VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.

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)
BENGALURU-560019
JUN-2023 to SEP-2023

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 LAB**" carried out by **SHREYANSH KUDTALKAR (1BM22CS419)**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

Q1) Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping message.

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

Topology:

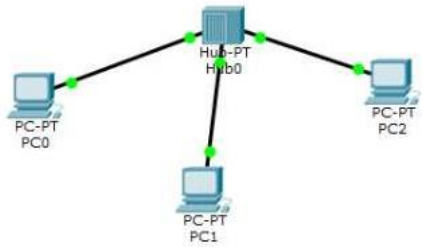


Fig 1: Topology with hub as connecting device

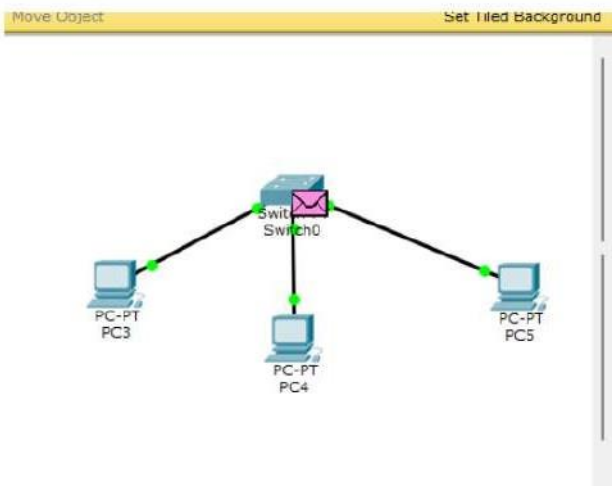


Fig 2: Topology with switch as connecting device

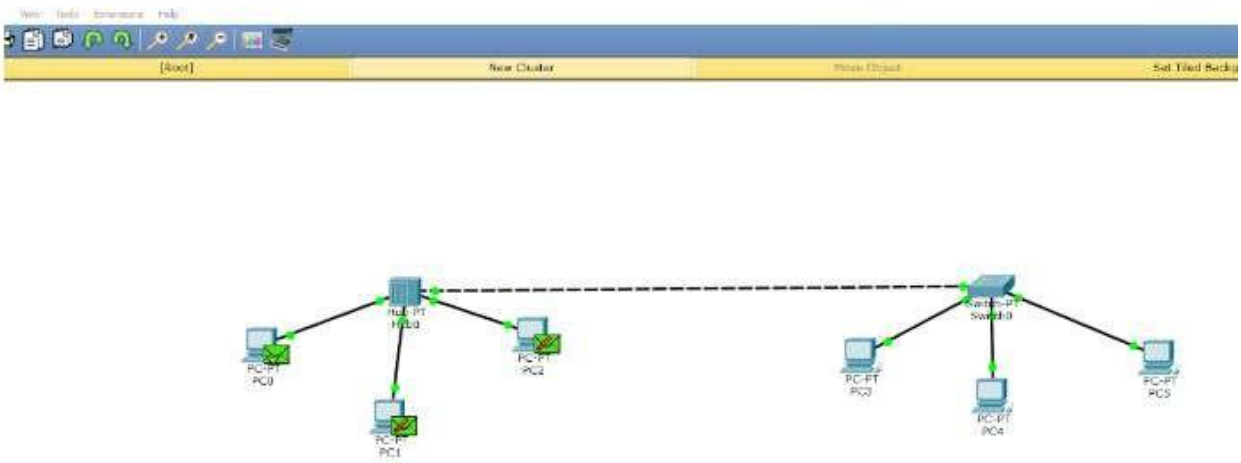


Fig 3: Topology with switch and hub connected

Output:

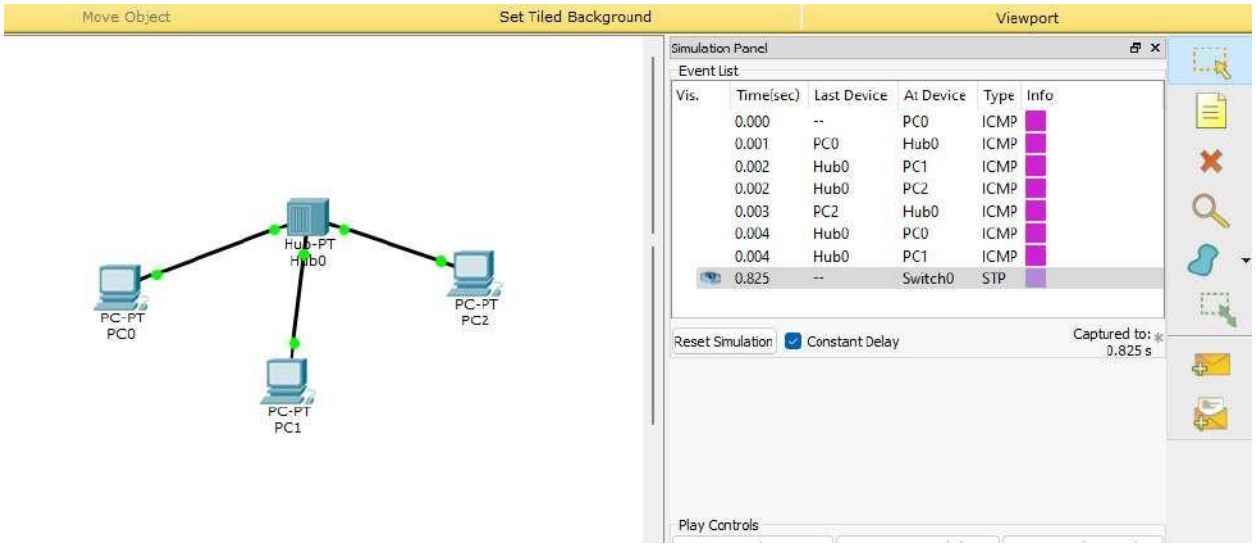


Fig 4:Output of topology with hub as connecting device

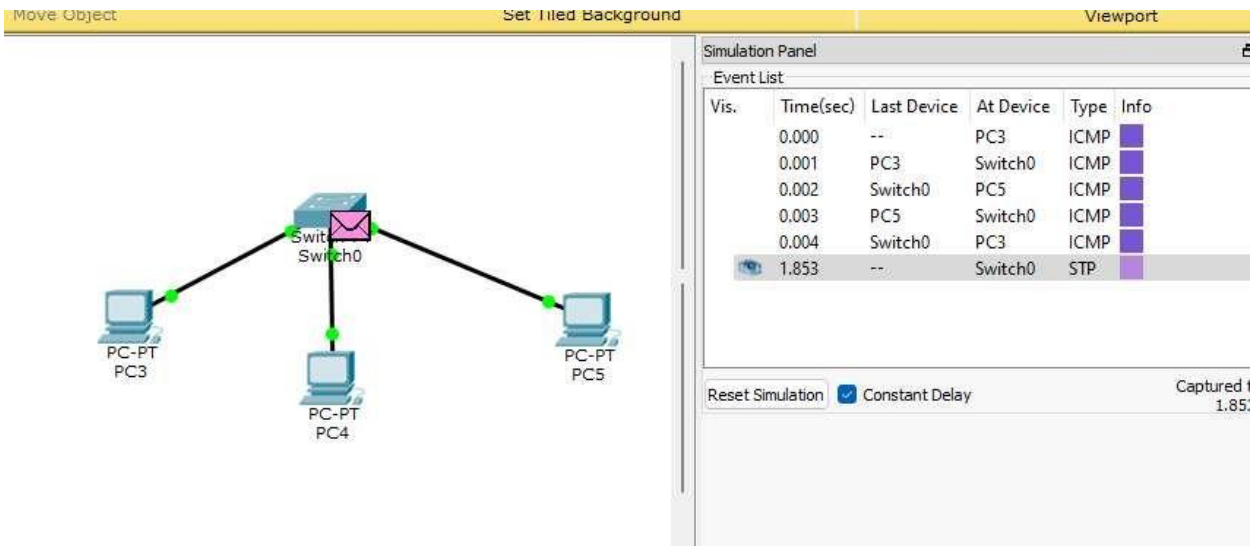


Fig 5: Output of topology with switch as connecting device

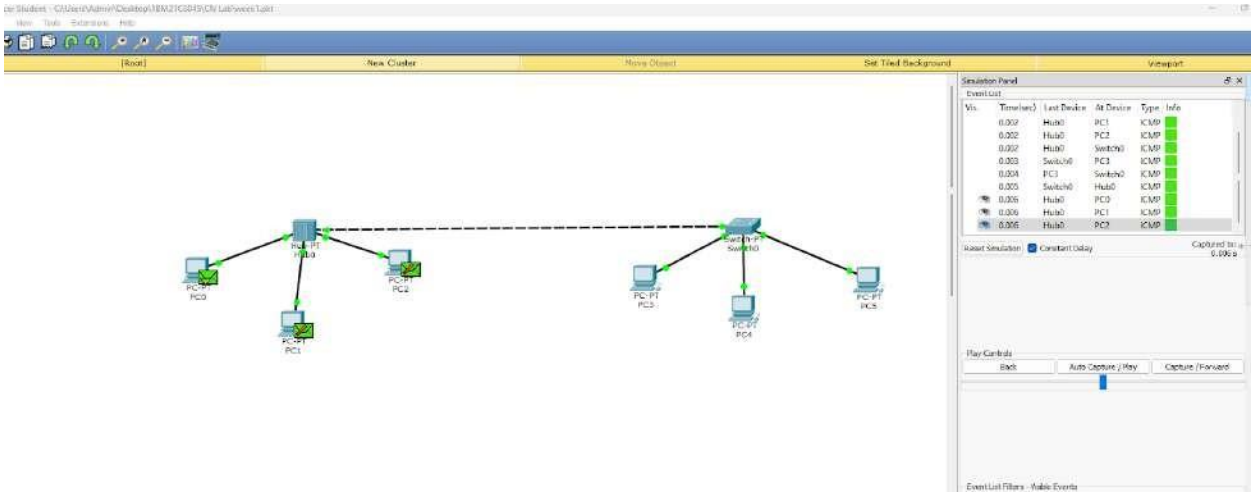
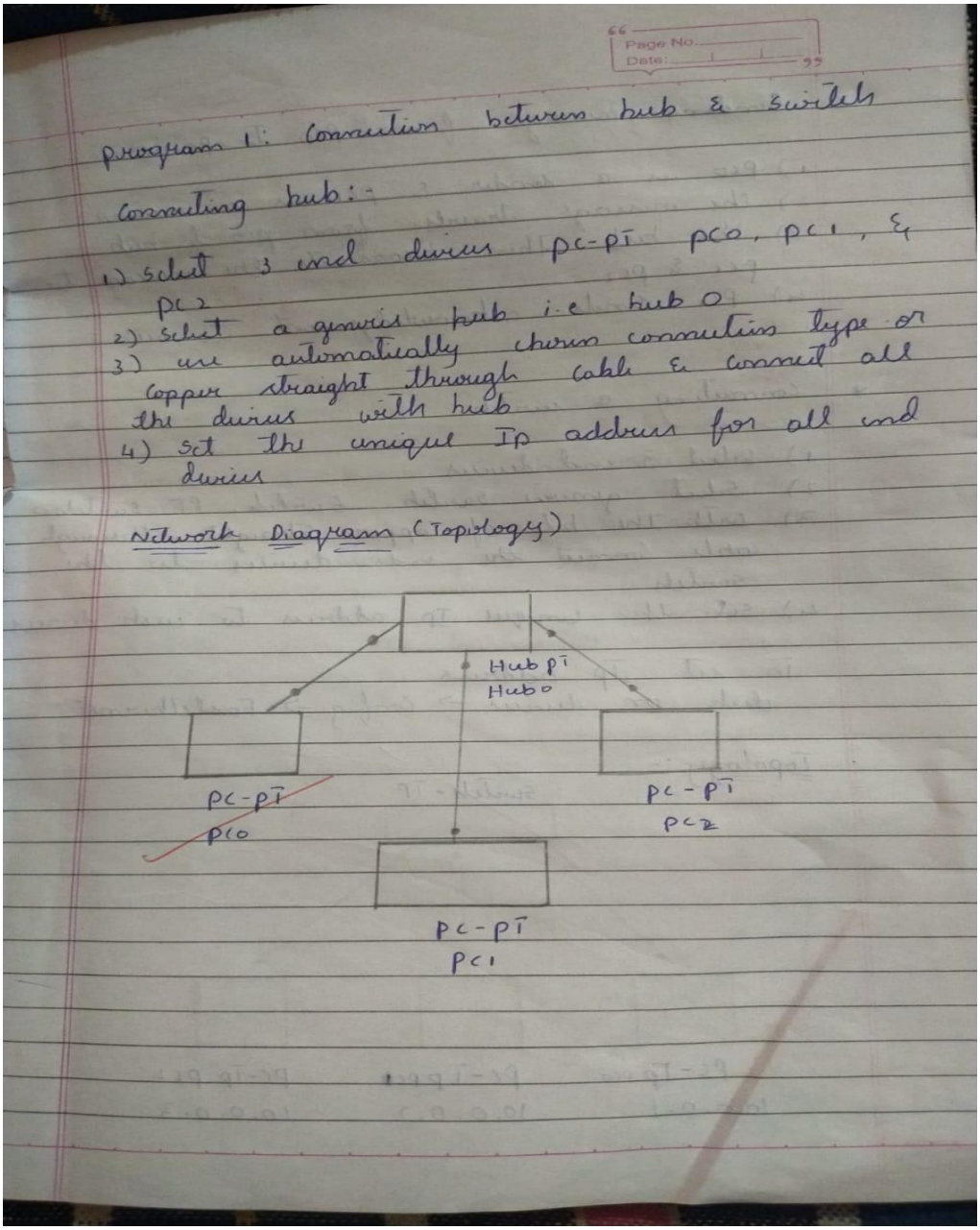


Fig 6: Output of topology with switch and hub connected

Observation:



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Program 1: Connection between hub & switch

Connecting hub:-

1) Select 3 end devices PC-PT PC0, PC1, & PC2
2) Select a generic hub i.e hub 0
3) Use automatically chosen connection type or copper straight through cable & connect all the devices with hub
4) Set the unique IP address for all end devices

Network Diagram (Topology)

Data transfer between pc0 to pc5

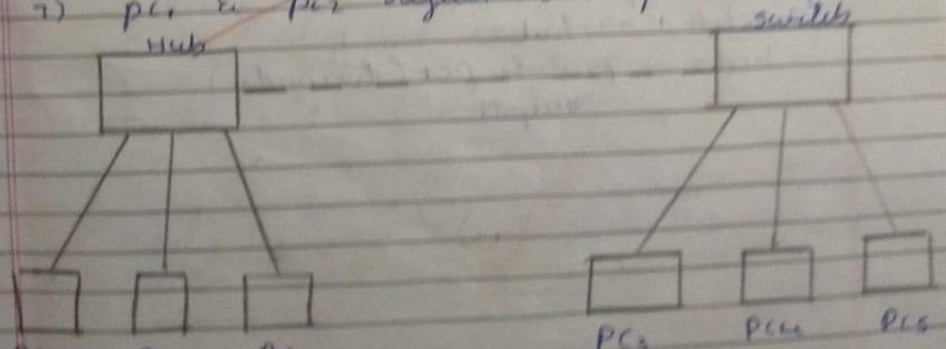
1) pc0 → switch
2) switch broadcasts to pc1 & pc2 only pc2 sends
3) acknowledgement
4) Data from pc0 → switch
5) switch → pc5

* Connecting hub network with switch network

Connect a hub network & switch network using copper cross over connection Connection

Transfer between pc0 → pc5

1) pc0 → hub
2) hub → pc1, pc2 & switch
3) switch → pc5
4) pc5 → switch
5) switch → hub
6) hub → pc0, pc1, pc2
7) pc1 & pc2 reports with pc0 accepts



(Topology)

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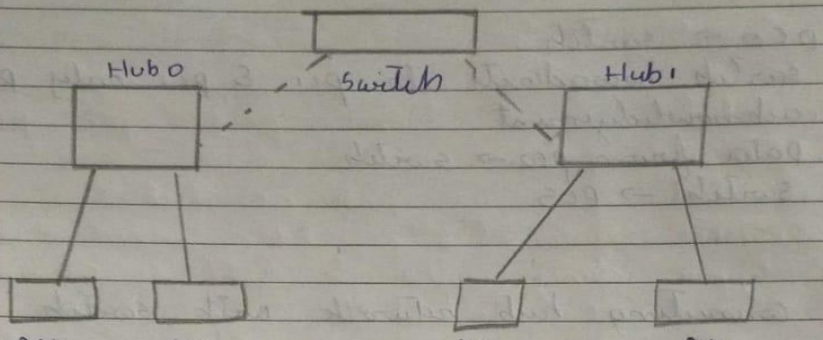
Connecting 2 hub network via switch



Transfer between PC0 → PC3
ping 10.0.0.4

PC0 → hub 0
hub 0 → PC1 & switch
PC1 discards
switch → hub 1
hub 1 → PC2 & PC3
PC2 discards, PC3 sends ack → hub 1
hub 1 → PC1 & switch
switch 1 → hub 0
hub 0 → PC0 & PC1 (discards)
ack pkt

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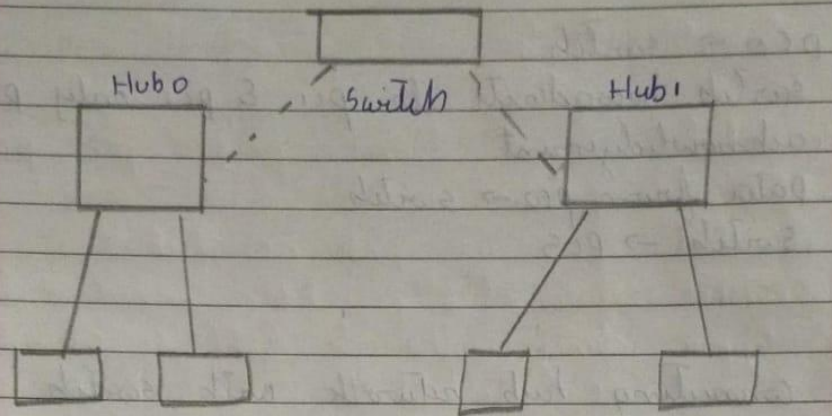
Connecting 2 hub network via switch



Transfer between PC0 → PC3
ping 10.0.0.4

PC0 → hub 0
hub 0 → PC1 & switch
PC1 discards
switch → hub 1
hub 1 → PC2 & PC3
PC2 discards, PC3 sends ack → hub 1
hub 1 → PC0 & switch
switch 1 → hub 0
hub 0 → PC0 & PC1 (discards)
ack pkt

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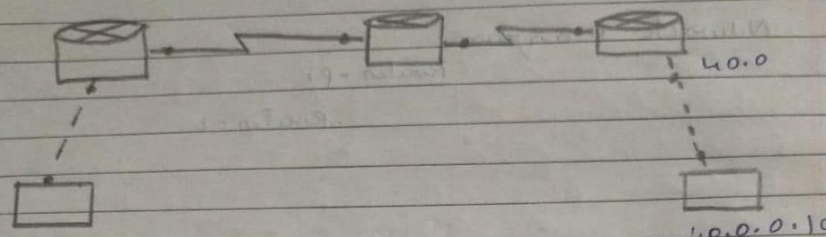
static routing



Router PT-1

Router > enable
Router # Configure terminal
Router (config) # interface fastethernet 0/0
Router (config-if) # ip address 10.0.0.1 250.0.0.0
Router (config-if) # no shut down
Router (config-if) # exit
Router (config) # interface Serial 2/0
Router (Config if) # ip address 20.0.0.1 255.0
Router (config if) # no shutdown
Router (config if) # exit

Router PT-2
Router > enable
Router # Configure terminal
Router (config) # interface Serial 2/0
Router (config-if) # ip address 20.0.0.2 255.0
Router (config-if) # no shutdown
Router (config-if) # exit

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Repeat the steps for the outer routers (R1, R2)

Step3 :- Configure static route of router 1

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

Step 4 :- Configure default route for R0 & R2

Router 0

Router (config)# ip route 0.0.0.0 0.0.0.0 20.0.0

Router2

Router (config)# ip route 0.0.0.0 0.0.0.0 30.0.0.1

Step 5 :- Send pdu or try to ping

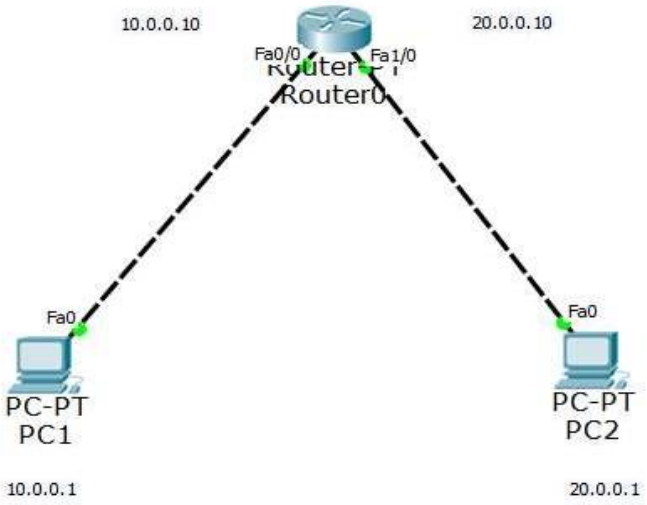
Experiment 2

Q2) Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply

Aim: To configure IP address to routers in packet tracer and explore ping responses, destination unreachable, request timed out, reply.

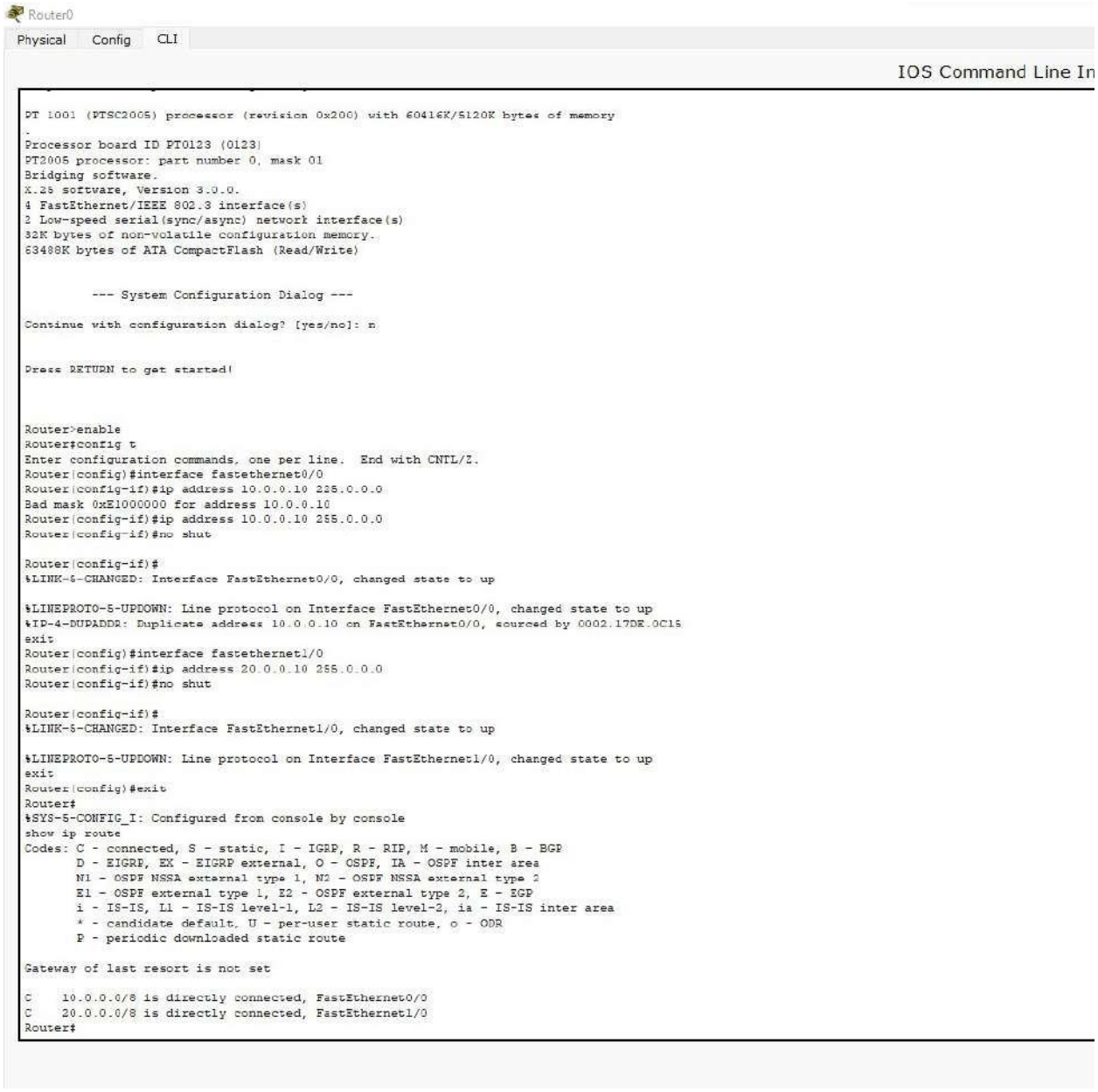
2A

Topology:

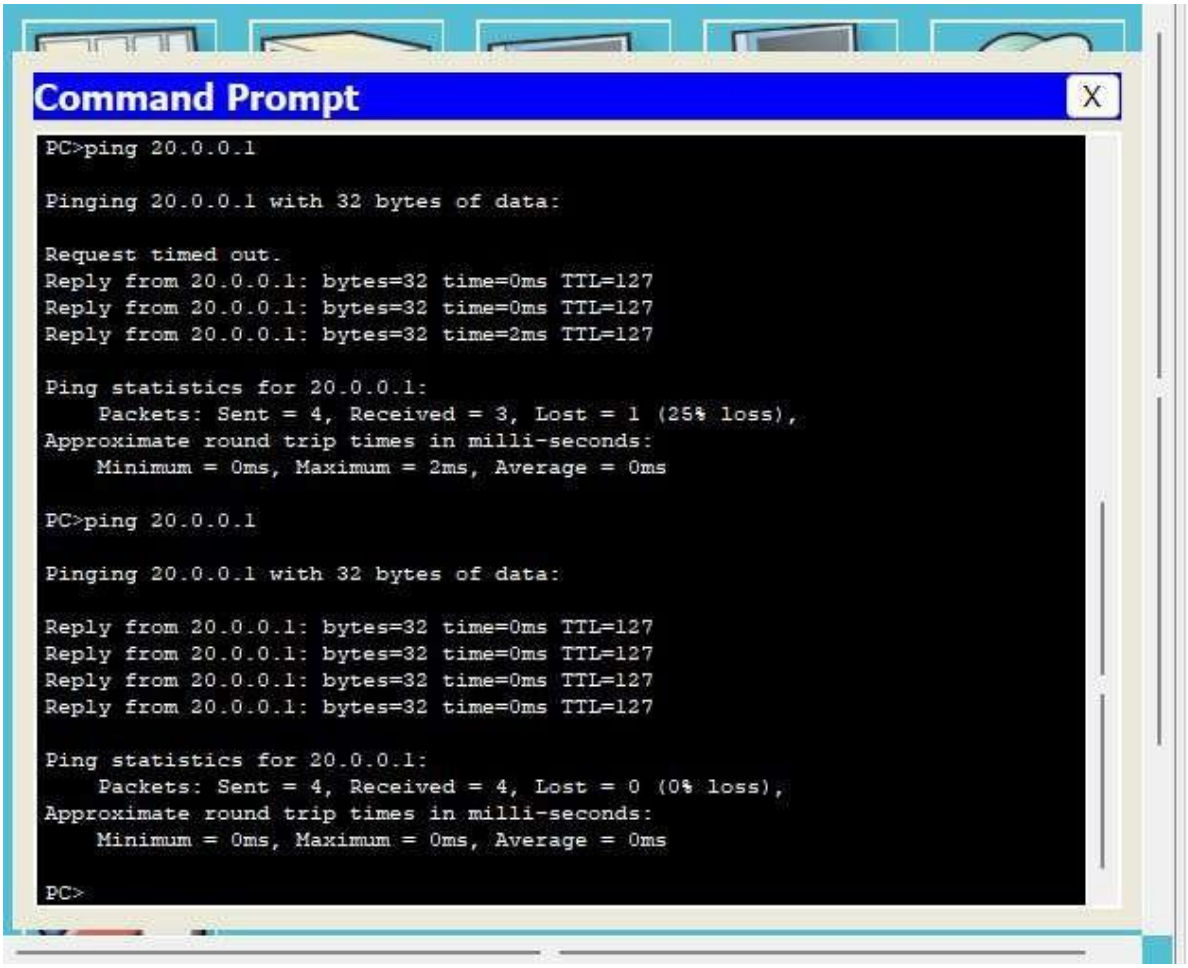


Procedure:

CLI command



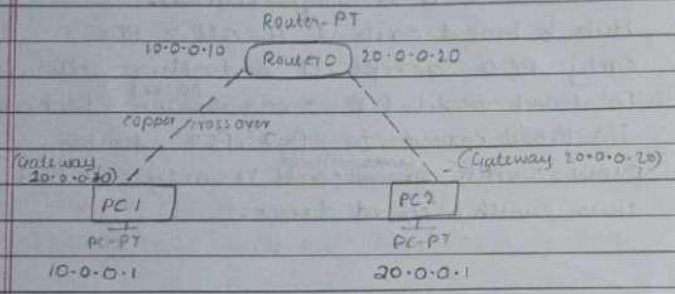
Output:


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=2ms 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 = 2ms, 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
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=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:

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

2a Aim: Configuring IP address to router and exploring ping messages.



Procedure:

Step 1: Select Router-PT and place it in workspace

Step 2: Take 2 end devices as PC-PT and drop them in workplace

Step 3: Connect FastEthernet0/0 of PC1 to FastEthernet 0/0 of Router and FastEthernet0/0 of PC2 to FastEthernet0/0 of Router using copper Cross-over

Step 4: Set IP address of PC1 as 10.0.0.1 and PC2 as 20.0.0.1

Step 5: In settings set Gateway of PC1 as 10.0.0.10 and PC2 as 20.0.0.10

Step 6: Setup the interface of router using the following steps

To configure router Command line interface (CLI) is used.

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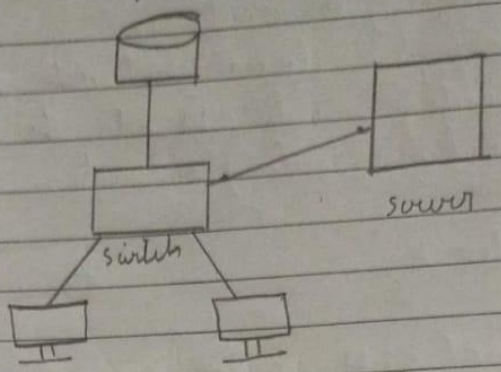
Configure DHCP server



1) Set the IP address for server → click on server → config → ip address
→ Enter 10.0.0.1

2) Set the IP address for router
* click on router → CLI
* Type the commands mode

configure terminal

Router (config) # interface fast Ethernet 0/0
Router (config) # ip address 10.0.0.2 255.0.0
Router (config) # no shutdown.
click on server → Services → DHCP
Set the Pool name

* Default gateway is the router address (10.0.0.2)

* DNS server is the server address (10.0.0.1

output

Enter the bucket size : 5000
Enter the outgoing rate : 200

Enter the packet size : 3000
The packet of size 3000 is added in the bucket

Enter 1 to continue or 0 to stop : 0

Router 0 CLI
(Press N)

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 fastethernet 1/0
Router (config-if) # ip address 20.0.0.10 255.0.0.0
Router (config-if) # no shut
exit

Router (config) # exit
Router #
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

Step 7 : Observation

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

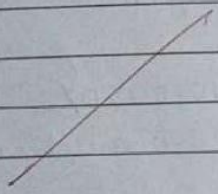
Ping output in PC0 :-

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

Ping statistics for 20.0.0.1
Packets: sent = 4, Received = 3, Loss = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average

Observation
On pinging in PC0 for the first time there is a 25% loss

From next ping, there are no losses.



2B)
Topology:

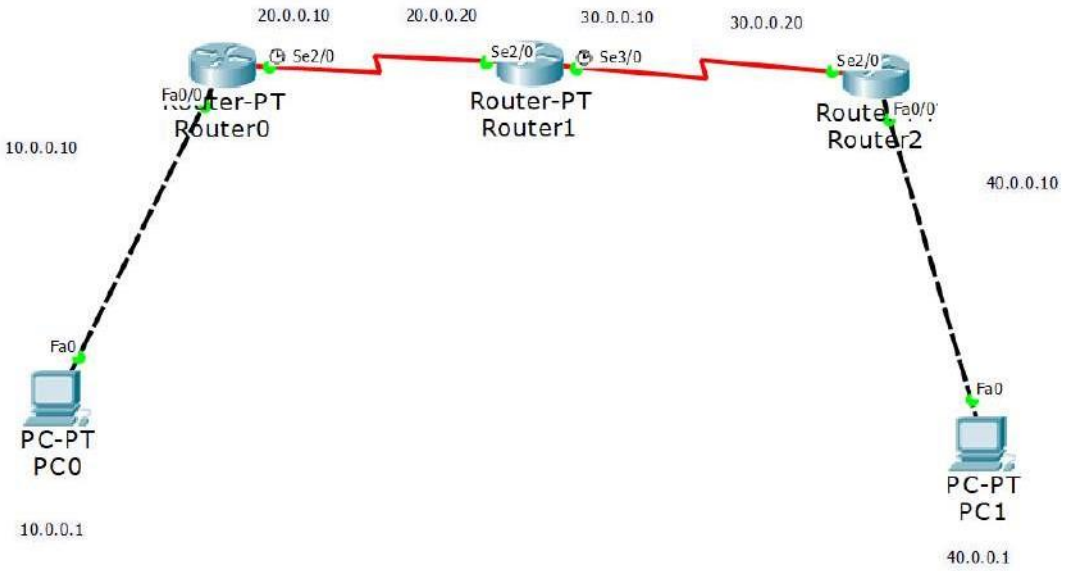


Fig: IP configuration of three routers

Procedure:
Cli commands:
Router0


```
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#
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:

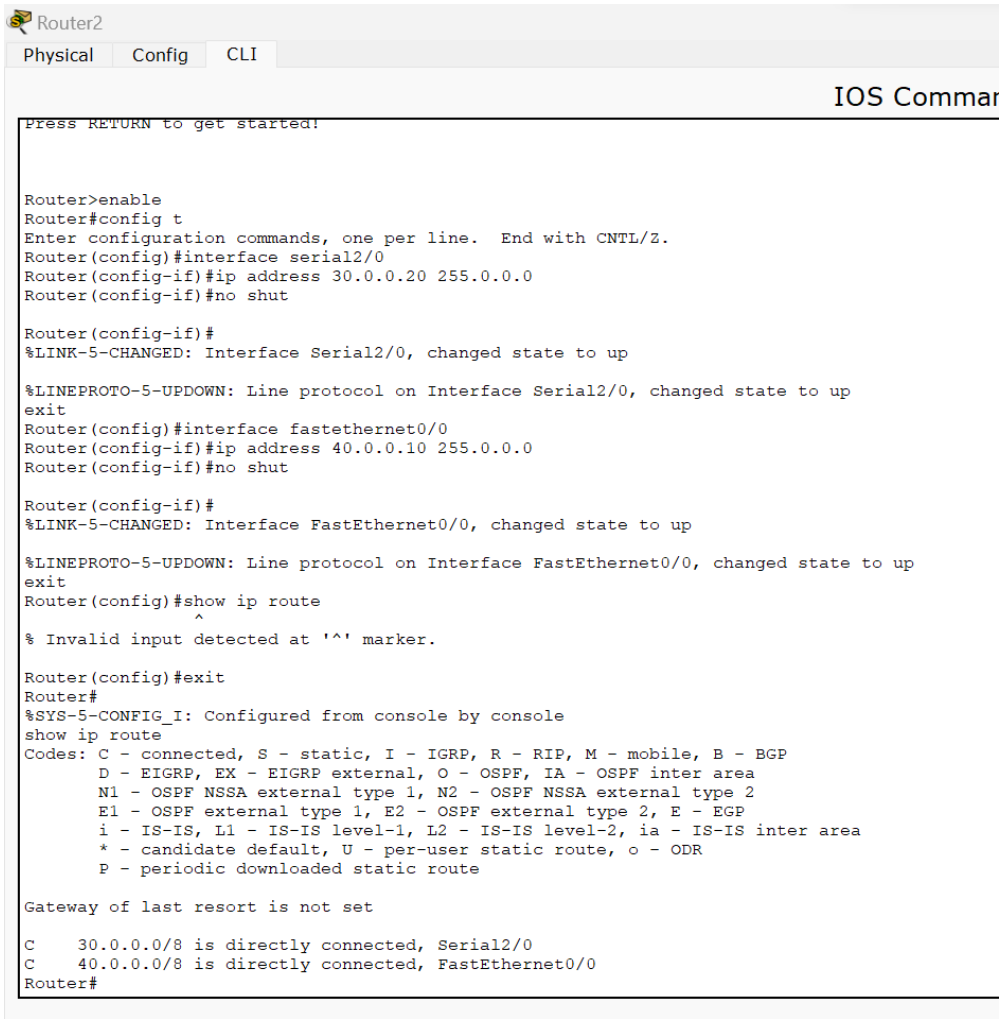
Router1

Physical | Config | CLI

IOS Command Line Interface

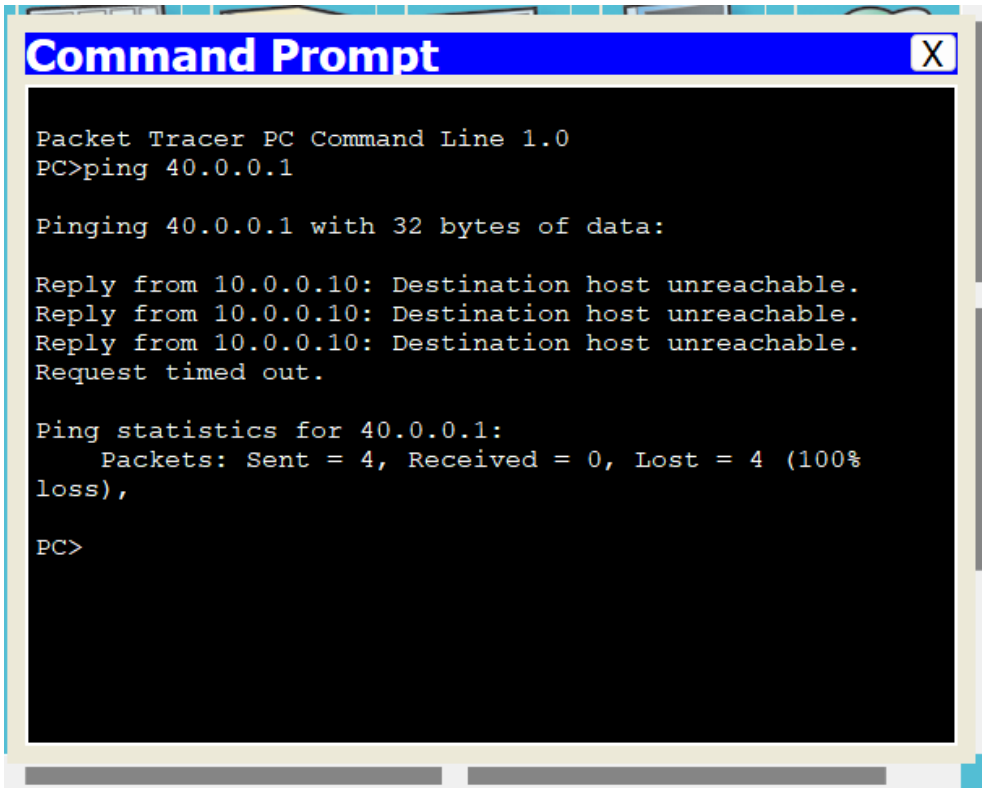
```
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

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#
```

```
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#
```


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#

```
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#
```

Output:

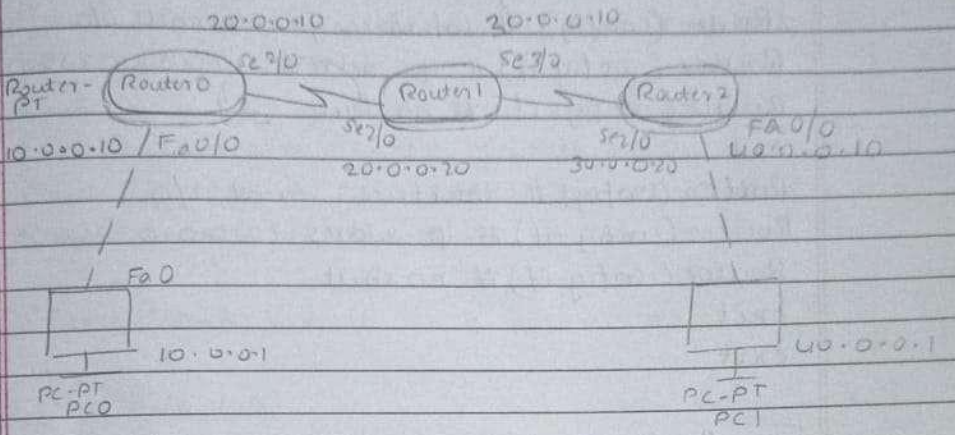


```
PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Request timed out.
Reply from 40.0.0.1: bytes=32 time=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:

2b. Aim: Configure using 3 routers and 2 PCs

Topology



Procedure

Step 1: The network is started by selecting end devices PC0 & PC1 i.e generic PCs and placing them in work space.

Step2: Select 3 Router-PT and place them as Router 0, Router1 and Router 2 in workspace

Step3: PC0 & PC1 are connected to Router 0 and Router 2 respatively using copper crossover

Step 4: Connect Router0 to Router1, Router1 to Router 2 using

Step 5: Set up IP address of PC0 to 10.0.0.1 PC1 to 40.0.0.1. Setup gateway of PC0 as 10.0.0.20 and PC1 as 40.0.0.10

Configure the router 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 addres 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) # interface serial 2/0

Router (config-if) # ip address 20.0.0.20 255.0.0.0

Router (config-if) no shut

exit

Router (config) # interface serial 3/0

Router (config-if) # ip address 30.0.0.20 255.0.0.0

Router (config-if) # no shut

exit

Router (config) # 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 fastether 0/0
Router(config-if)# ip address 40.0.0.10 255.0.0.0
Router(config-if)# no shut
exit
Router(config) exit
```

IP Route table:

Router 0:

```
Router# show ip route
C  10.0.0.0/8 is directly connected, FastEthernet 0/0
C  20.0.0.0/8 is directly connected, Serial 2/0
```

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, FastEthernet 0/0
```

Ping output in PC0

Ping 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

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

Observations:
Green lights appear on the wires when no shut is written

Now configure the router which does not have data of other network. Add the network in CLI
In all 3 Routers CLI write 'config t', then set route

Routers:

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

new IP route table
exit

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 30.00.0/8 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] 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 messages

PC> ping 40.0.0.9

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

Observation:
In first ping 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 or lost
After this ip route is explicitly
Now on pinging there is 25% loss in first time, the following one's has no loss

Experiment 3

Q3)Configure default route, static route to the Router.

Aim: To configure default route, static route to the Router.

Topology:

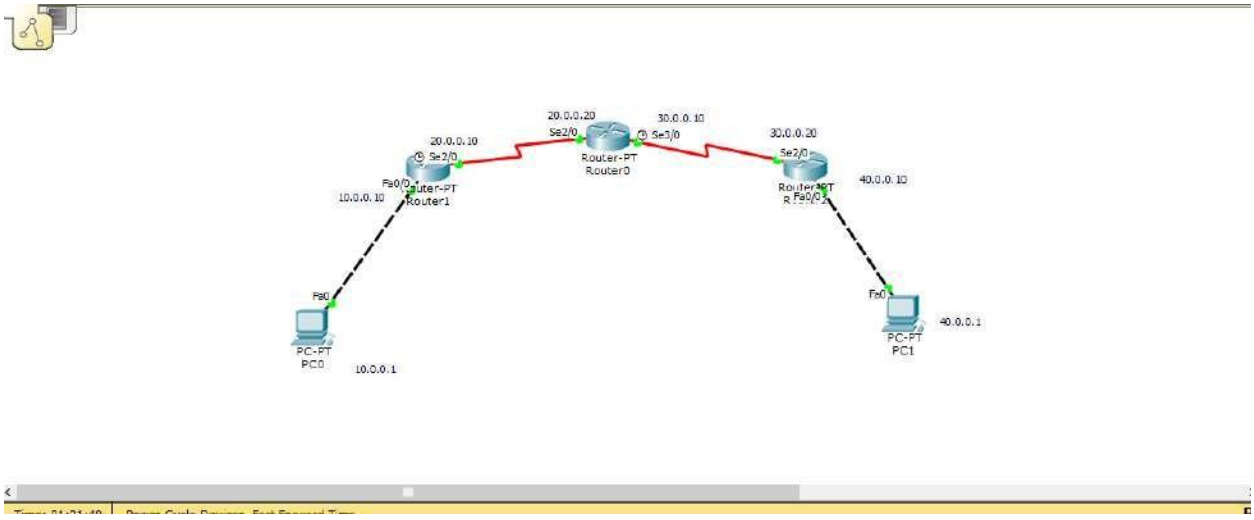
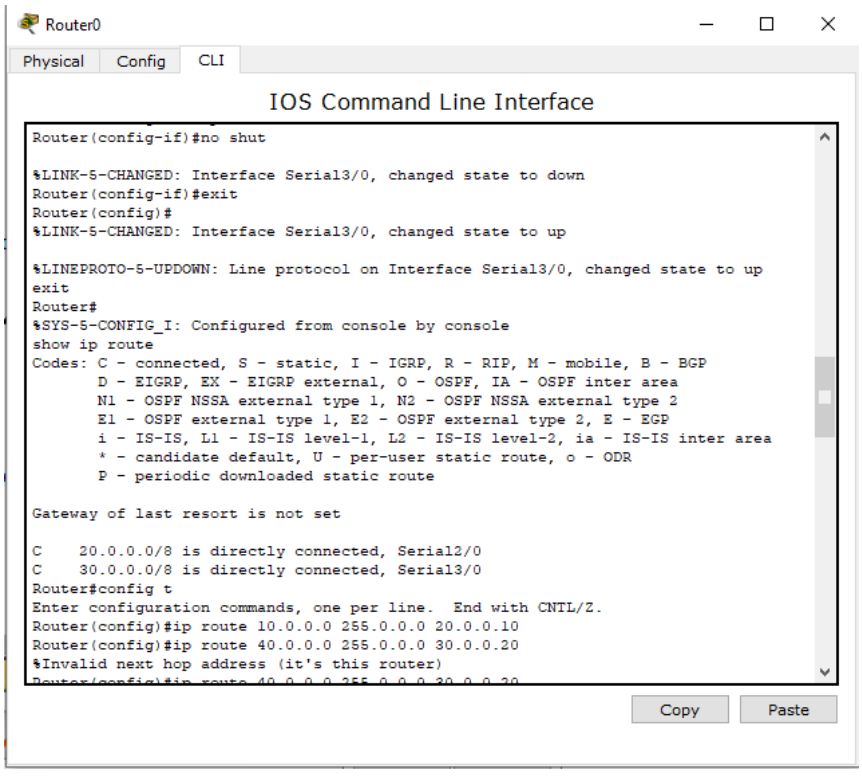
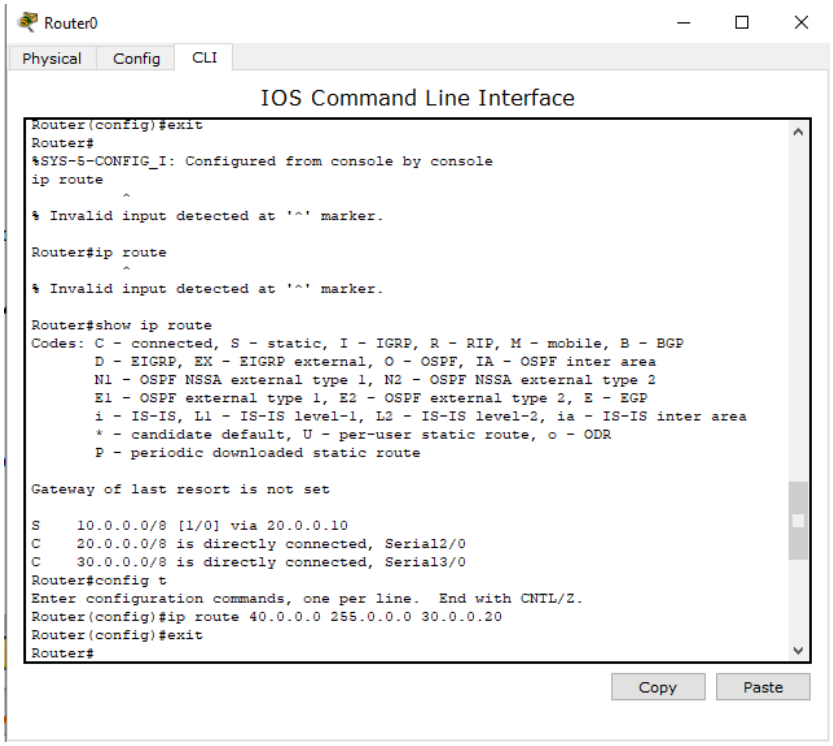


Fig: Default routing in router0

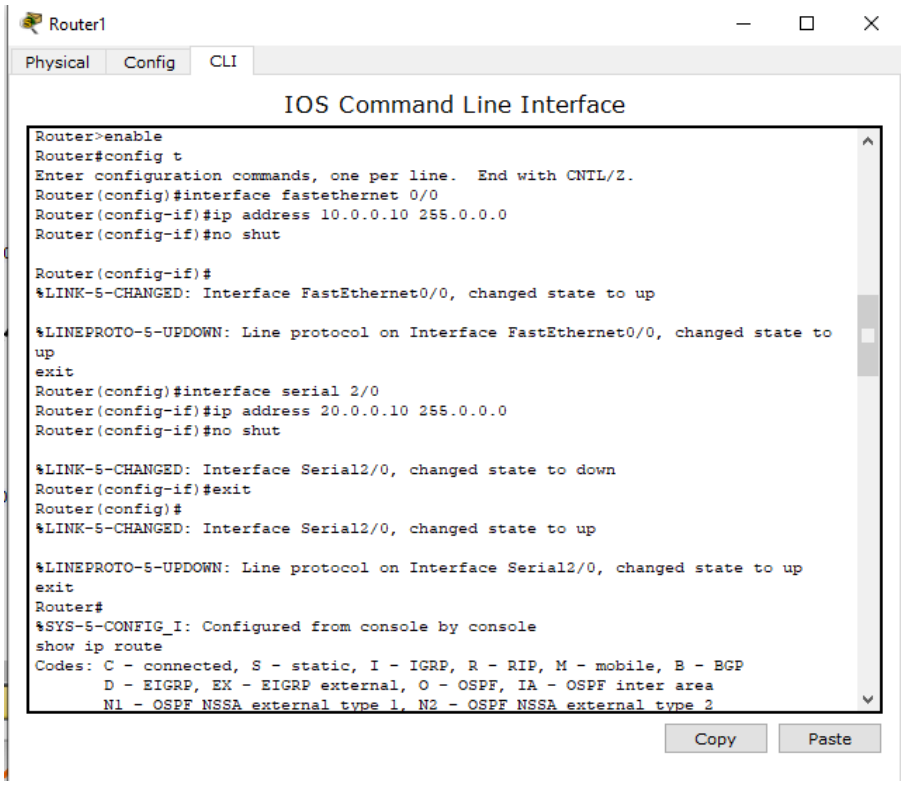
Procedure:

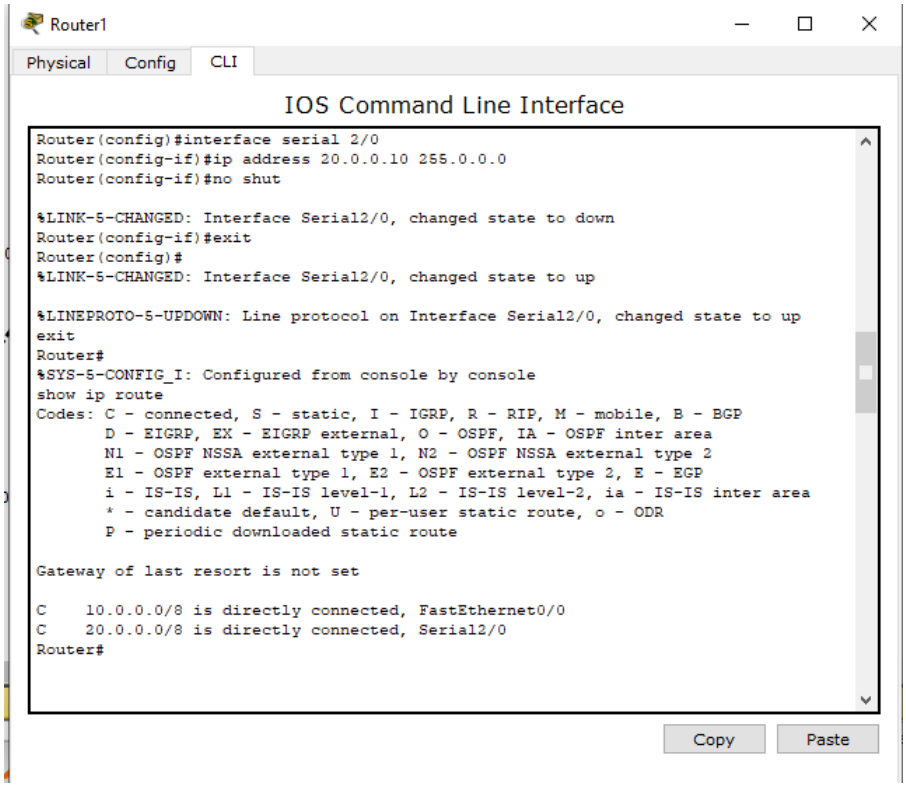
Router0



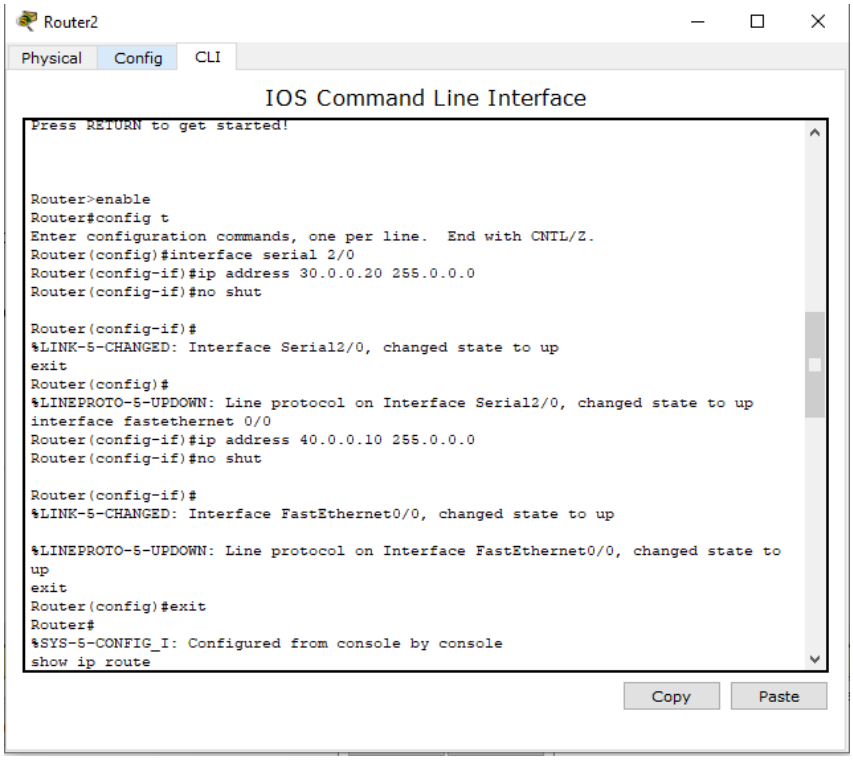

Router0
Physical
Config
CLI
IOS Command Line Interface
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
ip route
^
% Invalid input detected at '^' marker.
Router#ip route
^
% Invalid input detected at '^' marker.
Router#show ip route
Codes: C - connected, S - static, I - 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 20.0.0.10
C 20.0.0.0/8 is directly connected, Serial2/0
C 30.0.0.0/8 is directly connected, Serial3/0
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 30.0.0.20
Router(config)#exit
Router#
Copy
Paste

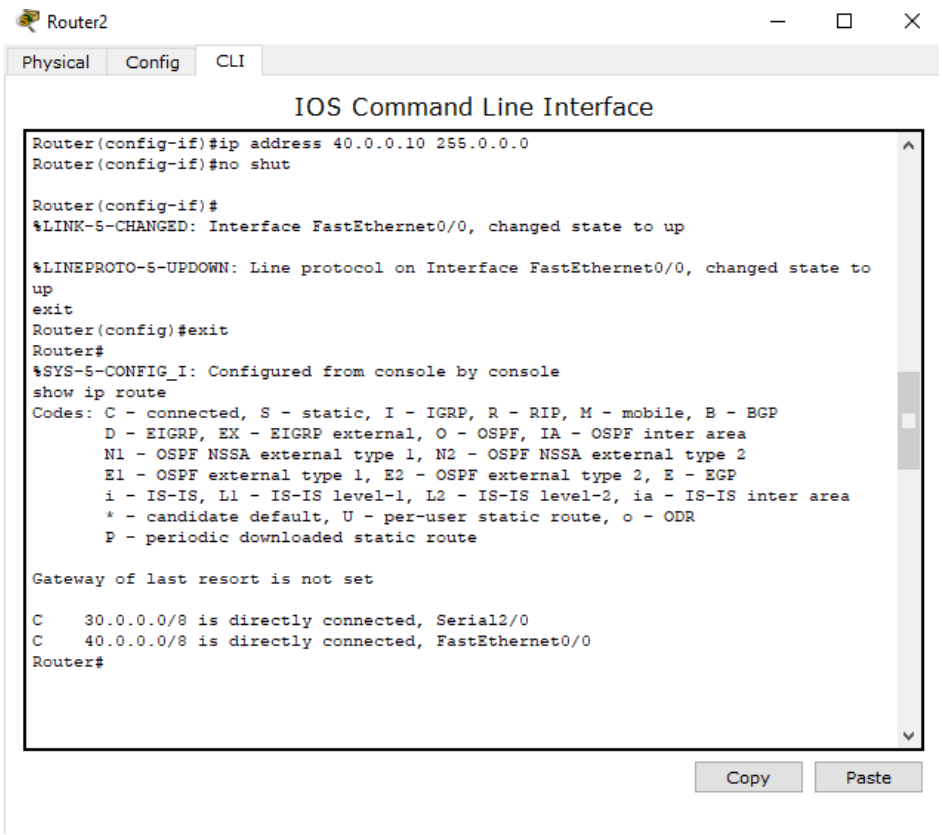
Router1


Router1
Physical
Config
CLI
IOS Command Line Interface
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)#
%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
Copy
Paste

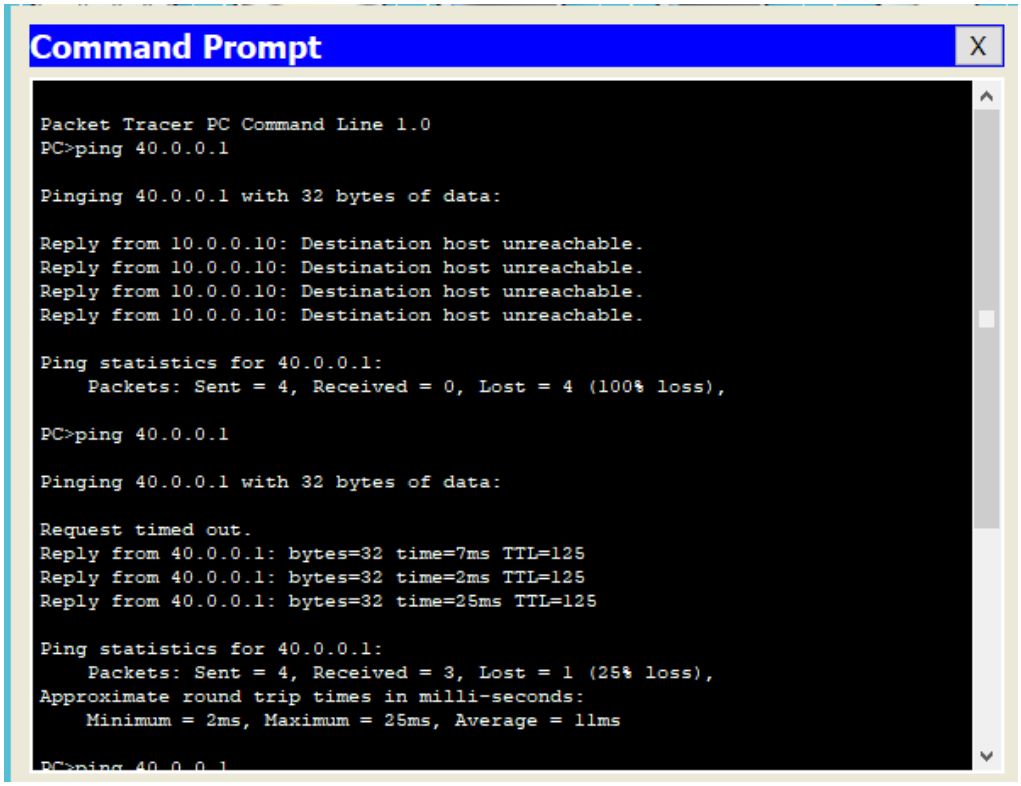

Router1
Physical
Config
CLI
IOS Command Line Interface
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut
%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#
%LINK-5-CHANGED: Interface Serial2/0, 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 10.0.0.0/8 is directly connected, FastEthernet0/0
C 20.0.0.0/8 is directly connected, Serial2/0
Router#
Copy
Paste

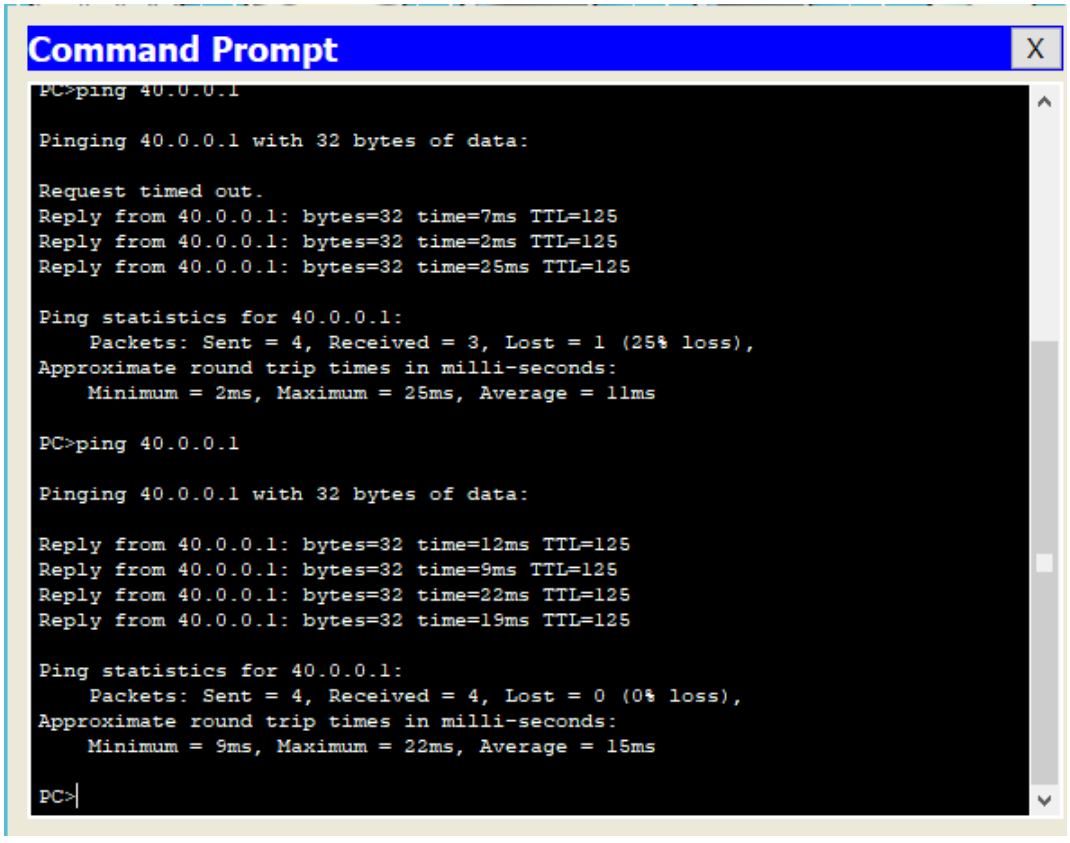
Router2:


Router2
Physical
Config
CLI
IOS Command Line Interface
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 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
exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
interface fastethernet 0/0
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)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Copy
Paste

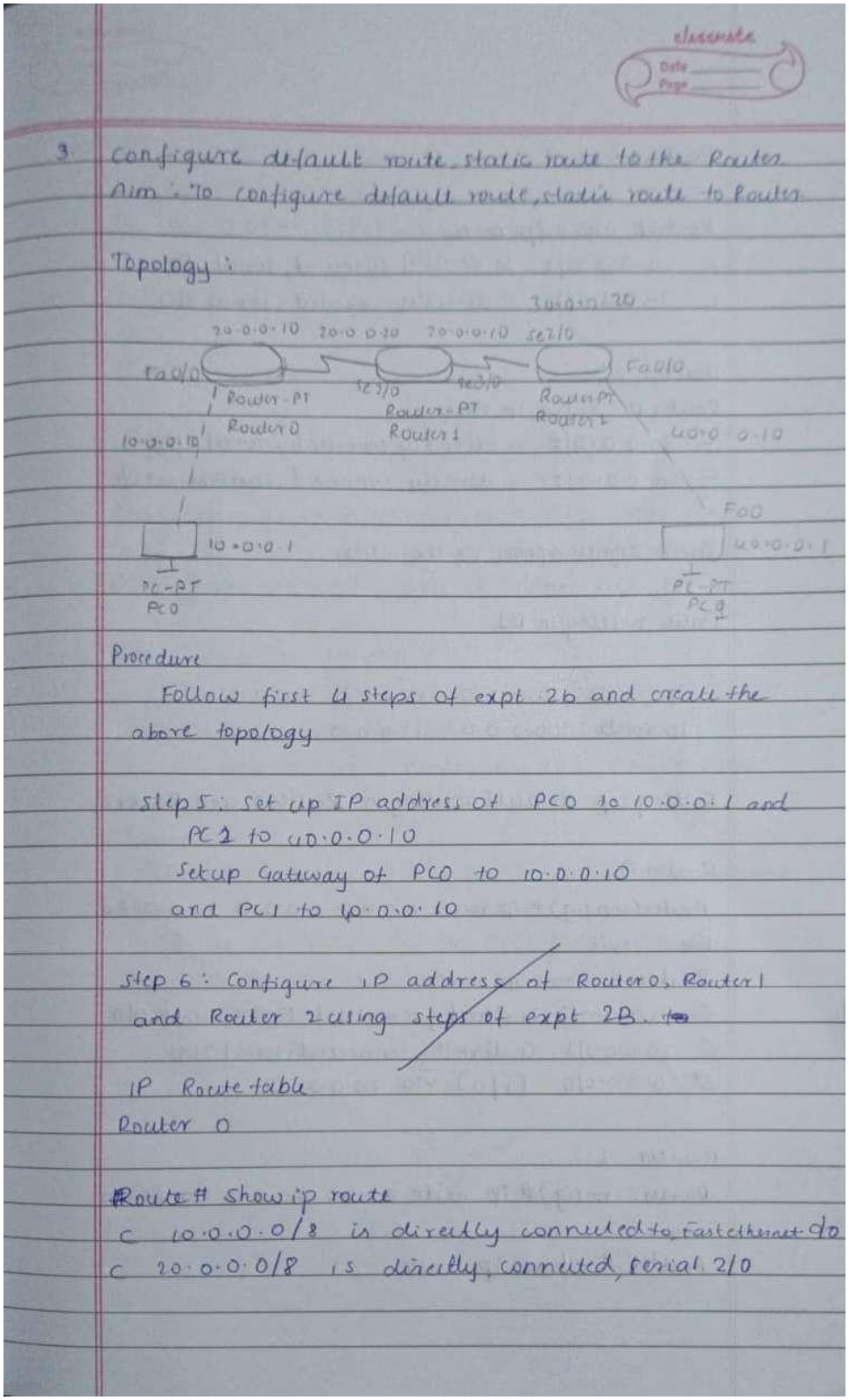

Router2
Physical
Config
CLI
IOS Command Line Interface
Router(config-if)#ip address 40.0.0.10 255.0.0.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#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#
Copy
Paste

Output:


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.
Reply from 10.0.0.10: Destination host unreachable.
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
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=7ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=25ms 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 = 25ms, Average = 11ms


Command Prompt
X
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=7ms TTL=125
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125
Reply from 40.0.0.1: bytes=32 time=25ms 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 = 25ms, Average = 11ms
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=12ms TTL=125
Reply from 40.0.0.1: bytes=32 time=9ms TTL=125
Reply from 40.0.0.1: bytes=32 time=22ms TTL=125
Reply from 40.0.0.1: bytes=32 time=19ms 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 = 9ms, Maximum = 22ms, Average = 15ms
PC>

Observation:



3. Configure default route, static route to the Router.

Aim: To configure default route, static route to Router.

Topology:

Procedure

Follow first 4 steps of expt 2b and create the above topology

step 5: Set up IP address of PC0 to 10.0.0.1 and PC1 to 40.0.0.10

Setup Gateway of PC0 to 10.0.0.10 and PC1 to 40.0.0.10

step 6: Configure IP address of Router0, Router1 and Router 2 using steps of expt 2B.

IP Route table

Router 0

#Route # show ip route

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

Green lights appear on the wires.

Static routing in R1

ip route 10.0.0.0 255.0.0.0 20.0.0.10
ip route 40.0.0.0 255.0.0.0 20.0.0.20

Setting up default routing in Router0 and Router2

Router 0
Router(config)# ip route 0.0.0.0 0.0.0.0 20.0.0.20
exit
Router# show ip route
C 10.0.0.0/8 is directly connected, FastEthernet 0/0
C 20.0.0.0/8 is directly connected, serial 2/0
S* 0.0.0.0/0 [1/0] via 20.0.0.20

Router 2
Router(config)# ip route 0.0.0.0 0.0.0.0 30.00.10
exit
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, FastEthernet 0/0
C 0.0.0.0/0 [1/0] via 30.0.0.10

Ping output:
PC 0
PC> ping 40.0.0.1

Pinging 20.0.0.1 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 status for 40.0.0.1
Packets: Sent=4, Received=3, Lost=1 (25% loss)
Approximate round trip times in milli-seconds:
Maximum=2ms, Minimum=2ms, Average=2ms

Observation:
Through default routing we configure the network here
When we ping PC1 to PC0 first packet is lost but after that all are transmitted.
We don't have to set routing for each and every router manually here.

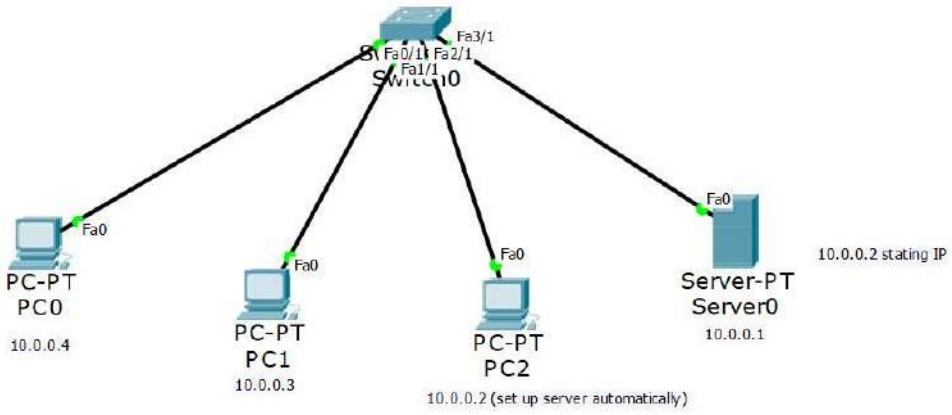
13/7/2023

Experiment 4

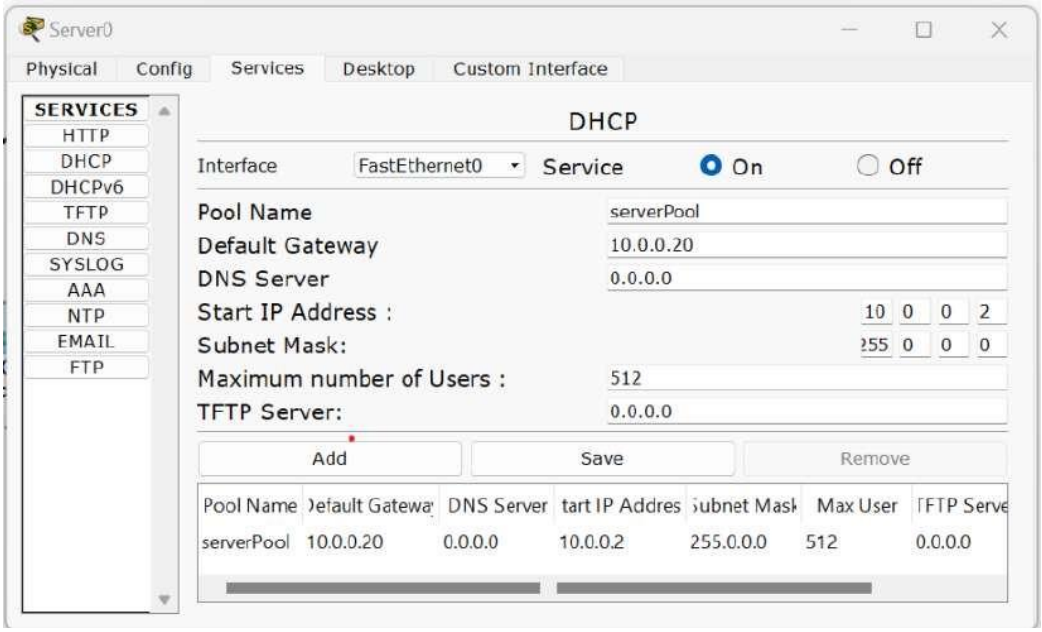
Q4) Configure DHCP within a LAN and outside LAN.

Aim: To configure DHCP within a LAN and outside LAN.

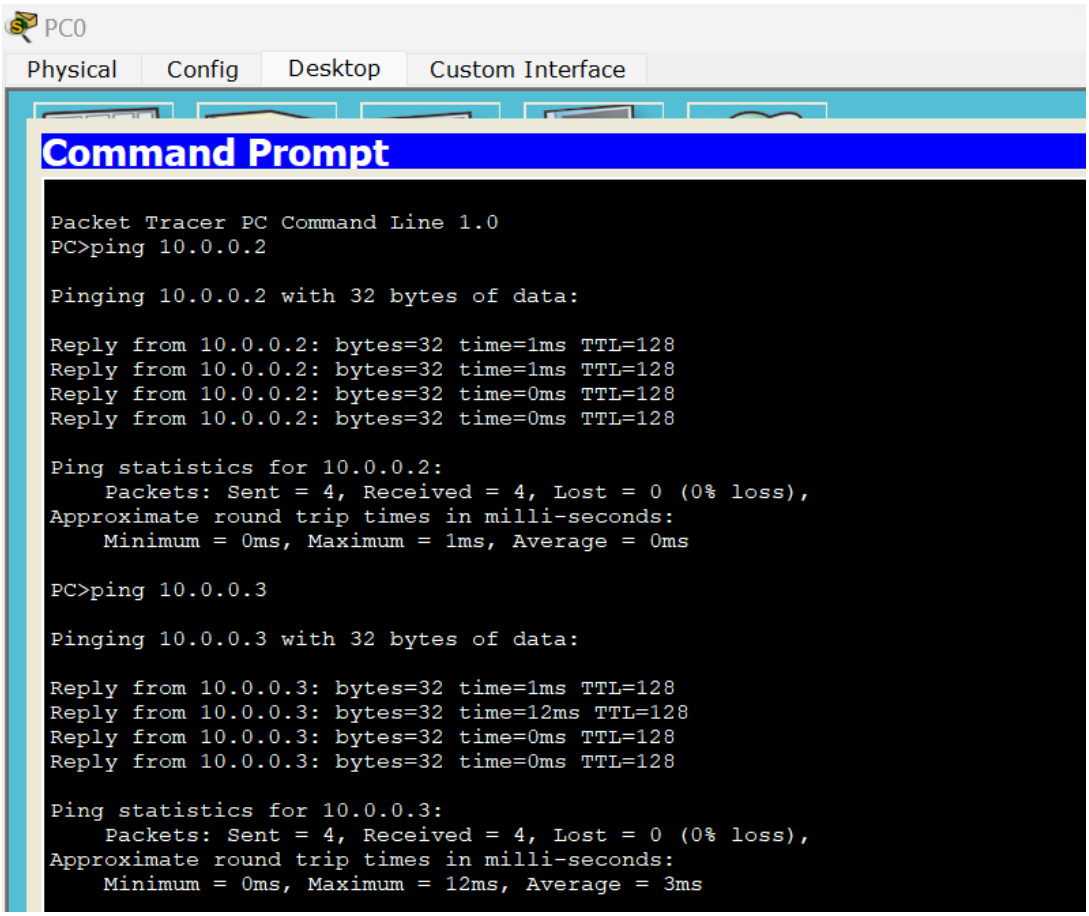
4A)
Topology:



Procedure:



Output:


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.2
Pinging 10.0.0.2 with 32 bytes of data:
Reply from 10.0.0.2: bytes=32 time=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

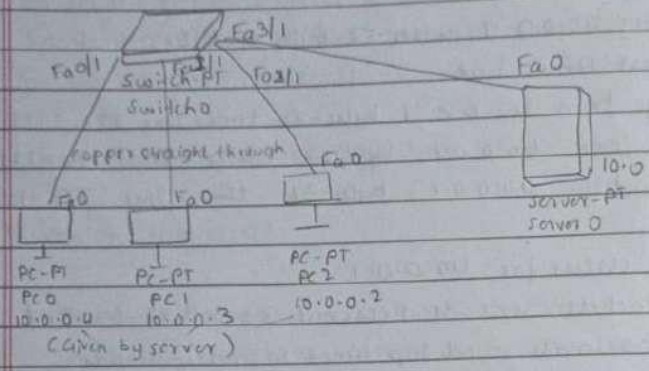
Observation:

4a. Configure DHCP within a LAN and outside LAN

Aim: To configure DHCP within a LAN and outside LAN

4A: within A LAN

Topology



Procedure

1. The topology is created by choosing 3 PC-PTs and one Server-PT

2. Generic switch, Switch-PT as connecting device and place it in workplace.

3. Copper straight through is used to connect all the devices.

4. Set IP address of server0 on desktop → IP configuration tab. Set IP address to 10.0.0.1 sd subnetmask.

5. On the DHCP protocol by going to
Server0 → Services → DHCP → On
Set start IP Adress as 10.0.0.2
subnetmask as 255.0.0.0

6. set dfault gatway : 10.0.0.20
and click on save.

7. Open PC2, go to IP configuration in desktop
and turn on DHCP
IP address will be assigned automatically as
10.0.0.2

8. When we reapeat above step in PC1 and PC2
the IP addresses will be 10.0.0.3 and
10.0.0.4 respectively.

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

- IP address are set automatically in PC0, PC1 and PC2 in the LAN network when we enable DHCP protocol.
This has application when large networks have 100s of PCs.
For all PCs gatway is automatically set to 10.0.0.20.

13/7/2023

4B)

Topology:

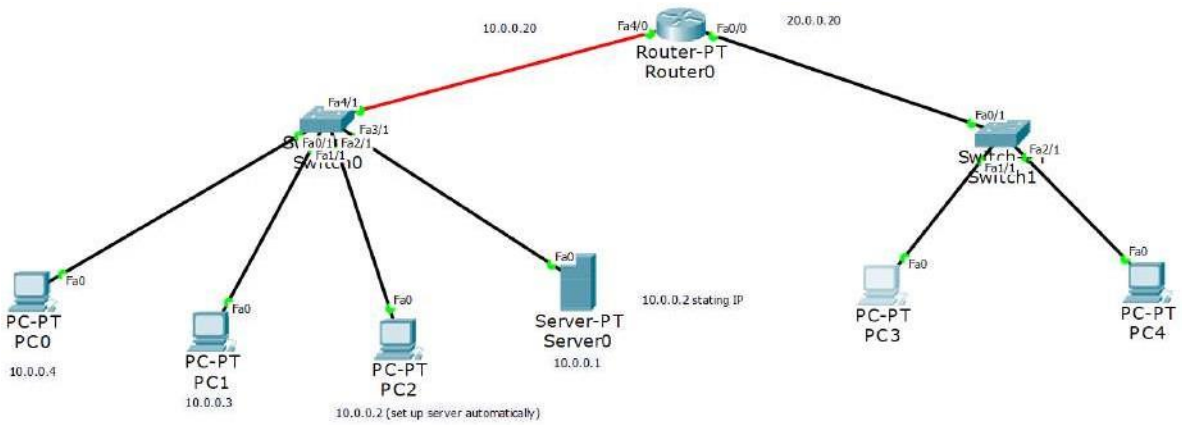


Fig: Configure DHCP outside LAN

Procedure:

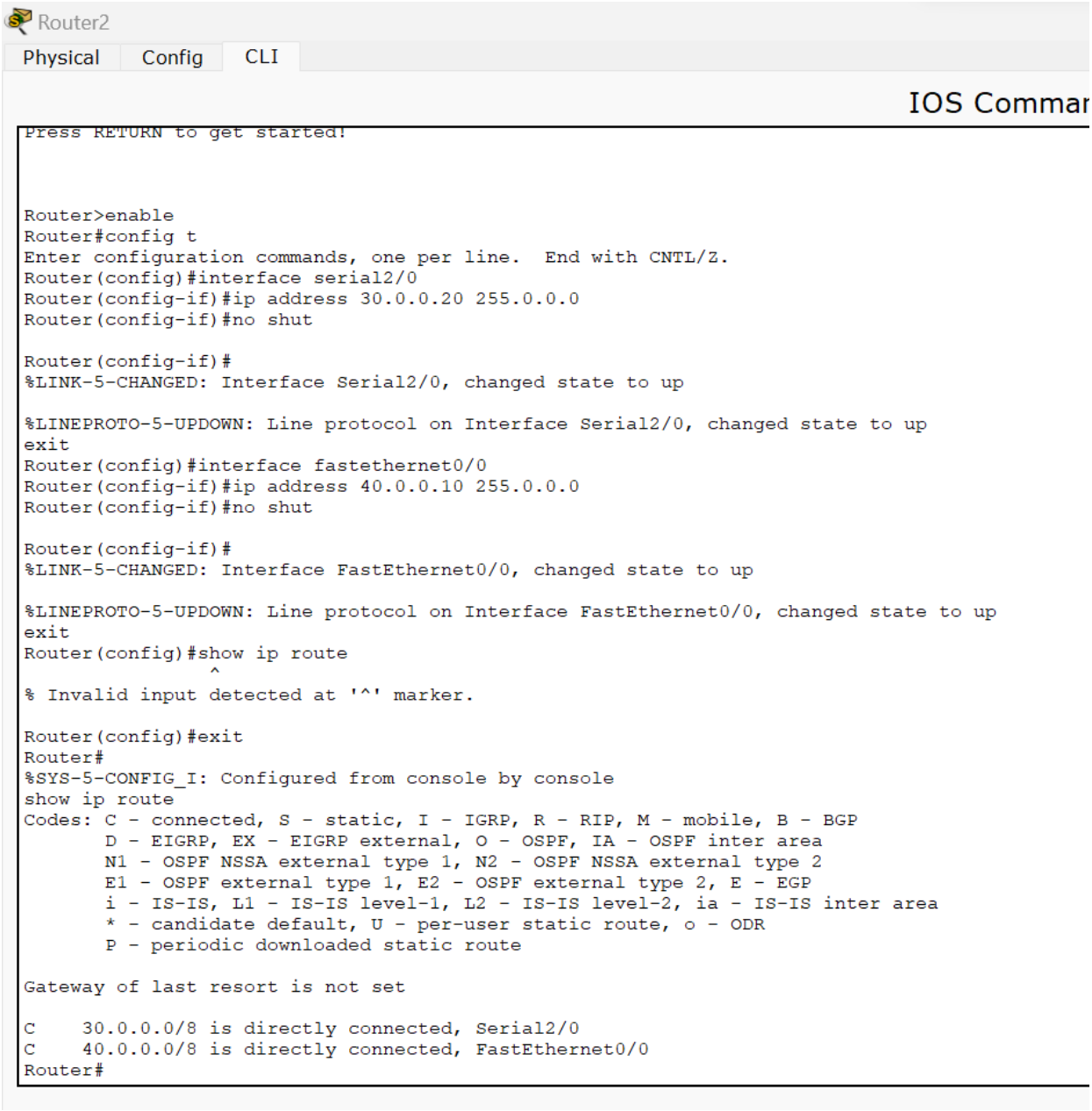
```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

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#
```

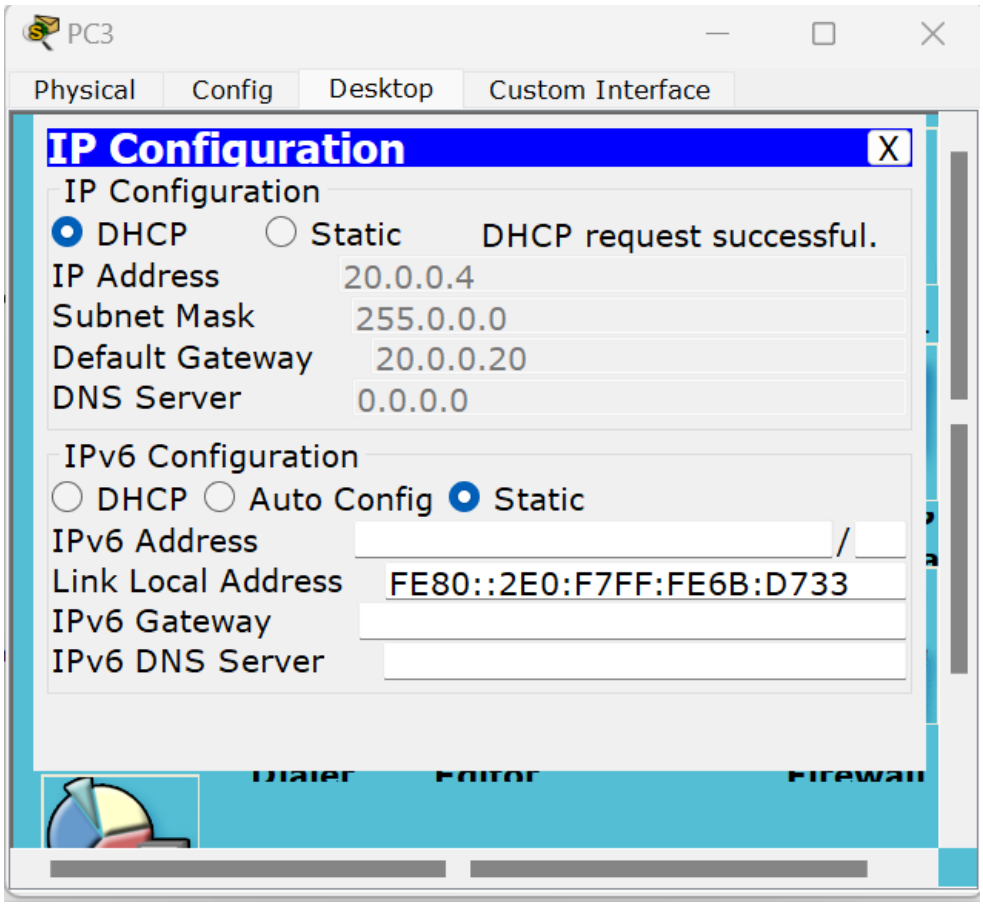
Router1

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#
```

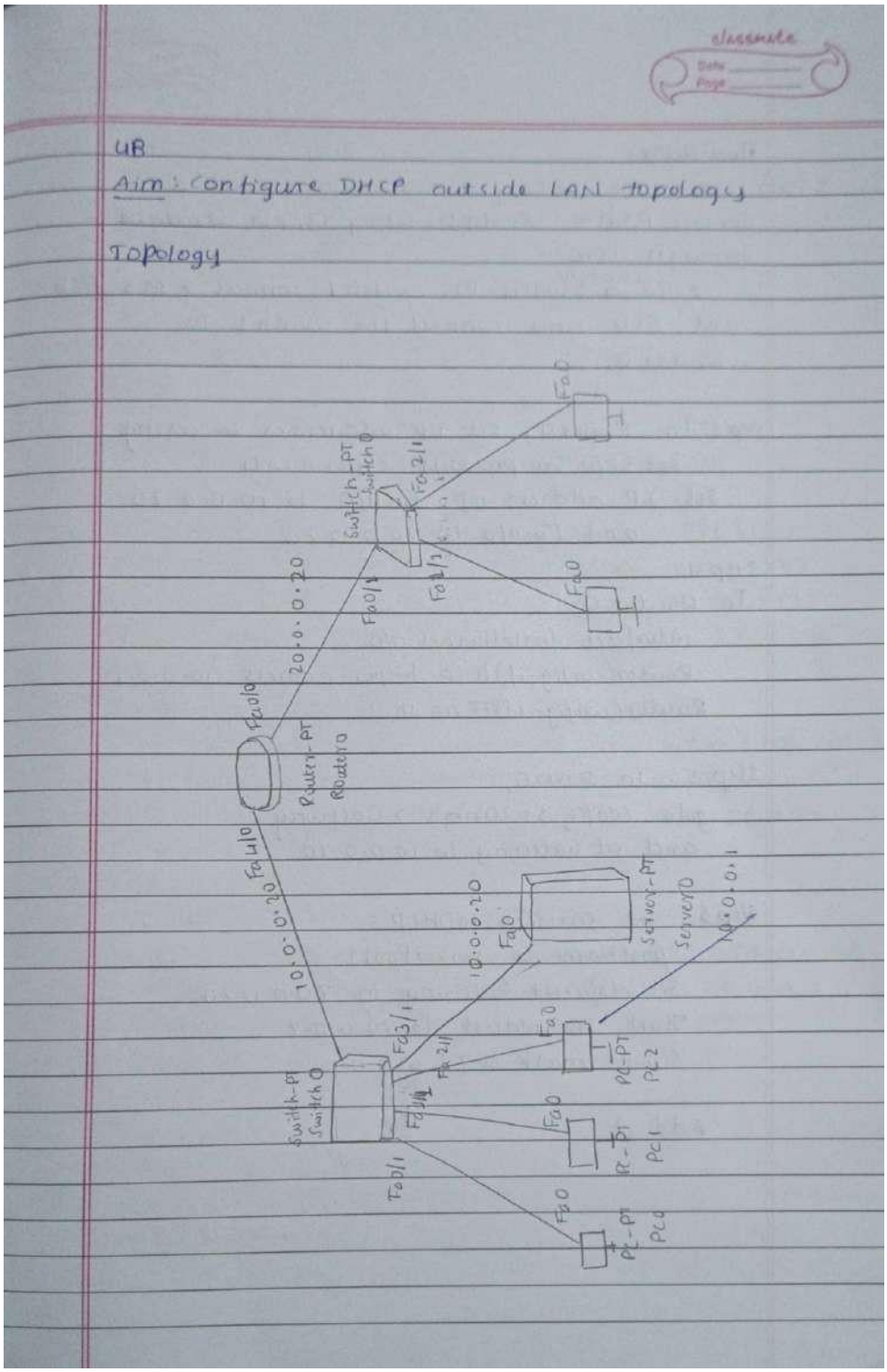

Router2
Physical
Config
CLI
IOS Commar
Press RETURN to get started!
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 30.0.0.20 255.0.0.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: 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#



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:



Procedure:

1. To the topology created in 4A, connect a Generic Router (Router 0) using copper straight through wire.
2. To ~~a~~ Through Switch-PT switch 1 connect 2 PCs, PC3 and PC4 and connect the switch 1 to Router 0

Step 3: In Router 0, set IP addresses ~~as~~ using ~~set~~ steps in previous experiments
Set IP address of FastEthernet 0/0 to 10.0.0.20
and Fa 0/0 to 20.0.0.20

Step 4:
In Router 0,
interface fastethernet 0/0
Router(config-if)# ip helper-address 10.0.0.1
Router(config-if)# no shut

Step 5: In server 0,
goto config > settings > Gateway
and set Gateway to 10.0.0.20

Step 6: Set services to DHCP
pool Name to serverPool 1
Set default Gateway to 20.0.0.20
Start IP address to 20.0.0.2
Subnet mask to 255.0.0.0

Add it.

Step 7:

In Desktop mode of PC3 and PC4 select DHCP and they will automatically get be assigned IP address as 20.0.0.2 and 20.0.0.3

Ping output

PC0

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

Maximum=0ms maximum=1ms, Average=0ms

Observations:

IP address of PC3 and PC4 are also automatically set by the server0. IP address of PC3 to 20.0.0.2 and PC4 to 20.0.0.3

We could successfully ping PC3 from PC0 without any loss.

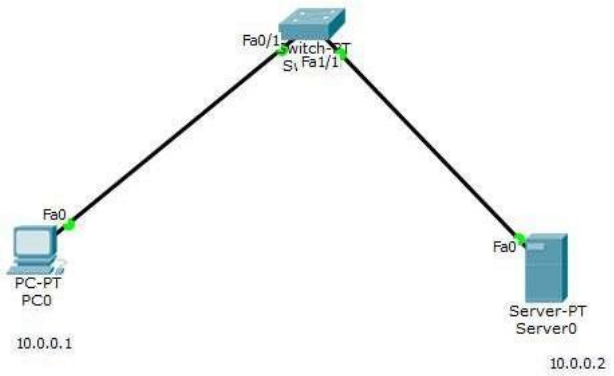
17/2/2023

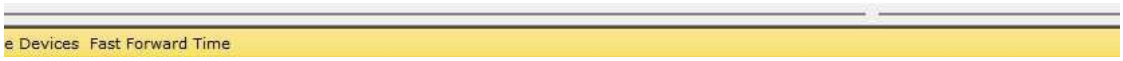
Experiment 5

Q5)Configure Web Server, DNS within a LAN

Aim: To configure Web Server, DNS within a LAN.

Topology:





Output:


Web Browser
X
<
>
URL http://Chinmayi
Go
Stop
CHINMAYI
Chinmayi
USN:1BM21CS045
email:chinmayi.cs21@bmsce.ac.in
CGPA: 9.63
Skills
C, Java, Mern Stack
My image

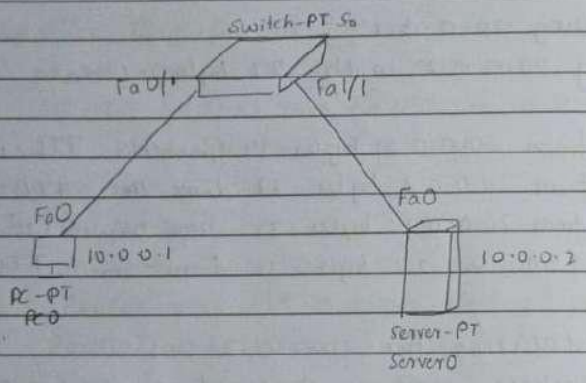

Web Browser
X
<
>
URL http://Chinmayi/image.html
Go
Stop
Image
Chinmayi

Observation:

6. Configure Web server, DNS within a LAN.

Aim: To configure a web server using DNS within a LAN

Topology



Procedure

Step1: Place a ~~switch~~ PC and server as end devices in the workspace

Step2: Select switch-PT as connecting device.

Step3: Connect switch to PC and server using copper straight through wire

Step4: Set IP address of PC0 as 10.0.0.1 and set subnet mask.

Step5: Set IP address of server as 10.0.0.2 and set subnet mask

Step6: In PC0 goto webbrowser in desktop mode. In the URL space write 10.0.0.2 and click on go. We can see the pre written web page on the screen.

Step 7: Go to server and make sure HTTP is on
Step 8: edit the html files in File manager to create a CV.

To add image click on ~~new~~ import and import the image. Now it can be displayed using suitable html tags.

Step 9: Go to DNS in services of server and on the DNS services.

In Name section set the domain name as desired. here Chimayi is set, and enter 10.0.0.2 in Address section and click on Add button.

Step 10: Go to web browser in PC, the domain name can be used to open the webpage instead of ip address.

Output:

The webpage in the server can be seen in PC.

Observation

DNS is used to give domain name to the website in the server. This ~~to~~ website can be accessed in PC using the domain name.

25/7/2023

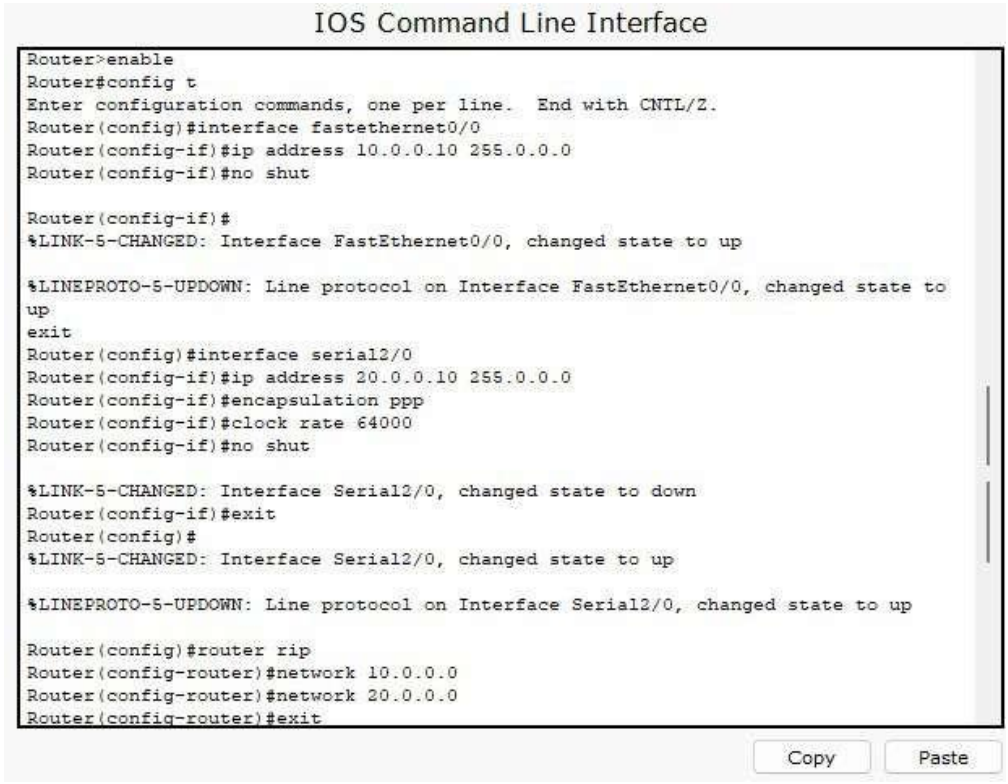
Experiment 6

Q6)Configure RIP routing Protocol in Routers

Aim: To configure RIP routing Protocol in Routers

Topology:

Procedure:



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

Gateway of last resort is 20.0.0.20 to network 0.0.0.0

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, 00:00:06, Serial2/0
R    40.0.0.0/8 [120/2] via 20.0.0.20, 00:00:06, Serial2/0
R*   0.0.0.0/0 [120/1] via 20.0.0.20, 00:00:06, Serial2/0
Router#
```

Copy Paste

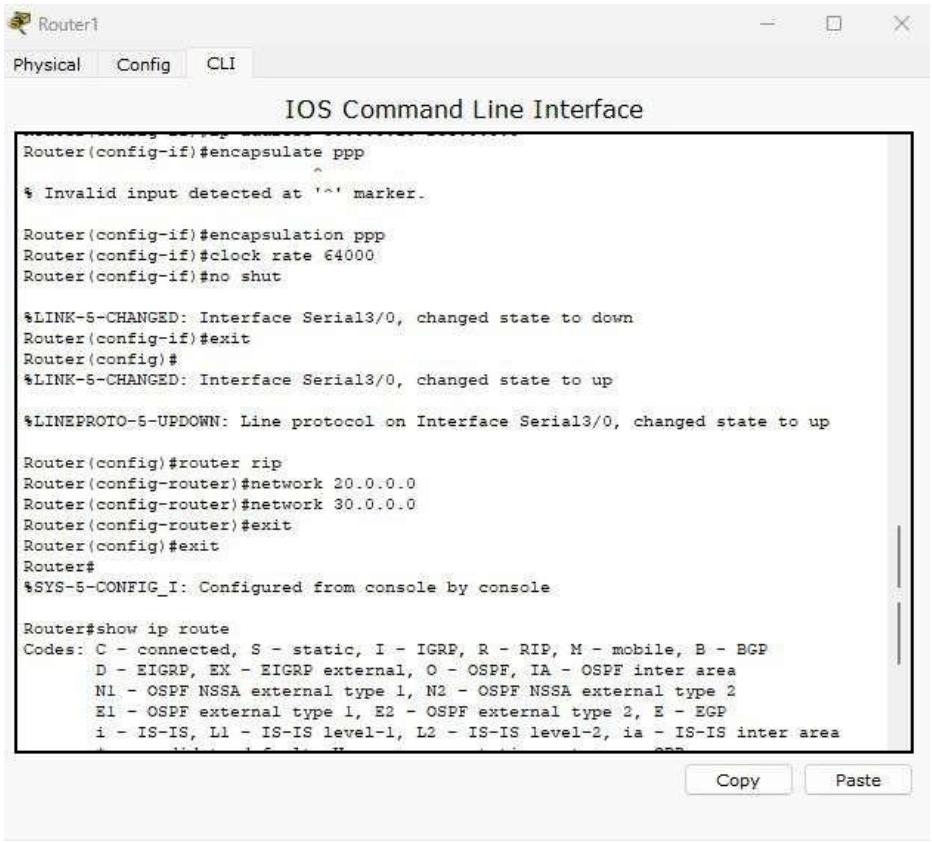
Router1

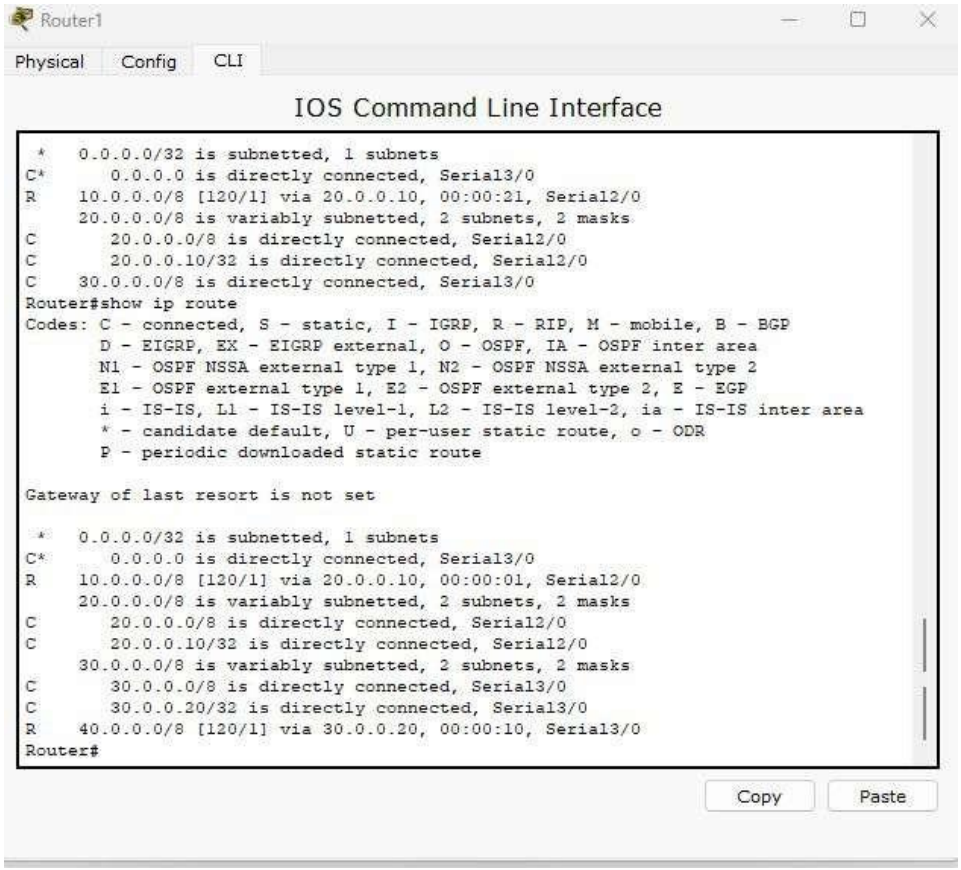
Physical Config CLI

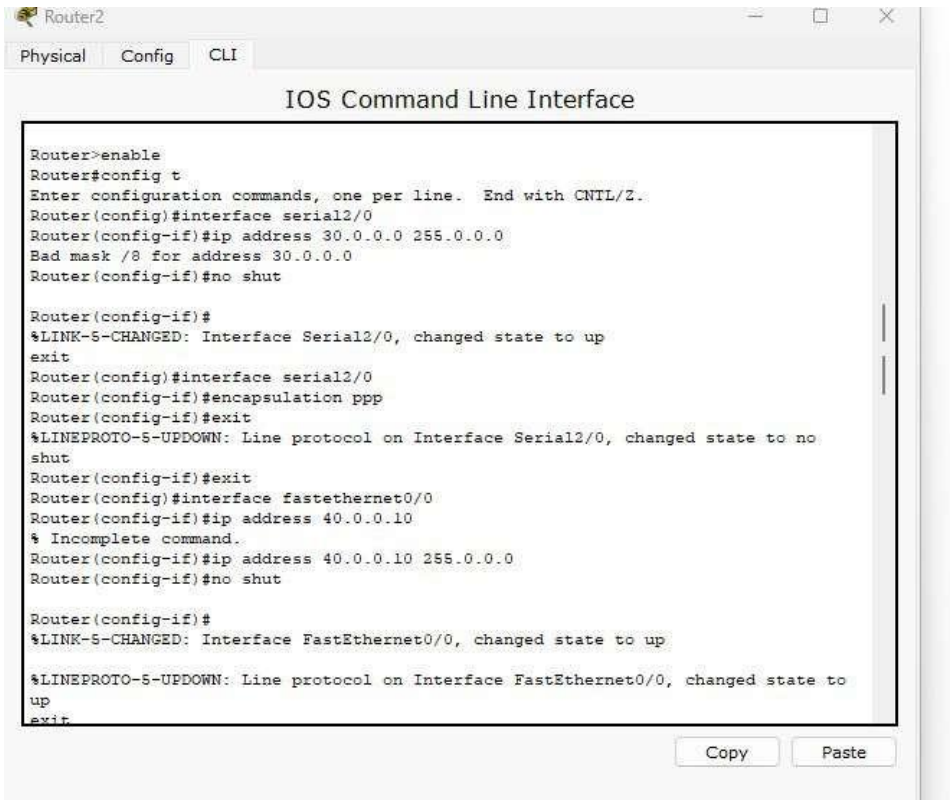
IOS Command Line Interface

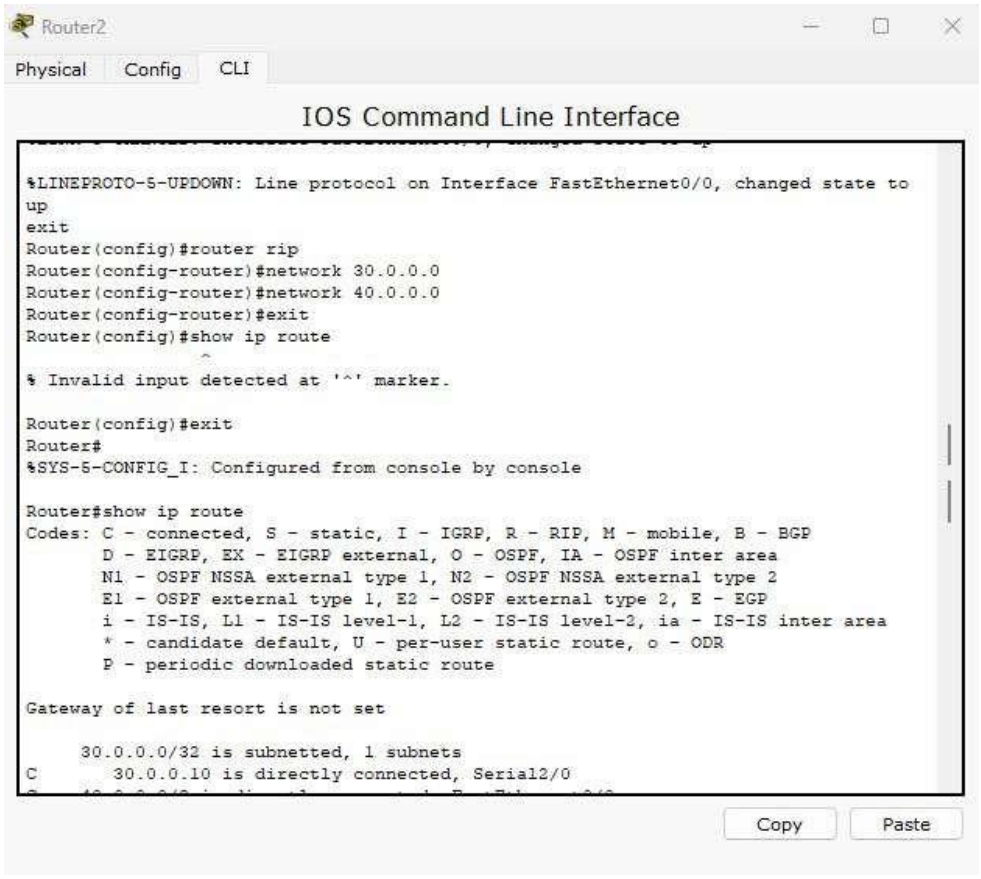
```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.20
% Incomplete command.
Router(config-if)#ip address 20.0.0.20 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut

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

Router(config-if)#interface serial3/0
Router(config-if)#ip address 30.0.0.10
% Incomplete command.
Router(config-if)#ip address 30.0.0.10 255.0.0.0
Router(config-if)#encapsulate ppp
                             ^
% Invalid input detected at '^' marker.

Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shut
```

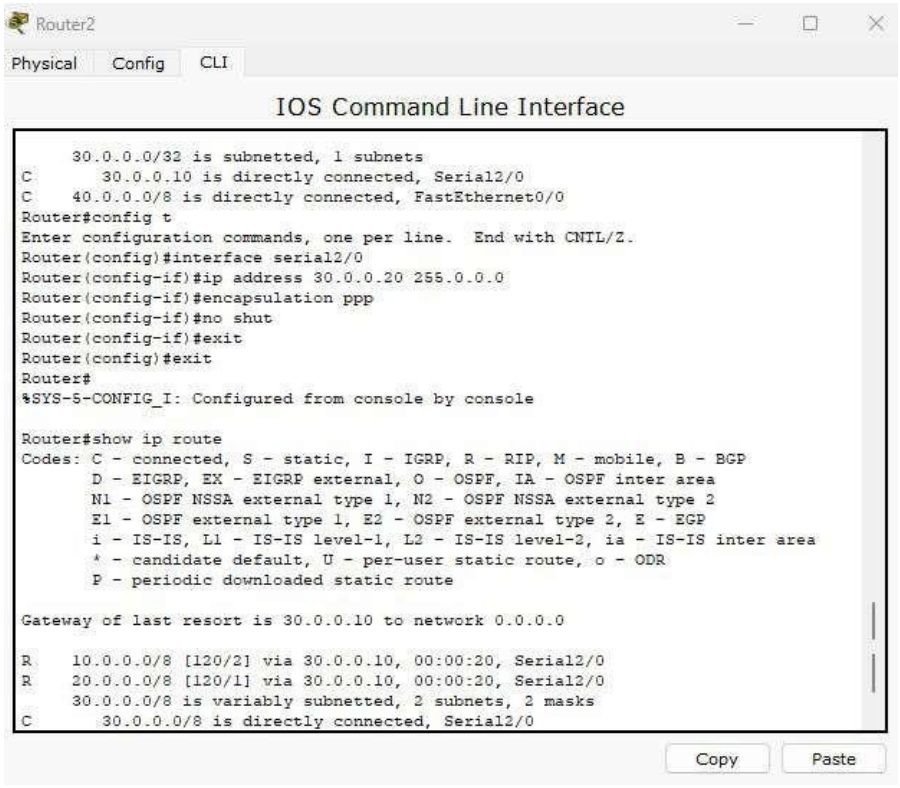
Copy Paste


Router1
Physical
Config
CLI
IOS Command Line Interface
Router(config-if)#encapsulate ppp
^
% Invalid input detected at '^' marker.
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)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
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
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
Copy
Paste

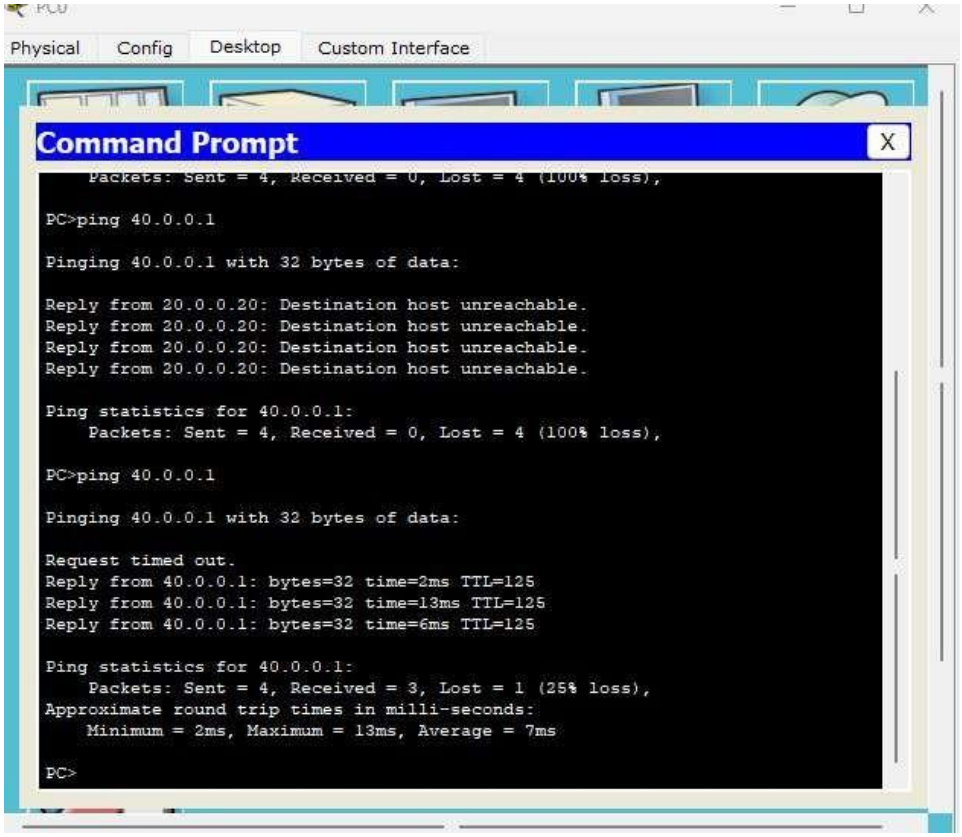

Router1
Physical
Config
CLI
IOS Command Line Interface
* 0.0.0.0/32 is subnetted, 1 subnets
C* 0.0.0.0 is directly connected, Serial3/0
R 10.0.0.0/8 [120/1] via 20.0.0.10, 00:00:21, Serial2/0
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial2/0
C 20.0.0.10/32 is directly connected, Serial2/0
C 30.0.0.0/8 is directly connected, Serial3/0
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
* 0.0.0.0/32 is subnetted, 1 subnets
C* 0.0.0.0 is directly connected, Serial3/0
R 10.0.0.0/8 [120/1] via 20.0.0.10, 00:00:01, 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, 00:00:10, Serial3/0
Router#
Copy
Paste

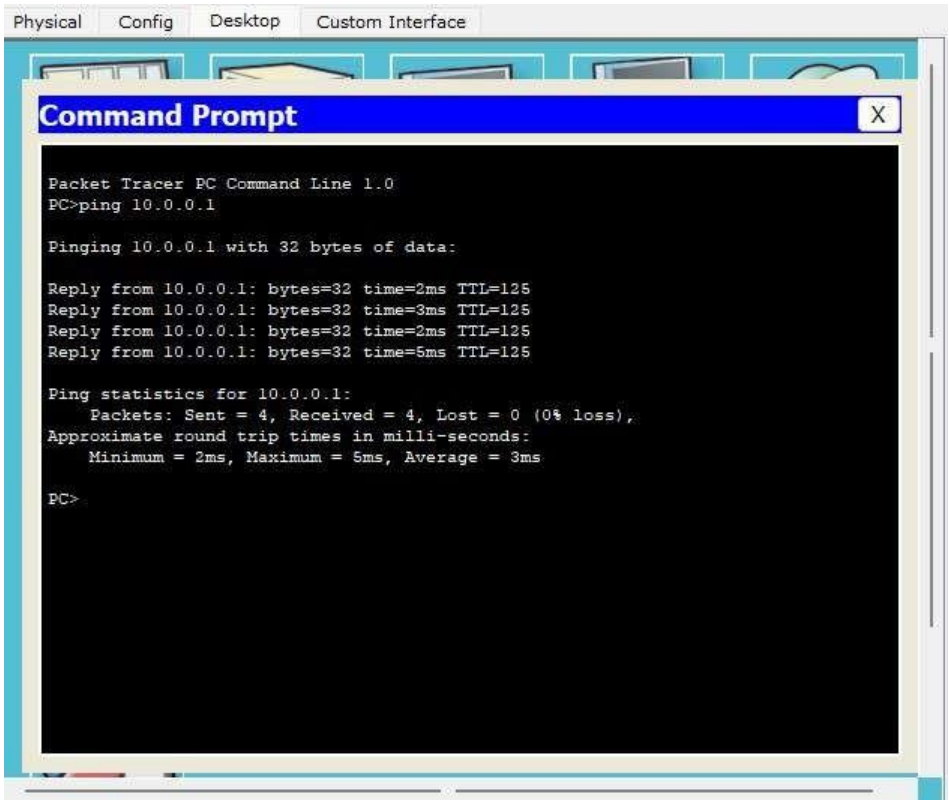

Router2
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 30.0.0.0 255.0.0.0
Bad mask /8 for address 30.0.0.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
exit
Router(config)#interface serial2/0
Router(config-if)#encapsulation ppp
Router(config-if)#exit
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to no
shut
Router(config-if)#exit
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 40.0.0.10
% Incomplete command.
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
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
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)#show ip route
% Invalid input detected at '^' marker.
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
30.0.0.0/32 is subnetted, 1 subnets
C 30.0.0.10 is directly connected, Serial2/0
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
30.0.0.0/32 is subnetted, 1 subnets
C 30.0.0.10 is directly connected, Serial2/0
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)#interface serial2/0
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)#exit
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 30.0.0.10 to network 0.0.0.0
R 10.0.0.0/8 [120/2] via 30.0.0.10, 00:00:20, Serial2/0
R 20.0.0.0/8 [120/1] via 30.0.0.10, 00:00:20, 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
Copy
Paste

Output:


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
PC>ping 40.0.0.1
Pinging 40.0.0.1 with 32 bytes of data:
Reply from 20.0.0.20: Destination host unreachable.
Reply from 20.0.0.20: Destination host unreachable.
Reply from 20.0.0.20: Destination host unreachable.
Reply from 20.0.0.20: Destination host unreachable.
Ping statistics for 40.0.0.1:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
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=13ms TTL=125
Reply from 40.0.0.1: bytes=32 time=6ms 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 = 13ms, Average = 7ms
PC>

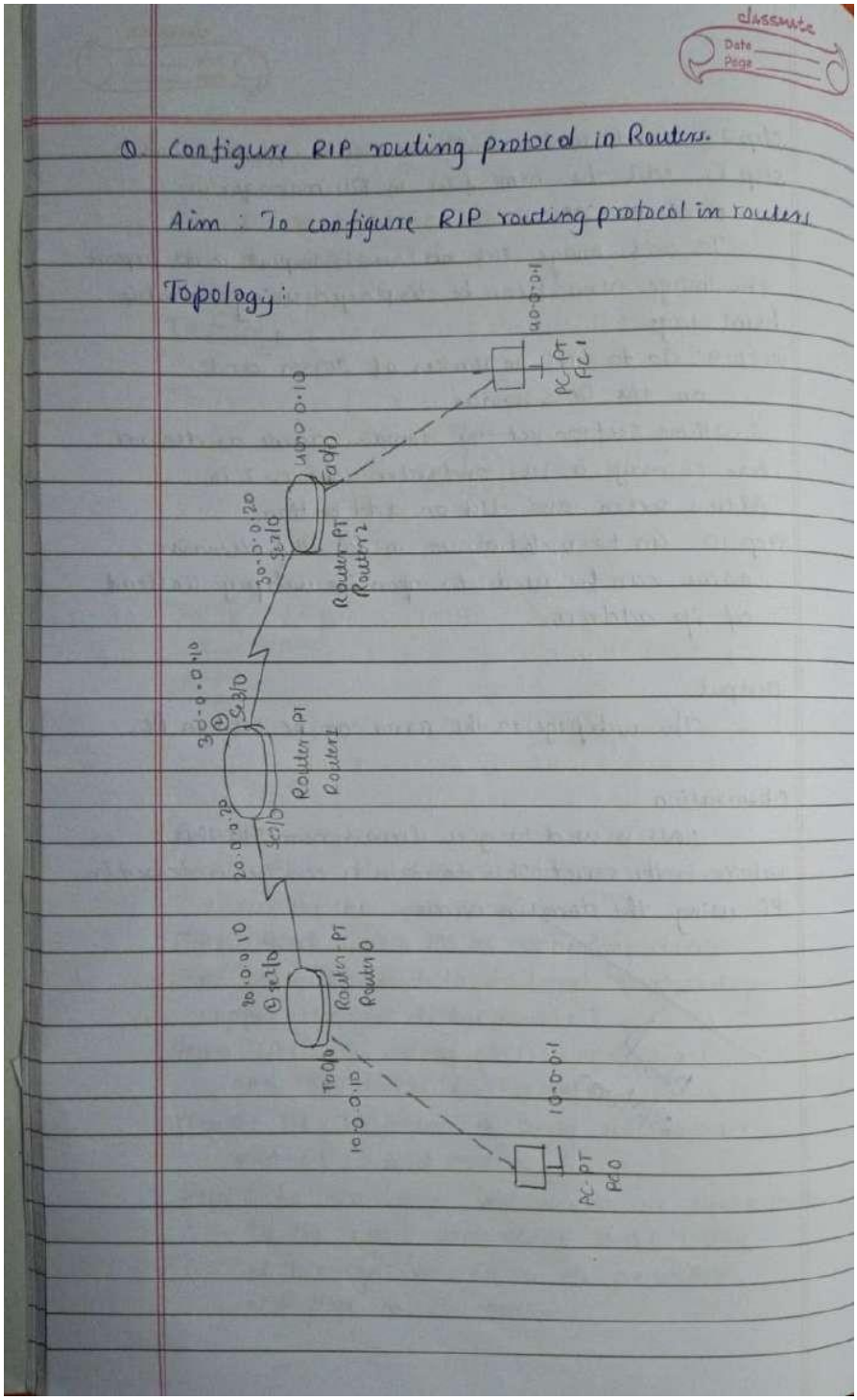


Observation:

Q. Configure RIP routing protocol in Routers.

Aim : To configure RIP routing protocol in routers.

Topology:



Procedure

Step 1: Select 2 PC-PTs as end devices.

Step 2: Select 3 routers as connecting devices.

Step 3: Connect PC0 to Router0 and PC1 to Router2 using copper crossover wire.

Step 4: Connect Router0 to Router1 and Router 1 to Router 2 using Serial DCE wire.

Step 5: Set IP address of PC0 as 10.0.0.1 and PC1 as 40.0.0.1

Step 6: Set gateway of PC0 as 10.0.0.10 and PC1 as 40.0.0.10

Step 7: Go to CLI mode of Router0.

```
Router>enable
Router#config t
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut.
exit
Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut
exit
Router(config)#interface serial2/0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shut
exit
```

NLP
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Step 8: Now go to Router 1 to set IP addresses

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

Step 9: Go to CLI mode of Router2.

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)# encapsulation ppp
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

Step 10: Set RIP routing in Router0

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

Step 11: Set RIP routing in Router1

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

Step 12: Set RIP routing in Router2

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

Step 13: Check the IP routing table

Router0

```
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, 00:00:06, Serial2/0
R    40.0.0.0/8 [120/2] via 20.0.0.20, 00:00:06, Serial2/0
R*   0.0.0.0/0 [120/1] via 20.0.0.20, 00:00:06, Serial2/0
```

Router 1

* 0.0.0.0/32 is subnetted, 1 subnets
C* 0.0.0.0 is directly connected, Serial 3/0
R 10.0.0.0/8 [120/1] via 20.0.0.10, 00:00:01, Serial2/0
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, serial 2/0
C 20.0.0.10/32 is directly connected, Serial 2/0
30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 30.0.0.0/8 is directly connected, serial 3/0
C 30.0.0.20/8 is directly connected, Serial3/0
R 40.0.0.0/8 [120/1] via 30.0.0.20, 00:00:10, Serial 3/0

Router 2

Router# show ip route
R 10.0.0.0/8 [120/2] via 30.0.0.10, 00:00:20, Serial2/0
R 20.0.0.0/8 [120/1] via 30.0.0.10, 00:00:20, 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 30.0.0.0/32 is directly connected, Serial2/0
C 40.0.0.0/8 is directly connected, FastEthernet0/0
R* 0.0.0.0/0 [120/1] via 30.0.0.10, 00:00:20, Serial2/0

Ping out

Pinging 40.0.0.1 from 10.0.0.1

~~ping~~ 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=7ms TTL=125
Reply from 40.0.0.1: bytes=32 time=7ms TTL=125
Reply from 40.0.0.1: bytes=32 time=25ms 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 = 25ms, Average = 11ms
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 = 12ms TTL = 125
Reply from 40.0.0.1: bytes = 32 time = 9ms TTL = 125
Reply from 40.0.0.1: bytes = 32 time = 22ms TTL = 125
Reply from 40.0.0.1: bytes = 32 time = 19ms 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 = 9ms, Maximum = 22ms, Average = 15ms

Observation.

RIP is a dynamic routing protocol that uses hop count as a routing metric to find the best path between source and destination. It is a distance-vector routing protocol.

Here for the first time request is timed out Next the packet is transferred according to RIP protocol.

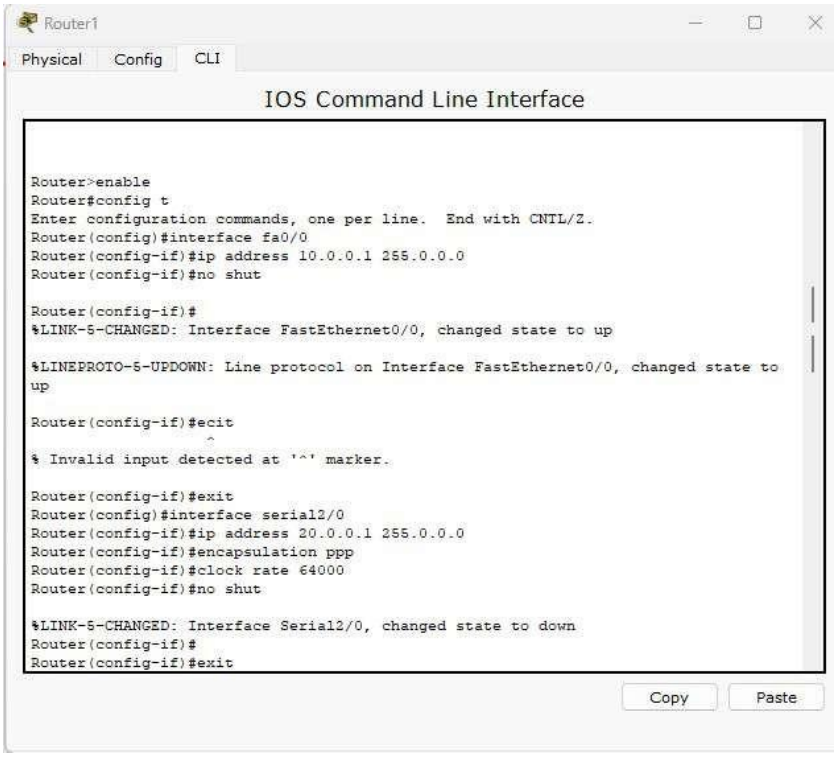
Experiment 7

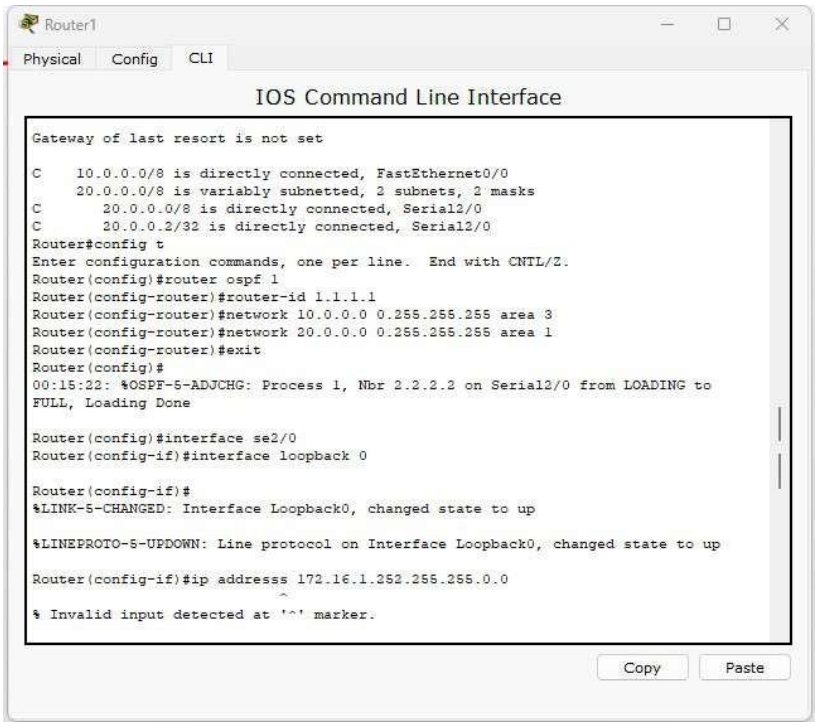
Q7) Configure OSPF routing protocol.

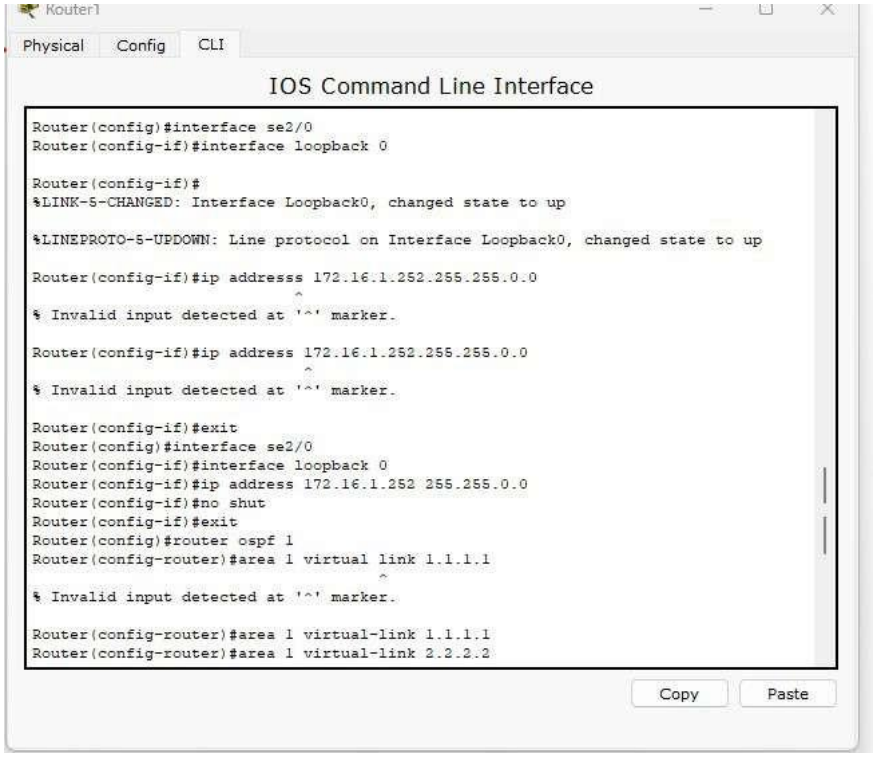
Aim: To configure OSPF routing protocol.

Topology:

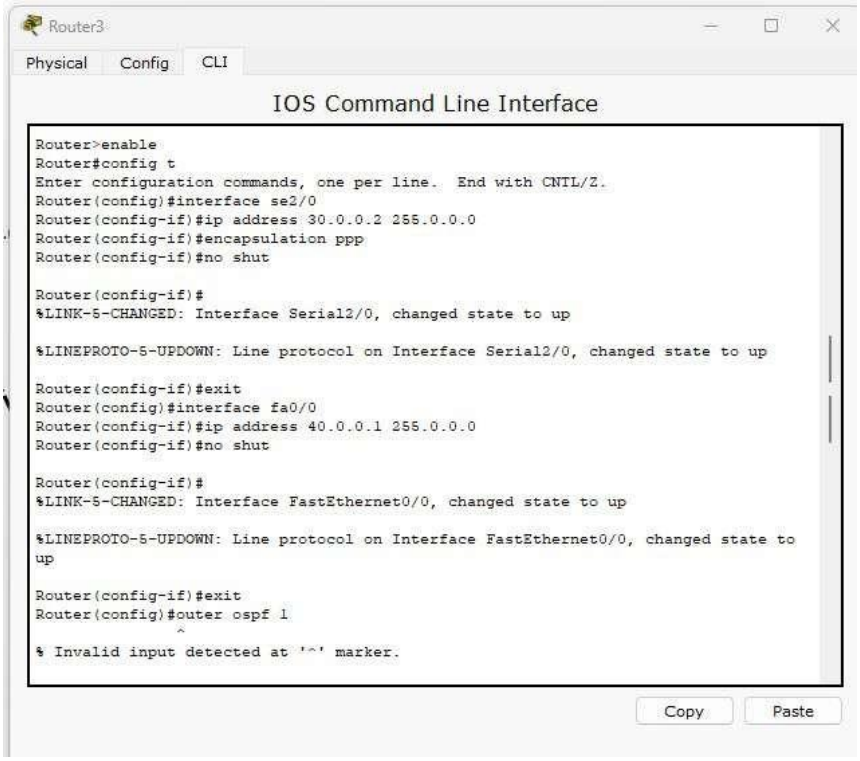
Procedure:

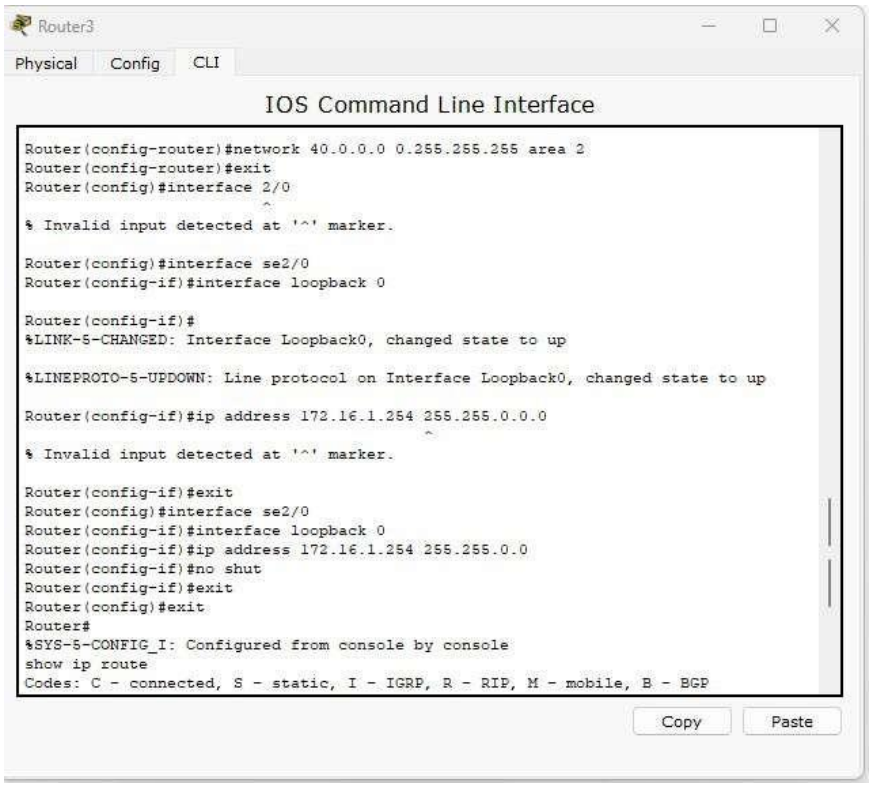

Router1
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#ecit
^
% Invalid input detected at '^' marker.
Router(config-if)#exit
Router(config)#interface serial2/0
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 shut
%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#
Router(config-if)#exit
Copy
Paste

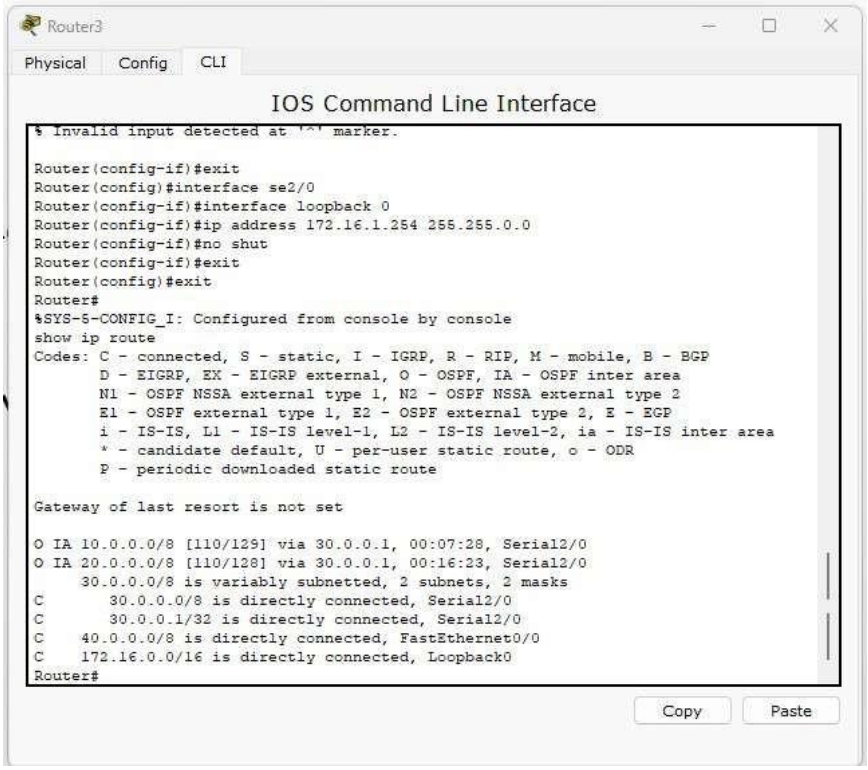

Router1
Physical
Config
CLI
IOS Command Line Interface
Gateway of last resort is not set
C 10.0.0.0/8 is directly connected, FastEthernet0/0
20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C 20.0.0.0/8 is directly connected, Serial2/0
C 20.0.0.2/32 is directly connected, Serial2/0
Router#config 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)#exit
Router(config)#
00:15:22: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading Done
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 addresss 172.16.1.252.255.255.0.0
^
% Invalid input detected at '^' marker.
Copy
Paste

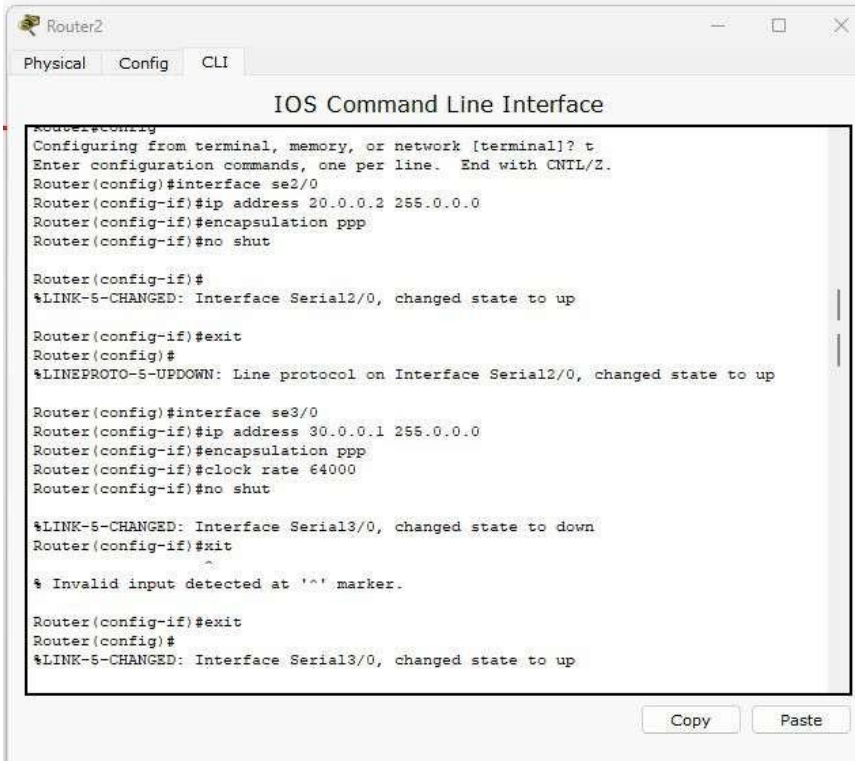

Router1
Physical
Config
CLI
IOS Command Line Interface
Router(config)#interface se2/0
Router(config-if)#interface loopback 0
Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
Router(config-if)#ip addresss 172.16.1.252.255.255.0.0
% Invalid input detected at '^' marker.
Router(config-if)#ip address 172.16.1.252.255.255.0.0
% Invalid input detected at '^' marker.
Router(config-if)#exit
Router(config)#interface se2/0
Router(config-if)#interface loopback 0
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 1.1.1.1
% Invalid input detected at '^' marker.
Router(config-router)#area 1 virtual-link 1.1.1.1
Router(config-router)#area 1 virtual-link 2.2.2.2
Copy
Paste

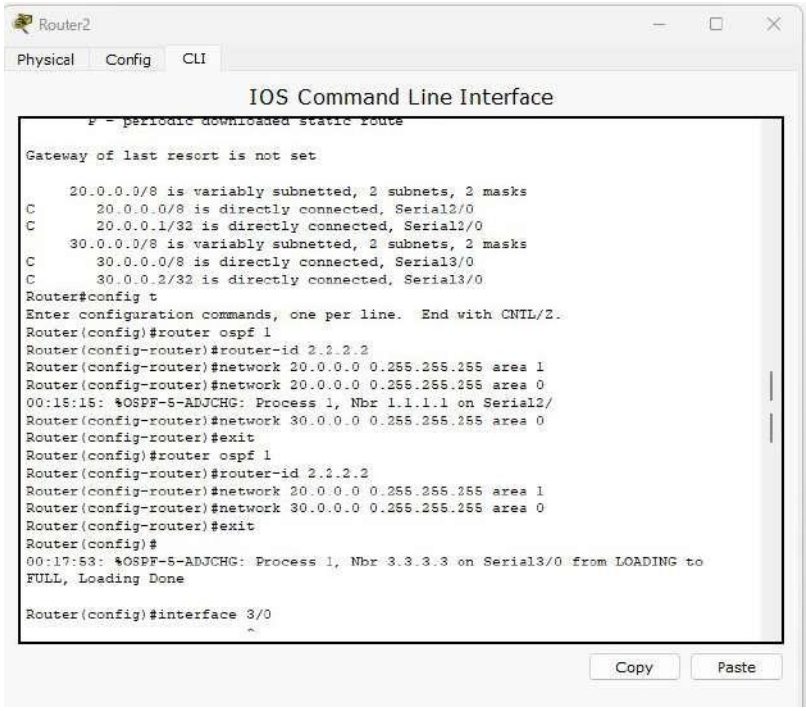

Physical
Config
CLI
IOS Command Line Interface
Router(config)#router ospf 1
Router(config-router)#area 1 virtual-link 2.2.2.2
Router(config-router)#exit
Router(config)#
00:26:54: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on OSPF_VL1 from LOADING to FULL,
Loading Done
Router(config)#exit
Router#
%SYS-5-CONFIG_I: 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 20.0.0.2/32 is directly connected, Serial2/0
O 30.0.0.0/8 [110/128] via 20.0.0.2, 00:03:03, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:03:03, Serial2/0
C 172.16.0.0/16 is directly connected, Loopback0
Router#
Copy
Paste

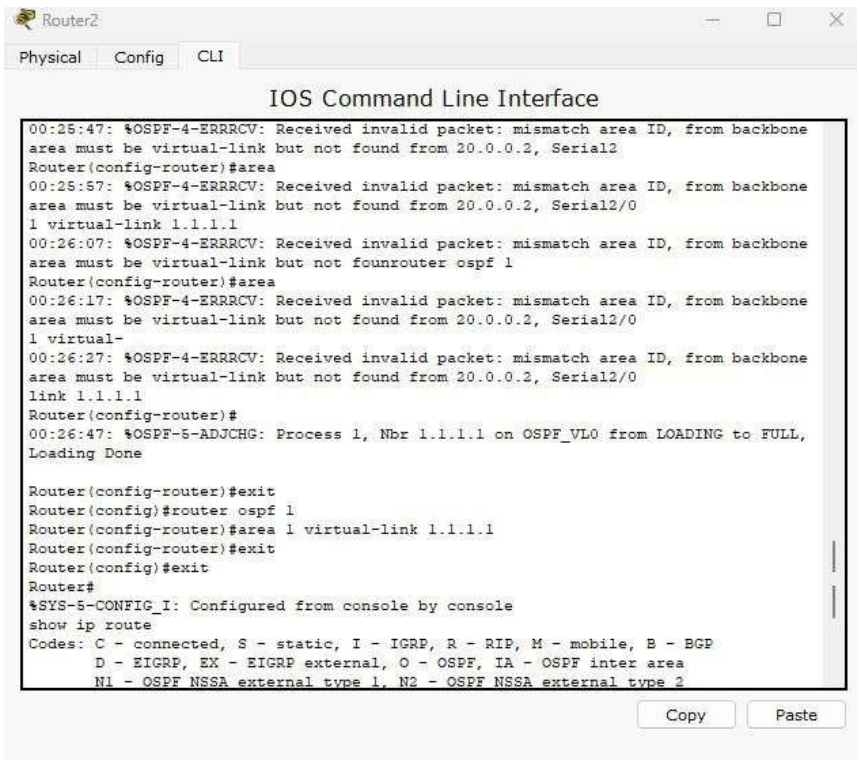

Router3
Physical
Config
CLI
IOS Command Line Interface
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface se2/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
Router(config-if)#exit
Router(config)#interface fa0/0
Router(config-if)#ip address 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
Router(config-if)#exit
Router(config)#outer ospf 1
% Invalid input detected at '^' marker.
Copy
Paste

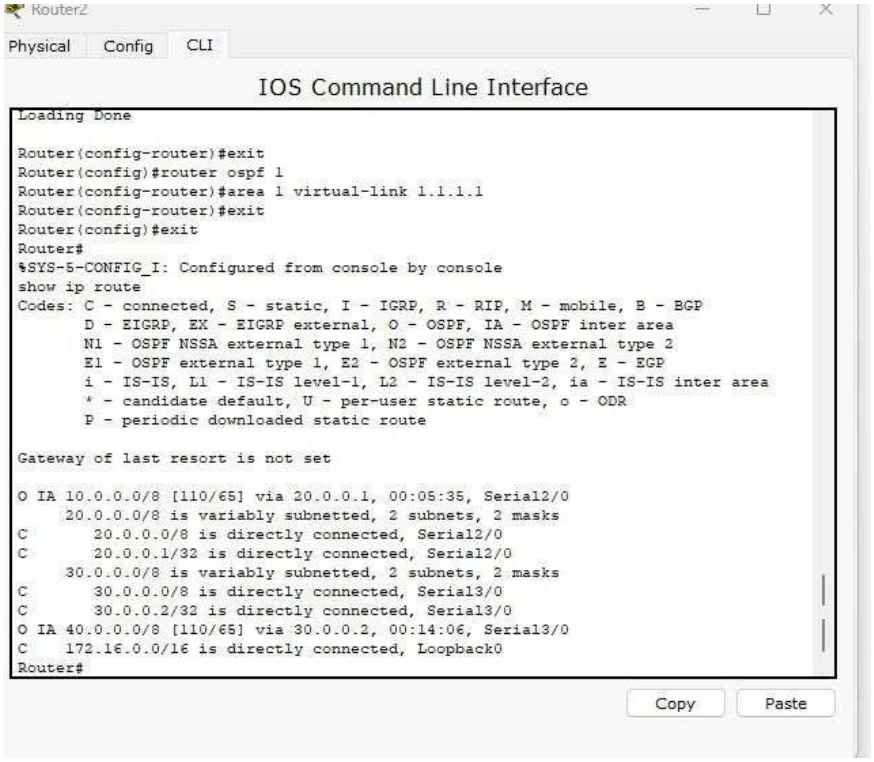

Router3
Physical
Config
CLI
IOS Command Line Interface
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#interface 2/0
% Invalid input detected at '^' marker.
Router(config)#interface se2/0
Router(config-if)#interface loopback 0
Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
Router(config-if)#ip address 172.16.1.254 255.255.0.0.0
% Invalid input detected at '^' marker.
Router(config-if)#exit
Router(config)#interface se2/0
Router(config-if)#interface loopback 0
Router(config-if)#ip address 172.16.1.254 255.255.0.0
Router(config-if)#no shut
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
Copy
Paste


Router3
Physical
Config
CLI
IOS Command Line Interface
% Invalid input detected at '^' marker.
Router(config-if)#exit
Router(config)#interface se2/0
Router(config-if)#interface loopback 0
Router(config-if)#ip address 172.16.1.254 255.255.0.0
Router(config-if)#no shut
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
O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:07:28, Serial2/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:16:23, 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#
Copy
Paste

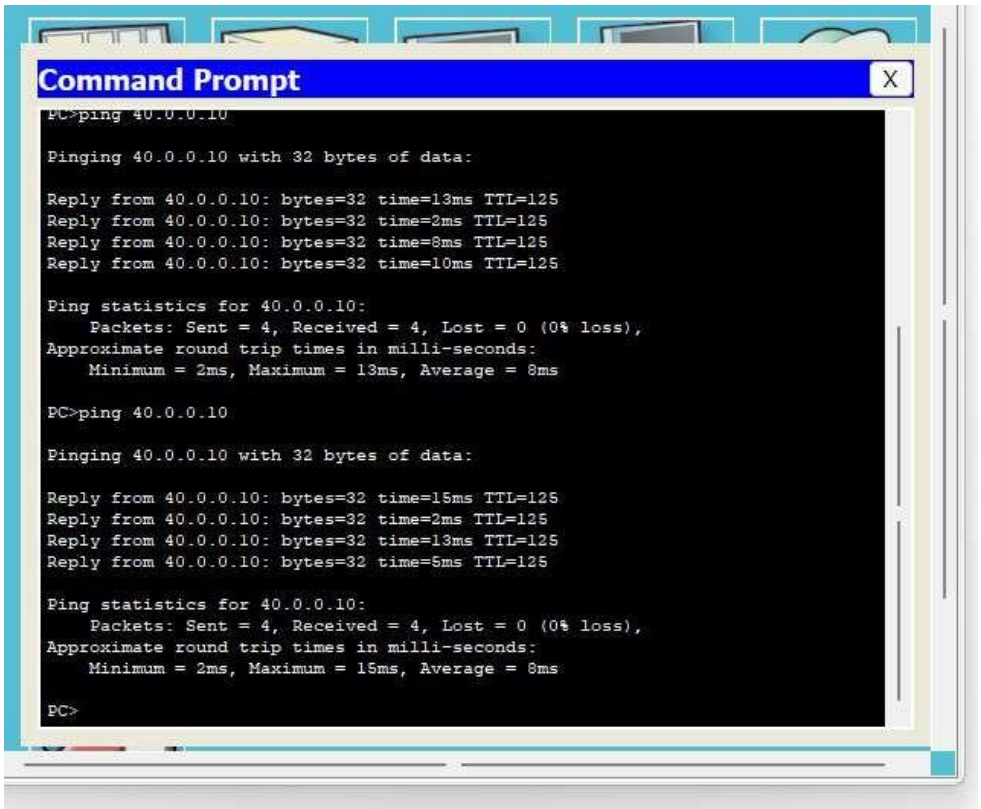

Router2
Physical
Config
CLI
IOS Command Line Interface
Configuring from terminal, memory, or network [terminal]? t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface se2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
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 shut
%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#xit
% Invalid input detected at '^' marker.
Router(config-if)#exit
Router(config)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
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
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 20.0.0.0 0.255.255.255 area 0
00:15:15: %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)#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)#exit
Router(config)#
00:17:53: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial3/0 from LOADING to FULL, Loading Done
Router(config)#interface 3/0
^
Copy
Paste

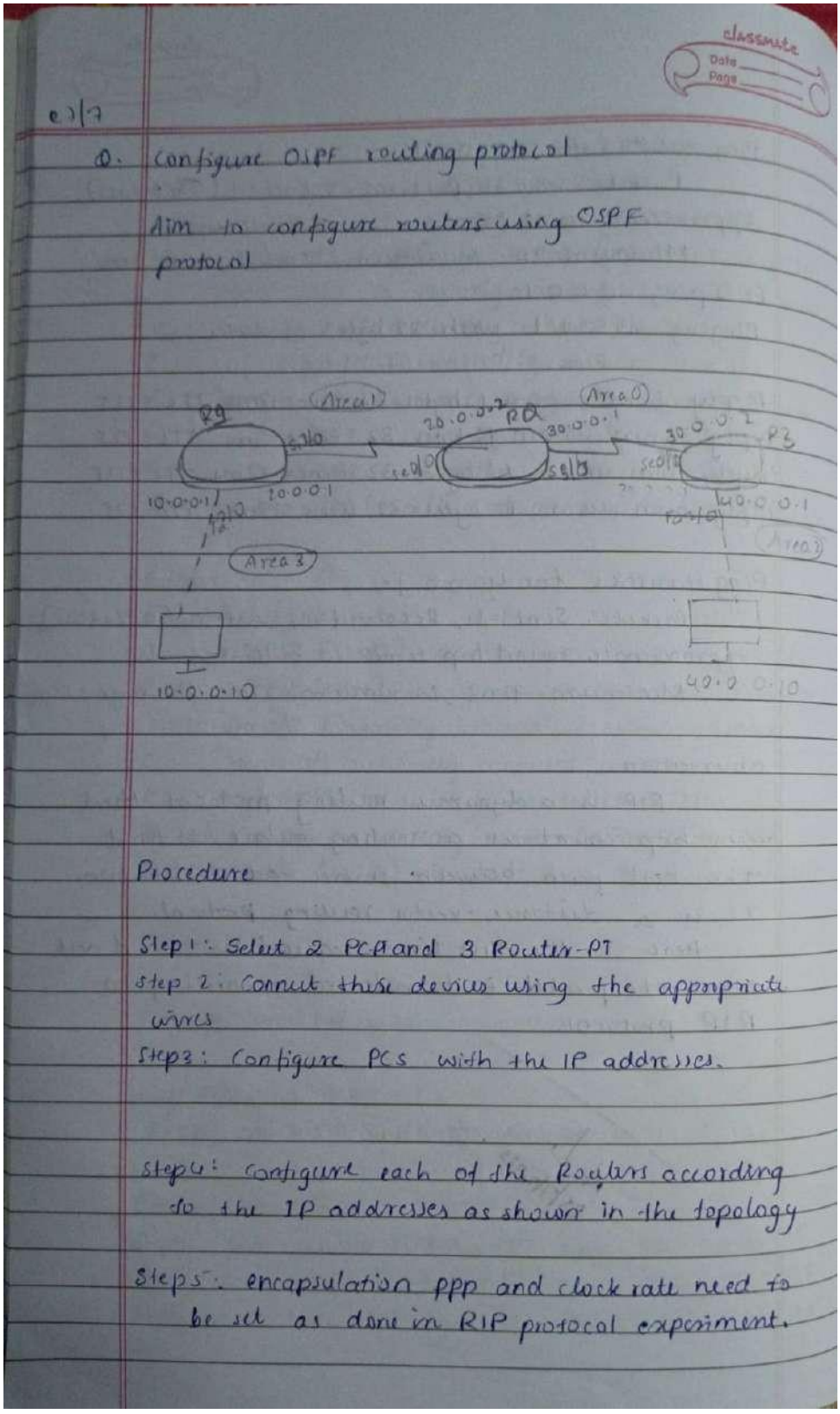

Router2
Physical
Config
CLI
IOS Command Line Interface
00:25:47: %OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not found from 20.0.0.2, Serial2
Router(config-router)#area
00:25:57: %OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not found from 20.0.0.2, Serial2/0
1 virtual-link 1.1.1.1
00:26:07: %OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not founrouter ospf 1
Router(config-router)#area
00:26:17: %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 virtual-
00:26:27: %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
link 1.1.1.1
Router(config-router)#
00:26:47: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on OSPF_VL0 from LOADING to FULL, Loading Done
Router(config-router)#exit
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
Copy
Paste


Router2
Physical
Config
CLI
IOS Command Line Interface
Loading Done
Router(config-router)#exit
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, 00:05:35, 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, 00:14:06, Serial3/0
C 172.16.0.0/16 is directly connected, Loopback0
Router#
Copy
Paste

Output:


Command Prompt
X
PC>ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
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=8ms 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 = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 2ms, Maximum = 13ms, Average = 8ms
PC>ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
Reply from 40.0.0.10: bytes=32 time=15ms TTL=125
Reply from 40.0.0.10: bytes=32 time=2ms TTL=125
Reply from 40.0.0.10: bytes=32 time=13ms TTL=125
Reply from 40.0.0.10: bytes=32 time=5ms 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 = 2ms, Maximum = 15ms, Average = 8ms
PC>

Observation:



Step 6: Enable ip routing by configuring ospf routing in 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
R1(config-router)# 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
```

Step 7: Loop back

In R1

```
R1(config)# interface se1/0
R1(config-if)# interface loopback 0
R1(config-if)# ip address 172.16.1.252 255.255.0.0
R1(config-if)# no shutdown
```

In R2

```
R2(config)# interface se2/0
```

R2(config-if)# interface loopback 0
R2(config-if)#ip address 172.16.1.253 255.255.0.0
R2(config-if)# no shut

In R3
R3(config)#interface se
R3(config-if)# interface loopback 0
R3(config-if)#ip address 172.16.254 255.255.0.0
R3(config-if)# no shut.

Step 8: Create virtual link b/w routers R1&R2 (R1-R2)
In Router R1,
R1(config)# router ospf 1
R1(config-router)# area1 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

Output

ping > 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:

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 = 8ms 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 = 4, Lost = 0 (0% loss)

Approximate round trip in milli-seconds:

Minimum = 2ms, Maximum = 13ms, Average = 8ms

Observation

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

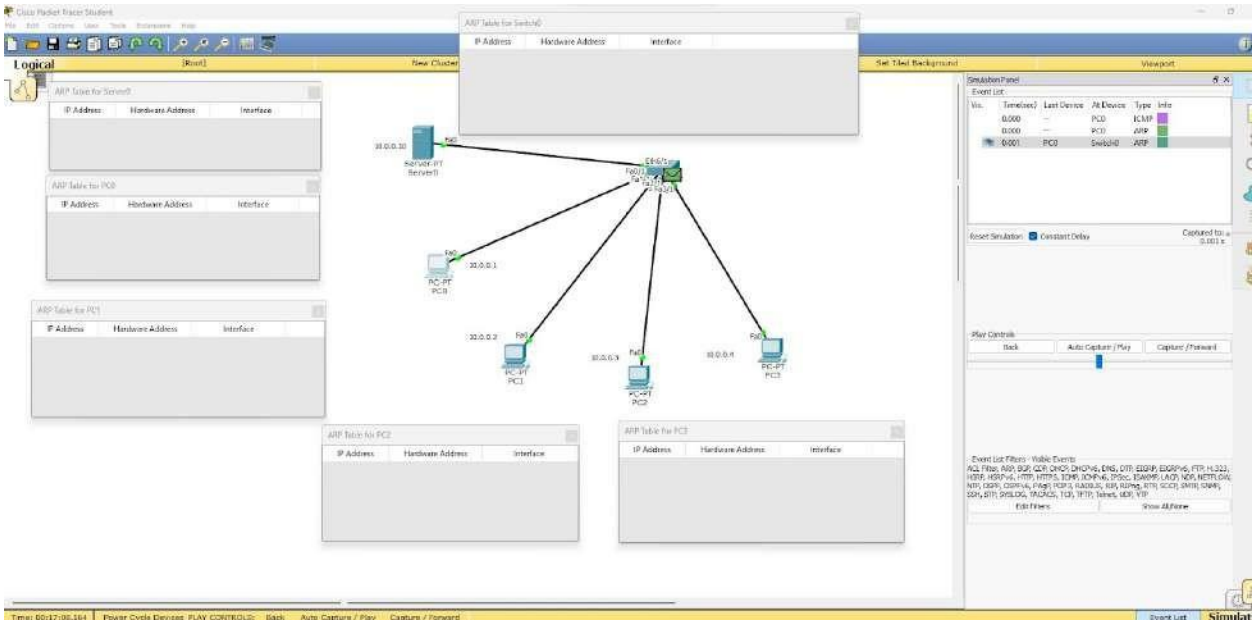
1/8/2023

Experiment 8

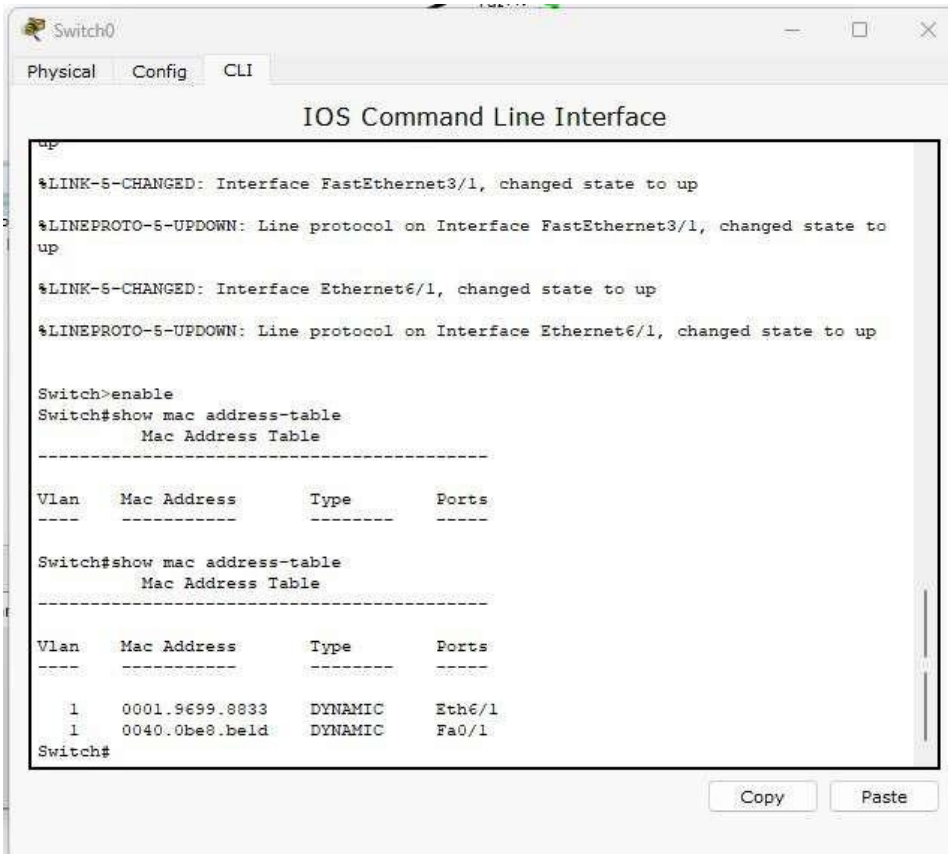
Q8) To construct simple LAN and understand the concept and operation of Address Resolution Protocol(ARP).

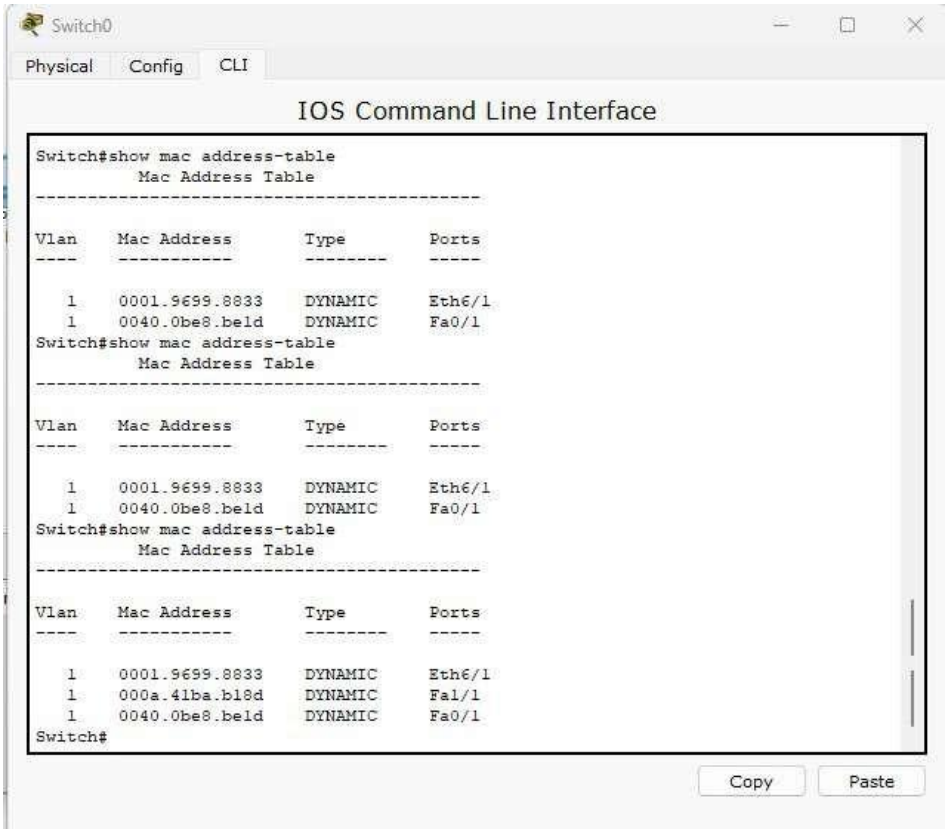
Aim: To construct simple LAN and understand the concept and operation of Address Resolution Protocol(ARP).

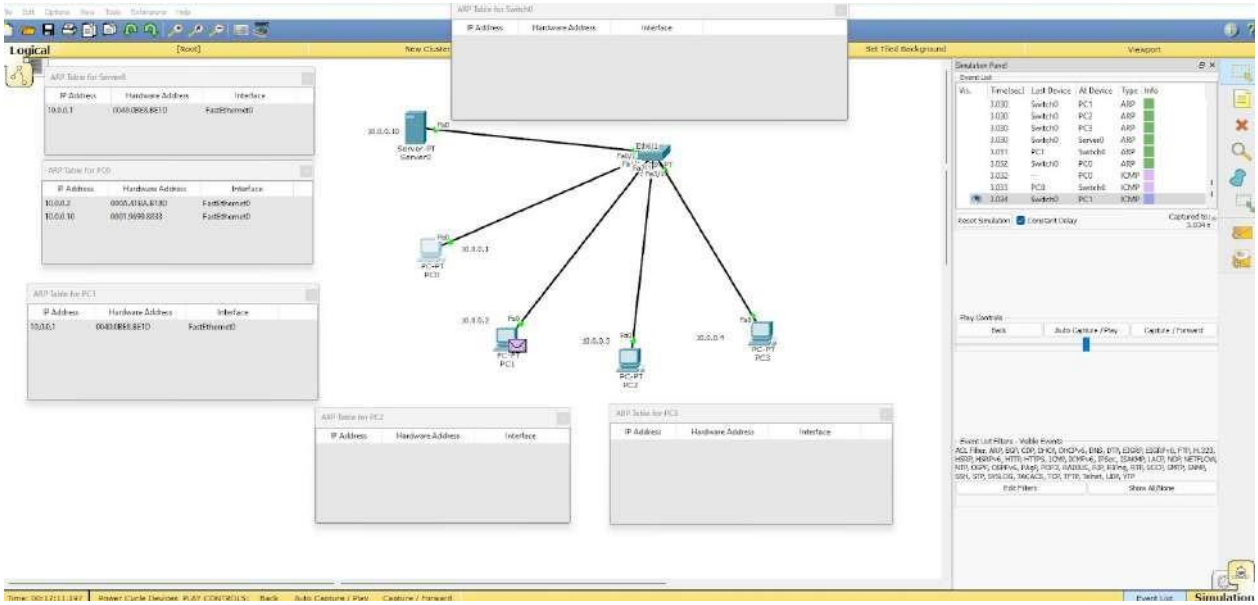
Topology:



Procedure:


Switch0
Physical
Config
CLI
IOS Command Line Interface
%LINK-5-CHANGED: Interface FastEthernet3/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up
%LINK-5-CHANGED: Interface Ethernet6/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet6/1, changed state to up
Switch>enable
Switch#show mac address-table
Mac Address Table
Vlan Mac Address Type Ports
Switch#show mac address-table
Mac Address Table
Vlan Mac Address Type Ports
1 0001.9699.8833 DYNAMIC Eth6/1
1 0040.0be8.be1d DYNAMIC Fa0/1
Switch#
Copy
Paste

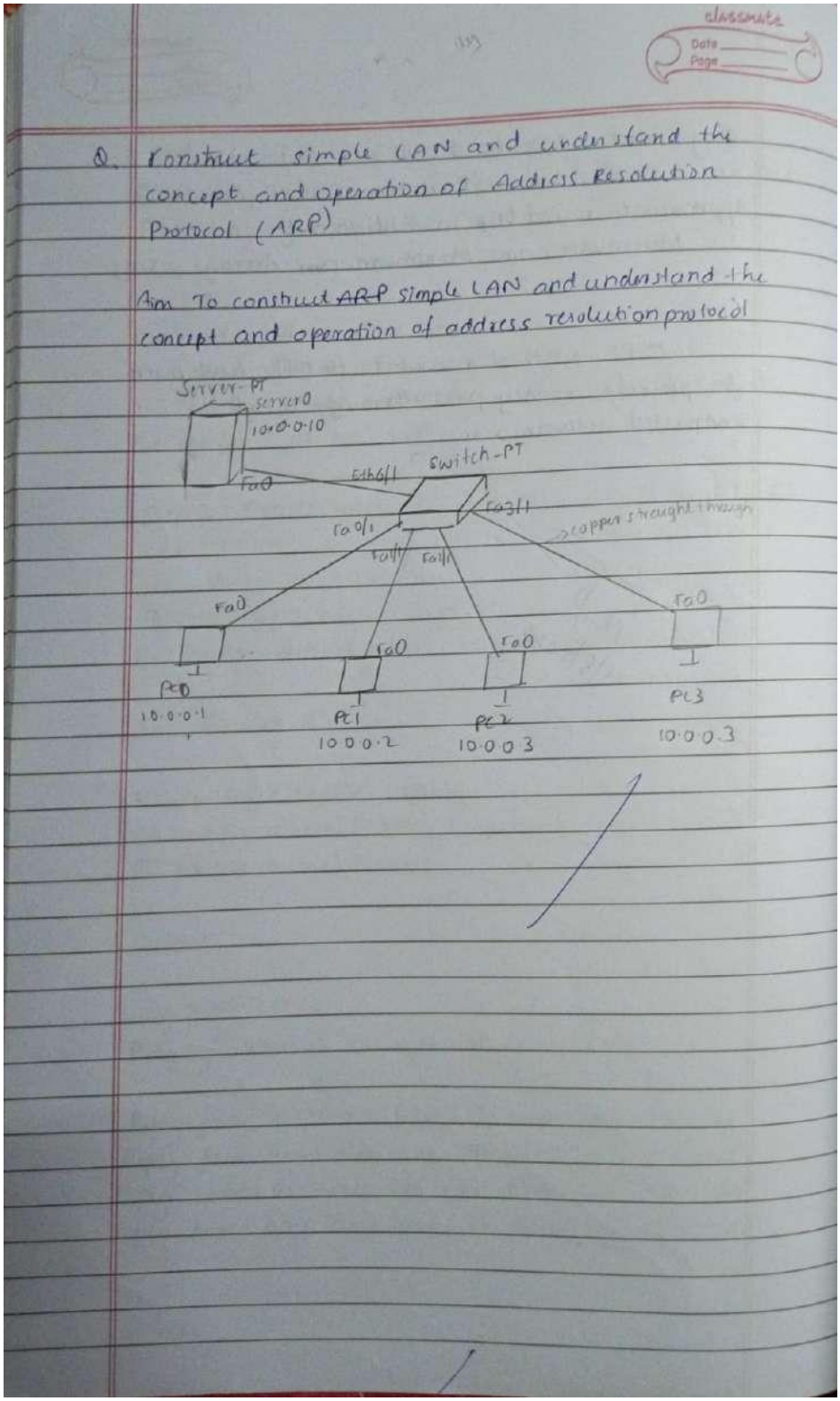

Switch0
Physical
Config
CLI
IOS Command Line Interface
Switch#show mac address-table
Mac Address Table
Vlan Mac Address Type Ports
1 0001.9699.8833 DYNAMIC Eth6/1
1 0040.0be8.be1d DYNAMIC Fa0/1
Switch#show mac address-table
Mac Address Table
Vlan Mac Address Type Ports
1 0001.9699.8833 DYNAMIC Eth6/1
1 0040.0be8.be1d DYNAMIC Fa0/1
Switch#show mac address-table
Mac Address Table
Vlan Mac Address Type Ports
1 0001.9699.8833 DYNAMIC Eth6/1
1 000a.41ba.b18d DYNAMIC Fa1/1
1 0040.0be8.be1d DYNAMIC Fa0/1
Switch#
Copy
Paste



Output:

```
Command Prompt                                                    X

Reply from 10.0.0.2: bytes=32 time=4ms TTL=128
Reply from 10.0.0.2: bytes=32 time=4ms 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 = 4ms, Maximum = 8ms, Average = 5ms

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=8ms TTL=128
Reply from 10.0.0.3: bytes=32 time=4ms TTL=128
Reply from 10.0.0.3: bytes=32 time=4ms TTL=128
Reply from 10.0.0.3: bytes=32 time=4ms 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 = 4ms, Maximum = 8ms, Average = 5ms

PC>arp -a
  Internet Address      Physical Address      Type
  10.0.0.2              000a.41ba.b18d        dynamic
  10.0.0.3              000c.8531.8d70        dynamic
  10.0.0.10             0001.9699.8833        dynamic

PC>
```

Observation:



Step 1: Create a topology of 4 PCs and a server and a switch

Step 2: Set IP address to all devices as shown in the topology.

Step 3: Use inspect tool to click on devices to see ARP table

Step 4: in command prompt of PC0 etc write arp -a to see that arp table.

O/P) No ARP entries Found.

Step 5: In CLI of switch

switch > enable

switch# show mac address table.

Mac Address table is empty.

Step 6: Go to simulation mode

ping the server from PC0.

Use capture button in simulation ~~mode~~ panel to go step by step changes in ARP. ~~to be~~

PC0 > ping 10.0.0.10

~~Ping out put~~ ping > 10

Observation: In the first turn the packet is broad casted by the switch. It is accepted only by server and rejected by others.

Then the acknowledgement is sent only to PC0.

Now the switch has learnt.

Ping output

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 = 4ms 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 = 1ms, Maximum = 8ms, Average = 5ms

R) arp -a

Internet Address	Physical address	Type
10.0.0.10	000a.41bc.b18d	dynamic

Observation

We can see mac address table of switch in CLI

We can observe that ARP request is broadcast

Later ICMP packets are sent.

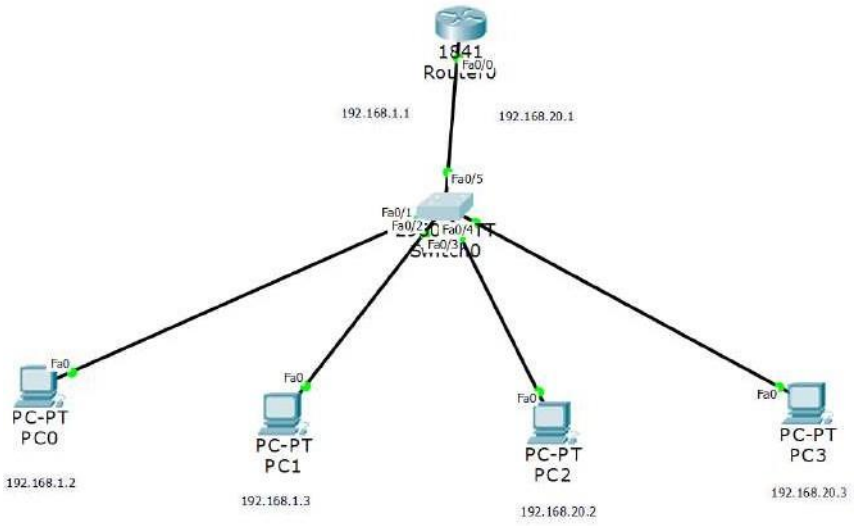
NLP
31/8/2023

Experiment 9

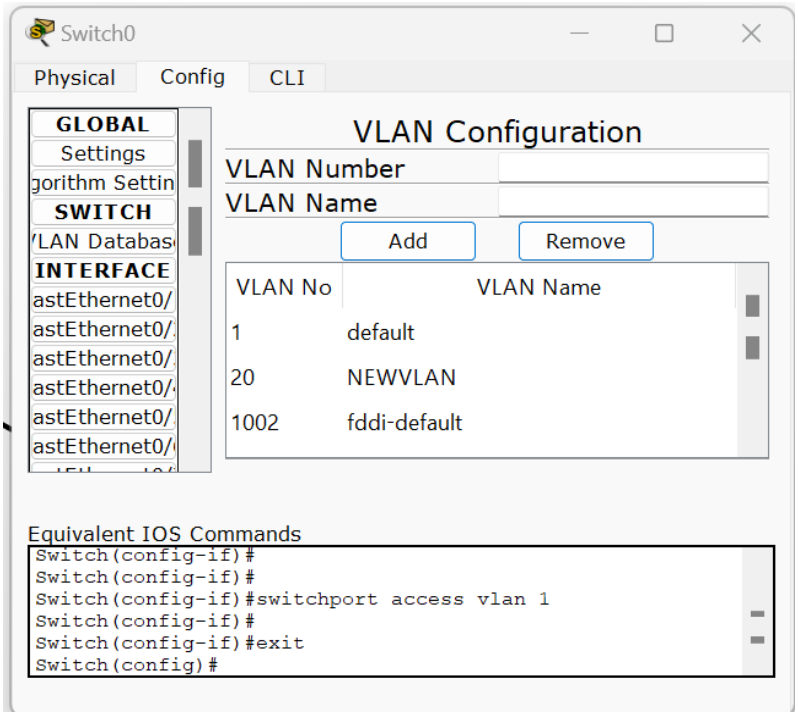
Q9)To construct a VLAN and make the PC's communicate among a VLAN

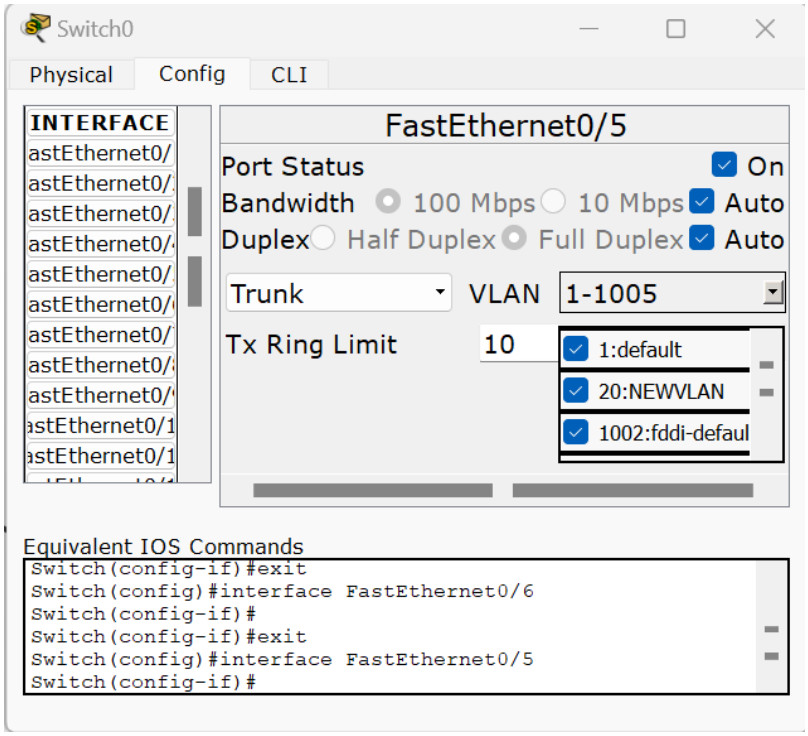
Aim: To construct a VLAN and make the PC's communicate among a VLAN

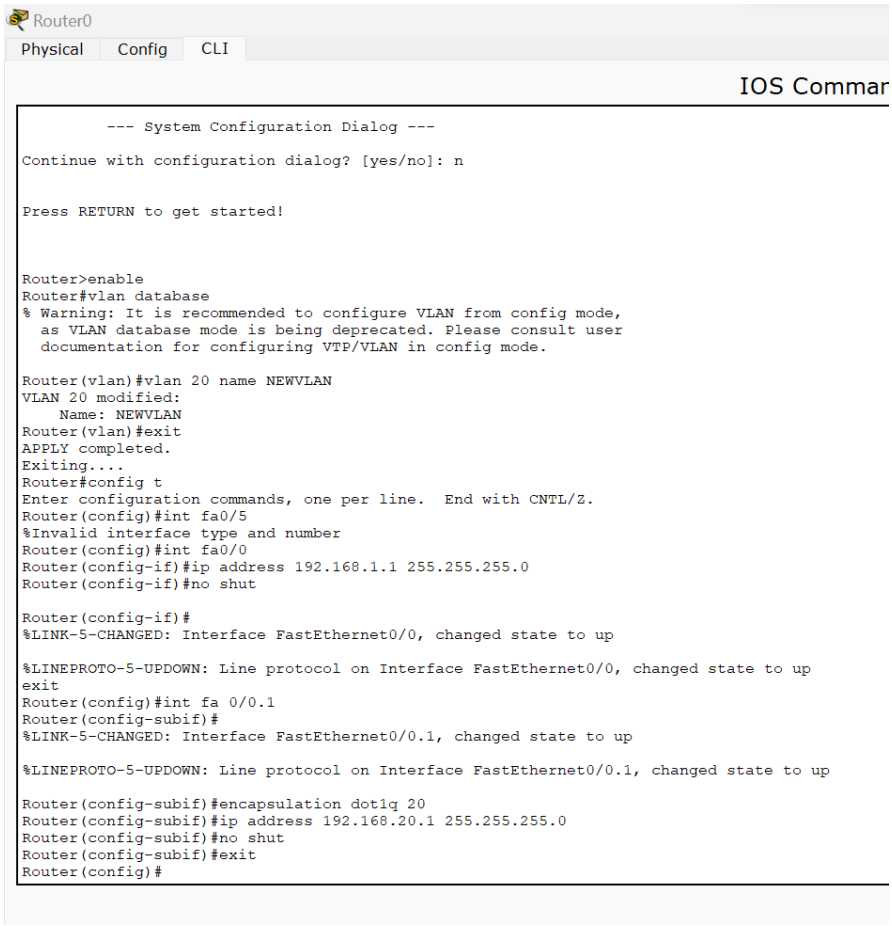
Topology:



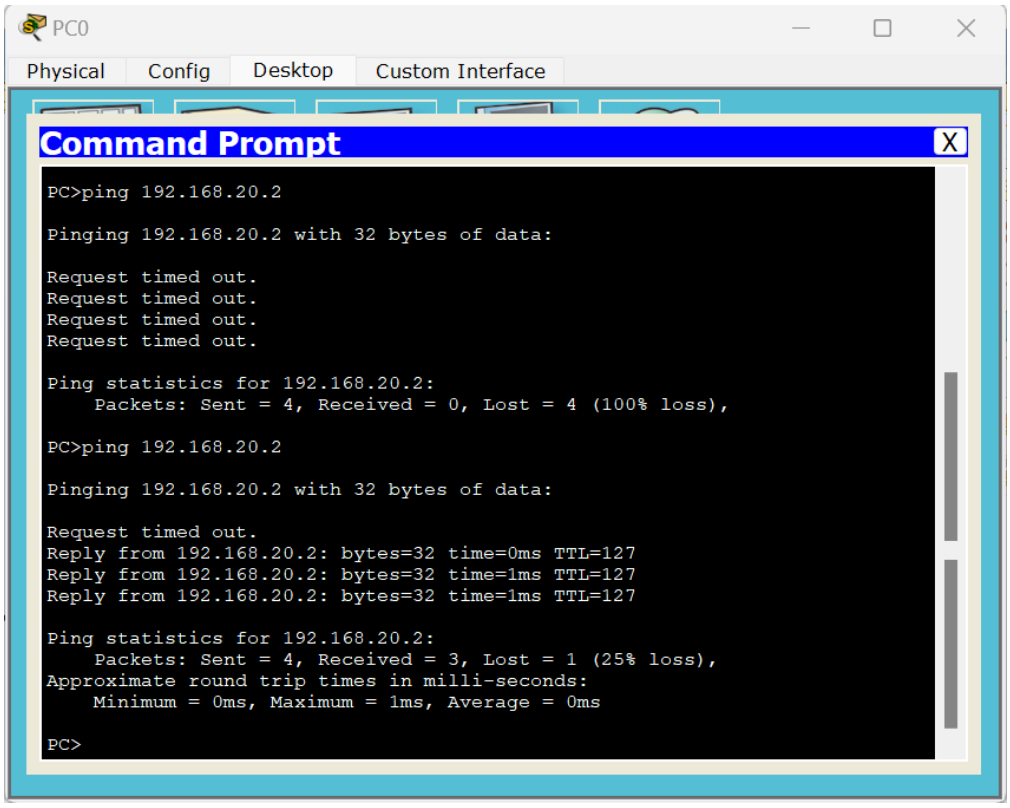
Procedure:



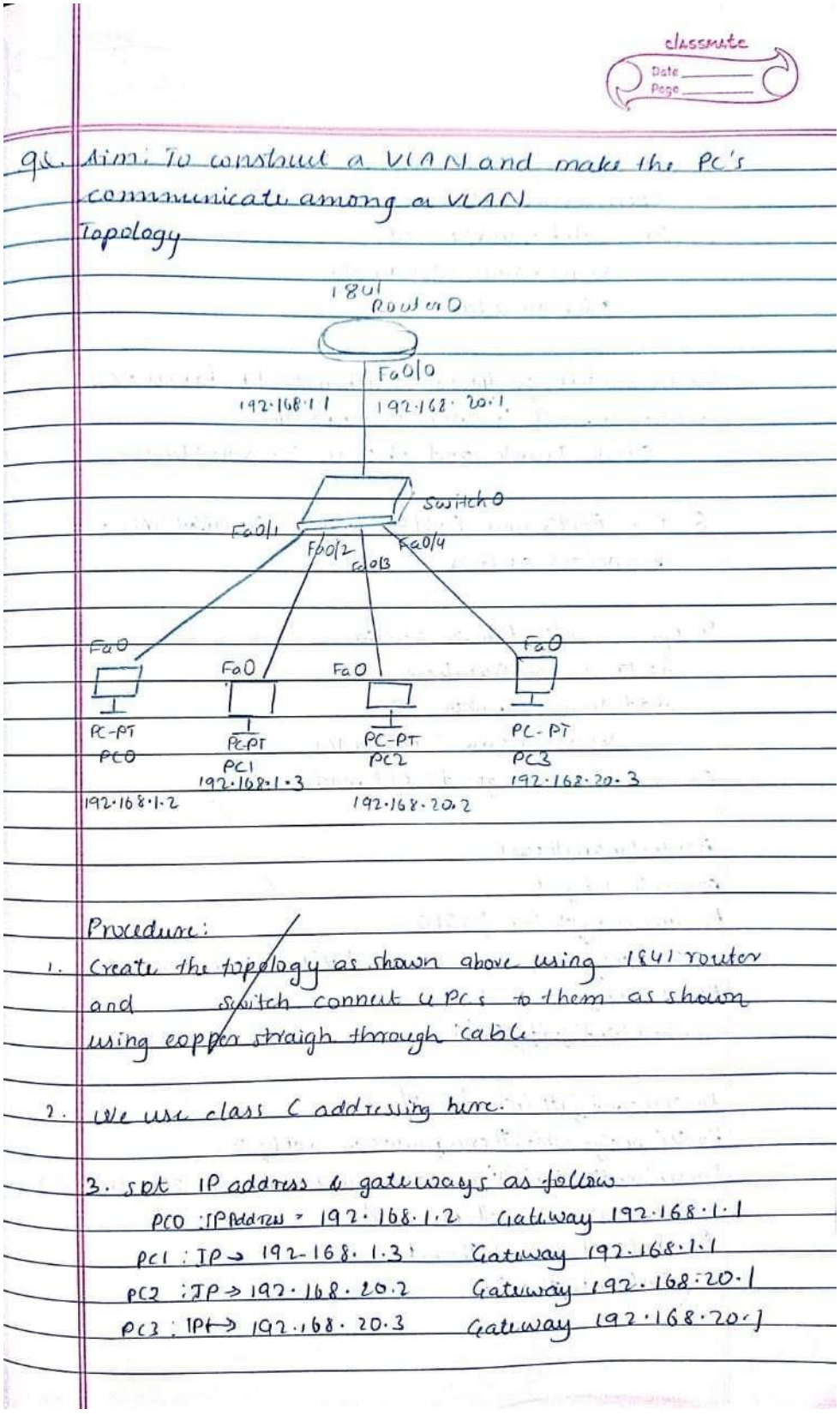

Switch0
Physical
Config
CLI
INTERFACE
astEthernet0/
astEthernet0/
astEthernet0/
astEthernet0/
astEthernet0/
astEthernet0/
astEthernet0/
astEthernet0/
astEthernet0/
stEthernet0/1
stEthernet0/1
FastEthernet0/5
Port Status
On
Bandwidth
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
Trunk
VLAN
1-1005
Tx Ring Limit
10
1:default
20:NEWVLAN
1002:fddi-defaul
Equivalent IOS Commands
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/6
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/5
Switch(config-if)#


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)#

Output:


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
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:



4. Go to config tab of switch
Open VLAN database
Set VLAN number = 20
VLAN name = NEWVLAN
click on add.

5. In switch go to fastethernet 5/0 for under interface as it is connected to router
Select Trunk and choose 20: NEW VLAN.

6. For Fa0/3 and Fa0/4 select 20:NEWLAN. and keep Access as it is.

7. Open config tab in router
Go to VLAN Database
Add VLAN Number 20
VLAN name : NEWVLAN

8. In Router0 go to CLI mode

```
Router(vlan)# exit
Router# config t
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)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
```

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=0ms 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

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

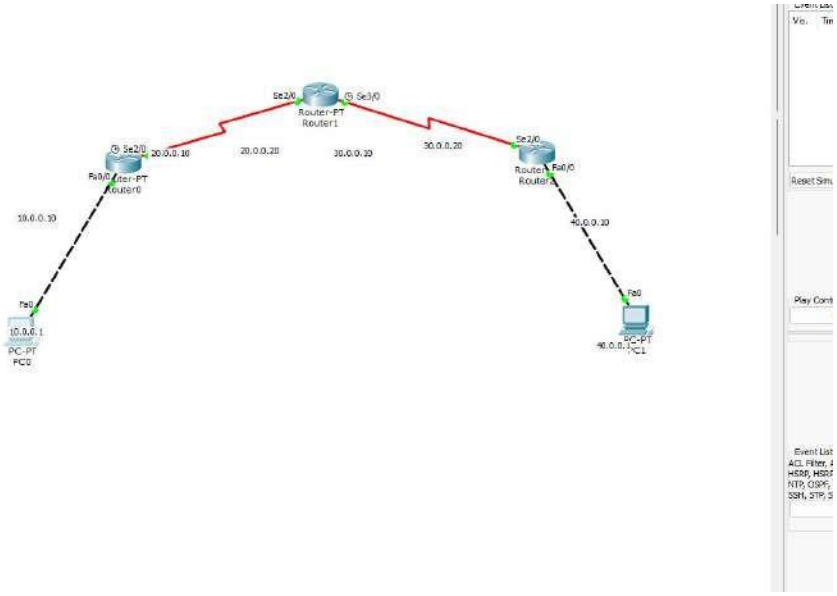
192.168.20.1 is a sub interface of router

Experiment 10

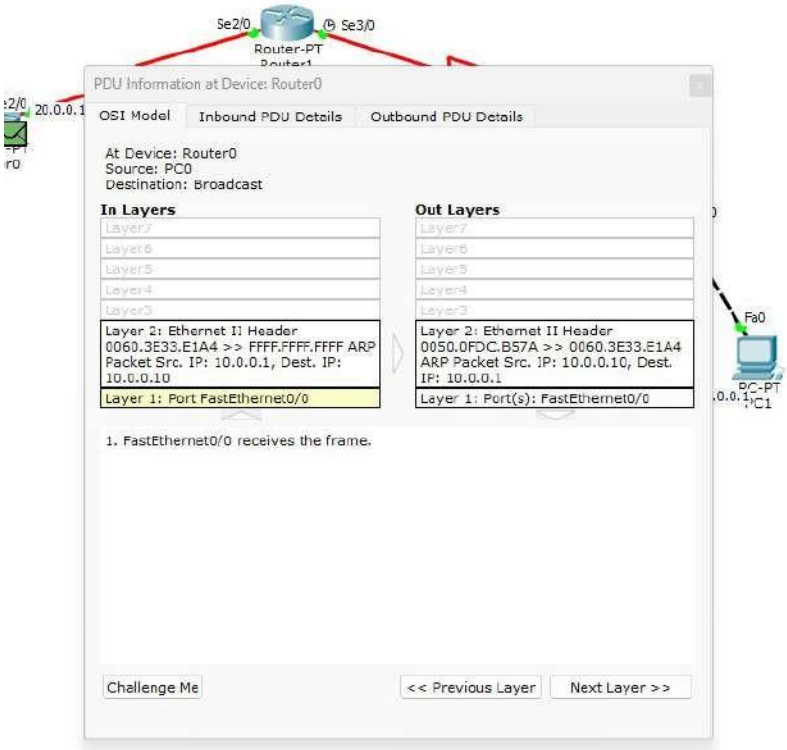
Q10) Demonstrate the TTL/ Life of a Packet

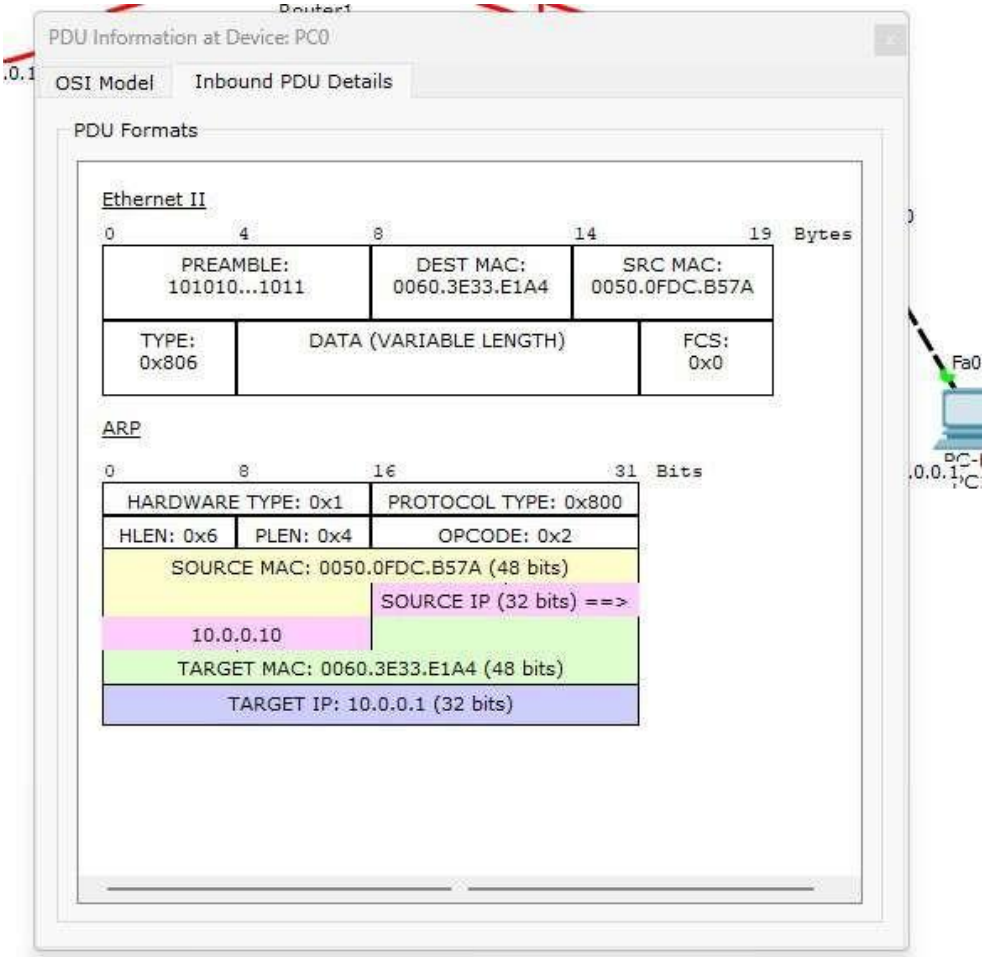
Aim: To observe the TTL/ Life of a Packet

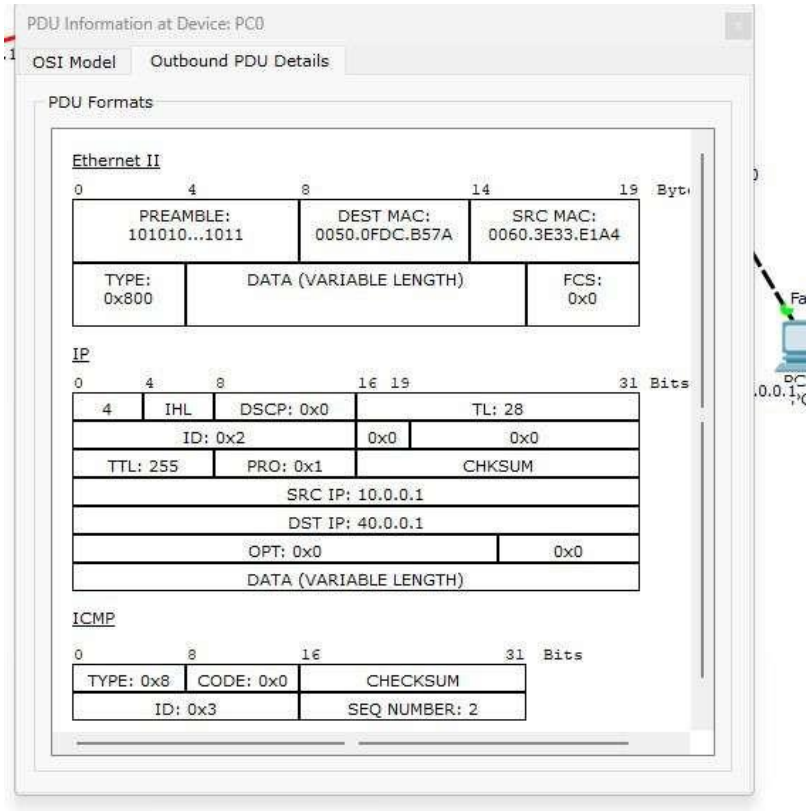
Topology:

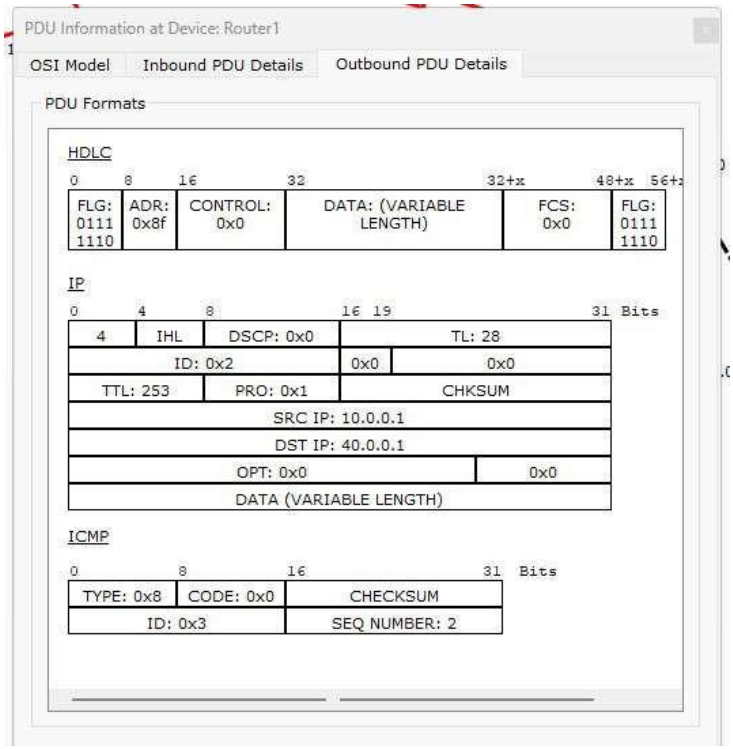


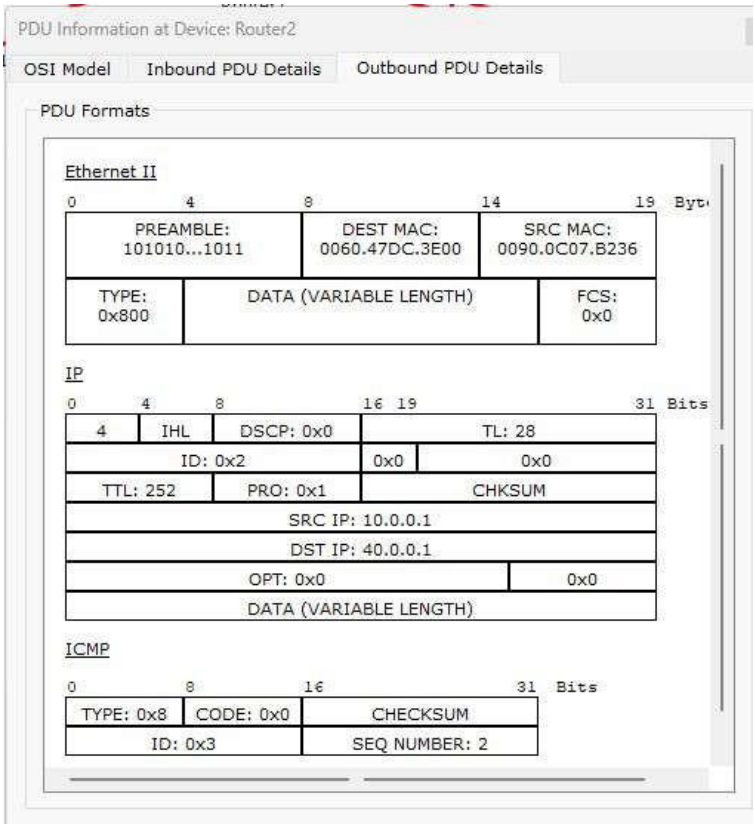
Output:




PDU Information at Device: PC0
OSI Model
Inbound PDU Details
PDU Formats
Ethernet II
0 4 8 14 19 Bytes
PREAMBLE: 101010...1011
DEST MAC: 0060.3E33.E1A4
SRC MAC: 0050.0FDC.B57A
TYPE: 0x806
DATA (VARIABLE LENGTH)
FCS: 0x0
ARP
0 8 16 31 Bits
HARDWARE TYPE: 0x1
PROTOCOL TYPE: 0x800
HLEN: 0x6
PLEN: 0x4
OPCODE: 0x2
SOURCE MAC: 0050.0FDC.B57A (48 bits)
SOURCE IP (32 bits) ==>
10.0.0.10
TARGET MAC: 0060.3E33.E1A4 (48 bits)
TARGET IP: 10.0.0.1 (32 bits)
Fa0


PDU Information at Device: PC0
OSI Model
Outbound PDU Details
PDU Formats
Ethernet II
0 4 8 14 19 Byt
PREAMBLE: 101010...1011
DEST MAC: 0050.0FDC.B57A
SRC MAC: 0060.3E33.E1A4
TYPE: 0x800
DATA (VARIABLE LENGTH)
FCS: 0x0
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0x2
0x0
0x0
TTL: 255
PRO: 0x1
CHKSUM
SRC IP: 10.0.0.1
DST IP: 40.0.0.1
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x8
CODE: 0x0
CHECKSUM
ID: 0x3
SEQ NUMBER: 2

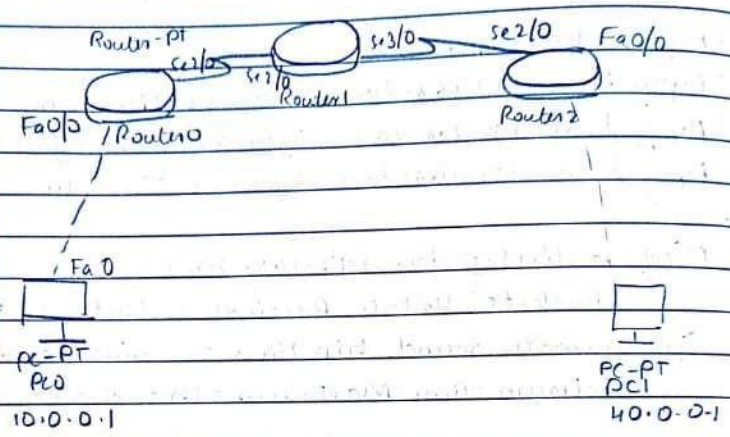

PDU Information at Device: Router1
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
HDLC
0 8 16 32 32+x 48+x 56+x
FLG: 0111 1110
ADR: 0x8f
CONTROL: 0x0
DATA: (VARIABLE LENGTH)
FCS: 0x0
FLG: 0111 1110
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0x2
0x0
0x0
TTL: 253
PRO: 0x1
CHKSUM
SRC IP: 10.0.0.1
DST IP: 40.0.0.1
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x8
CODE: 0x0
CHECKSUM
ID: 0x3
SEQ NUMBER: 2


PDU Information at Device: Router2
OSI Model
Inbound PDU Details
Outbound PDU Details
PDU Formats
Ethernet II
0 4 8 14 19 Byt
PREAMBLE: 101010...1011
DEST MAC: 0060.47DC.3E00
SRC MAC: 0090.0C07.B236
TYPE: 0x800
DATA (VARIABLE LENGTH)
FCS: 0x0
IP
0 4 8 16 19 31 Bits
4
IHL
DSCP: 0x0
TL: 28
ID: 0x2
0x0
0x0
TTL: 252
PRO: 0x1
CHKSUM
SRC IP: 10.0.0.1
DST IP: 40.0.0.1
OPT: 0x0
0x0
DATA (VARIABLE LENGTH)
ICMP
0 8 16 31 Bits
TYPE: 0x8
CODE: 0x0
CHECKSUM
ID: 0x3
SEQ NUMBER: 2

Observation:

10 Aim : Demonstrate the TTL/life of a Packet

Topology:



Procedure.

(1) Create a topology as shown above and configure the PCs and routers as shown above Static routing is done here. ~~We can~~

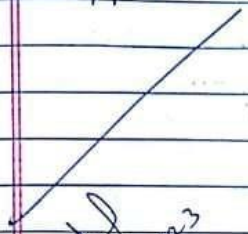
2) Go to simulation mode
Send simple PDU from PC0 to PC1

3) Click on capture/forward button to run it step by step

4) Views the inbound and outbound PDU details in each step by clicking on PDU.

Observation

- The TTL is reduced by one in when the packet crosses every router.
- If TTL becomes 0, packet will be dropped.



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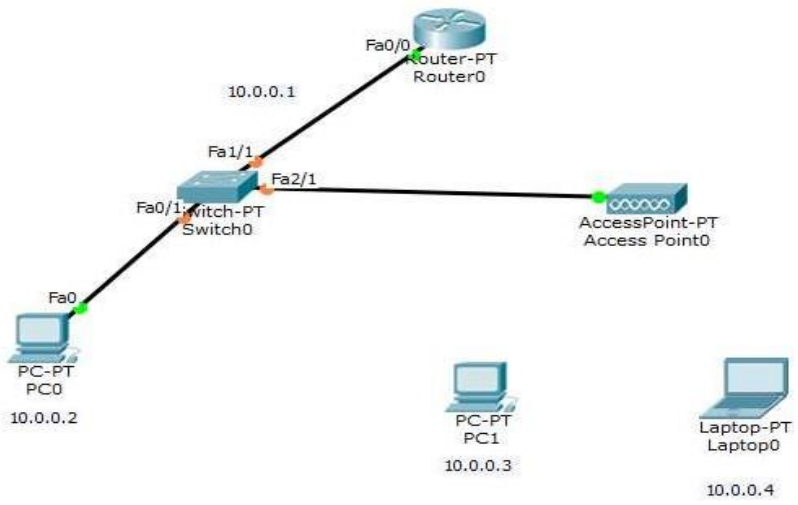
Experiment 11

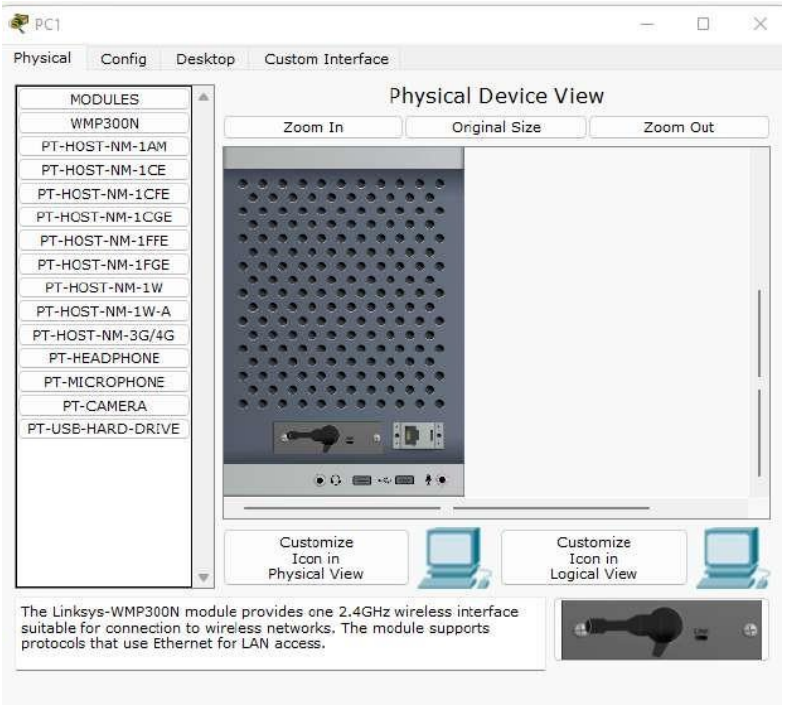
Q11) To construct a WLAN and make the nodes communicate wirelessly.

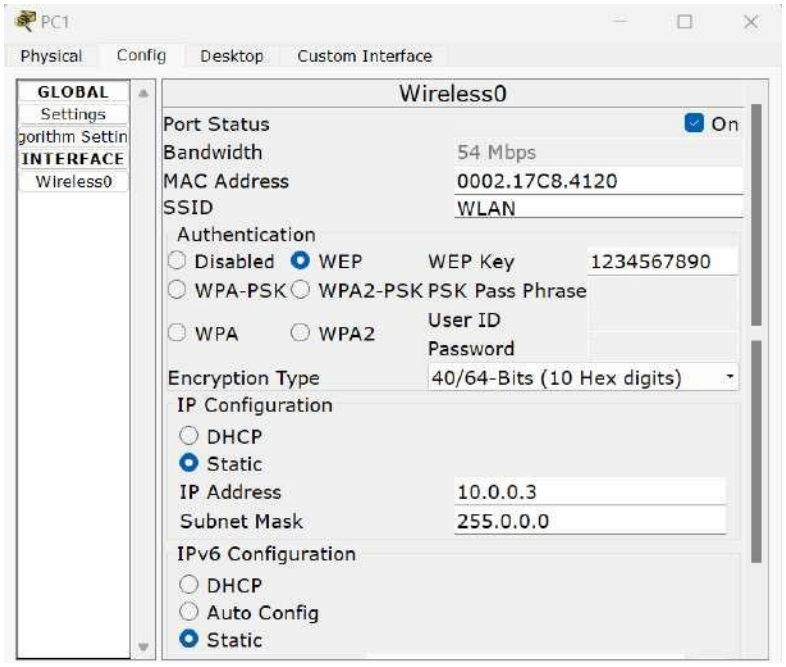
Aim: To construct a WLAN and make the nodes communicate wirelessly.

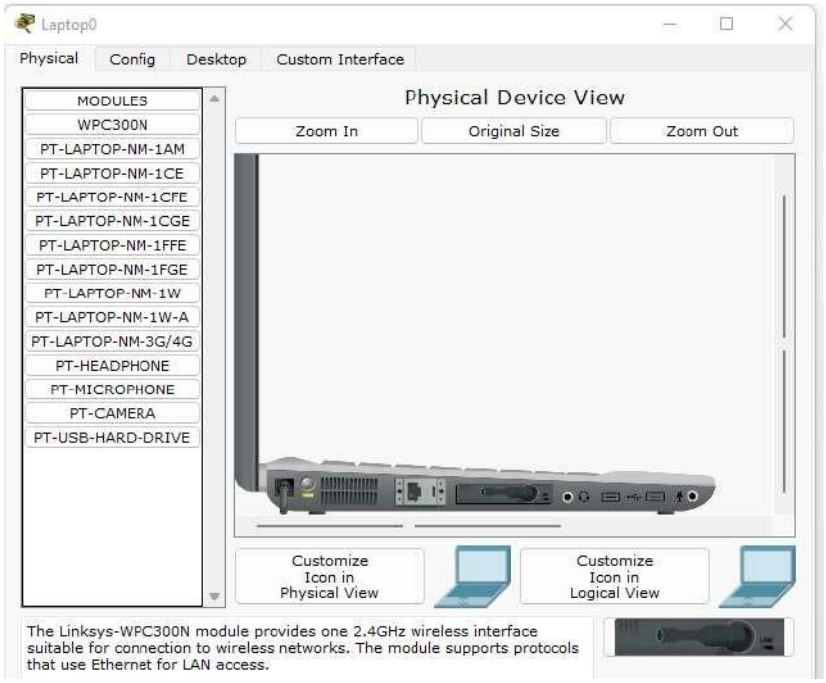
Topology:

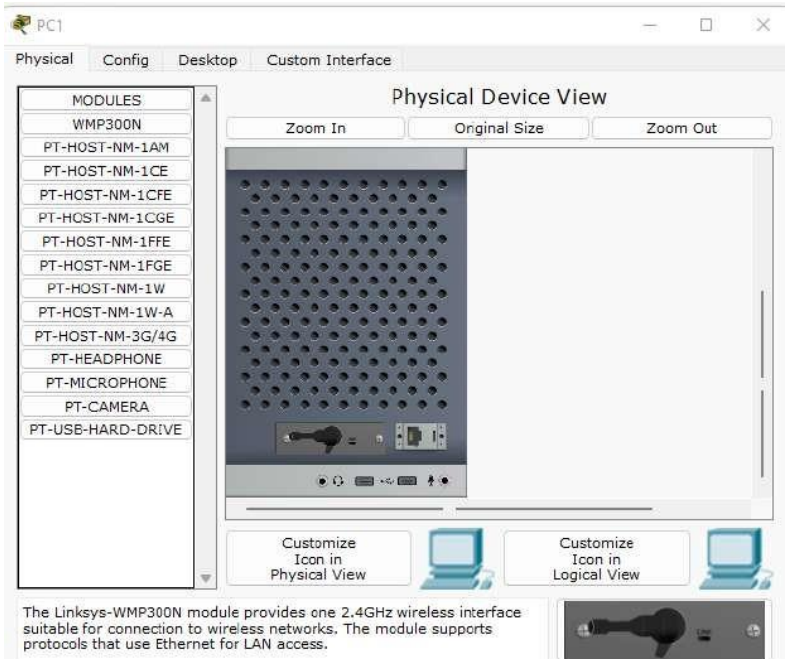


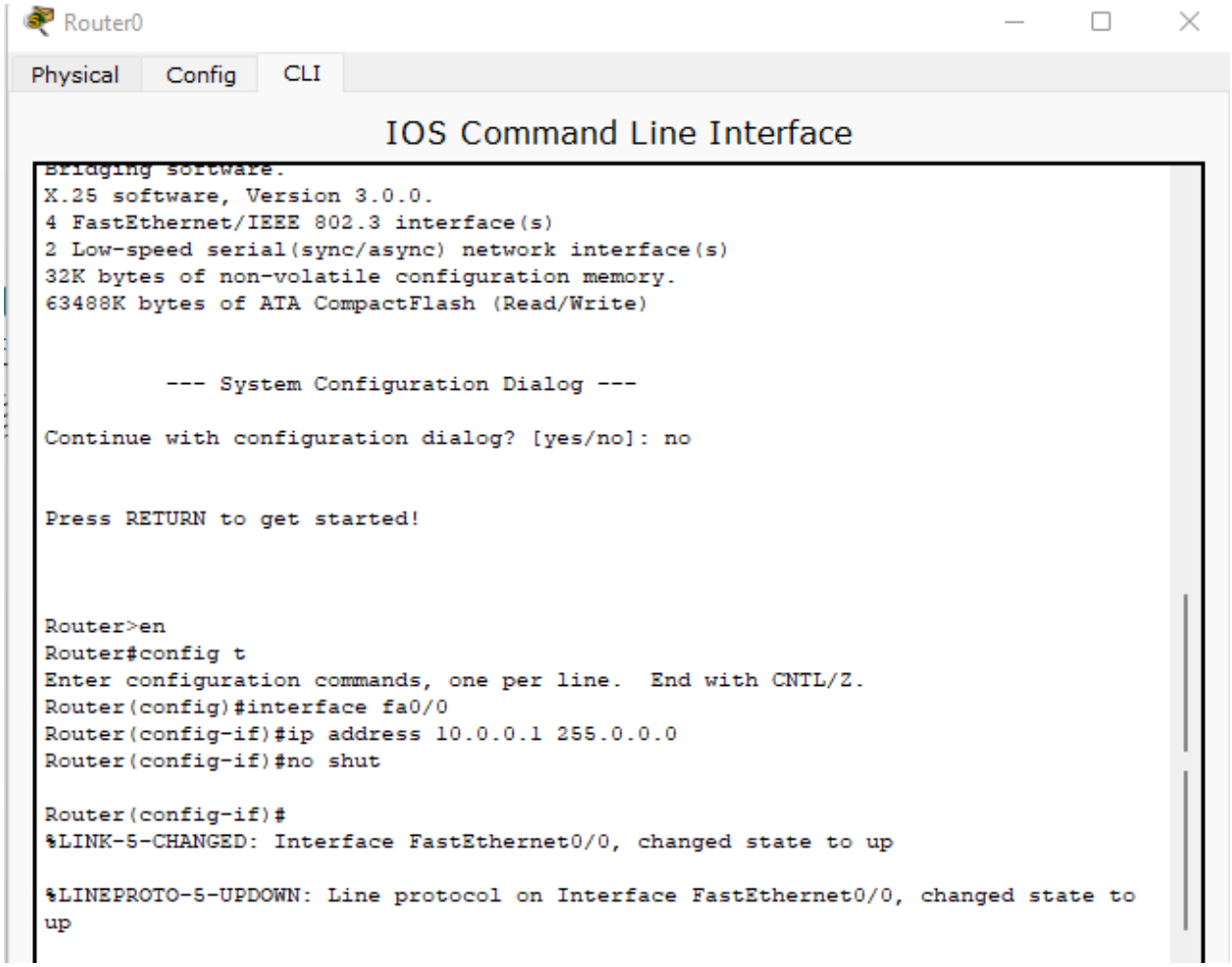
Procedure:



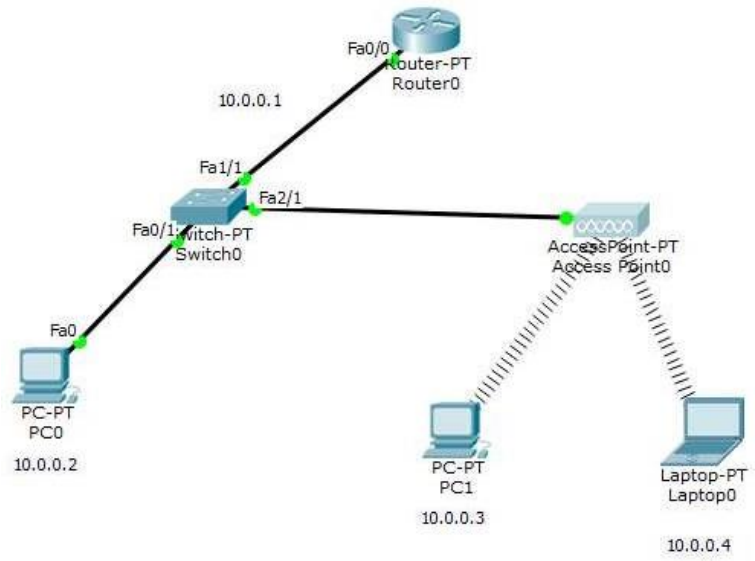

PC1
Physical
Config
Desktop
Custom Interface
GLOBAL
Settings
gorithm Settin
INTERFACE
Wireless0
Wireless0
Port Status
On
Bandwidth
54 Mbps
MAC Address
0002.17C8.4120
SSID
WLAN
Authentication
Disabled
WEP
WEP Key
1234567890
WPA-PSK
WPA2-PSK
PSK Pass Phrase
WPA
WPA2
User ID
Password
Encryption Type
40/64-Bits (10 Hex digits)
IP Configuration
DHCP
Static
IP Address
10.0.0.3
Subnet Mask
255.0.0.0
IPv6 Configuration
DHCP
Auto Config
Static

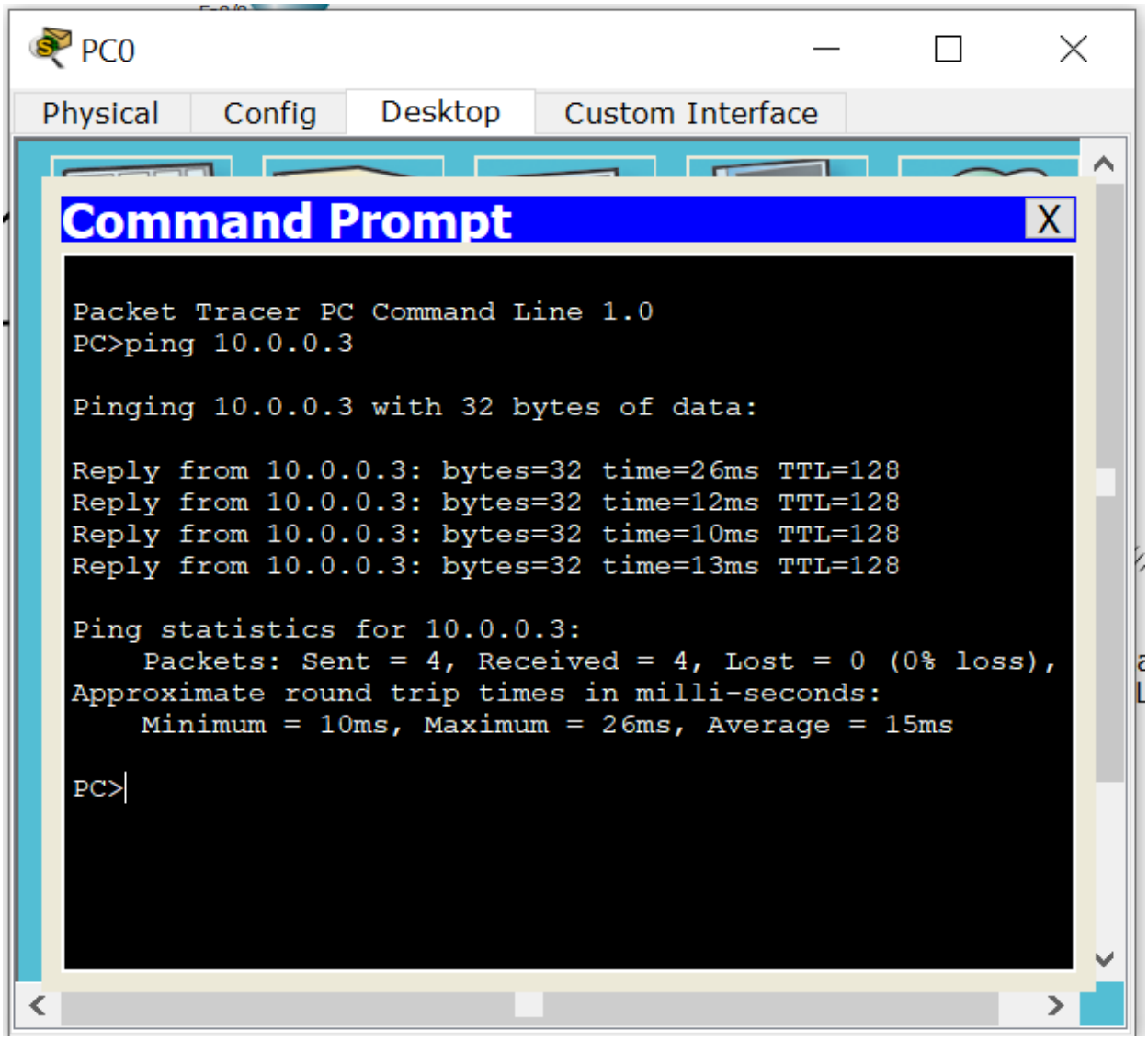

Laptop0
Physical
Config
Desktop
Custom Interface
MODULES
WPC300N
PT-LAPTOP-NM-1AM
PT-LAPTOP-NM-1CE
PT-LAPTOP-NM-1CFE
PT-LAPTOP-NM-1CGE
PT-LAPTOP-NM-1FFE
PT-LAPTOP-NM-1FGE
PT-LAPTOP-NM-1W
PT-LAPTOP-NM-1W-A
PT-LAPTOP-NM-3G/4G
PT-HEADPHONE
PT-MICROPHONE
PT-CAMERA
PT-USB-HARD-DRIVE
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The Linksys-WPC300N module provides one 2.4GHz wireless interface suitable for connection to wireless networks. The module supports protocols that use Ethernet for LAN access.


PC1
Physical
Config
Desktop
Custom Interface
MODULES
WMP300N
PT-HOST-NM-1AM
PT-HOST-NM-1CE
PT-HOST-NM-1CFE
PT-HOST-NM-1CGE
PT-HOST-NM-1FFE
PT-HOST-NM-1FGE
PT-HOST-NM-1W
PT-HOST-NM-1W-A
PT-HOST-NM-3G/4G
PT-HEADPHONE
PT-MICROPHONE
PT-CAMERA
PT-USB-HARD-DRIVE
Physical Device View
Zoom In
Original Size
Zoom Out
Customize Icon in Physical View
Customize Icon in Logical View
The Linksys-WMP300N module provides one 2.4GHz wireless interface suitable for connection to wireless networks. The module supports protocols that use Ethernet for LAN access.


Router0
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)
--- 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

Output:


Fa0/0
Router-PT
Router0
10.0.0.1
Fa1/1
Fa2/1
Fa0/1
Switch-PT
Switch0
AccessPoint-PT
Access Point0
Fa0
PC-PT
PC0
10.0.0.2
PC-PT
PC1
10.0.0.3
Laptop-PT
Laptop0
10.0.0.4


PC0
Physical
Config
Desktop
Custom Interface
Command Prompt
X
Packet Tracer PC Command Line 1.0
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=26ms TTL=128
Reply from 10.0.0.3: bytes=32 time=12ms TTL=128
Reply from 10.0.0.3: bytes=32 time=10ms TTL=128
Reply from 10.0.0.3: bytes=32 time=13ms 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 = 10ms, Maximum = 26ms, Average = 15ms
PC>

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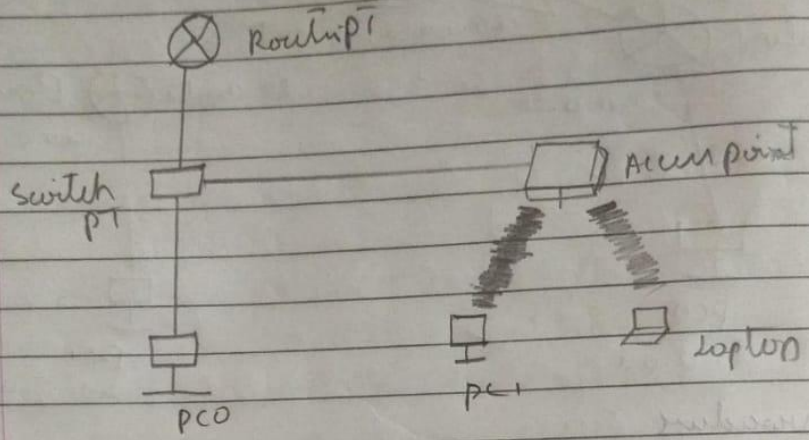
Date: / /

Q) To Construct a WLAN & make the nodes communicate wirelessly



procedure

1) Create the topology as shown above
2) Configure PC3
   IP address : 0.0.0.2
3) Configure Router 0
   ↳ set the IP address as 10.0.0.1 for Fa0/0
4) Configure the Access point - PT
   in Config of port 1
   → SSID = WLAN
   Select WEP & give any 10 digit hex as password
   1234567890
5) To Configure PC1 & laptop with wireless standard
   Switch off the device
   Drag the existing PT-host-NM-1AM to LHS & place it on its same mentioned

Observations:

4). Goto Config tab of switch
open VLAN database
set VLAN number = 20
VLAN name = NEW VLAN
click on Add

5). In switch go to fastethernet 5/0 under interface as it is connected to router
select trunk & choose 20: NewVLAN

6) For Fa 0/3 & Fa 0/4 select 20: NewLAN & keep Access as it is

7) Open Config Tab in router
Go to VLAN Database
Add VLAN number 20
VLAN name : NewLAN

8) In router 0 go to CLI mode

Router (vlan)# exit
Router # config t
Router (config)# int fa 0/0
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

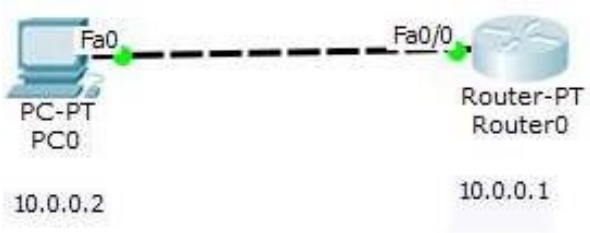
Router (config-subif)# no shut
Router (config-subif)# exit

Experiment 12

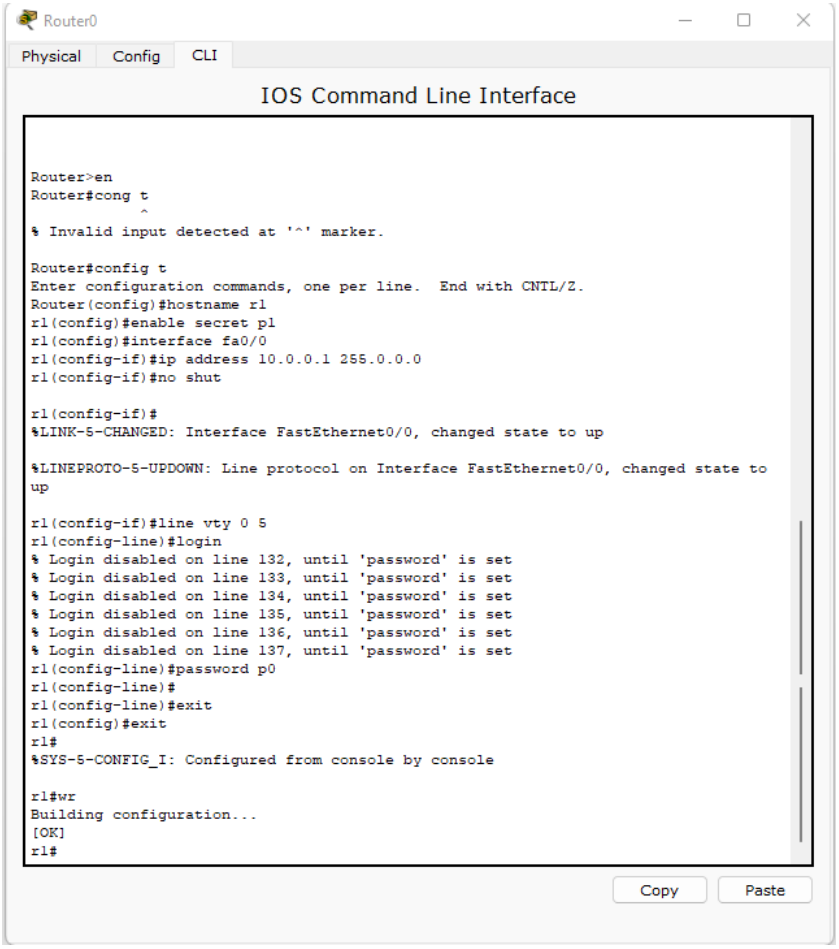
Q12) To understand the operation of TELNET by accessing the router in server room from a PC in IT office.

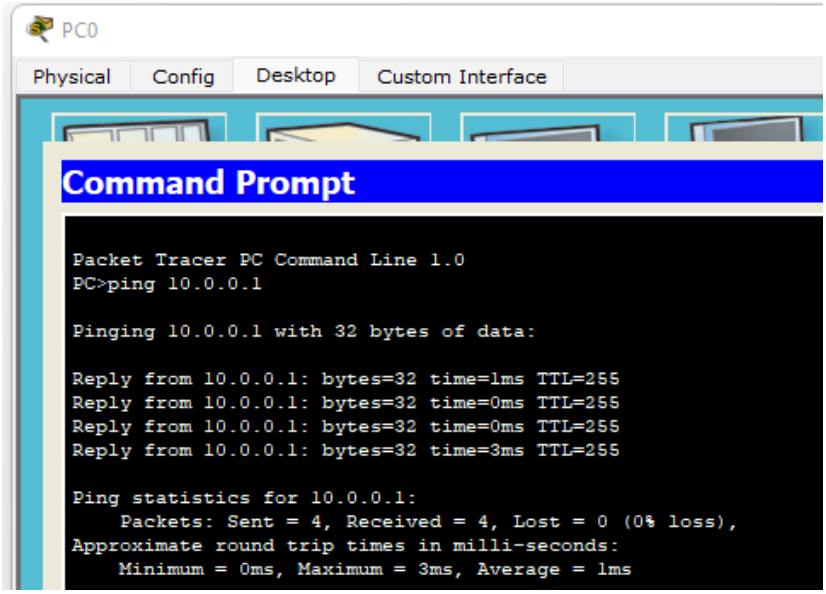
Aim: To understand the operation of TELNET by accessing the router in server room from a PC in IT office.

Topology:

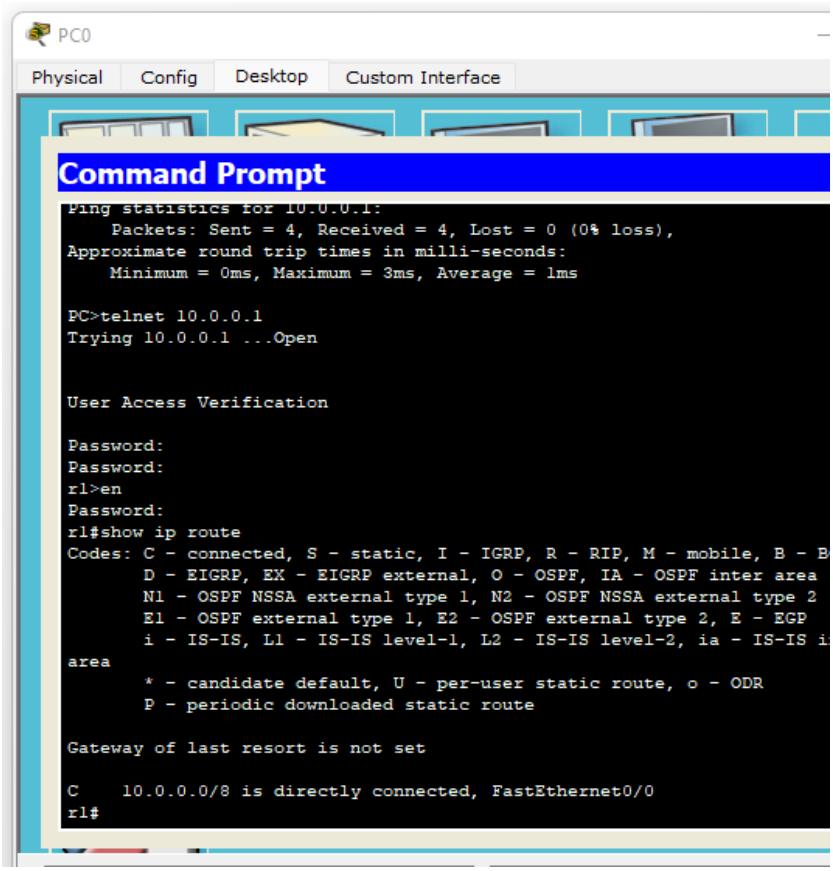


Procedure:




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

Output:


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:
r1>en
Password:
r1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - B
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 i
area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route
Gateway of last resort is not set
C 10.0.0.0/8 is directly connected, FastEthernet0/0
r1#

Observation:

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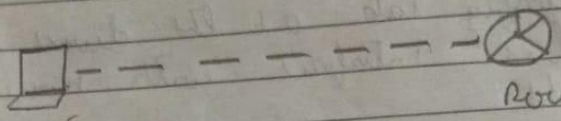
Q To understand the operation of Telnet by accessing the router in server room from a PC in IT office



procedure

1) create the topology as shown above use end device copper cross over wire
2) configure the PC
   Ip address = 10.0.0.2
   Gateway = 10.0.0.1
3) Go to CLI mode in Router 0

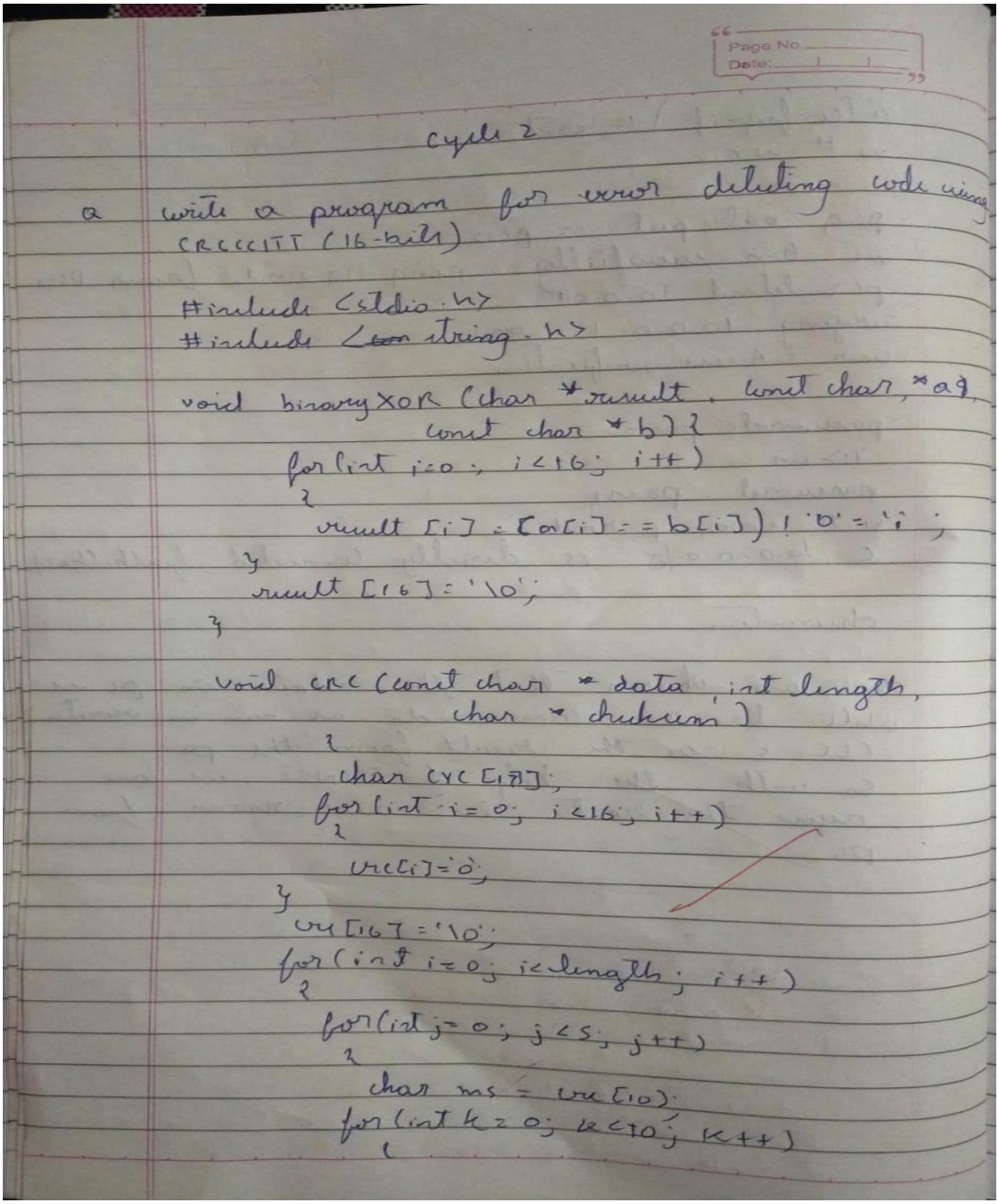
```
Router>en
Router# configure
Router(config)# hostname r1
r1(config)# enable secret p1
r1(config-if)# interface fa0/0
r1(config-if)# ip address 10.0.0.1 255.0.0.0
r1(config-if)# no shut
r1(config-if)# line vty 0 5
r1(config-if)# login
r1(config-line)# password p0
```

Cycle - 2

Experiment 13

Q13) Write a program for error detecting code using CRCCCITT (16-bits).

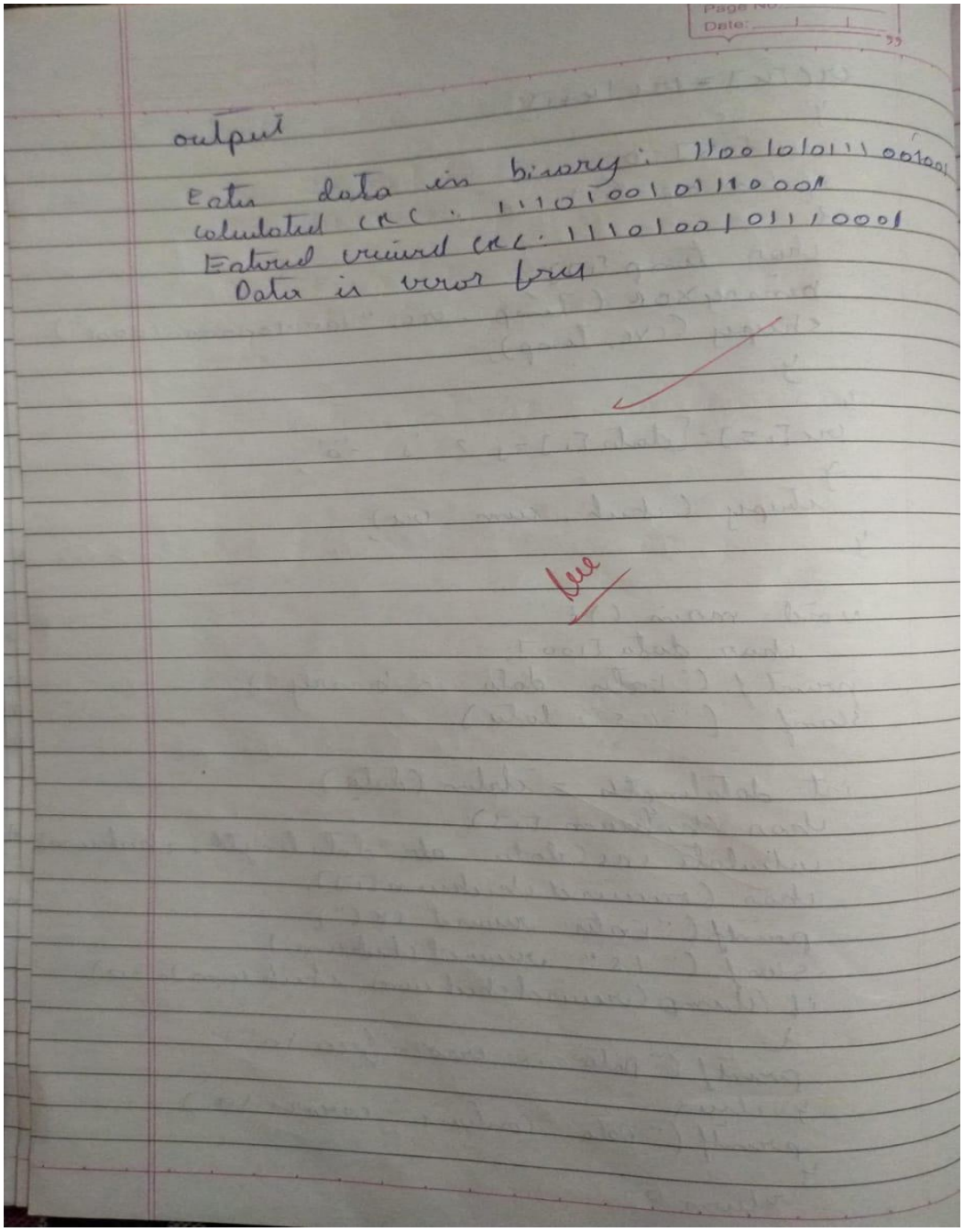
Observation:



cycle 2

Q write a program for error detecting code using CRCCCITT (16-bits)

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

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';
}

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<5; j++)
        {
            char ms = crc[0];
            for(int k=0; k<16; k++)
            {
```


output

Enter data in binary: 1100101011100101

Calculated CRC: 1110100101110001

Entered recived CRC: 1110100101110001

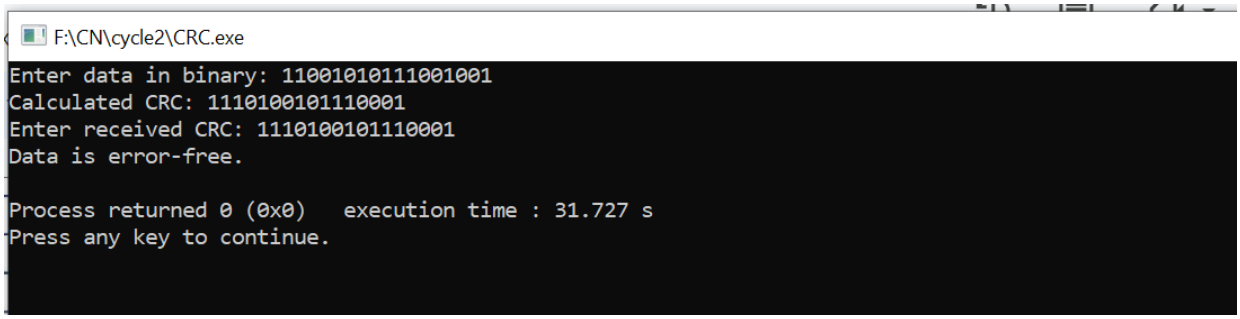
Data is error free

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);
}

int 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");
    }

    return 0;
}
```

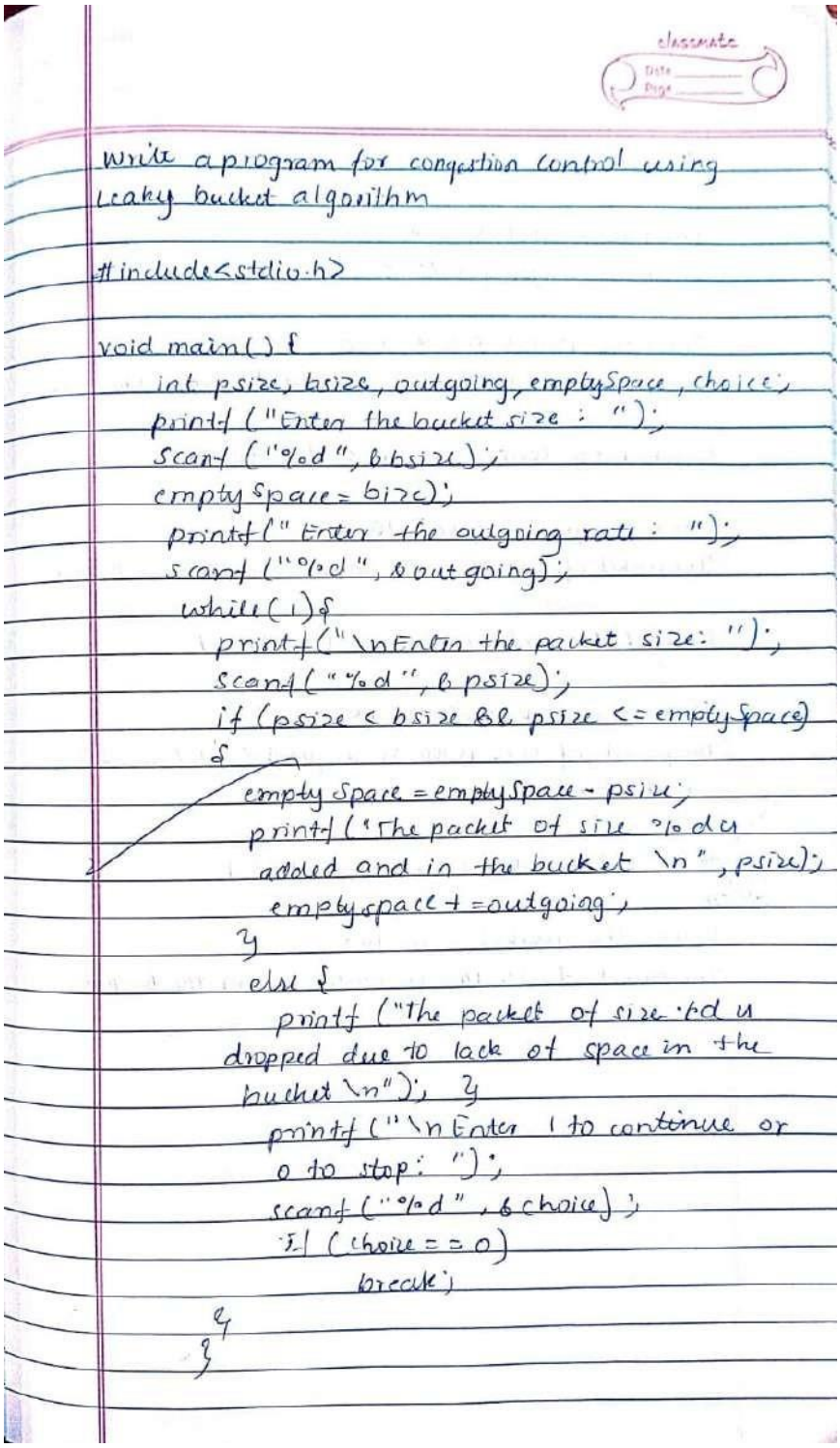
Output:


F:\CN\cycle2\CRC.exe
Enter data in binary: 11001010111001001
Calculated CRC: 1110100101110001
Enter received CRC: 1110100101110001
Data is error-free.
Process returned 0 (0x0)   execution time : 31.727 s
Press any key to continue.

Experiment 14

Q14)Write a program for congestion control using Leaky bucket algorithm.

Observation:



Write a program for congestion control 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;
        }
        else {
            printf("The packet of size %d is
        dropped due to lack of space in the
        bucket \n");
        }
        printf("\n Enter 1 to continue or
        0 to stop: ");
        scanf("%d", &choice);
        if (choice == 0)
            break;
    }
}
```

Output:

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 15000 is dropped due to lack of space in the bucket.

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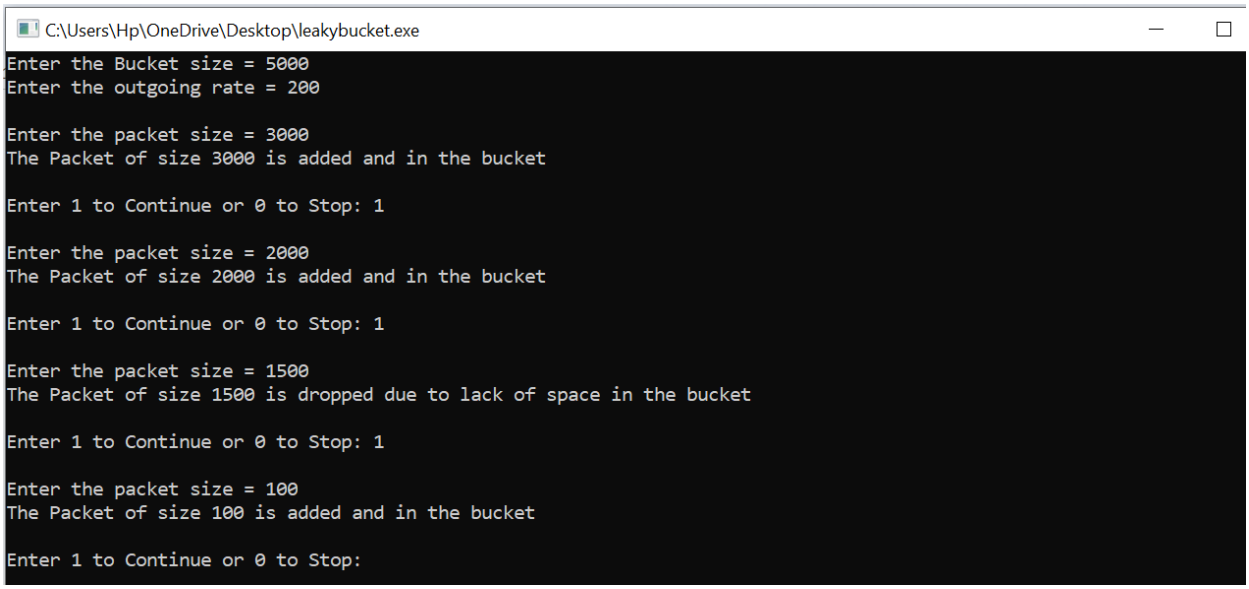
Enter 1 to continue or 0 to stop : 1

Enter the packet size : 100
The packet of size 100 is added and in the bucket

Program:

```
#include<stdio.h>

void main()
{
   int 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;
      }

      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;

   }
}
```

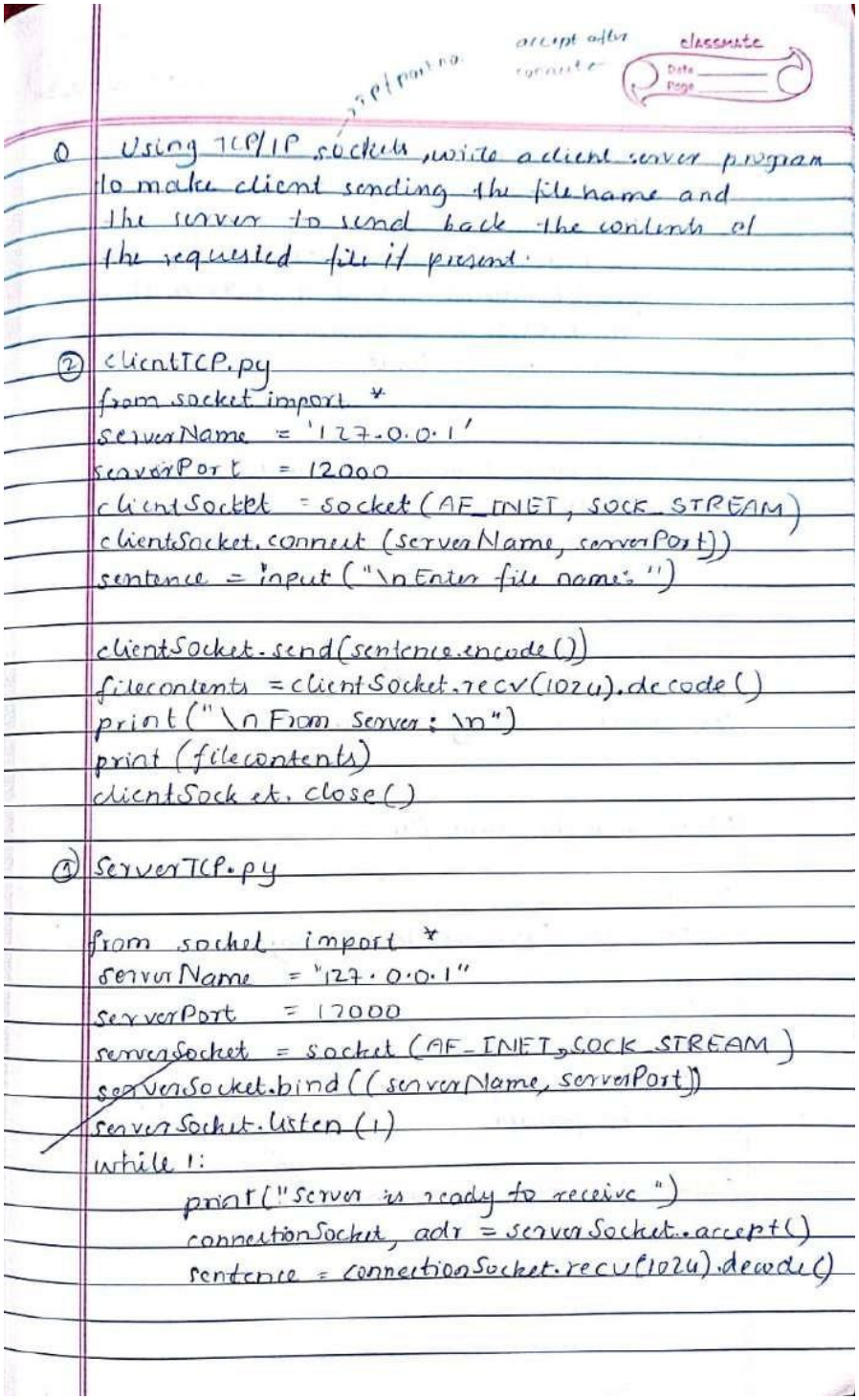
Output:


C:\Users\Hp\OneDrive\Desktop\leakybucket.exe
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 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
Enter 1 to Continue or 0 to Stop:

Experiment 15

Q15)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.

Observation:



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 if present.

② 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()
```

① 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("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()
```

Note:

Create 2 IDLE instances and write client and server files.

Run server first and the client.

Server:

```
The server is ready to receive

#Now run the client file

Client
    Enter the file name: ServerTCP.py

    From server

    The contents of the the file ServerTCP.py
    will be printed

#Now look into server window
```

Server

Send contents of ServerTCP.py
The server is ready to receive

The server is now ready to accept the request of the next client.

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Program:

ClientTCP.py

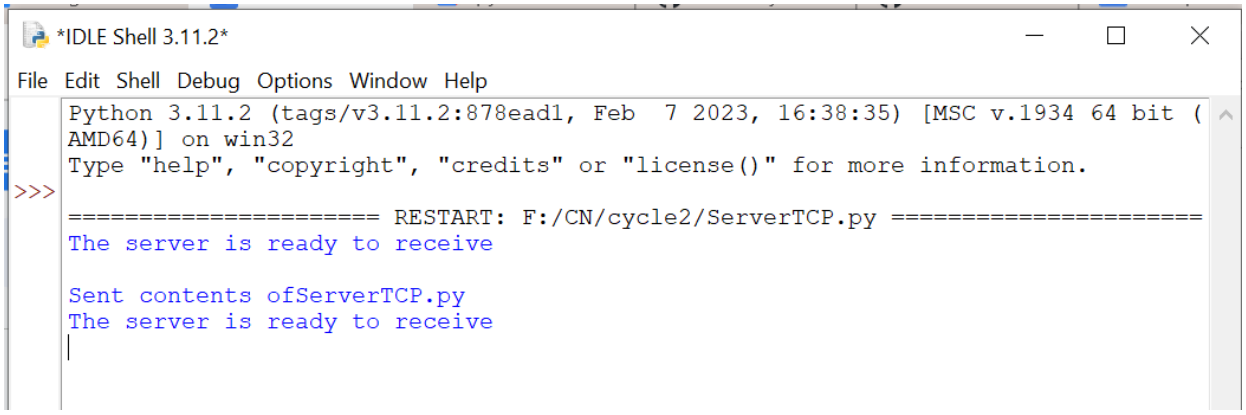
```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
clientSocket = socket(AF_INET,SOCK_STREAM)
clientSocket.connect((serverName,serverPort))
sentence=input("\nEnter the file name: ")

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

ServerTCP.py

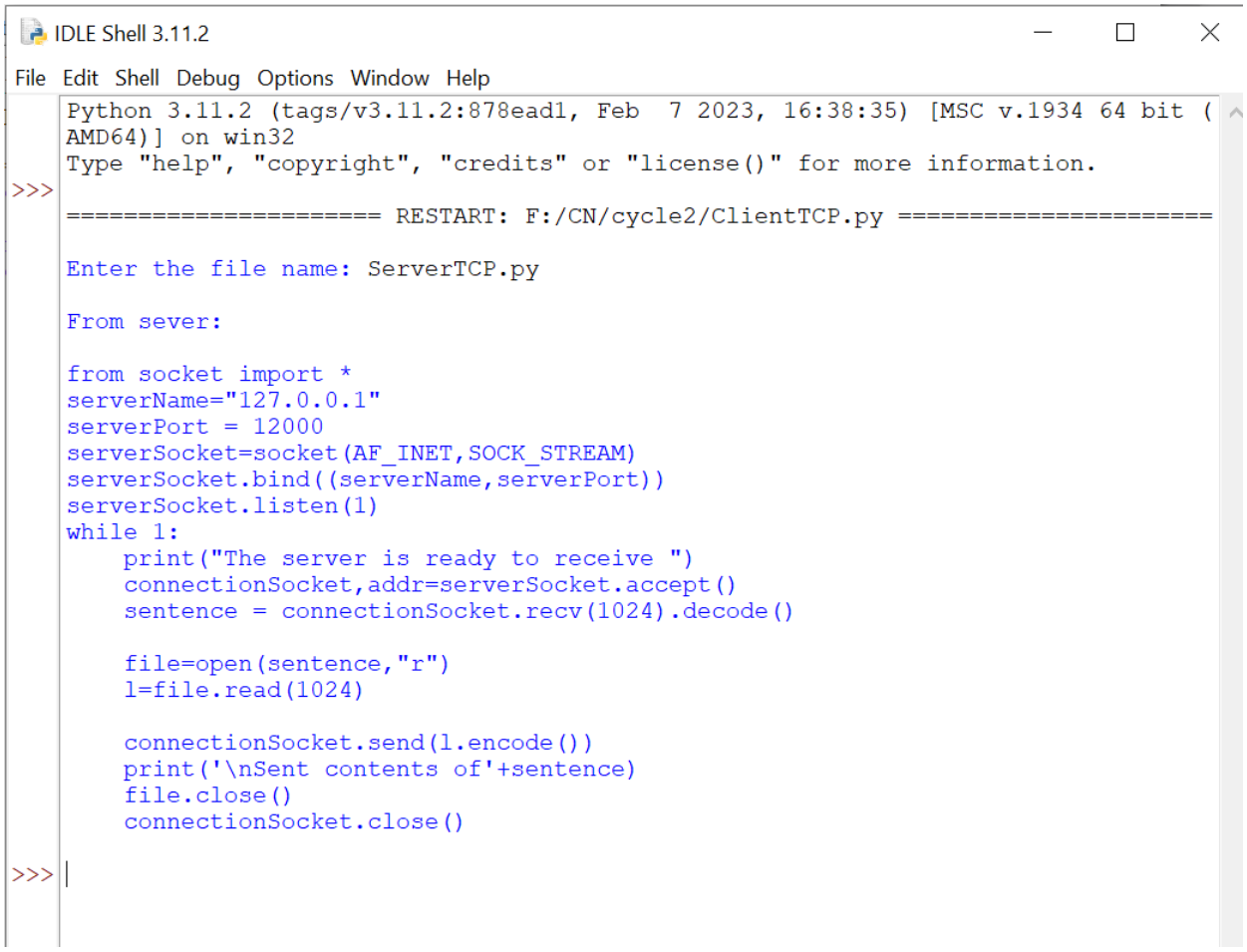
```
from socket import *
serverName="127.0.0.1"
serverPort = 12000
serverSocket=socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while 1:
    print("The server is ready to receive ")
    connectionSocket,addr=serverSocket.accept()
    sentence = connectionSocket.recv(1024).decode()

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

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

Output:

Server output:



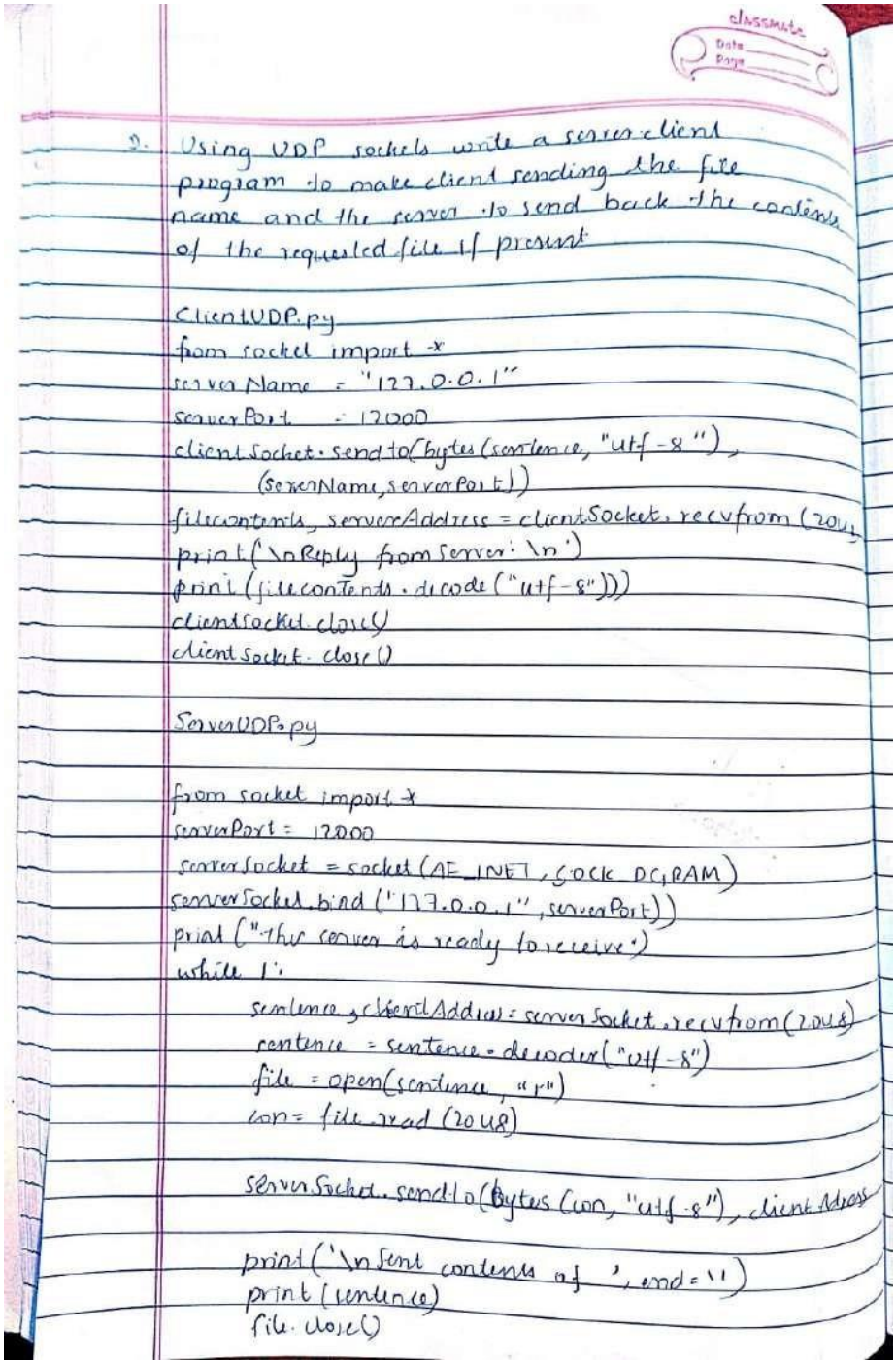
Client output:



Experiment 16

Q16)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.

Observation:



2. Using UDP sockets write a server-client program to make client sending the file name and the server to send back the contents of the requested file if present

ClientUDP.py

```
from socket import *
serverName = "127.0.0.1"
serverPort = 12000
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()
```

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('\n Sent contents of ', end=' ')
        print(sentence)
        file.close()
```

Output:

Server

The server is ready to receive

(Now run client)
Client

Enter file name: ServerUDP.py

Reply from server:

The content of the file ServerUDP.py will be printed.

>>

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

ALD
29/8/2023

Program:

ClientUDP.py

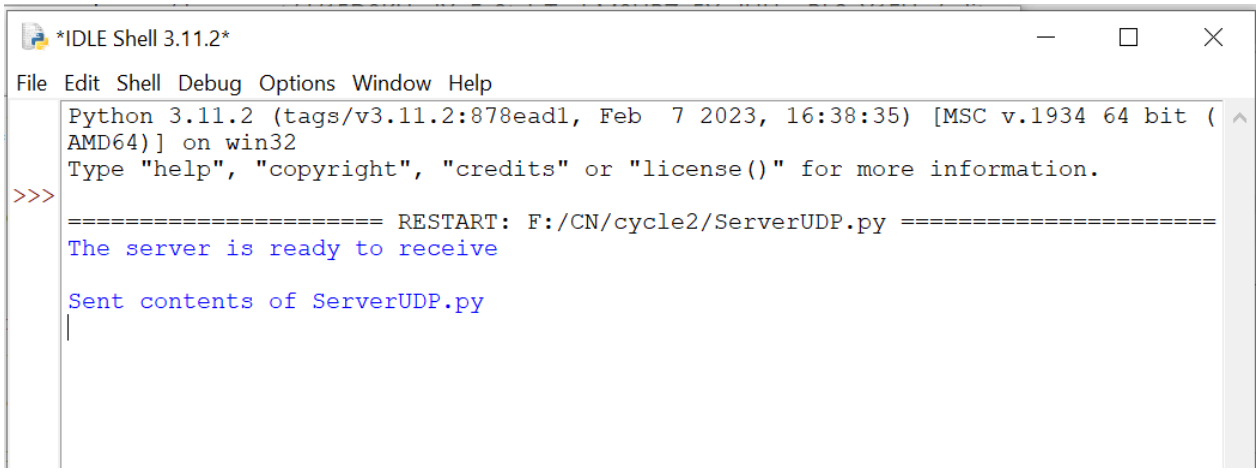
```
from socket import *
serverName = '127.0.0.1'
serverPort = 12000
clientSocket = socket(AF_INET,SOCK_DGRAM)

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"))
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)

   file.close()
```

Output:

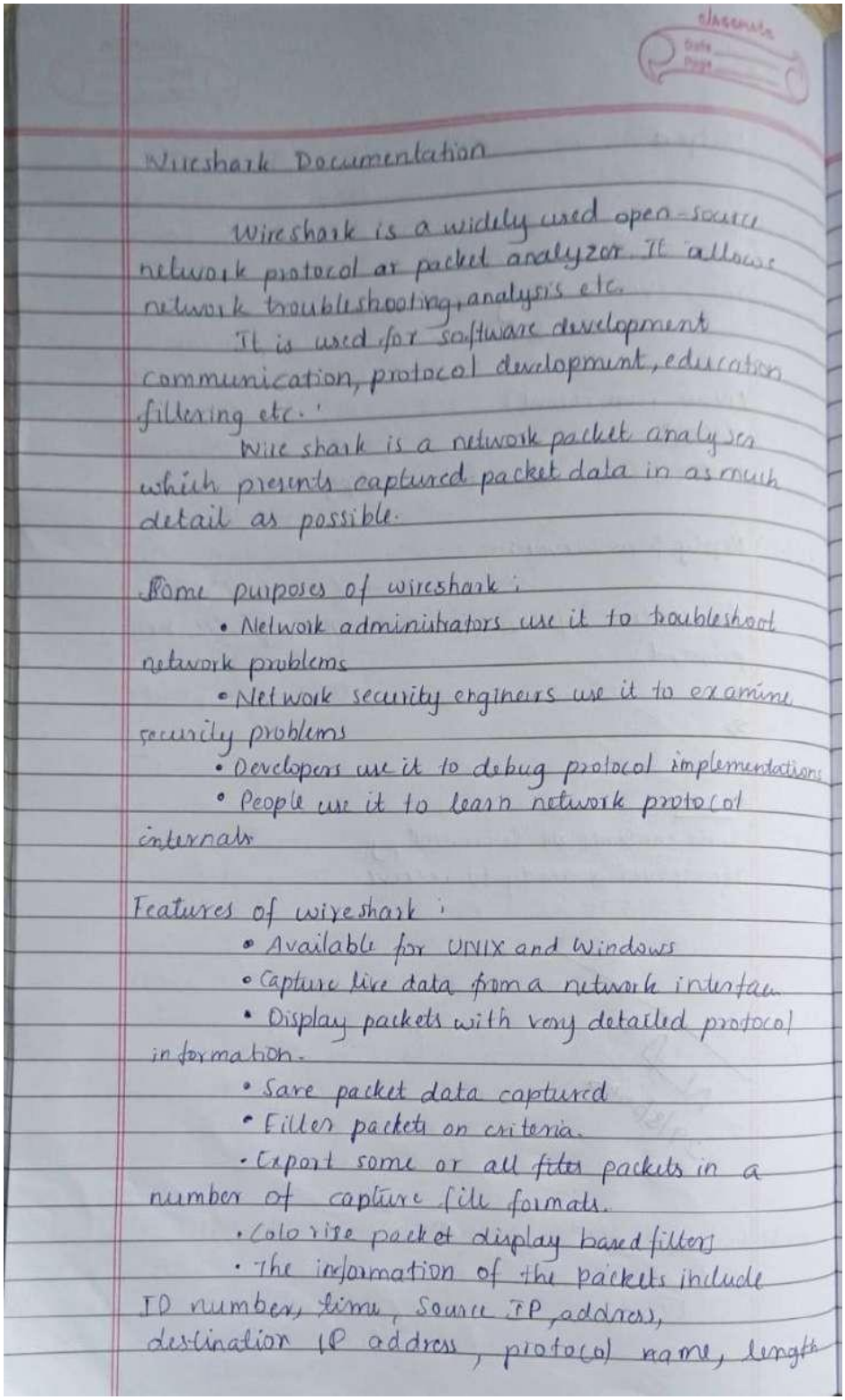
Server output:



Client output:

Experiment 17

Q17)Tool Exploration - WireShark



Wireshark Documentation

Wireshark is a widely used open-source network protocol or packet analyzer. It allows network troubleshooting, analysis etc.

It is used for software development communication, protocol development, education filtering etc.

Wire shark is a network packet analyzer which presents captured packet data in as much detail as possible.

Some purposes of wireshark:

- Network administrators use it to troubleshoot network problems
- Network security engineers use it to examine security problems
- Developers use it to debug protocol implementations
- People use it to learn network protocol internals

Features of wireshark:

- Available for UNIX and Windows
- Capture live data from a network interface
- Display packets with very detailed protocol information.
- Save packet data captured
- Filter packets on criteria.
- Export some or all filter packets in a number of capture file formats.
- Colorise packet display based filters
- The information of the packets include ID number, time, Source IP address, destination IP address, protocol name, length

and other important information.

- The IP address of the device can be used in the filter to capture only packets sent out to that particular IP address.
- various settings, timers and filters can be set that ensure only triggered traffic appears.

Functionality of wireshark

- Wire shark is a remote machine that captures packets and sends captured packets to a machine running wireshark. it directs the packets so it can analyzire packets captured on a remote machine at the time they are captured.
- It is similar to TCP dump in networking It has a graphic and filtering functions. It also monitors the unicast traffic.
- Port moving is a method to monitor network traffic. When it is enabled switch sends copies of of all network packets present at one port to another port.
- It also supports capture formats from several other commercial and open source network sniffers.
- It lets user put network interface controllers that support promiscuous mode in that mode so that they can see all traffic in the interface.

NL
19/2023.