
No ARP Entries Found
C:\>
```

Pinging in Simulation Mode

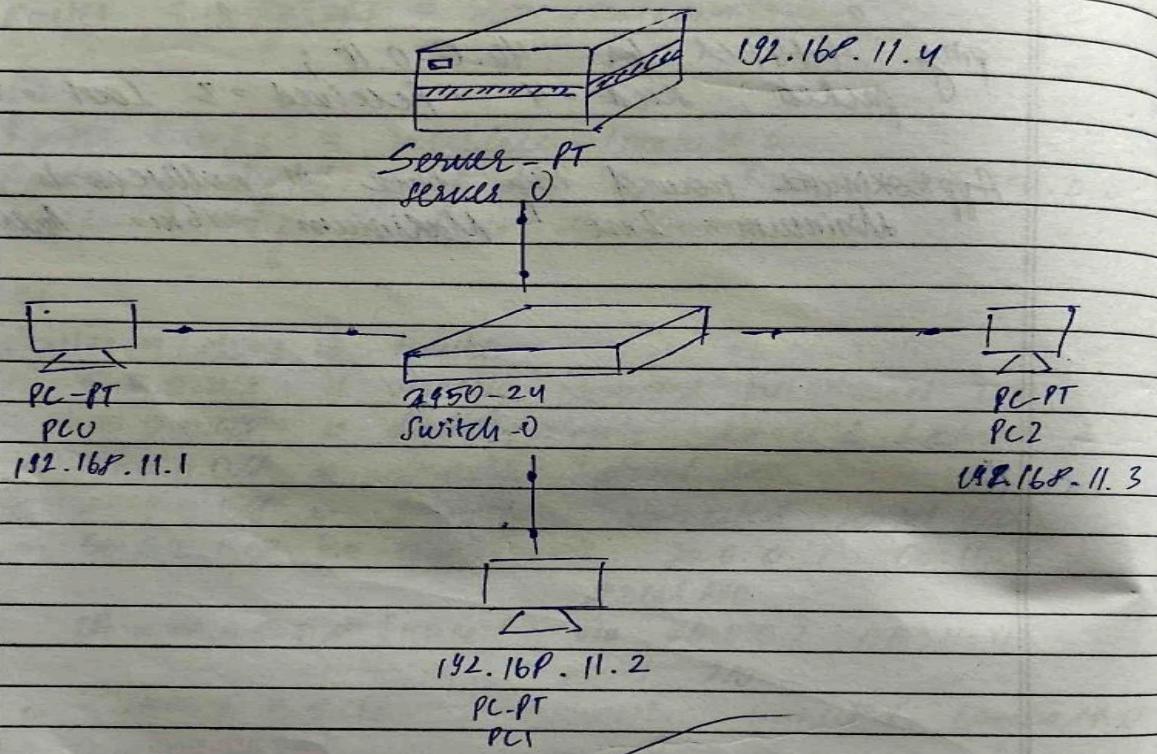


iv. Observation

PAGE NO :
DATE : 20/12/24

LAB 10

- Q. To construct simple LAN and understand the concept and operation of Address Resolution Protocol.



Steps:

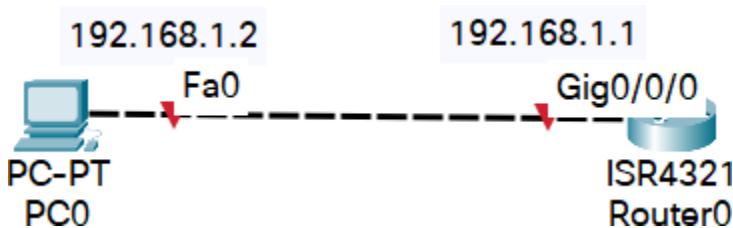
1. Drag switch 2950-24 from switch panel service - PT from hub and two PC's from wireless device - connect all devices with switch using copper straight through
2. Assign IP address to all PCs and server with 192.168.11.1, 192.168.11.2, 192.168.11.3, 192.168.11.4

5. Go to simulation panel, click on inspect and right click on PCO (ie. search option)
6. After clicking on PCO click ARP Table and notice that no entries are not in ARP table. Repeat
7. Click on PCO and go to command prompt
Type arp -a
Initially there are no ARP entries
8. Try pinging from PCO to server by giving command,
ping 192.168.11.4
9. Send package from PCO to server, you can notice that two packets are created ICMP and ARP
10. Click on ARP packet then click on capture button to start the simulation
11. After doing everything click on inspect option and click PCO to check ARP table

Now you can see that there is entries present.

Program 10

- i. To understand the operation of TELNET by accessing the router in server room from a PC in IT office.
- ii. Procedure along with the topology



- iii. Screen shots/ output

Router

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#enable secret hello
R1(config)#interface g0/0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown

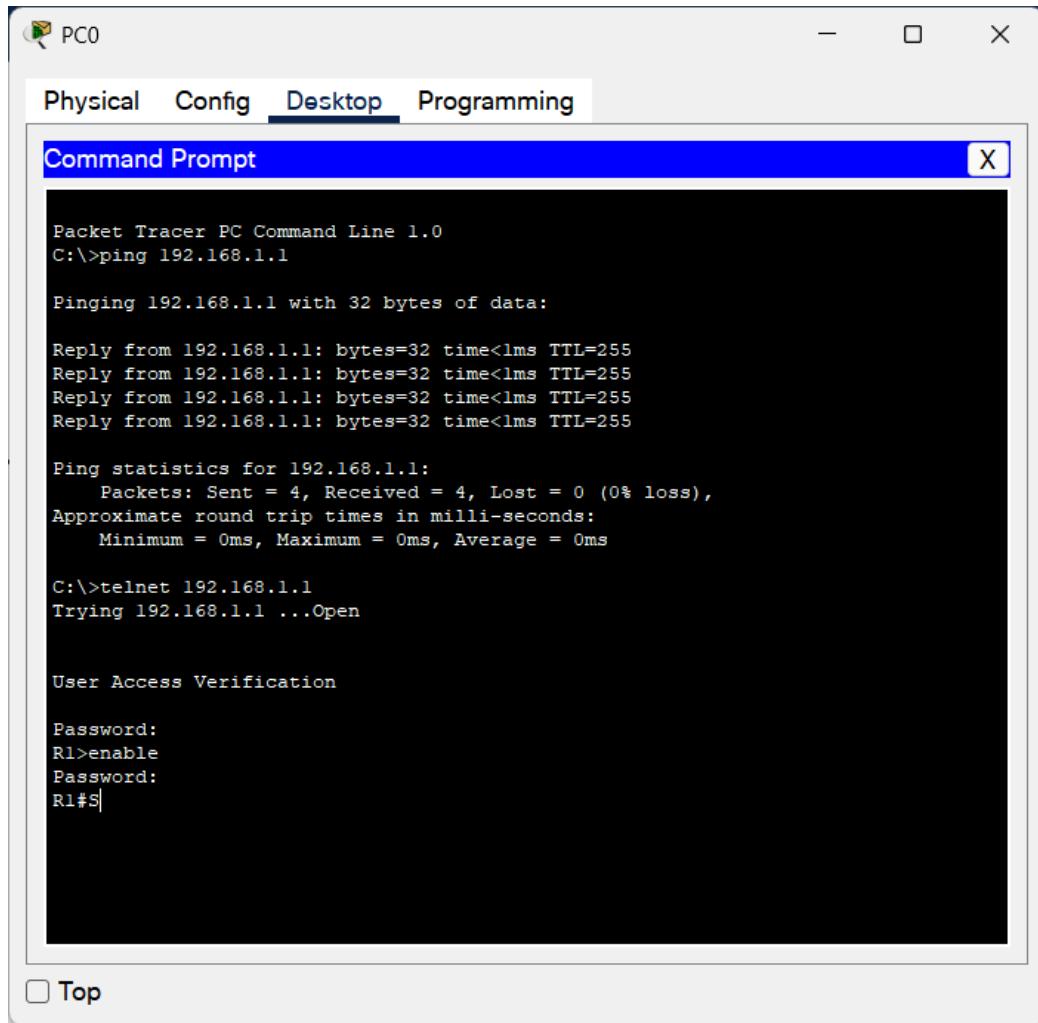
R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up

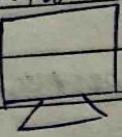
R1(config-if)#line vty 0 5
R1(config-line)#login
% Login disabled on line 2, until 'password' is set
% Login disabled on line 3, until 'password' is set
% Login disabled on line 4, until 'password' is set
% Login disabled on line 5, until 'password' is set
% Login disabled on line 6, until 'password' is set
% Login disabled on line 7, until 'password' is set
R1(config-line)#password pass
R1(config-line)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#wr
Building configuration...
[OK]
R1#
```

PC



iv. Observation

Q. Configure TELNET Protocol	
192.168.1.2	192.168.1.1
	
PC-PT PCI	Router-PT Router 0
<p>Steps:</p> <ol style="list-style-type: none"> 1. Plug PC and Router PT from the panel and connect both with copper - cross wire 2. Configure the IP address and gateway for PC Go to desktop → 192.168.1.2, 255.255.255.0, Gateway - 192.168.1.1, DNS server - 0.0.0.0 3. Configure the router in CLI Router > os Router # config t Router(config)# hostname R1 R1(config) # enable secret rp R1(config) # int Fa 0/0 R1(config-if) # ip add 192.168.1.1 255.255.255.0 R1(config-if) # no shut R1(config-if) # timer vty 0 6 	

Trying 192.168.1.1 open

User Access Verification:

Password :

R1>en

Password :

R1#rp

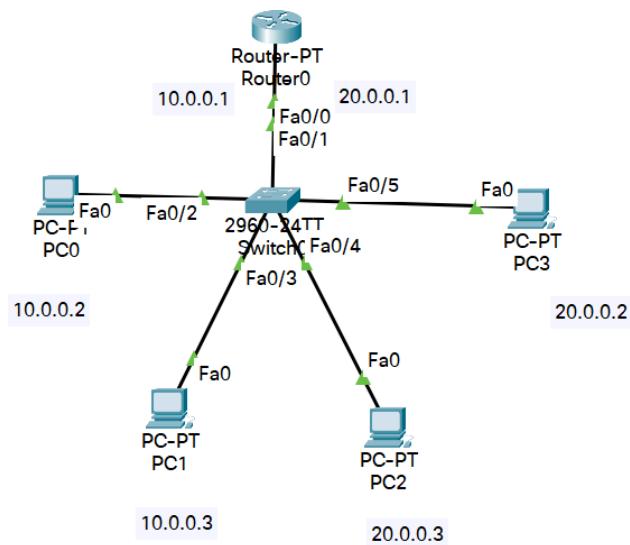
R1#rp

R1#

g. Now the password is set.

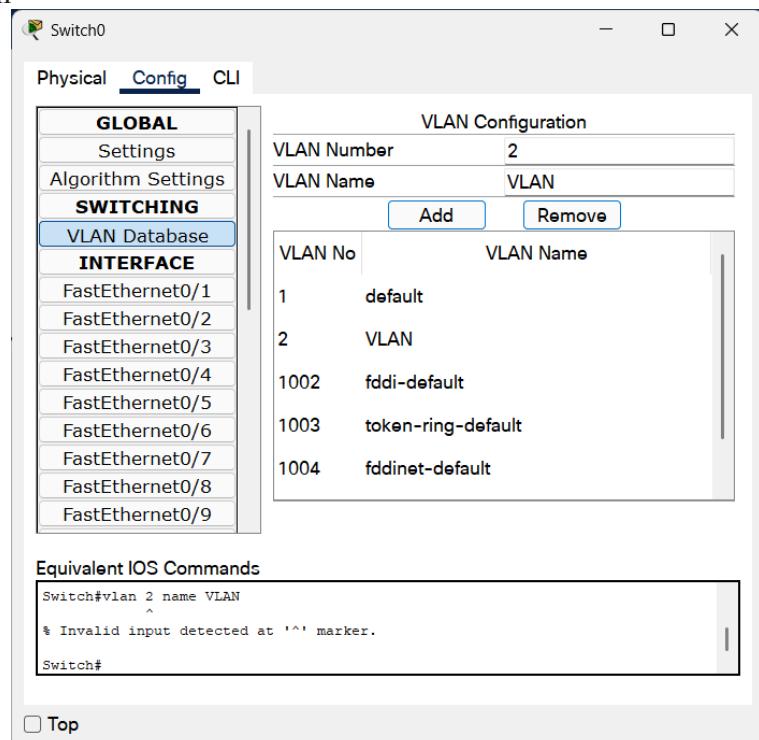
Program 11

- i. To construct a VLAN and make the PC's communicate among a VLAN
- ii. Procedure along with the topology

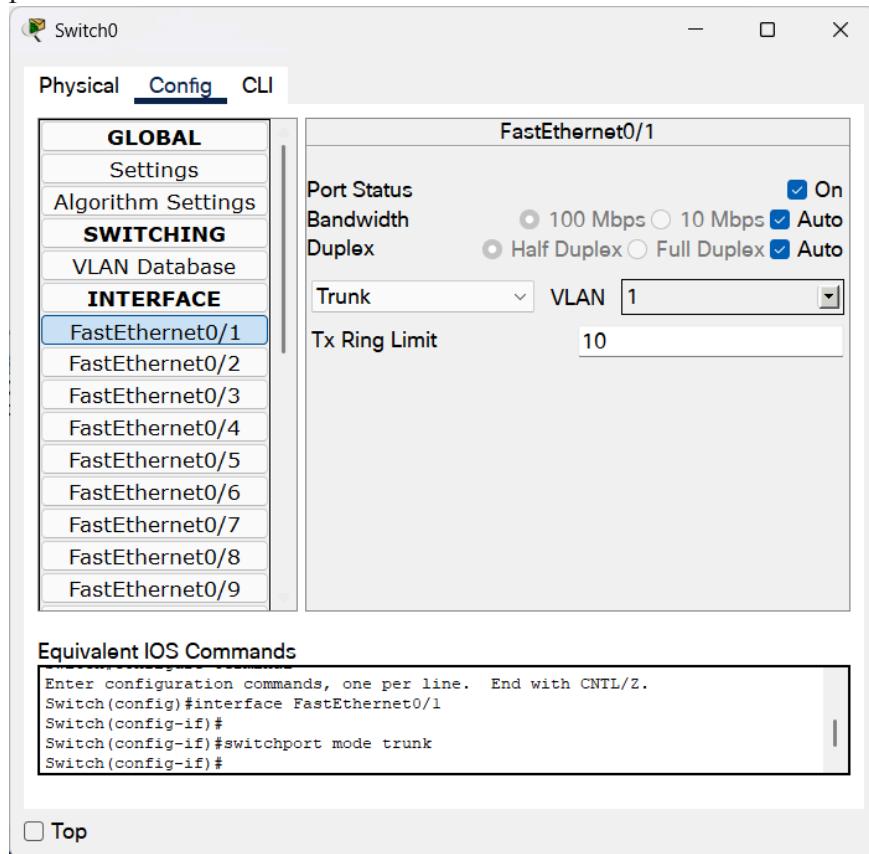


iii. Screen shots/ output

Switch Configuration



Configuration of port connected to router



Configuration of ports connected to other networks

The screenshot shows the configuration interface for a switch named "Switch0". The left sidebar lists various configuration tabs: GLOBAL, Settings, Algorithm Settings, SWITCHING, VLAN Database, and INTERFACE. Under INTERFACE, "FastEthernet0/4" and "FastEthernet0/5" are selected. The main panel displays the configuration for "FastEthernet0/4" and "FastEthernet0/5". Both ports have "Port Status" set to "On" (checked). For "FastEthernet0/4", "Bandwidth" is "Auto" (checkbox checked) and "Duplex" is "Auto" (checkbox checked). The "Access" dropdown is set to "VLAN" and the "VLAN" dropdown is set to "2". The "Tx Ring Limit" is set to "10". For "FastEthernet0/5", "Bandwidth" is "Auto" (checkbox checked) and "Duplex" is "Auto" (checkbox checked). The "Access" dropdown is set to "VLAN" and the "VLAN" dropdown is set to "2". The "Tx Ring Limit" is set to "10". Below each port, there is an "Equivalent IOS Commands" section:

For FastEthernet0/4:

```
Switch(config)#interface FastEthernet0/4
Switch(config-if)#
Switch(config-if)#switchport access vlan 2
Switch(config-if)#

```

For FastEthernet0/5:

```
Switch(config)#interface FastEthernet0/5
Switch(config-if)#
Switch(config-if)#switchport access vlan 2
Switch(config-if)#

```

Top

Configuartion of Router

The screenshot shows a Windows application window titled "Router0". The tab bar at the top has three tabs: "Physical", "Config", and "CLI", with "CLI" being the active tab. Below the tabs is a title bar "IOS Command Line Interface". The main area is a text terminal window displaying configuration commands. At the bottom of the terminal window are two buttons: "Copy" and "Paste". Below the terminal window is a status bar with the text "Ctrl+F6 to exit CLI focus" and a checkbox labeled "Top".

```
Router>enable
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 shutdown

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

Router(config-if)#exit
Router(config)#interface Fa0/0.1
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

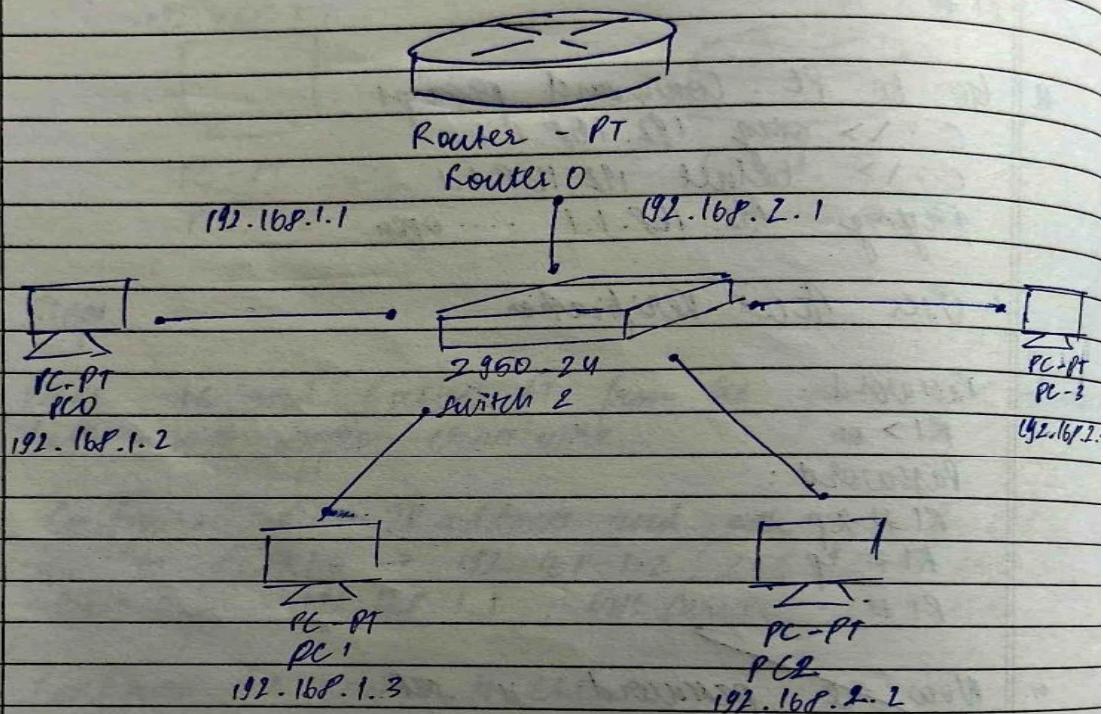
Router(config-subif)#encapsulation dot1q 2
Router(config-subif)#ip address 20.0.0.1 255.0.0.0
Router(config-subif)#no shutdown
Router(config-subif)#exit
Router(config)#

Ctrl+F6 to exit CLI focus
```

iv. Observation

CAB 12

Q. Construct Virtual LAN:



Steps:

1. Drag Router, PC's and switch from the panel and connect switch with copper straight wire with every thing.
2. Configure all PC's and Router.
3. For configuring other ip address in Router go to switch - config tab and select VLAN Database.

4. Give VLAN Number - 2 , VLAN Name - NEWVLAN and add them
5. In switch whatever wire is connected with wire click on that link or ours it is Fa 0/1 and make it the trunk
basically VLAN trunking allows switches to forward frames from different VLAN over a single link called trunk.
This makes the switch understand NEW VLAN
6. Go to CLI of Router.

Router # config t

Router (config) # interface fastethernet 0/0-1

Router (config-subif) #

Router (config-subif) # encapsulation dot1q 2

Router (config-subif) # ip address 192.168.2.1 255.255.255.0

Router (config-subif) # no snat

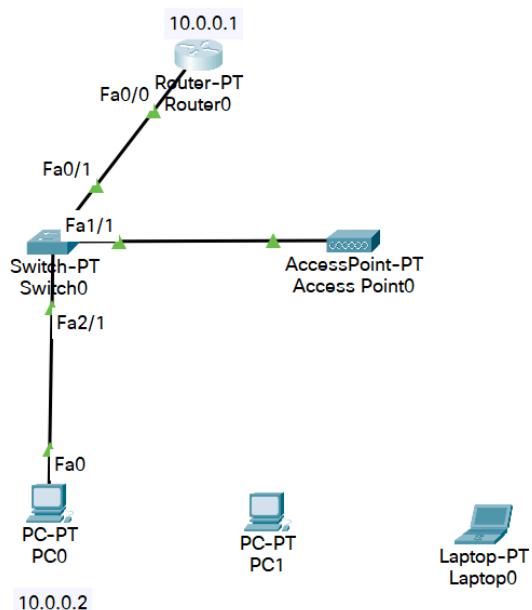
Router (config-subif) # exit

Encapsulation dot1q -

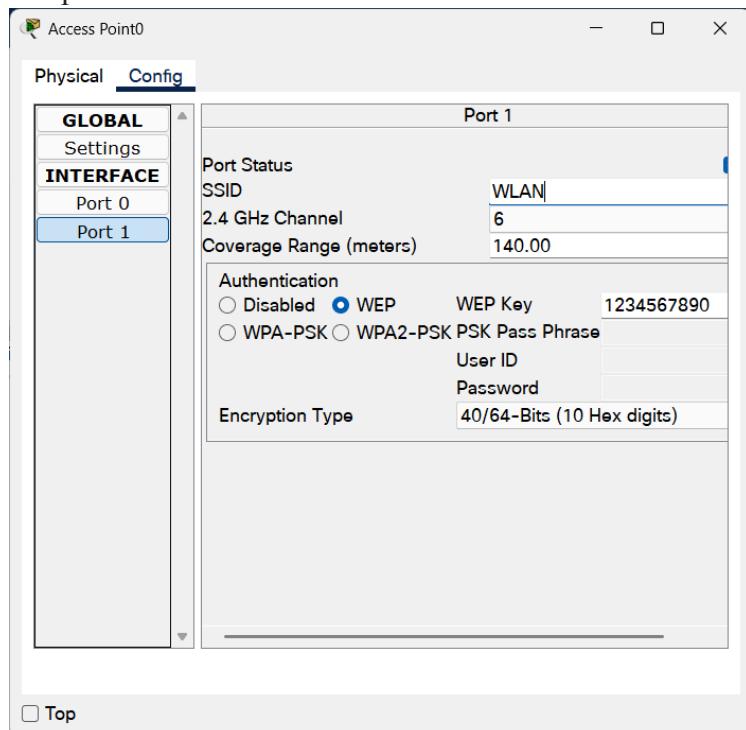
it is the networking standard that supports virtual LAN's (VLAN's) on an IEEE 802.3 Ethernet network. It is the most widely used encapsulation method for VLAN tagging.

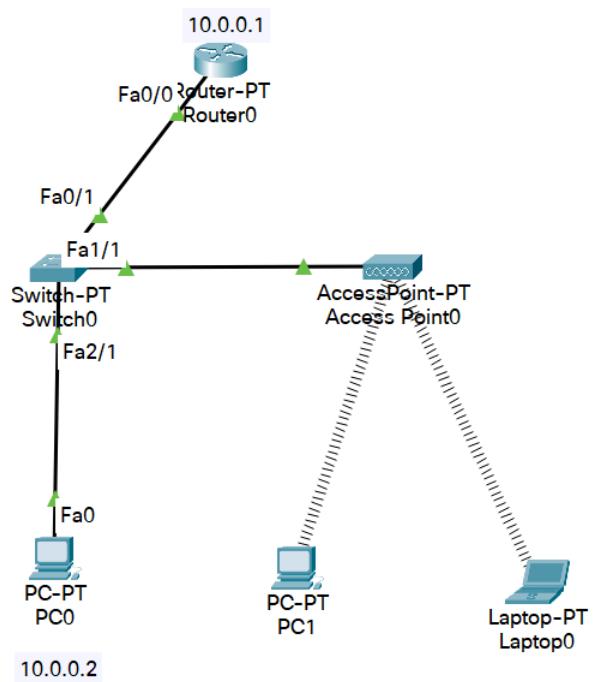
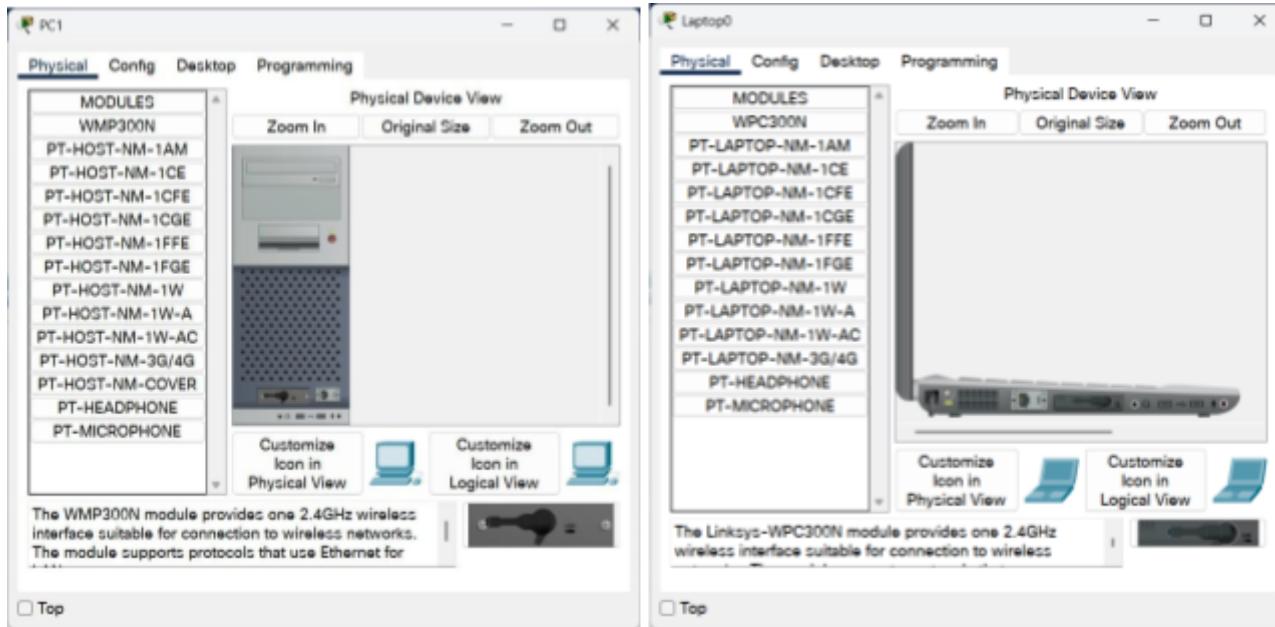
Program 12

- i. To construct a WLAN and make the nodes communicate wirelessly.
- ii. Procedure along with the topology

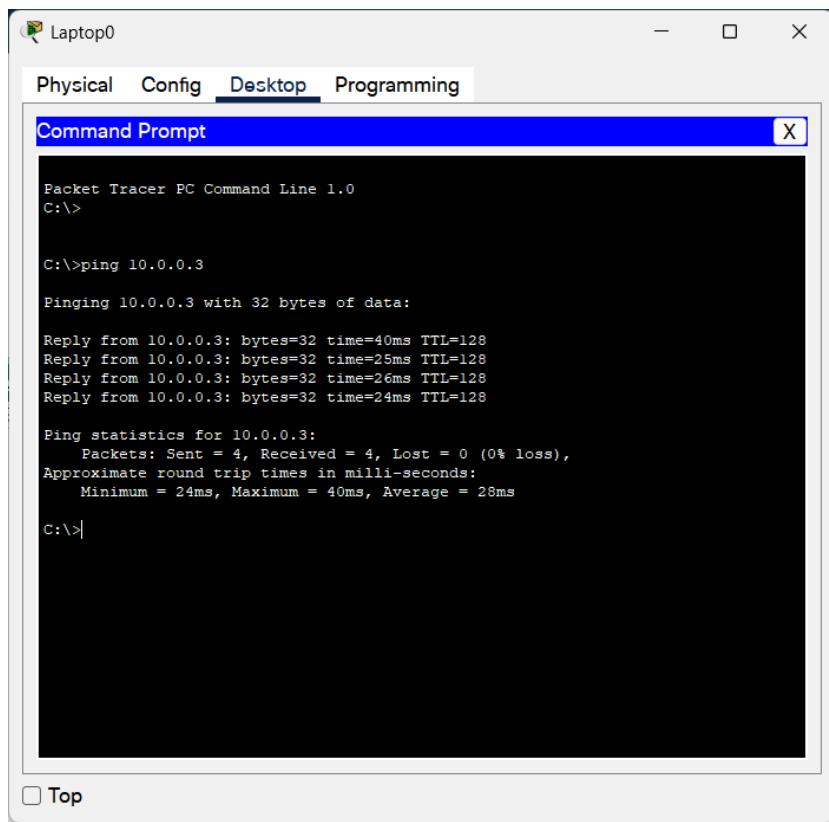


- iii. Screen shots/ output





Ping:



Packet Tracer PC Command Line 1.0
C:\>

C:\>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=40ms TTL=128
Reply from 10.0.0.3: bytes=32 time=25ms TTL=128
Reply from 10.0.0.3: bytes=32 time=26ms TTL=128
Reply from 10.0.0.3: bytes=32 time=24ms TTL=128

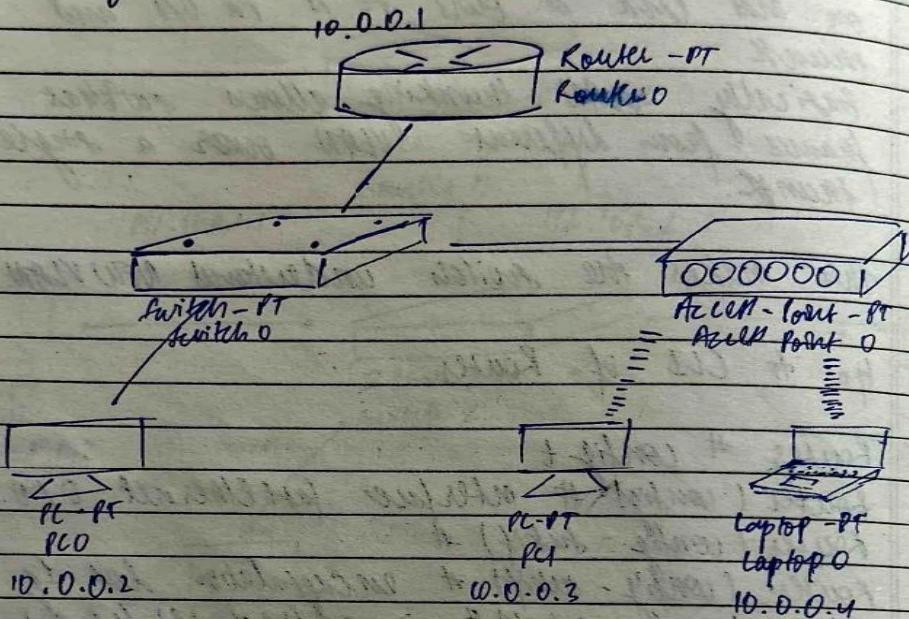
Ping statistics for 10.0.0.3:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 24ms, Maximum = 40ms, Average = 28ms

C:\>|

iv. Observation

LAB13:

- Q. Construct a WLAN and make the nodes communicate wirelessly.



Steps:

1. Drag Switch, PC and Router and configure it, then after connecting with copper straight through wire.
2. Drag access point from the wireless device and drag one PC and laptop also.
3. for Router give IP address 10.0.0.1 and for PC give IP address 10.0.0.2 following the gateway 10.0.0.1
4. Connect switch and access point-PT with copper straight wire.

6. In access point go to Port 1 give SSID - WLAN, change it to WEP and give WEP key as 1234567890
6. Configure PC and Laptop with wireless standard follow the steps.
 - i) Switch off the device
 - ii) Drag the existing PT - HOST - NM - IAM to the component folder in the LHS
 - iii) Drag WMP300N wireless interface to the empty port.
 - iv) Switch on the device
 - v) In the config tab a new wireless interface would have been added.
 - vi) Now configure SSID as WLAN , authentication WEP and WEP key 1234567890
 - vii) Do save for laptop
7. Now your device are connected wirelessly.

Cycle-II

Program 1

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

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

int crc(char *ip, char *op, char *poly, int mode) {
    strcpy(op, ip);

    if (mode) {
        for (int i = 1; i < strlen(poly); i++) {
            strcat(op, "0");
        }
    }

    // Perform XOR on the message with the selected polynomial
    for (int i = 0; i < strlen(ip); i++) {
        if (op[i] == '1') {
            for (int j = 0; j < strlen(poly); j++) {
                if (op[i + j] == poly[j])
                    op[i + j] = '0';
                else
                    op[i + j] = '1';
            }
        }
    }

    // Check for errors. Return 0 if error detected
    for (int i = 0; i < strlen(op); i++) {
        if (op[i] == '1')
            return 0;
    }

    return 1;
}

int main() {
    char ip[50], op[50], recv[50];
    char poly[] = "1000100000100001";

    printf("Enter the input message in binary: ");
    scanf("%os", ip);
```

```
crc(ip, op, poly, 1);
printf("The transmitted message is: %s%s\n", ip, op + strlen(ip));
printf("Enter the received message in binary: ");
scanf("%s", recv);

if (crc(recv, op, poly, 0)) {
    printf("No error in data\n");
} else {
    printf("Error in data transmission has occurred\n");
}

return 0;
}
```

iii. Screen shots/ output

```
Enter the input message in binary: 11111
The transmitted message is: 111111110001111011110
Enter the received message in binary: 1111
Error in data transmission has occurred

Process returned 0 (0x0)  execution time : 7.354 s
Press any key to continue.
```

```
Enter the input message in binary: 11111
The transmitted message is: 111111110001111011110
Enter the received message in binary: 11111
No error in data

Process returned 0 (0x0)  execution time : 7.201 s
Press any key to continue.
```

iv. Observation

CAB - 7

PAGE NO :
DATE :

Write a program for Error Detection using CRC

```
#include <iostream>
#include <string.h>
using namespace std;

int CRC( char *ip, char *op, char *poly, int model )
{
    strcpy( op, ip );
    if (model) {
        for (int i=1; i<strlen(poly); i++)
            strcat( op, "0" );
    }
    for (int j=0; i<strlen(poly); j++) {
        if (op[i+j] == poly[j])
            op[i+j] = '0';
        else
            op[i+j] = '1';
    }
    for (int i=0; i<strlen(op); i++)
        if (op[i] != '1')
            return 0;
    return 1;
}
```

```

int main()
{
    char ip[50], op[50], rev[50];
    char poly17 = "10001000000100001";
    cout << "Enter the input message in binary" << endl;
    cin >> ip;
    crc(ip, op, poly17);
    cout << "The transmitted message is:" << ip << op + endl;
    cout << "Enter the received message in binary" << endl;
    cin >> rev;
    if (crc(rev, op, poly17) == 0)
        cout << "No error in data" << endl;
    else
        cout << "Error in data transmission has occurred" << endl;
    return 0;
}

```

Output.

Enter the input message in binary : 10011

The transmitted message is : 10011001000100 1010010

Enter the received message in binary : 1001000100010100
~~No error in data.~~

Program 2

- i. Write a program for congestion control using Leaky bucket algorithm
- ii. Procedure

```
#include <stdio.h>

int main() {
    int no_of_queries, storage, output_pkt_size;
    int input_pkt_size, bucket_size, size_left;
    storage = 0;
    no_of_queries = 4;
    bucket_size = 10;
    input_pkt_size = 4;
    output_pkt_size = 1;

    for (int i = 0; i < no_of_queries; i++) {
        size_left = bucket_size - storage;

        if (input_pkt_size <= size_left) {
            // Update storage
            storage += input_pkt_size;
        } else {
            printf("Packet loss = %d\n", input_pkt_size);
        }

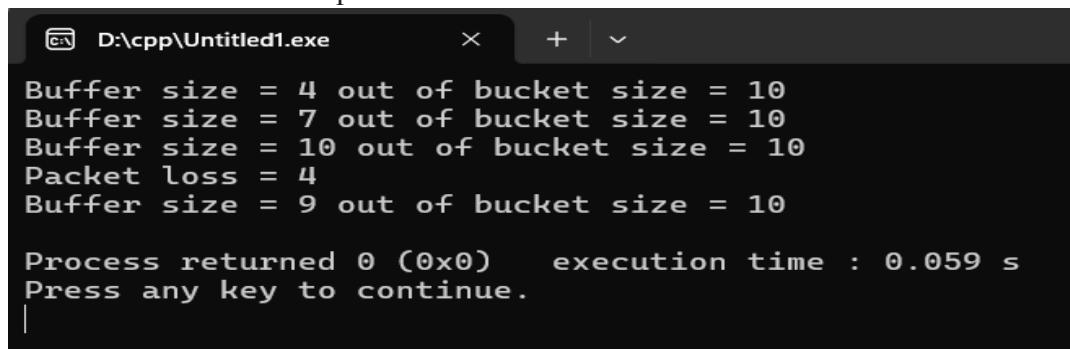
        printf("Buffer size = %d out of bucket size = %d\n",
               storage, bucket_size);

        // Packets leaving the bucket
        storage -= output_pkt_size;

        // Ensure storage doesn't go negative
        if (storage < 0) {
            storage = 0;
        }
    }

    return 0;
}
```

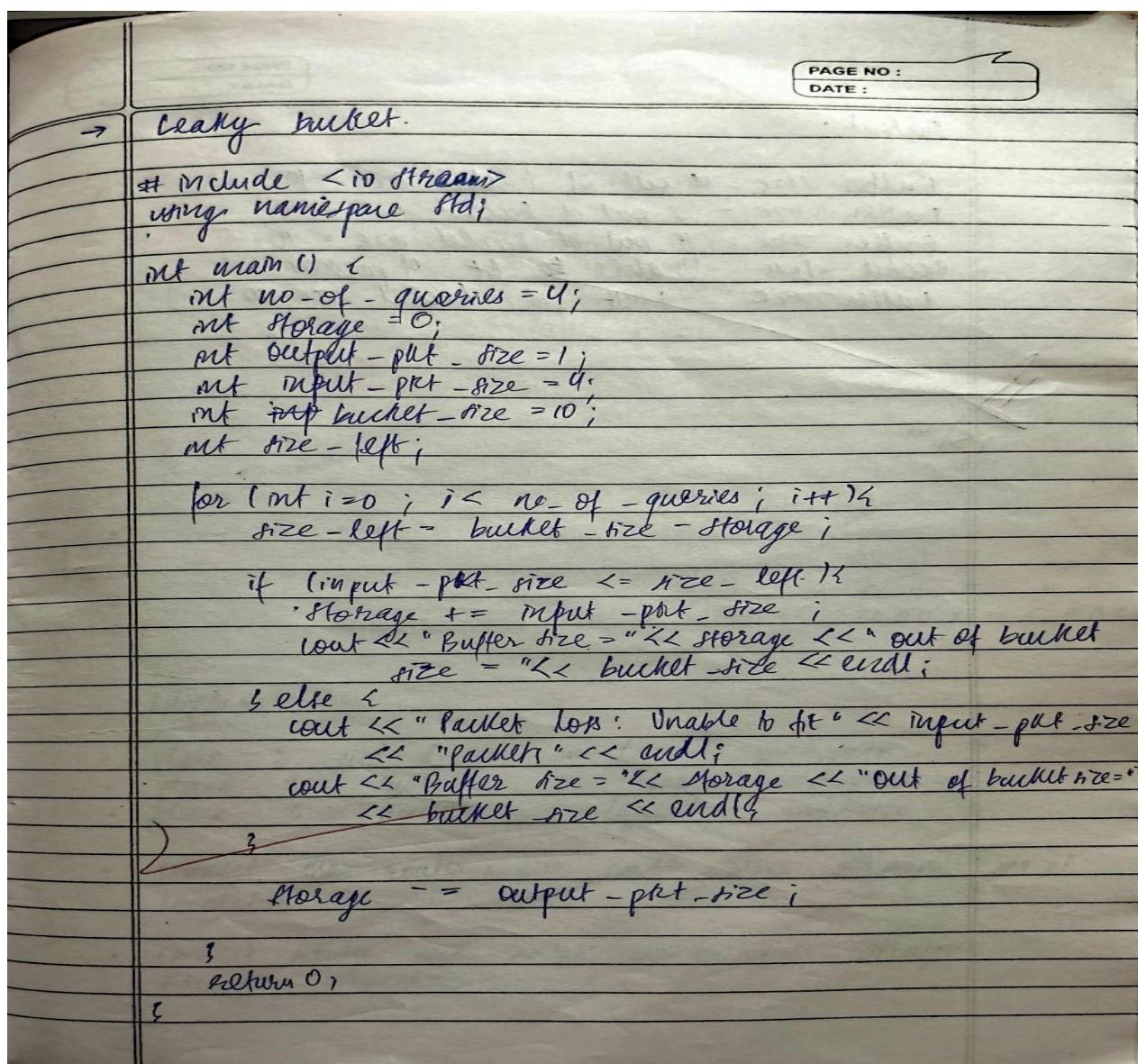
iii. Screen shots/ output



```
D:\cpp\Untitled1.exe
Buffer size = 4 out of bucket size = 10
Buffer size = 7 out of bucket size = 10
Buffer size = 10 out of bucket size = 10
Packet loss = 4
Buffer size = 9 out of bucket size = 10

Process returned 0 (0x0)   execution time : 0.059 s
Press any key to continue.
```

iv. Observation



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→ Leaky bucket.

```
#include <iostream>
using namespace std;

int main() {
    int no_of_queries = 4;
    int storage = 0;
    int output_pkt_size = 1;
    int input_pkt_size = 4;
    int inp_bucket_size = 10;
    int size_left;

    for (int i=0; i< no_of_queries; i++) {
        size_left = bucket_size - storage;

        if (input_pkt_size <= size_left) {
            storage += input_pkt_size;
            cout << "Buffer size = " << storage << " out of bucket size = " << bucket_size << endl;
        } else {
            cout << "Packet loss: Unable to fit " << input_pkt_size << " packets " << endl;
            cout << "Buffer size = " << storage << " out of bucket size = " << bucket_size << endl;
        }
    }

    storage -= output_pkt_size;

    return 0;
}
```

Output:

Buffer size = 4 out of bucket size = 10
Buffer size = 7 out of bucket size = 10
Buffer size = 10 out of bucket size = 10
Packet loss: Unable to fit of packets
Buffer size = 9 out of bucket size = 10

25/4

Program 3

- i. 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.
- ii. Procedure

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()
```

serverTCP.py

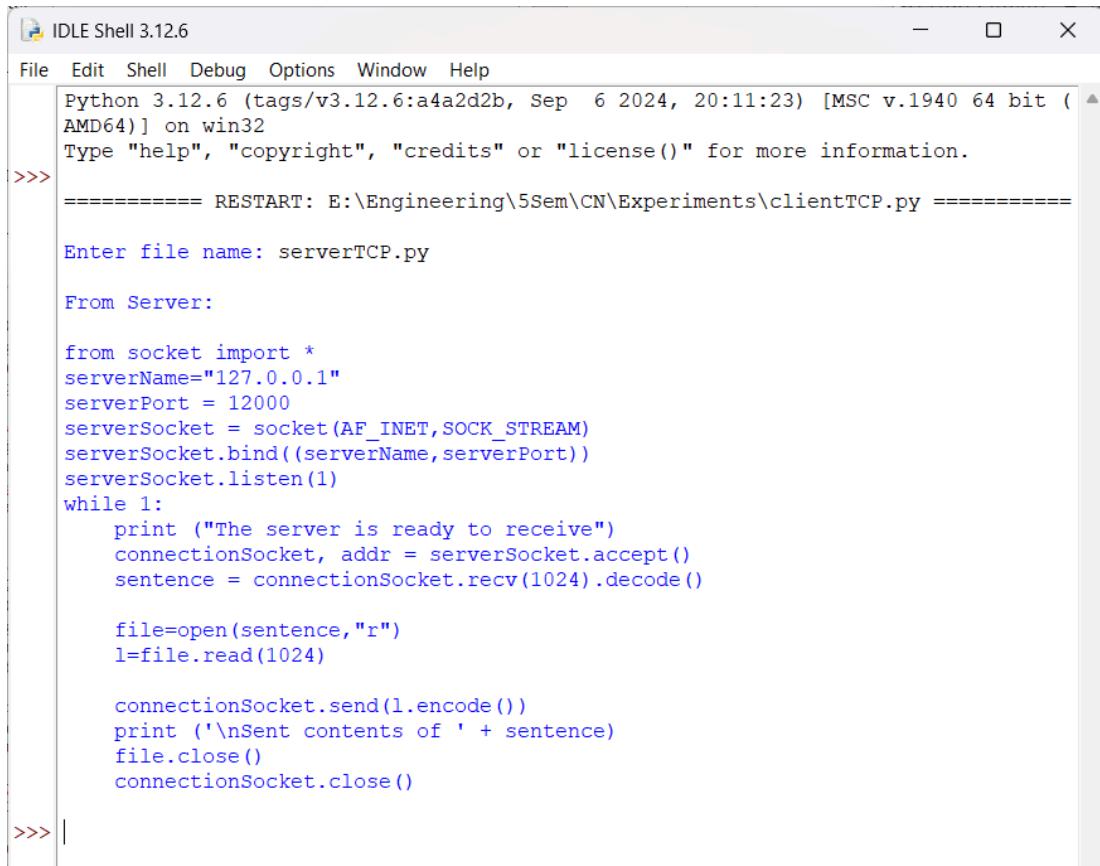
```
from socket import *
serverName="127.0.0.1"
serverPort = 12000
serverSocket = socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while 1:
    print ("The server is ready to receive")
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

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

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

iii. Screen shots/ output

Client



```
IDLE Shell 3.12.6
File Edit Shell Debug Options Window Help
Python 3.12.6 (tags/v3.12.6:a4a2d2b, Sep  6 2024, 20:11:23) [MSC v.1940 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: E:\Engineering\5Sem\CN\Experiments\clientTCP.py =====

Enter file name: serverTCP.py

From Server:

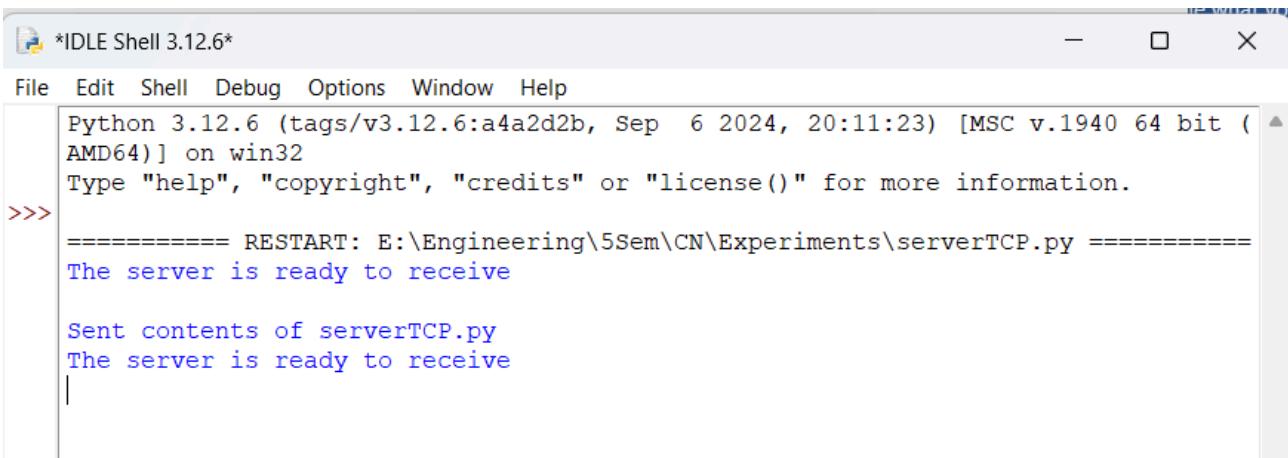
from socket import *
serverName="127.0.0.1"
serverPort = 12000
serverSocket = socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while 1:
    print ("The server is ready to receive")
    connectionSocket, addr = serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

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

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

>>>
```

Server



```
*IDLE Shell 3.12.6*
File Edit Shell Debug Options Window Help
Python 3.12.6 (tags/v3.12.6:a4a2d2b, Sep  6 2024, 20:11:23) [MSC v.1940 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.

>>> ===== RESTART: E:\Engineering\5Sem\CN\Experiments\serverTCP.py =====
The server is ready to receive

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

iv. Observation

		PAGE NO : DATE : 20.12.24
Program 3 :		
Q 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.		
Python Program for Socket Programming		
Client TCP.py		
from socket import *		
serverName = "127.0.0.1"		
serverPort = 12000		
clientSocket = socket (AF_INET, SOCK_STREAM)		
clientSocket . connect ([serverName, serverPort])		
sentence = input ("In Enter file name")		
clientSocket . send (sentence . encode ())		
filecontents = clientSocket . recv (1024) . decode ()		
print ("In From Server :\n")		
print (filecontents)		
clientSocket . close ()		
server TCP.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 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 ('In sent contents of ' + sentence)
file.close()
connectionSocket.close()
```

Output:

Enter file name: serverTCP.py
The server is ready to receive
sent contents of serverTCP.py
the result is ready to receive

Program 4

- i. 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.
- ii. Procedure

clientUDP.py

```
from socket import *
serverName = "127.0.0.1"
serverPort = 12000
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"))
# for i in filecontents:
#     # print(str(i), end = "")
clientSocket.close()
clientSocket.close()
```

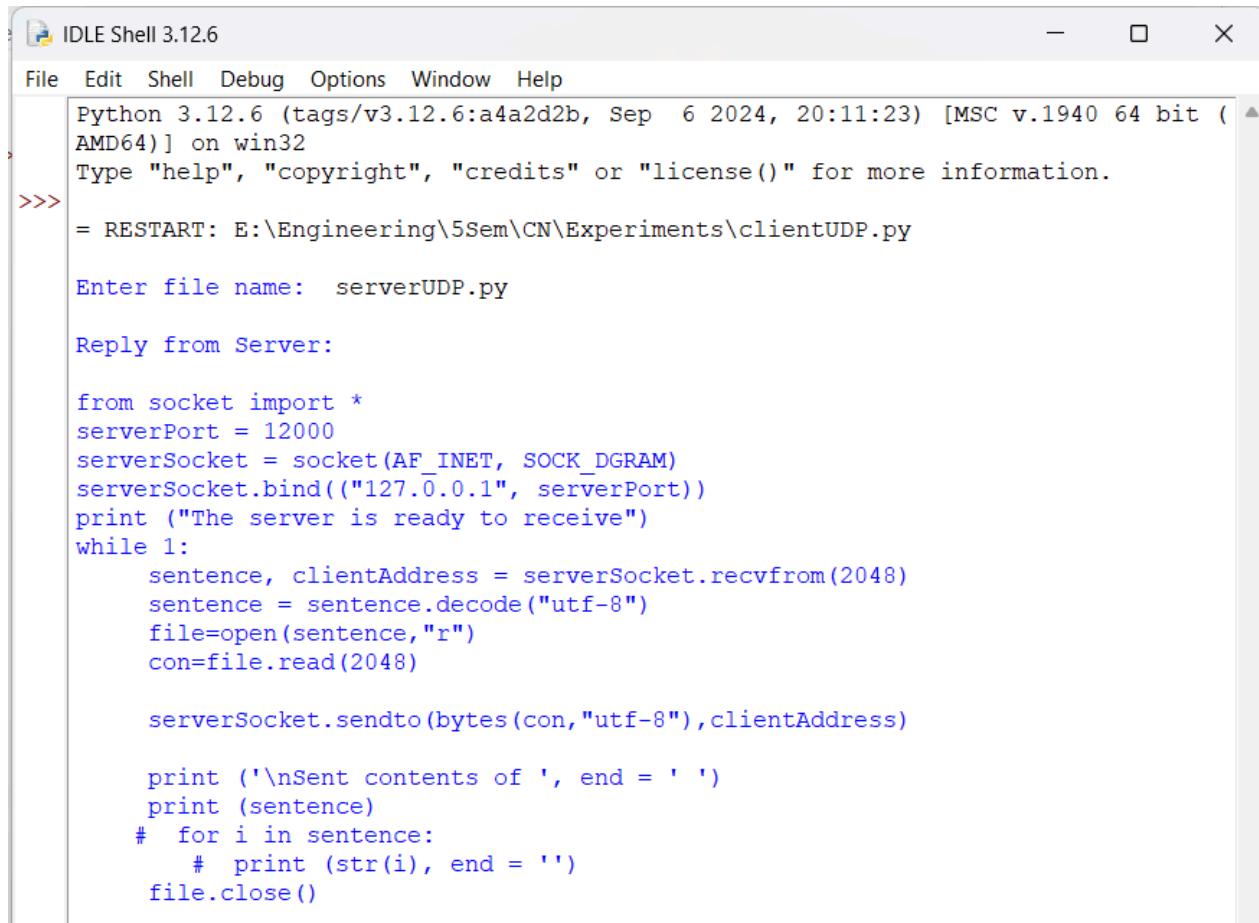
serverUDP.py

```
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)
    # for i in sentence:
```

```
# print (str(i), end = "")
file.close()
```

iii. Screen shots/ output

Client



```
IDLE Shell 3.12.6
File Edit Shell Debug Options Window Help
Python 3.12.6 (tags/v3.12.6:a4a2d2b, Sep  6 2024, 20:11:23) [MSC v.1940 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> = RESTART: E:\Engineering\5Sem\CN\Experiments\clientUDP.py

Enter file name: serverUDP.py

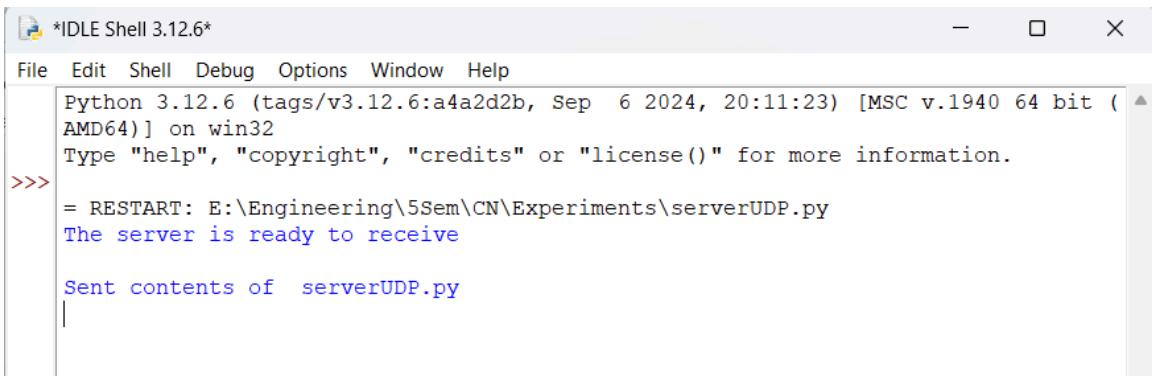
Reply from Server:

from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
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)
# for i in sentence:
#     print (str(i), end = '')
    file.close()
```

Server



```
*IDLE Shell 3.12.6*
File Edit Shell Debug Options Window Help
Python 3.12.6 (tags/v3.12.6:a4a2d2b, Sep  6 2024, 20:11:23) [MSC v.1940 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> = RESTART: E:\Engineering\5Sem\CN\Experiments\serverUDP.py
The server is ready to receive

Sent contents of  serverUDP.py
```

iv. Observation

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Program 4:

Q. Using UDP socket, 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.

Client UDP.py

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

```
sentence = input("In Enter file name: ")
```

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

```
fileContent, serverAddress = clientSocket.recvfrom(2048)
print('In Reply from Server: ', fileContent)
print(fileContent.decode("utf-8"))
# for i in fileContent:
#     print(str(i), end = "")
clientSocket.close()
clientSocket.close()
```

Server UDP.py

```
from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print("The server is ready to receive")
```

while 1:

```
sentence, clientAddress = serversocket.recvfrom(2048)
sentence = sentence.decode("utf-8")
file = open(sentence, "r")
con = file.read(2048)
```

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

```
print('In Sent contents of ', end = '')
```

```
print(sentence)
```

```
# for i in sentence:
```

```
# print(str(i), end = '')
```

```
file.close()
```

Output:

```
Enter file name : server UDP.py
```

```
Reply from server:
```

```
from socket import *
```

```
file.close()
```

~~The server is ready to receive
sent contents of serverUDP.py~~