

# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



## LAB REPORT on

## Computer Networks

*Submitted by*

**SUBRAMANYA L(1BM21CS222)**

*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**

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**B. M. S. College of Engineering,**

**Bull Temple Road, Bangalore 560019**

(Affiliated To Visvesvaraya Technological University, Belgaum)

## Department of Computer Science and Engineering



### CERTIFICATE

This is to certify that the Lab work entitled “**Computer Networks**” carried out by SUBRAMANYAL L(1BM21CS222), 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 academic semester May- 2023 to July-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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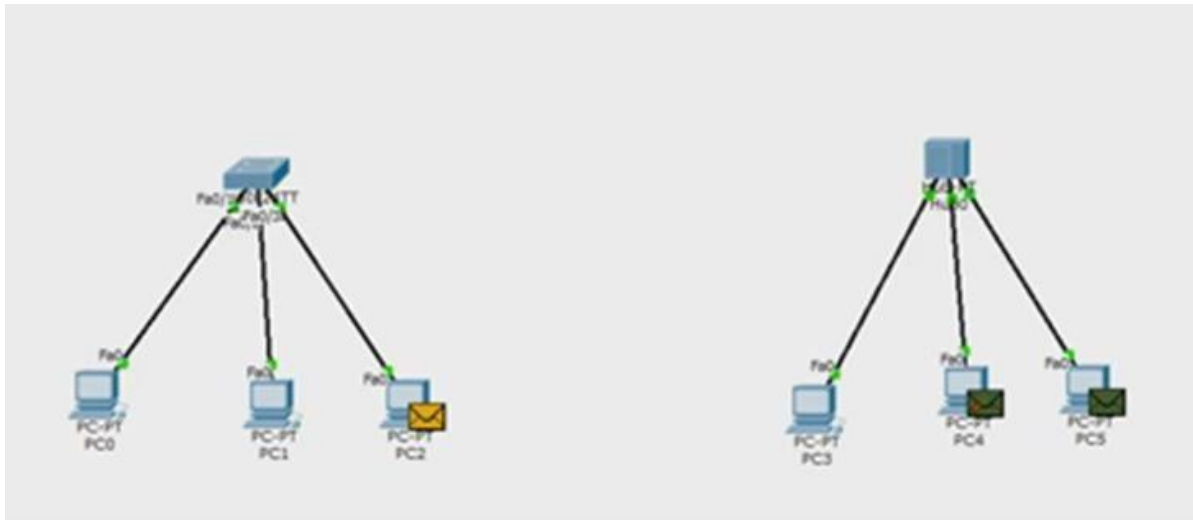
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## Course Outcome

CO1	Apply the fundamental concepts of communication in networking.
CO2	Analyze the various protocols, techniques in TCP/IP network architecture.
CO3	Develop programs that demonstrate the functionalities of physical, Data Link, Network, Transport or Application layer.

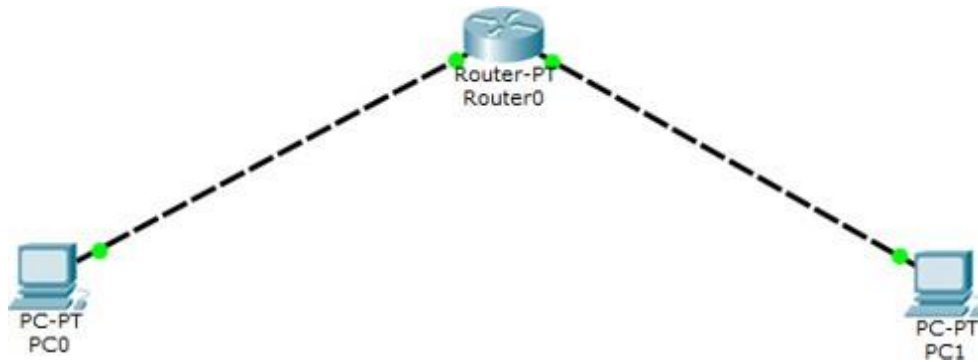
**1) Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices.**

Topology:



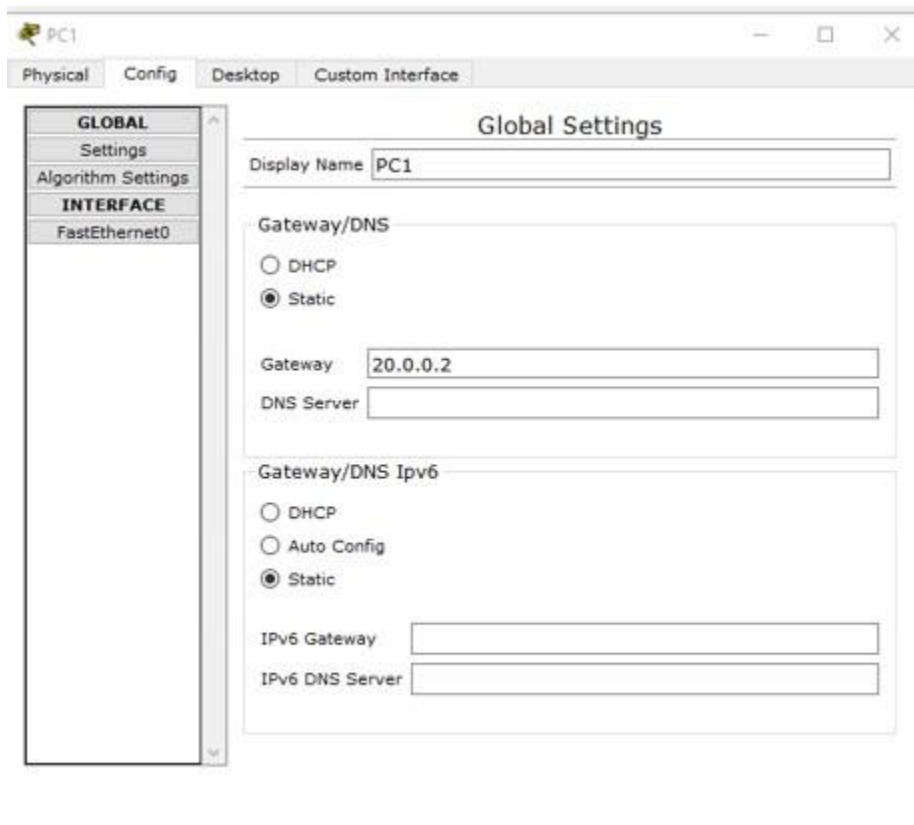
**2) Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.**

Topology:



The screenshot shows the configuration window for PC0. The window has a title bar with "PC0" and standard window controls. Below the title bar are four tabs: "Physical", "Config", "Desktop", and "Custom Interface". The "Config" tab is selected. On the left side of the "Config" tab is a tree view with two main sections: "GLOBAL" and "INTERFACE". Under "GLOBAL", there are "Settings" and "Algorithm Settings". Under "INTERFACE", there is "FastEthernet0". The "Settings" option under "GLOBAL" is selected, displaying the "Global Settings" configuration panel. This panel contains the following fields and options:

- Display Name:** A text box containing "PC0".
- Gateway/DNS:** A section with two radio buttons: "DHCP" (unselected) and "Static" (selected). Below the radio buttons are two text boxes: "Gateway" containing "10.0.0.2" and "DNS Server" (empty).
- Gateway/DNS Ipv6:** A section with three radio buttons: "DHCP" (unselected), "Auto Config" (unselected), and "Static" (selected). Below the radio buttons are two text boxes: "IPv6 Gateway" (empty) and "IPv6 DNS Server" (empty).



Now configure router interface with ip address and subnet mask then give no shutdown to make this interface and line protocol up (i.e. Carefully configure ip address with proper interfaces in this case f0/0 and f1/0, f is short form of fastethernet).

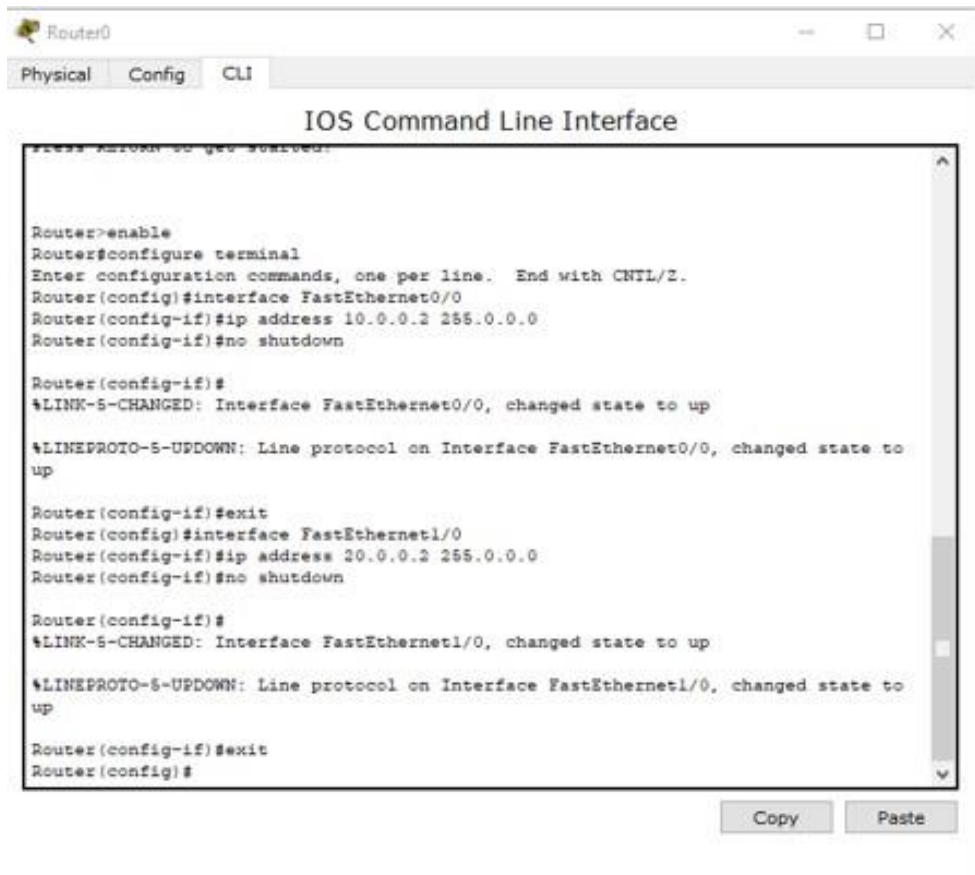
```
Router(config)#interface fastEthernet 0/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
```

Interface Line protocol on FastEthernet0/0, changed state to up

```
Router(config)#interface fastethernet 1/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
```

Interface Line protocol on FastEthernet1/0, changed state to up

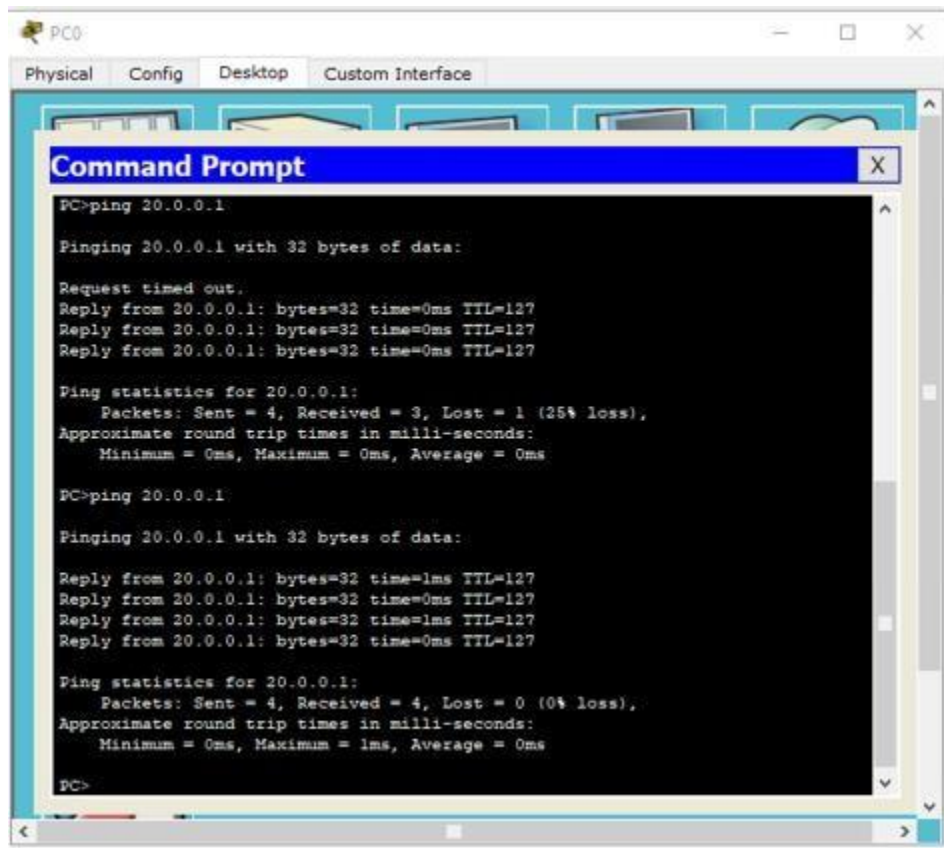
Now lights on all ports become green from red. Now click on PC1 -> Desktop -> Command Prompt.



Now give this command "ping 20.0.0.1" and press enter. you will get, connectivity between 10.0.0.1 and 20.0.0.1 is ok. Now PC1 communicates with PC2

Another way of checking connectivity is, select "simple PDU packet" from right side of packet tracer and select source PC and Destination PC. You will get response at right bottom of the packet tracer window.





The screenshot shows a virtual PC0 desktop with a taskbar at the top containing icons for Physical, Config, Desktop, and Custom Interface. A Command Prompt window is open, displaying the results of two ping commands to the IP address 20.0.0.1. The first command shows a 25% packet loss (1 out of 4 packets received), while the second command shows 0% packet loss (4 out of 4 packets received).

```
PC0>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, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC0>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

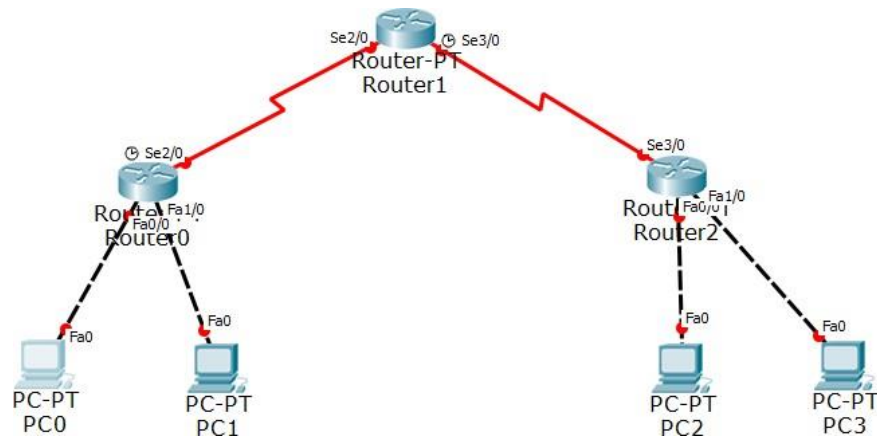
Reply from 20.0.0.1: bytes=32 time=1ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=1ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127

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 = 1ms, Average = 0ms

PC0>
```

### 3) Configure default, static route to the router.

#### Static routing:



Topology

Configure IP address and default gateway of PC'S

Configure the routers as shown below

R0

```
Router0
Physical Config CLI
IOS Command Line Interface
Enter configuration commands, one per line. End with
CNTL/Z.
Router(config)#interface fastEthernet0/0
Router(config-if)#ip address 10.0.0.3 255.0.0.0
Router(config-if)#no shutdown

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

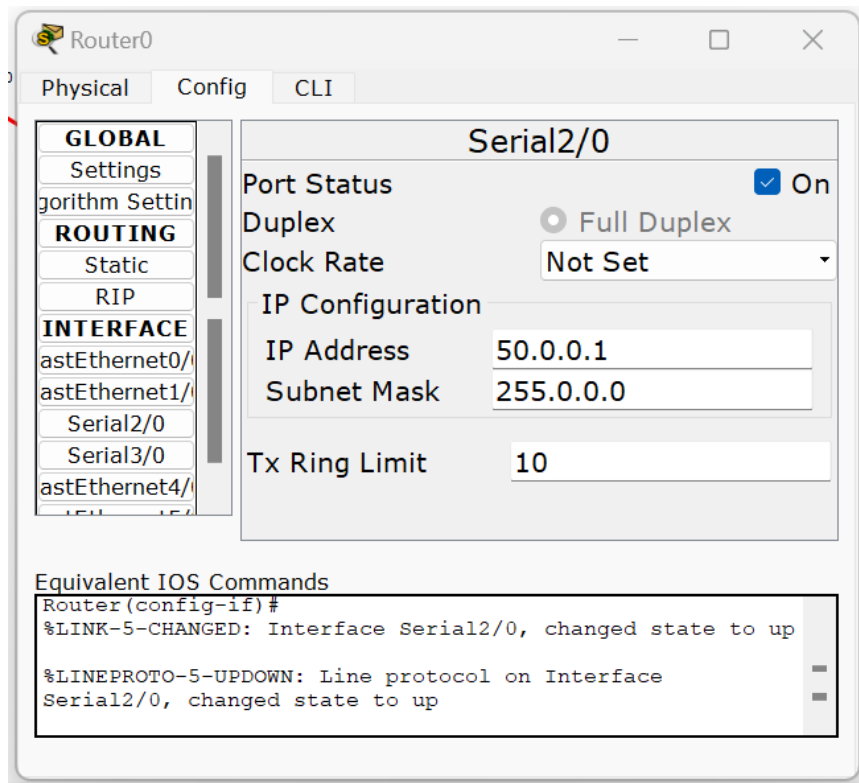
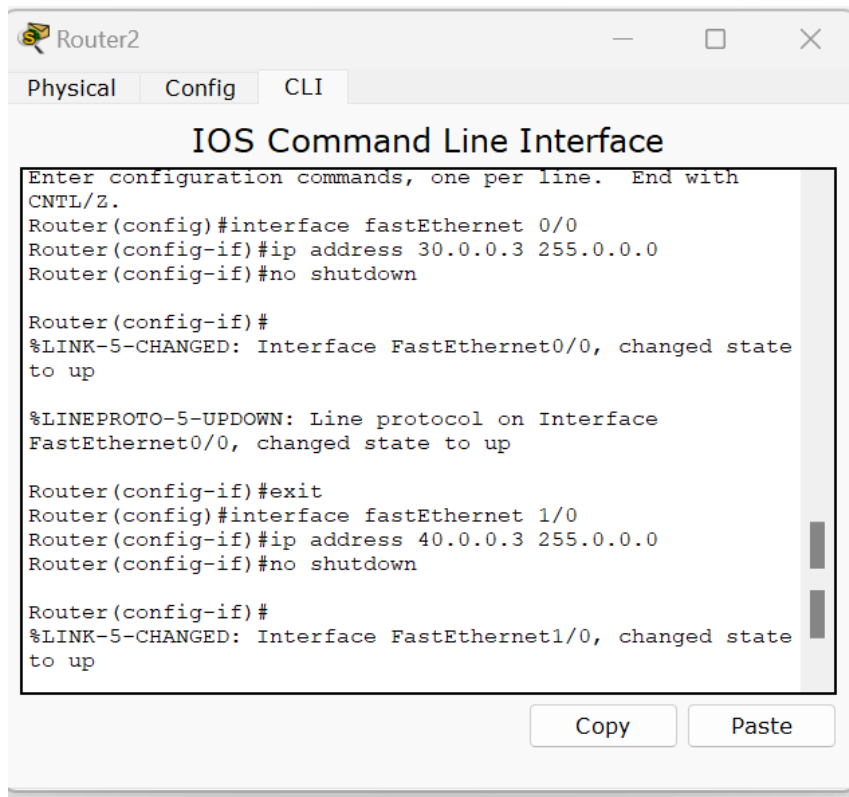
%LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/0, changed state to up

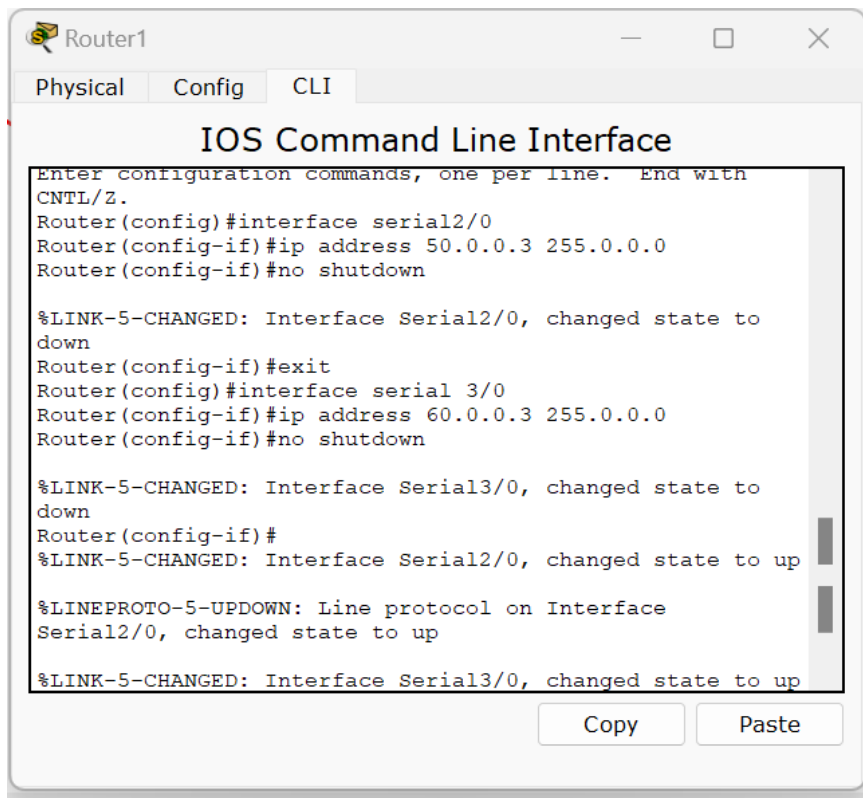
Router(config-if)#exit
Router(config)#interface fastEthernet1/0
Router(config-if)#ip address 20.0.0.3 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state
to up

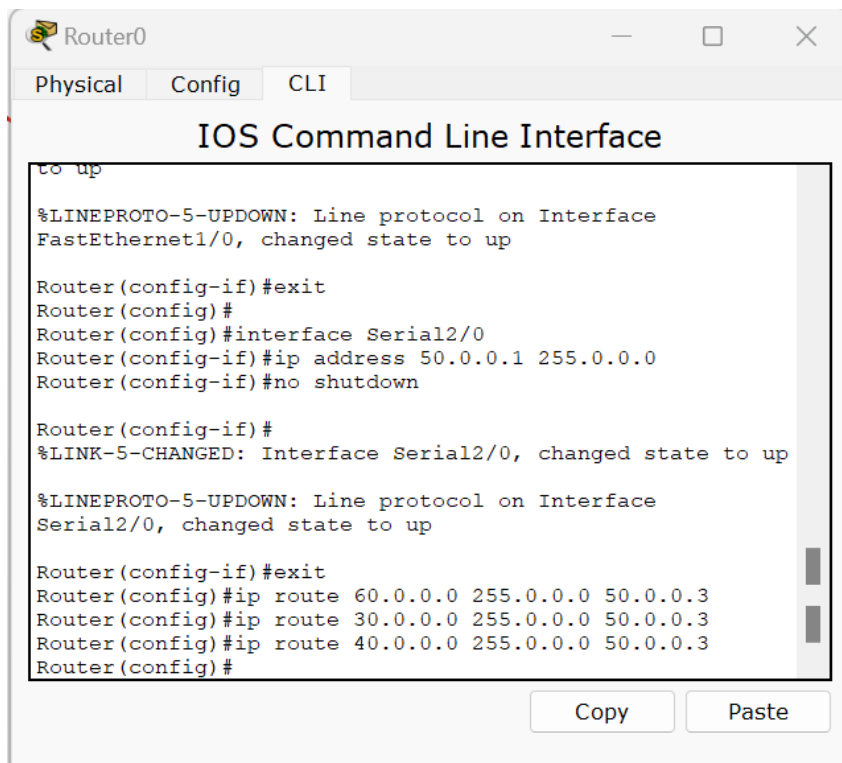
Copy Paste
```

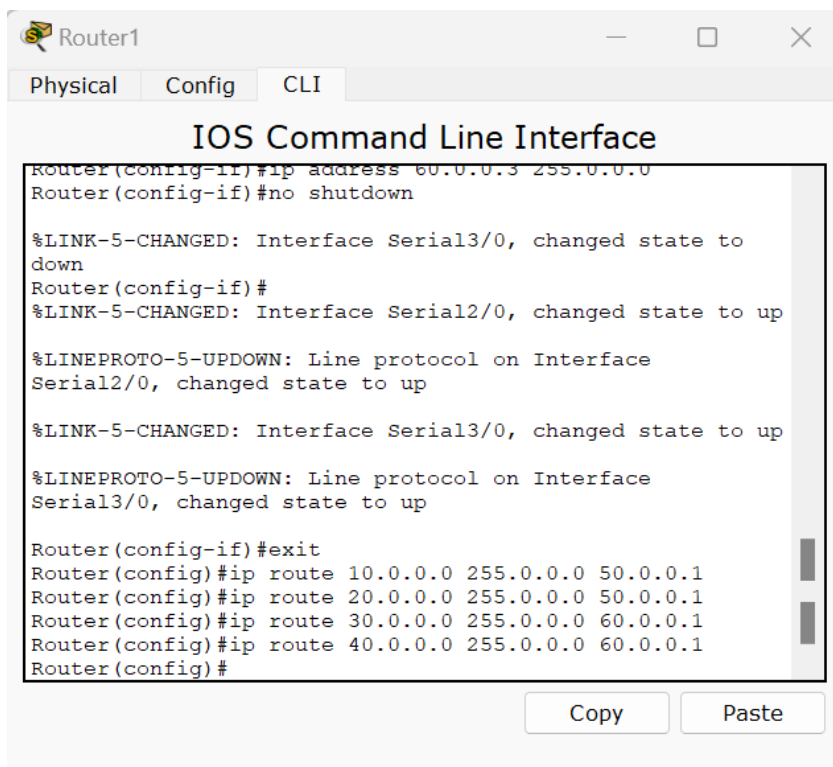
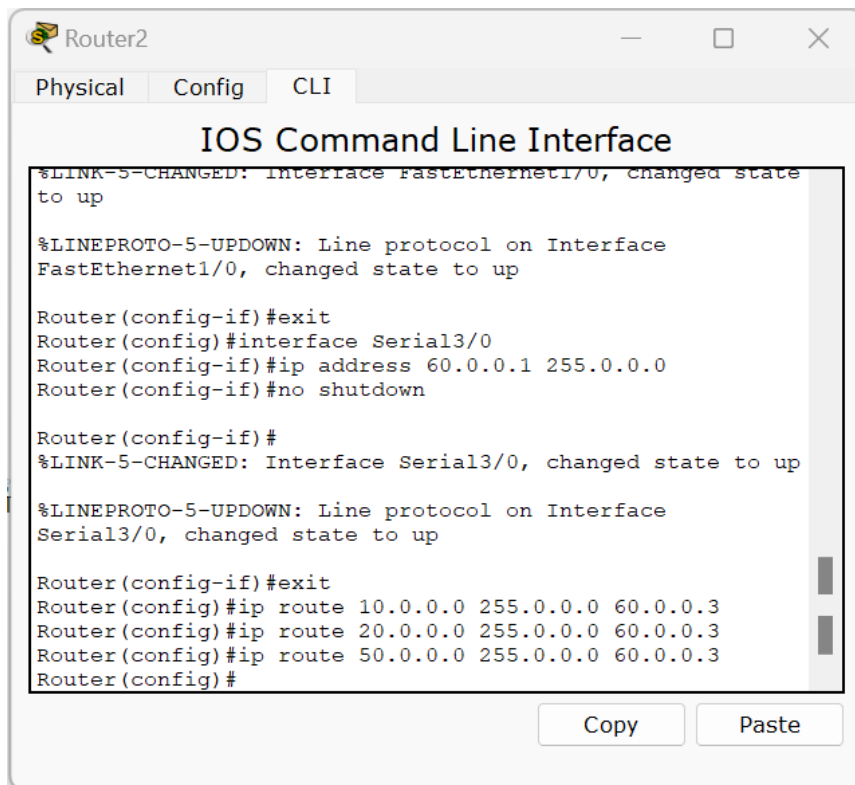
R2





## IP ROUTE COMMANDS





```
Command Prompt
Ping statistics for 30.0.0.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 17ms, Average = 11ms

PC>ping 30.0.0.1

Pinging 30.0.0.1 with 32 bytes of data:

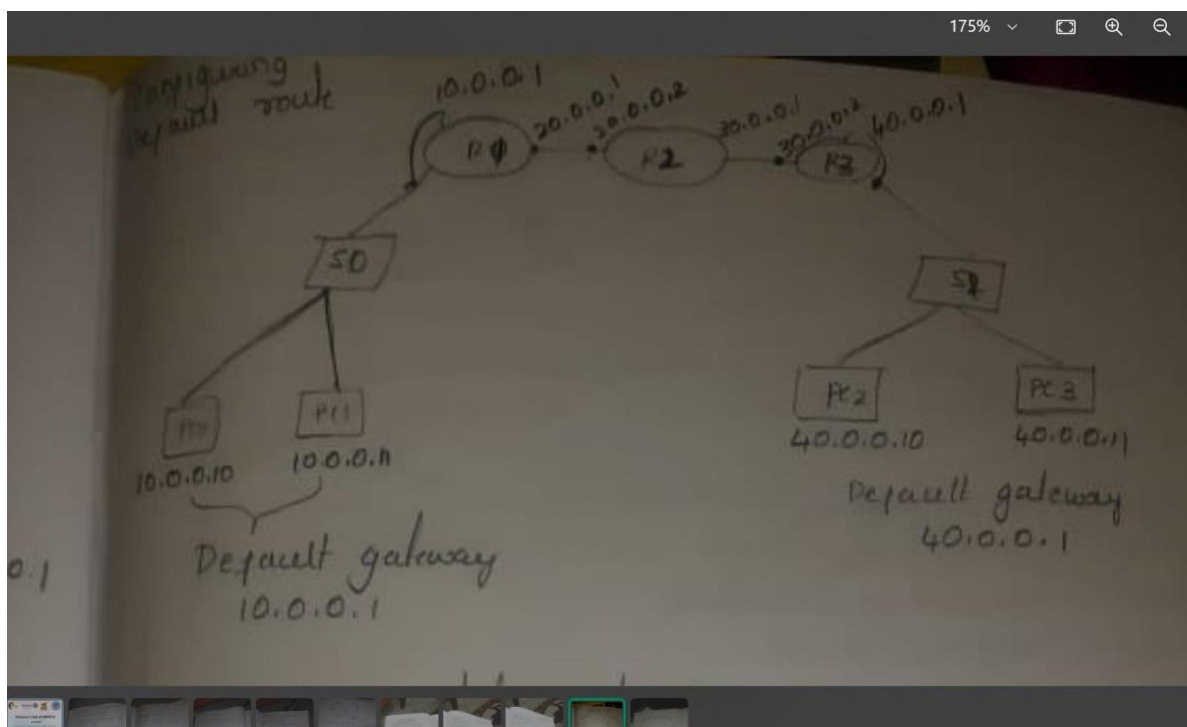
Reply from 30.0.0.1: bytes=32 time=12ms TTL=125
Reply from 30.0.0.1: bytes=32 time=11ms TTL=125
Reply from 30.0.0.1: bytes=32 time=2ms TTL=125
Reply from 30.0.0.1: bytes=32 time=2ms TTL=125

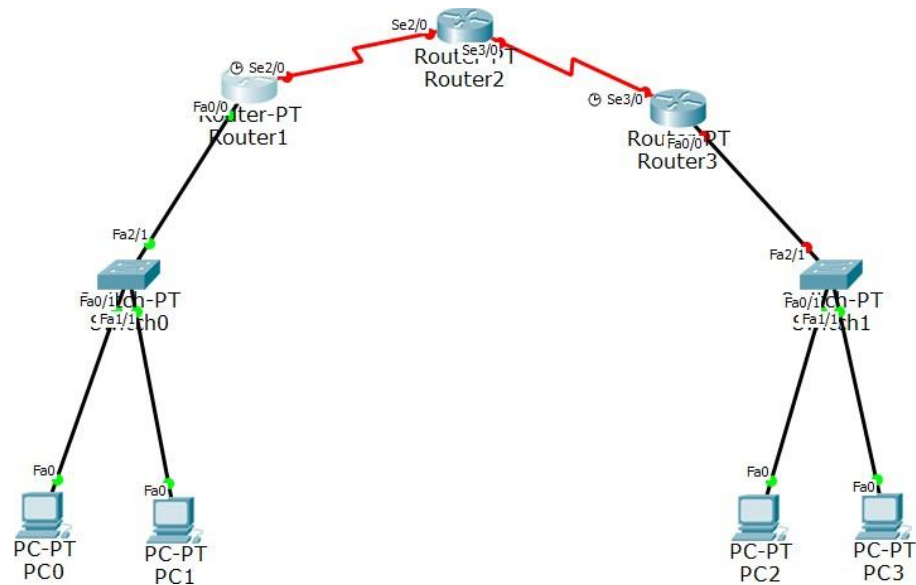
Ping statistics for 30.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 12ms, Average = 6ms

PC>
```

## Default routing

Set up topology as shown





Router1

Physical Config CLI

### IOS Command Line Interface

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Router(config)#interface fastEthernet0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown

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

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

Router(config-if)#interface serial2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#no shutdown

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

```

Copy Paste

## Router 2

```
System Configuration Dialog

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

Press RETURN to get started!

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#configure terminal
      ^
% Invalid input detected at '^' marker.

Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#no shutdown

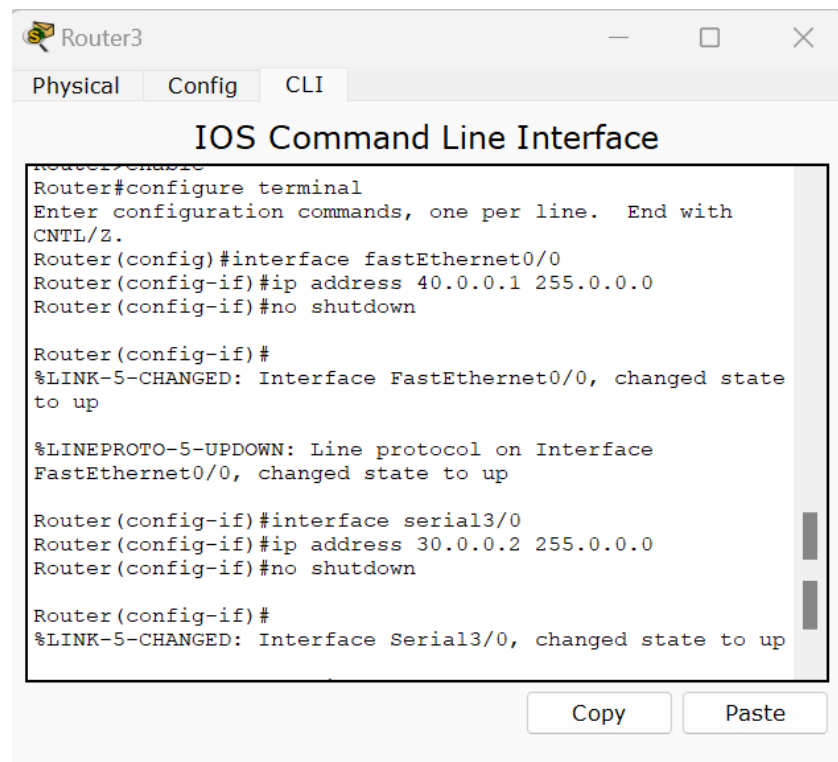
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

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

Router(config)#interface serial3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shutdown

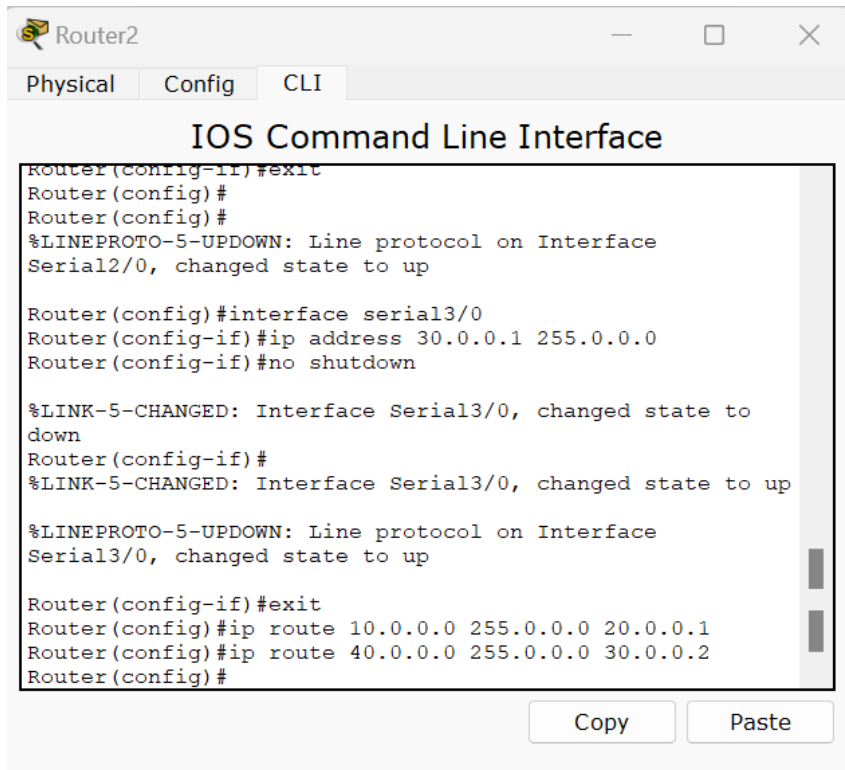
%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
```

## Router3





Configure static route for middle router R2 we have to do it for 40 & 10 network.



The screenshot shows the CLI window for Router2. The 'Config' tab is selected. The command history shows the following sequence of commands and system responses:

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

Router(config)#interface serial3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shutdown

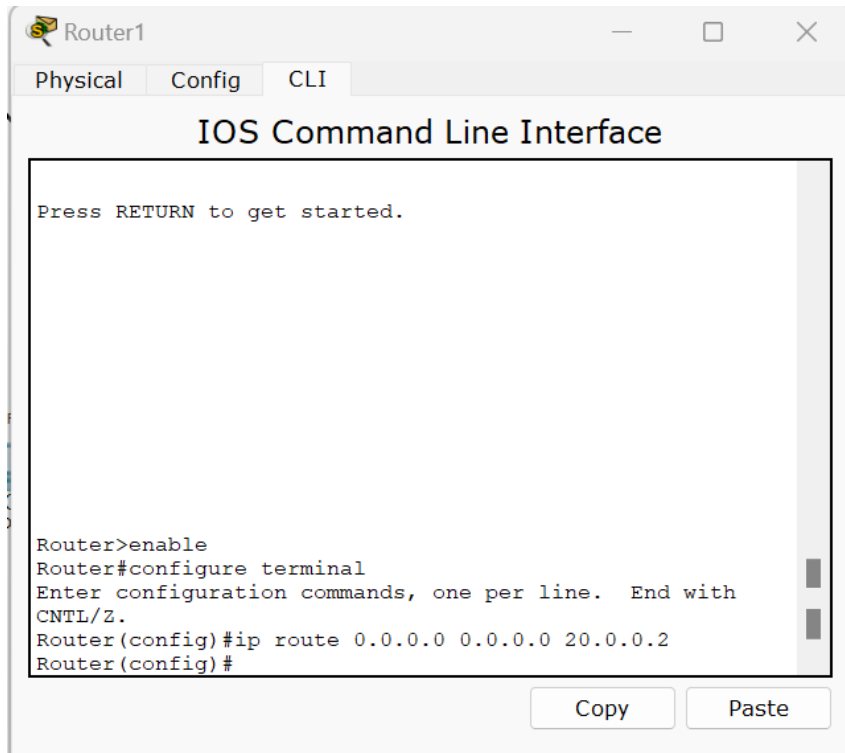
%LINK-5-CHANGED: Interface Serial3/0, changed state to
down
Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial3/0, changed state to up

Router(config-if)#exit
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.1
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.2
Router(config)#
```

At the bottom of the window, there are 'Copy' and 'Paste' buttons.

Default routing for router 1 and 3

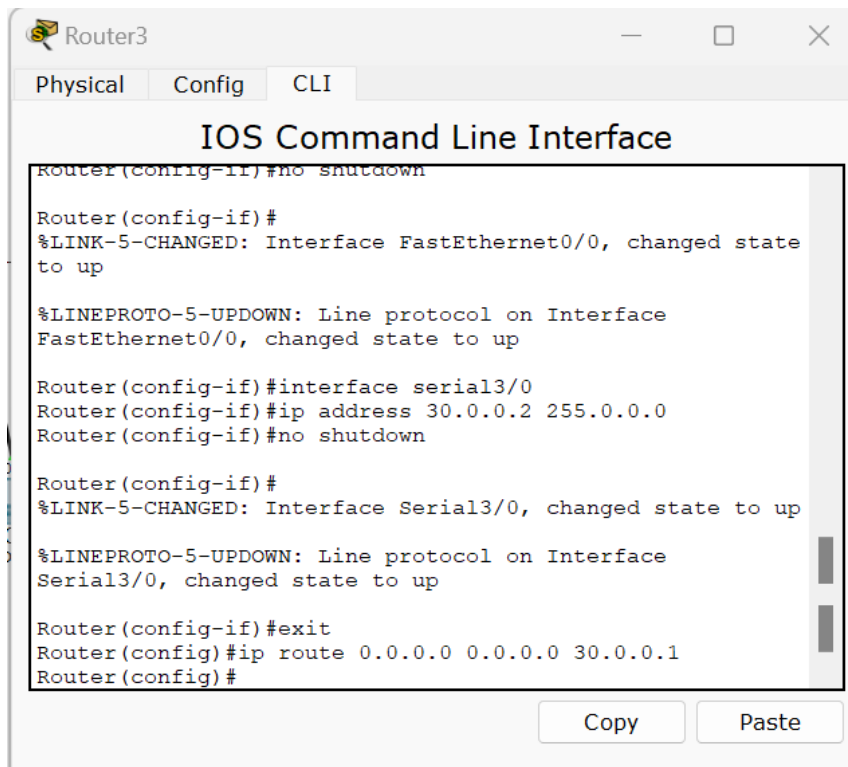


The screenshot shows the CLI window for Router1. The 'Config' tab is selected. The command history shows the following sequence of commands and system responses:

```
Press RETURN to get started.

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 20.0.0.2
Router(config)#
```

At the bottom of the window, there are 'Copy' and 'Paste' buttons.



Router3

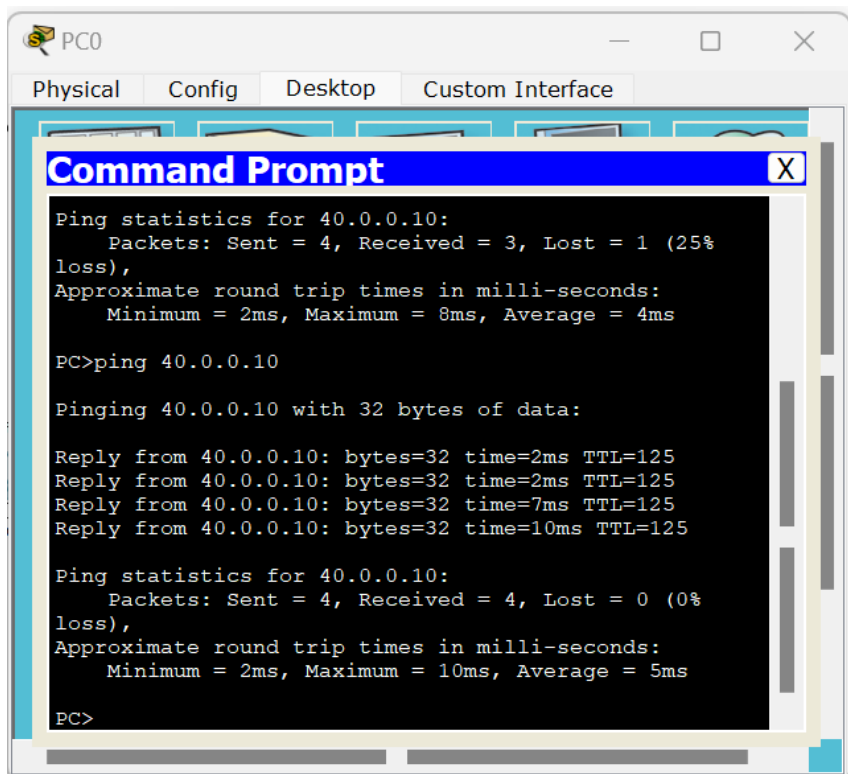
Physical Config CLI

### IOS Command Line Interface

```
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state
to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet0/0, changed state to up
Router(config-if)#interface serial3/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial3/0, changed state to up
Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 30.0.0.1
Router(config)#
```

Copy Paste

Ping from pc0 to pc2



PC0

Physical Config Desktop Custom Interface

### Command Prompt

```
Ping statistics for 40.0.0.10:
  Packets: Sent = 4, Received = 3, Lost = 1 (25%
loss),
Approximate round trip times in milli-seconds:
  Minimum = 2ms, Maximum = 8ms, Average = 4ms

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=2ms TTL=125
Reply from 40.0.0.10: bytes=32 time=2ms TTL=125
Reply from 40.0.0.10: bytes=32 time=7ms TTL=125
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 = 10ms, Average = 5ms

PC>
```

Router1

Physical Config CLI

### IOS Command Line Interface

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

Gateway of last resort is 20.0.0.2 to network 0.0.0.0

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

Copy Paste

Router2

Physical Config CLI

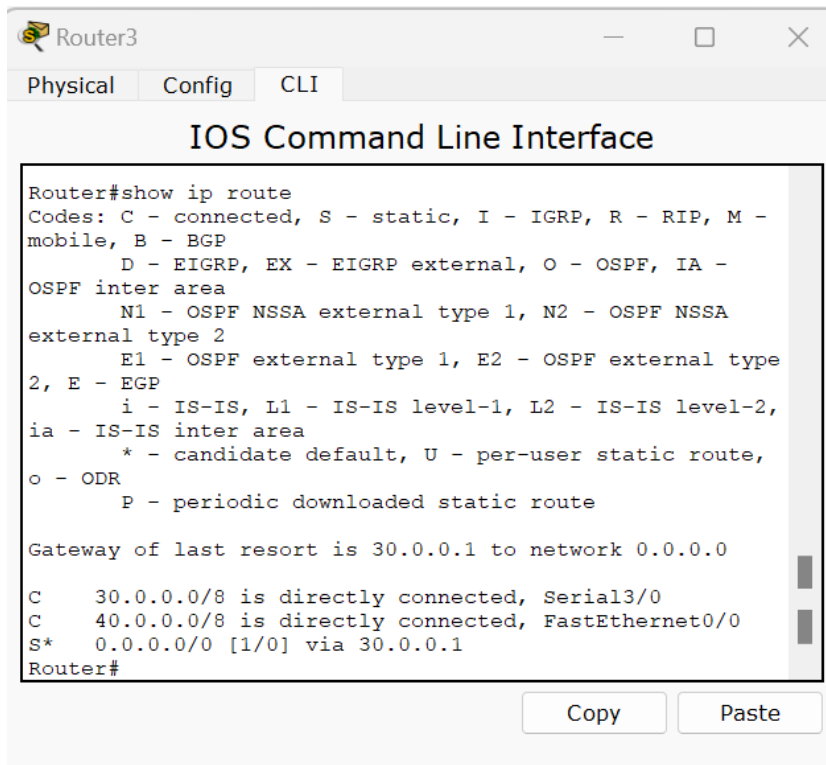
### IOS Command Line Interface

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

Gateway of last resort is not set

S    10.0.0.0/8 [1/0] via 20.0.0.1
C    20.0.0.0/8 is directly connected, Serial2/0
C    30.0.0.0/8 is directly connected, Serial3/0
S    40.0.0.0/8 [1/0] via 30.0.0.2
Router#
```

Copy Paste



The screenshot shows a window titled "Router3" with three tabs: "Physical", "Config", and "CLI". The "CLI" tab is active, displaying the "IOS Command Line Interface". The command "Router#show ip route" has been entered, and its output is shown below. The output includes a legend for route codes (C, S, I, R, M, B, D, EX, O, IA, N1, N2, E1, E2, i, L1, L2, ia, \*, U, o, P), the gateway of last resort (30.0.0.1), and the specific routes for 30.0.0.0/8 and 40.0.0.0/8. At the bottom of the CLI window, there are "Copy" and "Paste" buttons.

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

Gateway of last resort is 30.0.0.1 to network 0.0.0.0

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

#### 4) Configure DHCP within a LAN and outside LAN.

**Step 1:** Create a LAN like this,

```
Router>enable Router
#config t Router(config)
#interface fastethernet0/0 Router(config-if)
#ip address 10.0.0.1 255.0.0.0 Router(config-if)
#no shutdown Router(config-if)
#exit Router(config)
```

**Step 3:** click on server-> config, then assign gateway in our example 10.0.0.1

**Step 4:** Then Click on Fastethernet and assign ip address and subnet mask. I am going to use 10.0.0.2 and subnet mask 255.0.0.0 for our server.

**Step 5:** Click on DHCP, there you can see default pool,

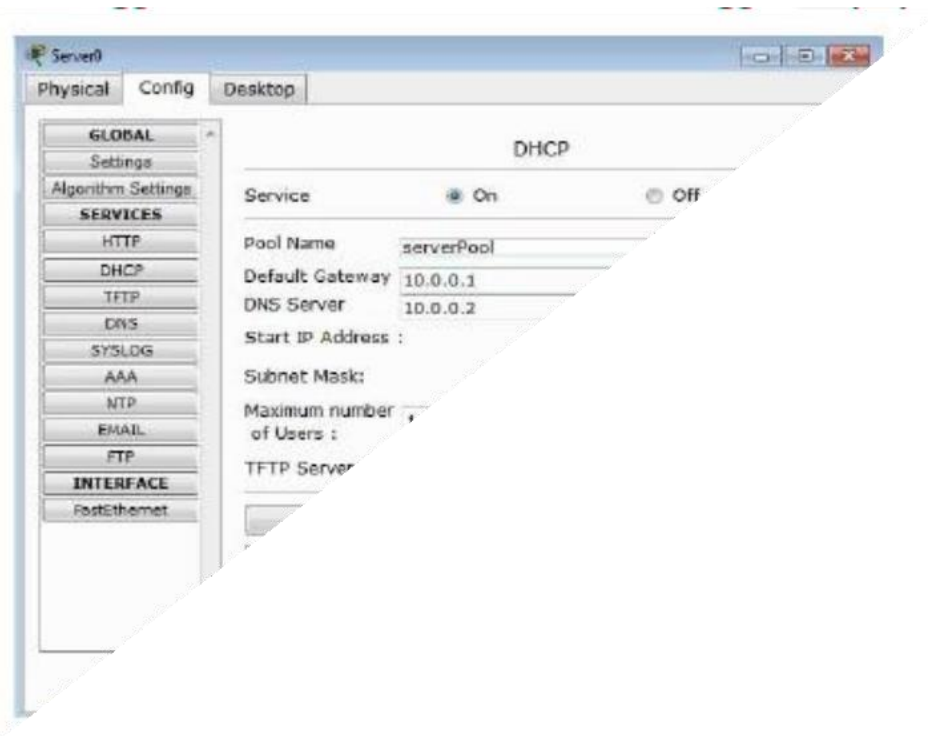
**Step 6:** Just give default gate way, here we are using 10.0.0.1.

**Step 7:** DNS server, Just give our server ip address, 10.0.0.2.

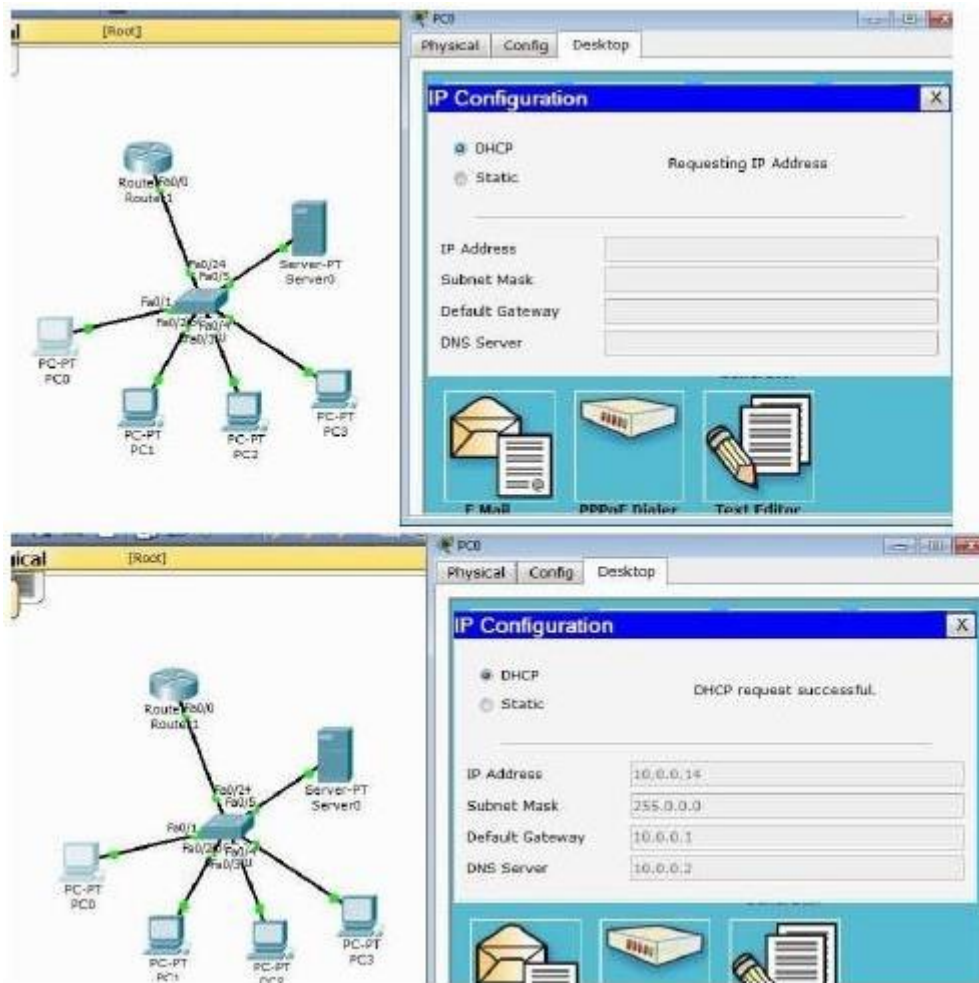
**Step 8:** Then just edit start ip address. I am going to give 10.0.0.10 and subnet mask 255.0.0.0 **Step 9:** In Maximum Number of Users, Here we are using Class A Network so we can use 1,67,77,216 ip address. just give how many ip address you want in this pool. I am going to give 500

**Step 10:** Assign TFTP server ip address, just give our server ip address, 10.0.0.2.

**Step 11:** And click on save. That's it...



**Step 12:** Now, Click on any of the PC-> then click on Desktop->Ip configuration, and Choose 'DHCP' wait for some time, if your dhcp request failed then try few more times. This is how you should get.



## DHCP outside LAN

Here we are going to see, how to configure DHCP for multiple networks. Can we get IP address from DHCP that is present in other network? Yes, we can. Let's see how to do with help of 'ip helper-address'.

**Step 1:** Create a topology like this,

**Step 2:** Configure the router

interface fastethernet0/0 and fastethernet 0/1 with IP address .

Router>enable Router

#config terminal Router(config)

#interface fastethernet0/0 Router(config-if)

#ip address 10.0.0.1 255.0.0.0 Router(config-if)

#no shutdown Router(config-if)

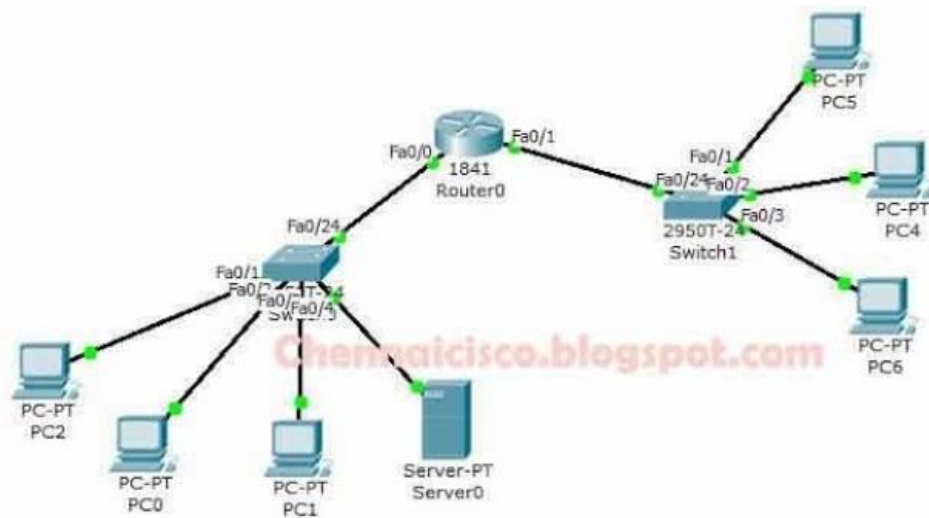
#exit Router(config)

#interface fastethernet0/1 Router(config-if)

#ip address 20.0.0.1 255.0.0.0 Router(config-if)

#no shutdown Router(config-if)

#exit



**Step 3:**Click on server->config->then just give the gateway ip address .Gateway for this network is 10.0.0.1

**Step 4:**Then click on fastethernet assign ip address.I am going to give 10.0.0.2 and subnetmask 255.0.0.0.Once we have configured the ip address for the server,DHCP server automatically assign 10 network for default pool.We don't have to create pool for 10 Network again.Just we need to give ip for DNS,Gateway and TFTP then we may configure starting ip address or leave it and Save. **Step 5:**Now,Click on Pc in a LAN with Server and Check whether DHCP working fine in this network.Click on any PC->Desktop->Ip configuration->Choose DHCP, then you will get ip from dhcp server for this PC.



**Step 6:** Now, we see how to get IP address for PC that is in a network without server. For that, first we have to add network pool in a DHCP server. So, Click on Server->Config->DHCP.

**Step 7:** Just edit Pool Name with any other name. I am going to give 20Network. Default Gateway->20.0.0.1, DNS Server->10.0.0.2

Start IP Address->20.0.0.10 Subnet Mask->255.0.0.0 Maximum Number Of Users->100 TFTP Server 10.0.0.2 Then, Click on Add and Save.

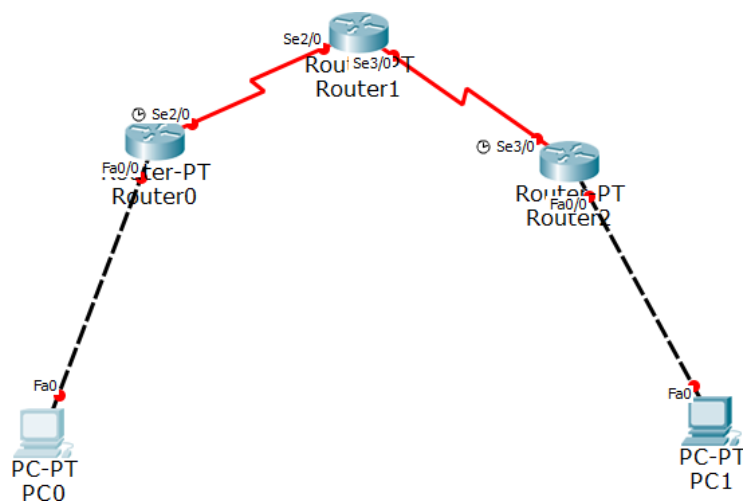
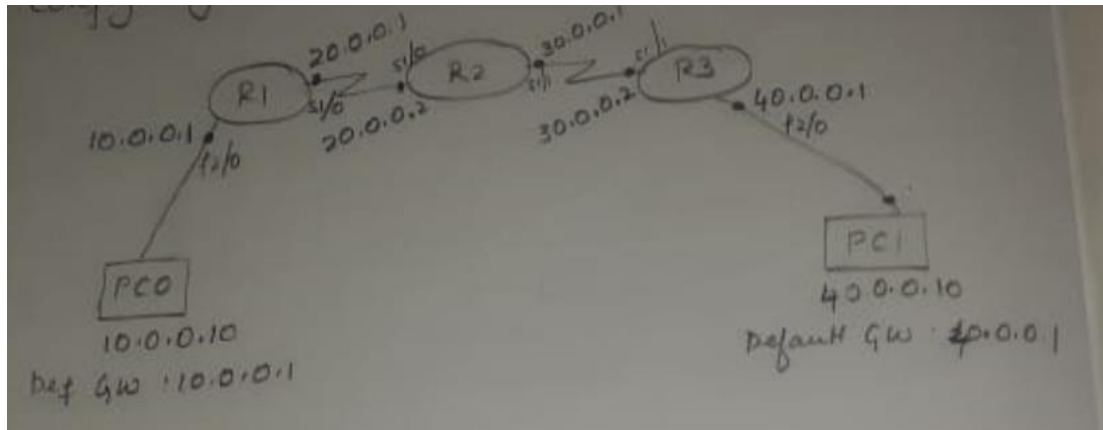
**Step 8:** Now go to router and give IP helper address under fastEthernet0/1, that is server address here our server address is 10.0.0.2. Now we can get IP for this network also in Router, (Global configuration mode)

```
Router(config)#interface fastethernet0/1  
Router(config-if)#ip helper-address 10.0.0.2  
Router(config-if)#exit
```

**Step 9:** Now, check whether PC from network without server getting ip from the DHCP server in another Network. Click on any PC->Desktop->Ip configuration->Choose DHCP. Now we have got ip address from dhcp server.

## 6) Configure RIP routing Protocol in Routers

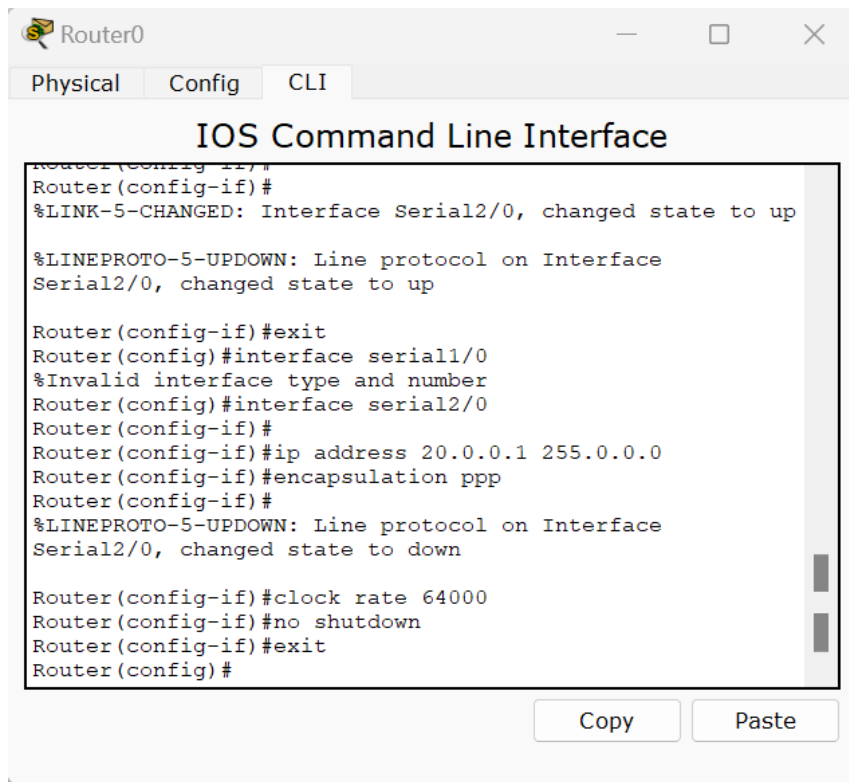
### TOPOLOGY



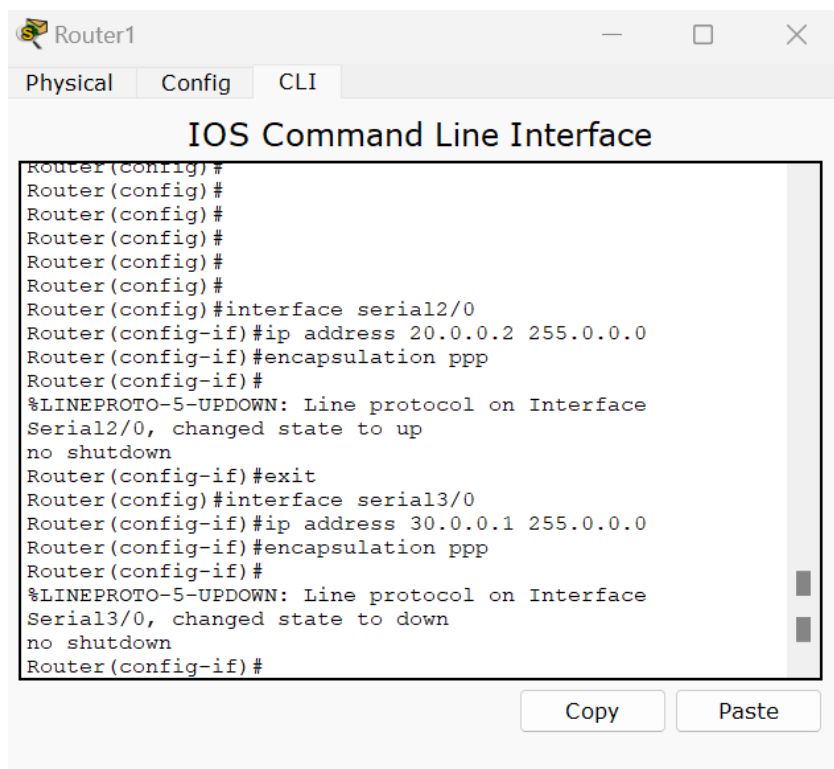
Configure ip address and gateway of PC's

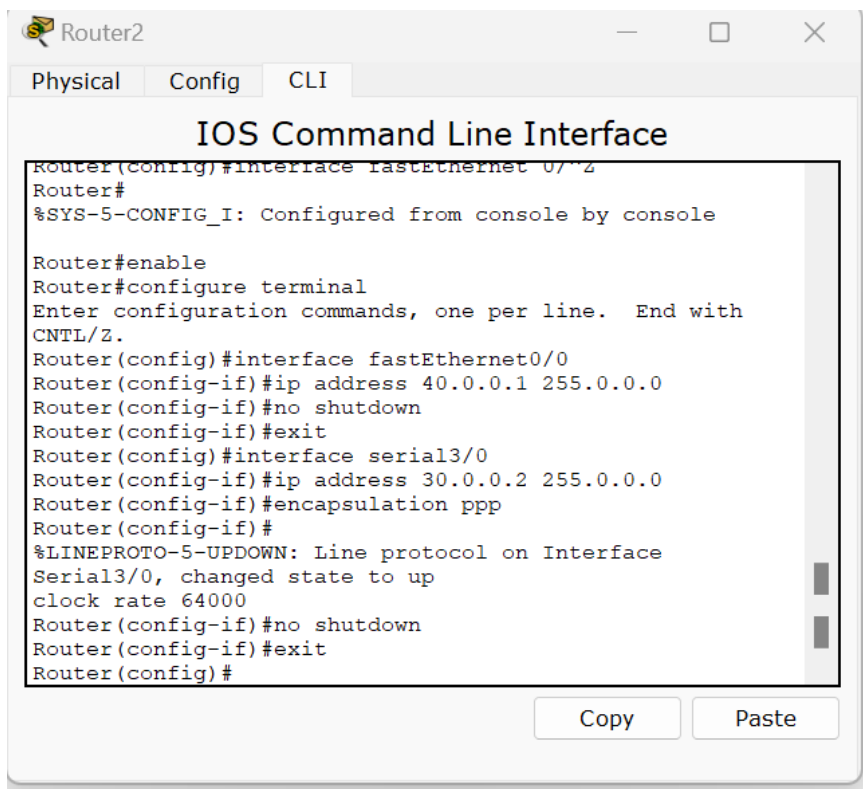
Configure routers as shown in diagram.

Now configure ppp or point to point protocol for all routers.

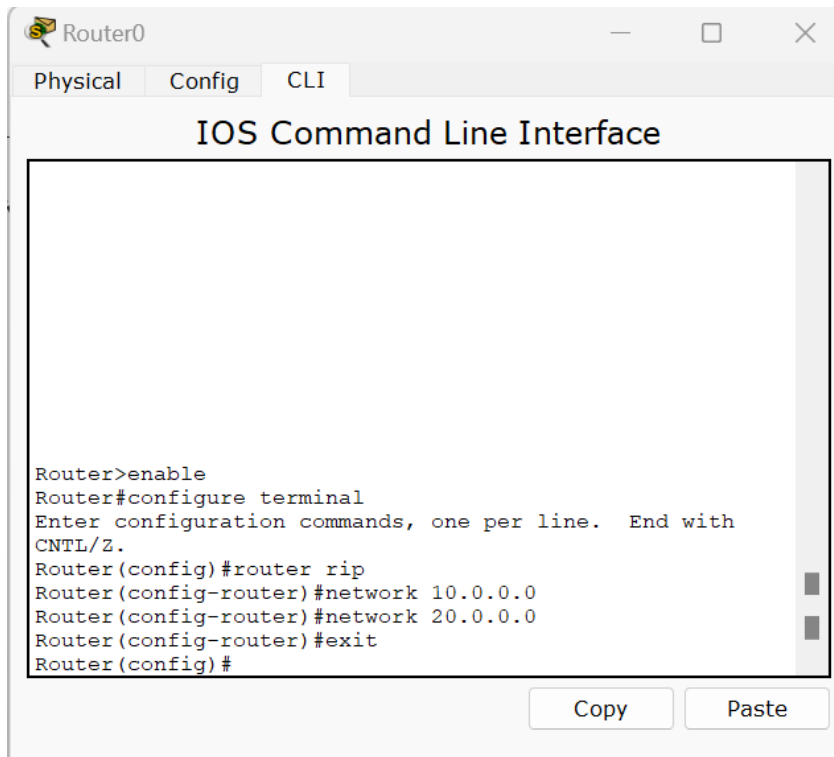


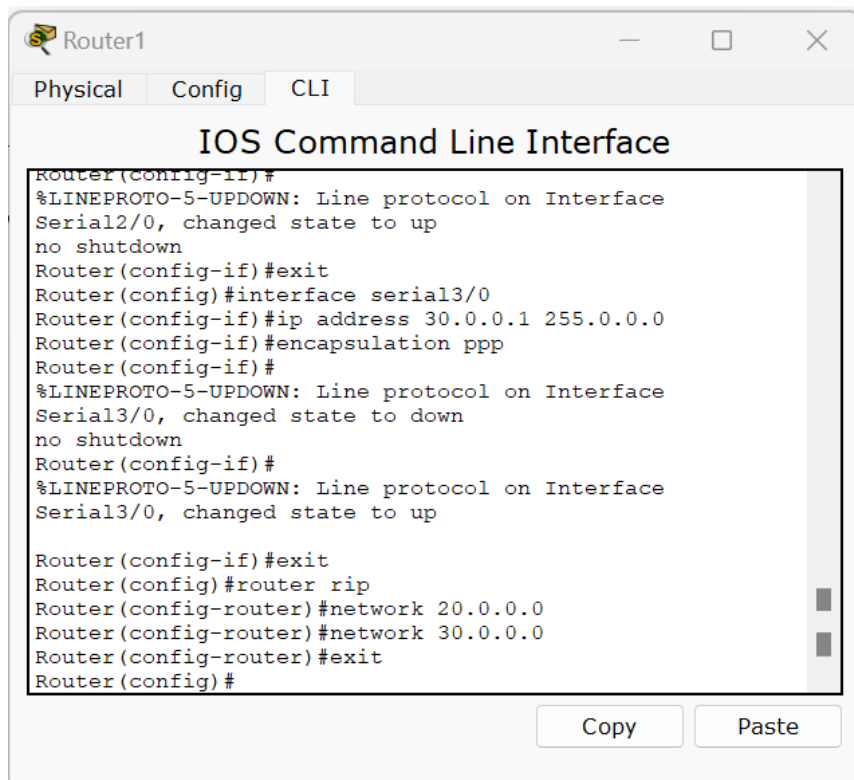
No need to give clk rate in second router





## CONFIGURE RIP





Router1

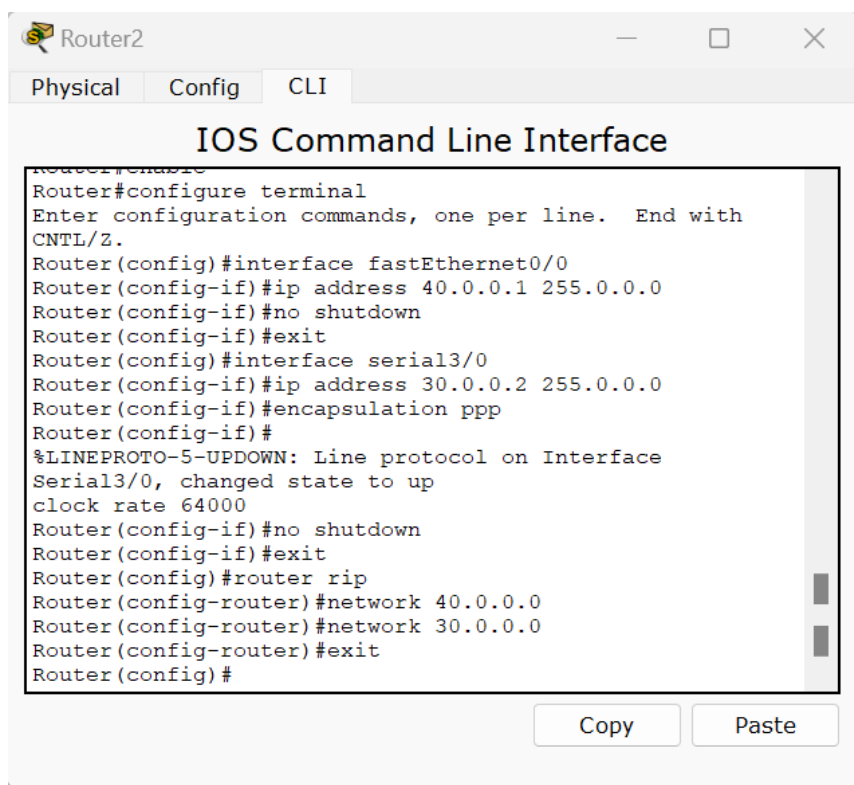
Physical Config CLI

### IOS Command Line Interface

```
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial2/0, changed state to up
no shutdown
Router(config-if)#exit
Router(config)#interface serial3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial3/0, changed state to down
no shutdown
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial3/0, changed state to up

Router(config-if)#exit
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)#
```

Copy Paste



Router2

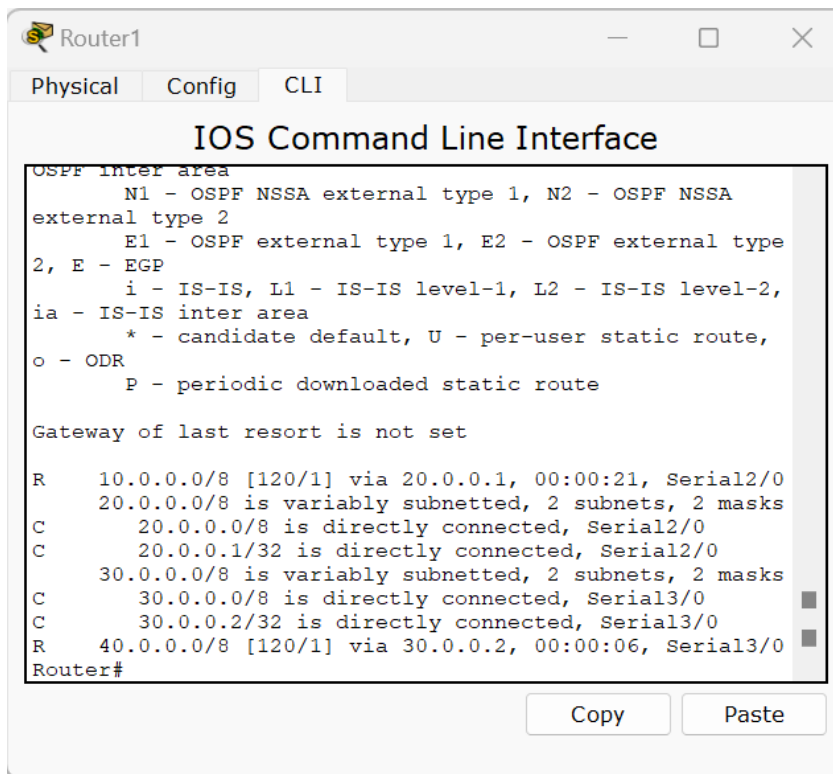
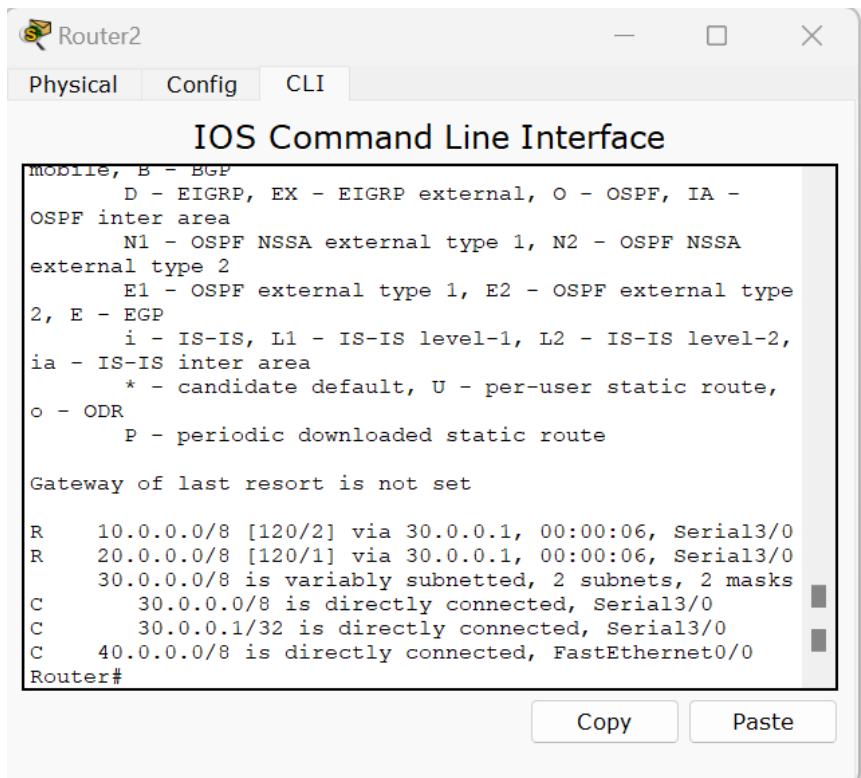
Physical Config CLI

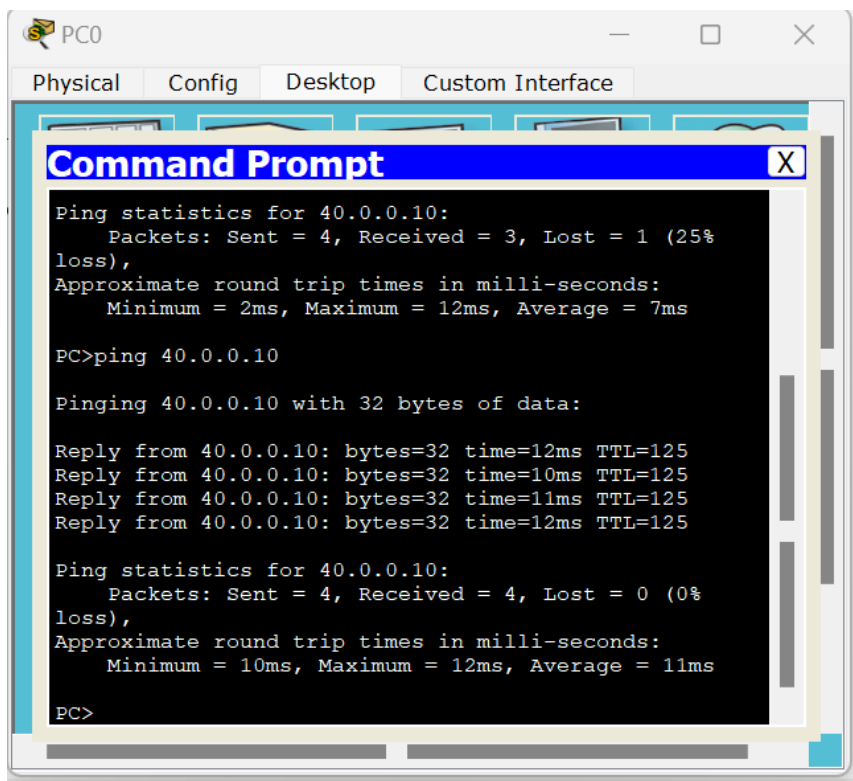
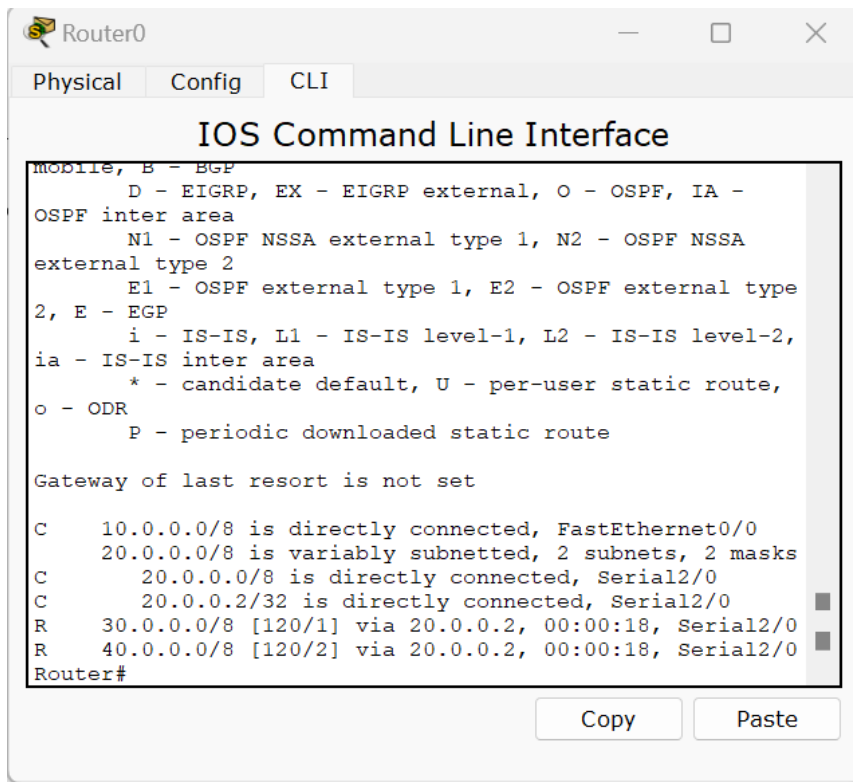
### IOS Command Line Interface

```
Router#enable
Router#configure terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Router(config)#interface fastEthernet0/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface serial3/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial3/0, changed state to up
clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#router rip
Router(config-router)#network 40.0.0.0
Router(config-router)#network 30.0.0.0
Router(config-router)#exit
Router(config)#
```

Copy Paste

Execute show ip route

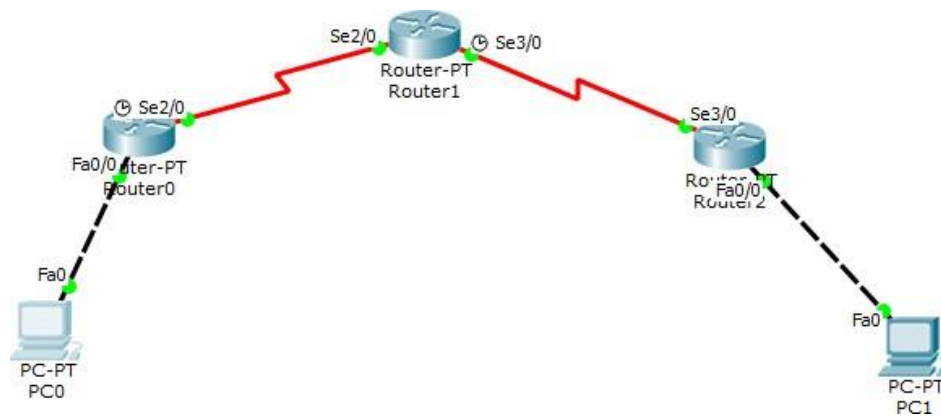






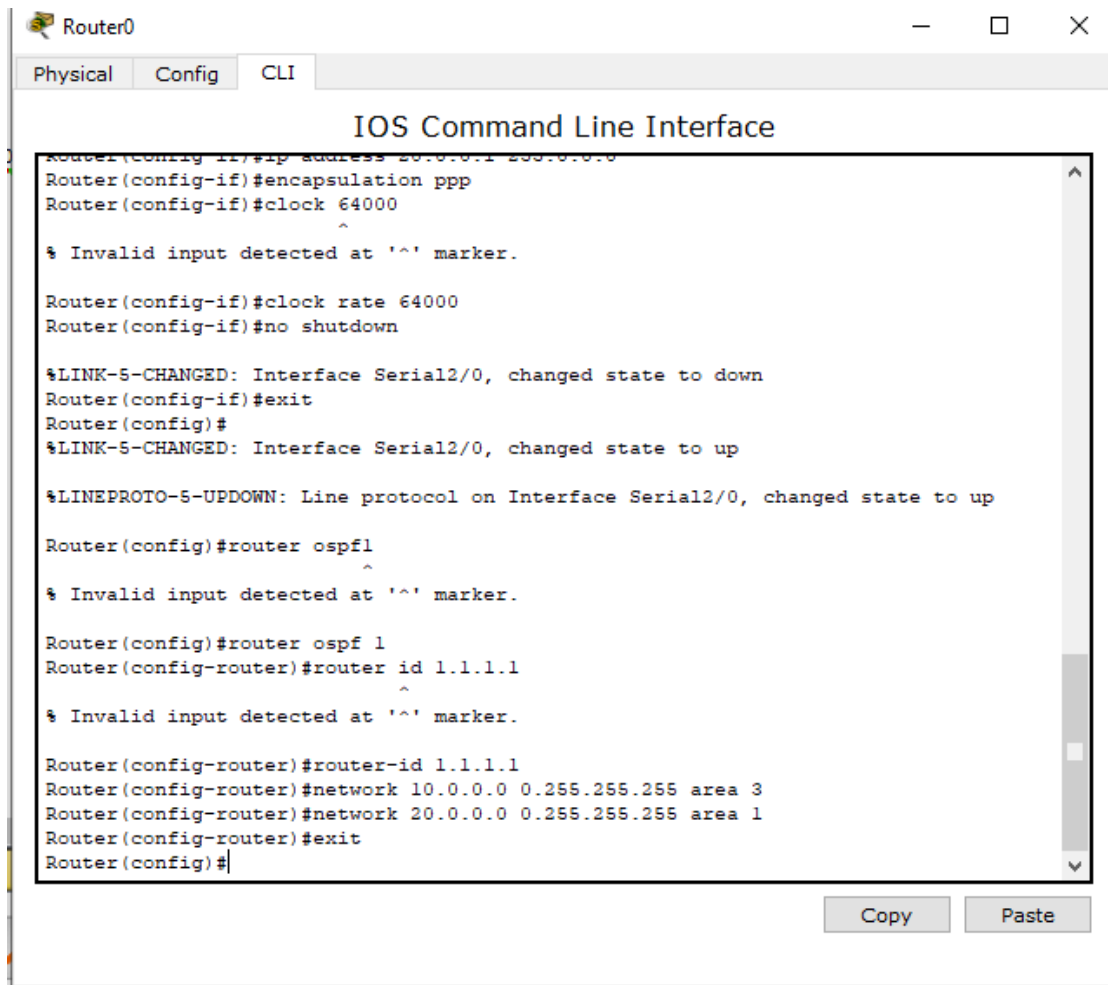
## 6) Configure OSPF routing protocol

Topology.



1.config rip.

## 2. Config ospf



The screenshot shows a window titled "Router0" with three tabs: "Physical", "Config", and "CLI". The "CLI" tab is active, displaying the "IOS Command Line Interface". The interface shows a series of commands and their outputs for configuring OSPF on a router. The commands are entered in a text area, and the outputs are displayed below them. The commands include setting the IP address, encapsulation, clock rate, and shutdown status for the interface, followed by enabling OSPF and configuring the network areas.

```
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock 64000
^
% Invalid input detected at '^' marker.

Router(config-if)#clock rate 64000
Router(config-if)#no shutdown

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

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

Router(config)#router ospf1
^
% Invalid input detected at '^' marker.

Router(config)#router ospf 1
Router(config-router)#router id 1.1.1.1
^
% Invalid input detected at '^' marker.

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)#
```

At the bottom right of the CLI window, there are two buttons: "Copy" and "Paste".

## IOS Command Line Interface

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

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

Router(config-if)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown

%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 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)#
00:15:10: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to
FULL, Loading Done

Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#
```

Copy

Paste

Router2

Physical Config CLI

### IOS Command Line Interface

```
Router(config)#interface FastEthernet0/0
Router(config-if)#no shutdown

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

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

Router(config-if)#interface serial3/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shutdown

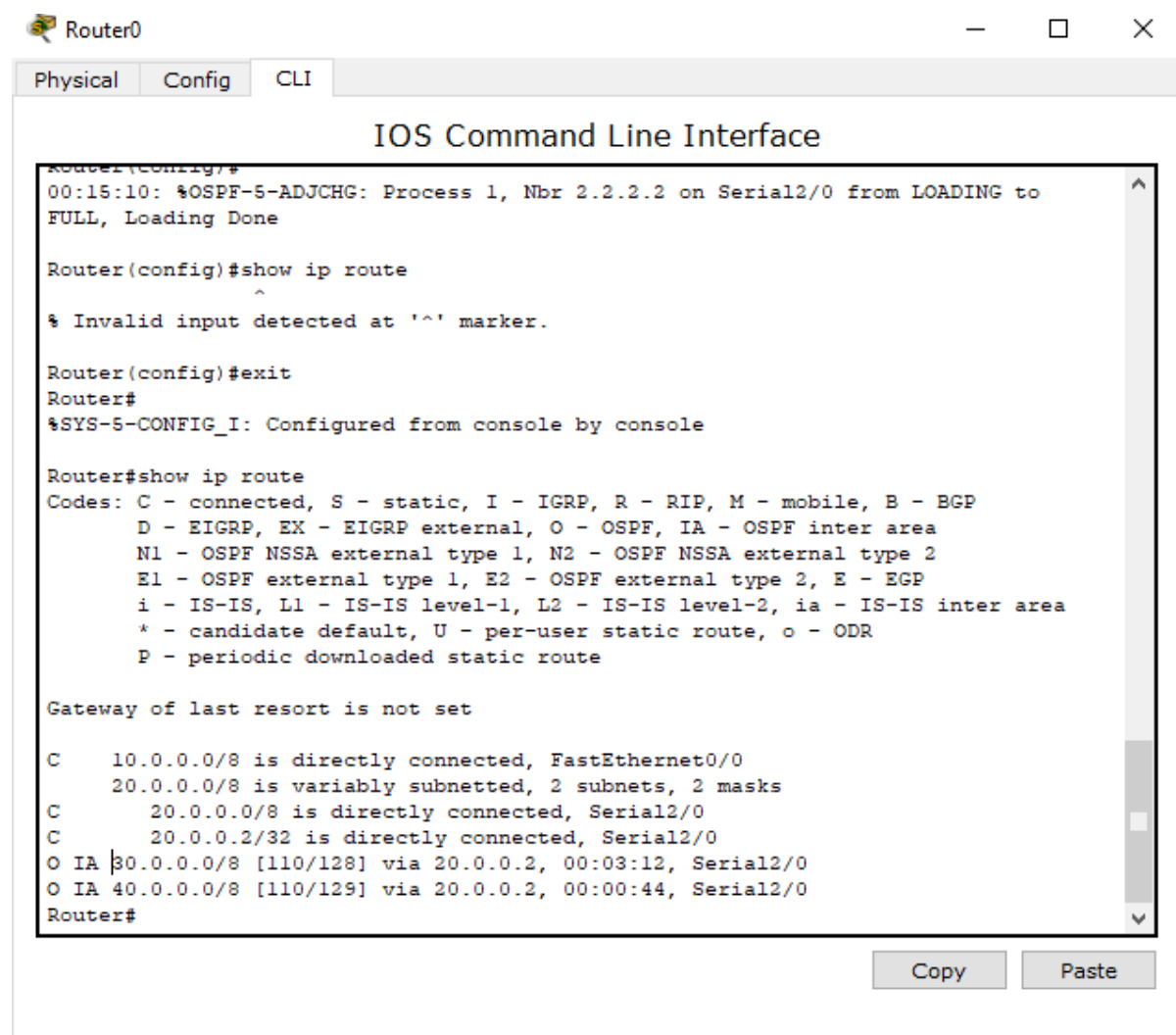
Router(config-if)#
%LINK-5-CHANGED: Interface Serial3/0, changed state to up

Router(config-if)#e
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
xit
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#
00:17:34: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to FULL, Loading Done

Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#
```

Copy Paste

Show ip route



The screenshot shows a Cisco Router CLI window titled "Router0" with three tabs: "Physical", "Config", and "CLI". The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal output shows the following sequence of commands and responses:

```
Router(config)#
00:15:10: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading Done

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

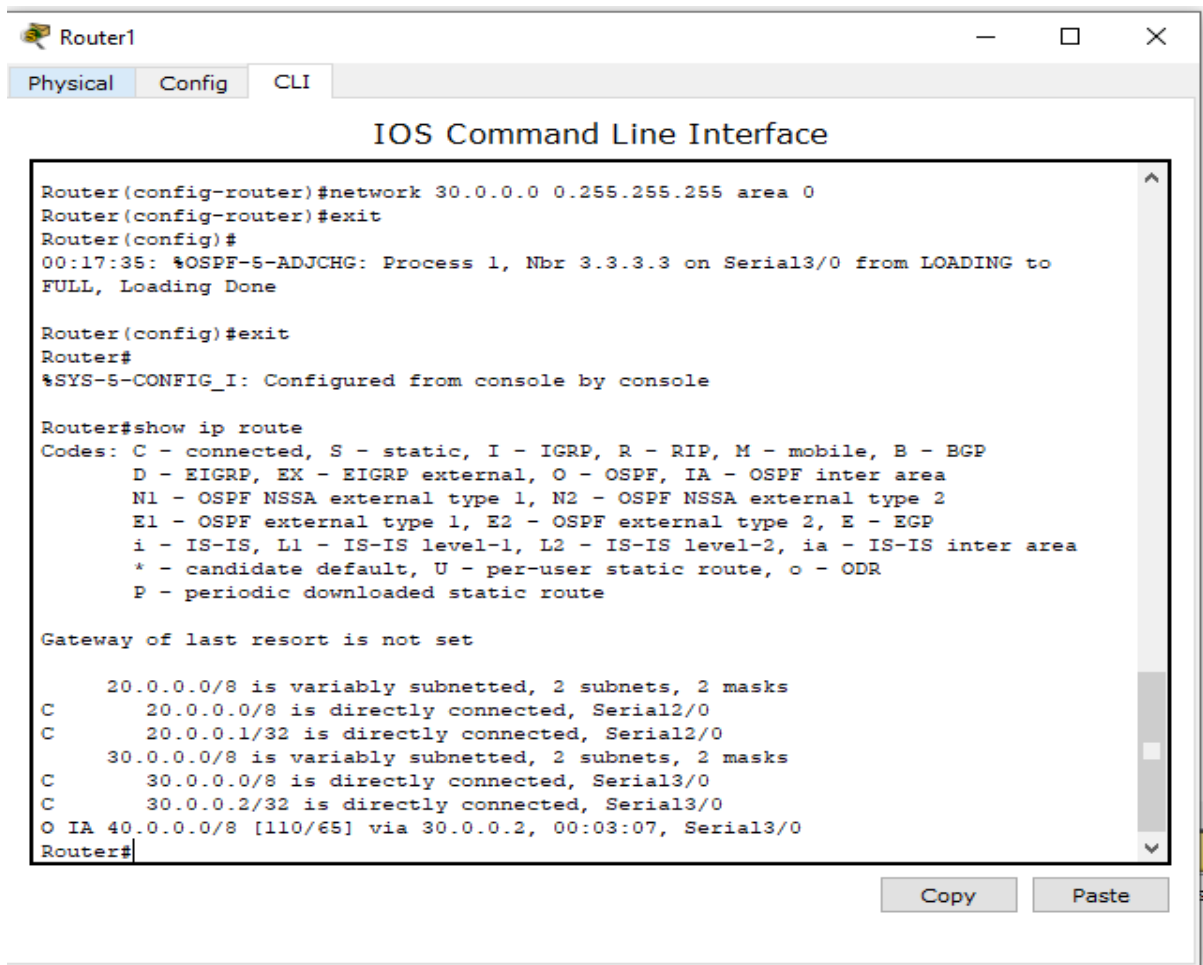
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

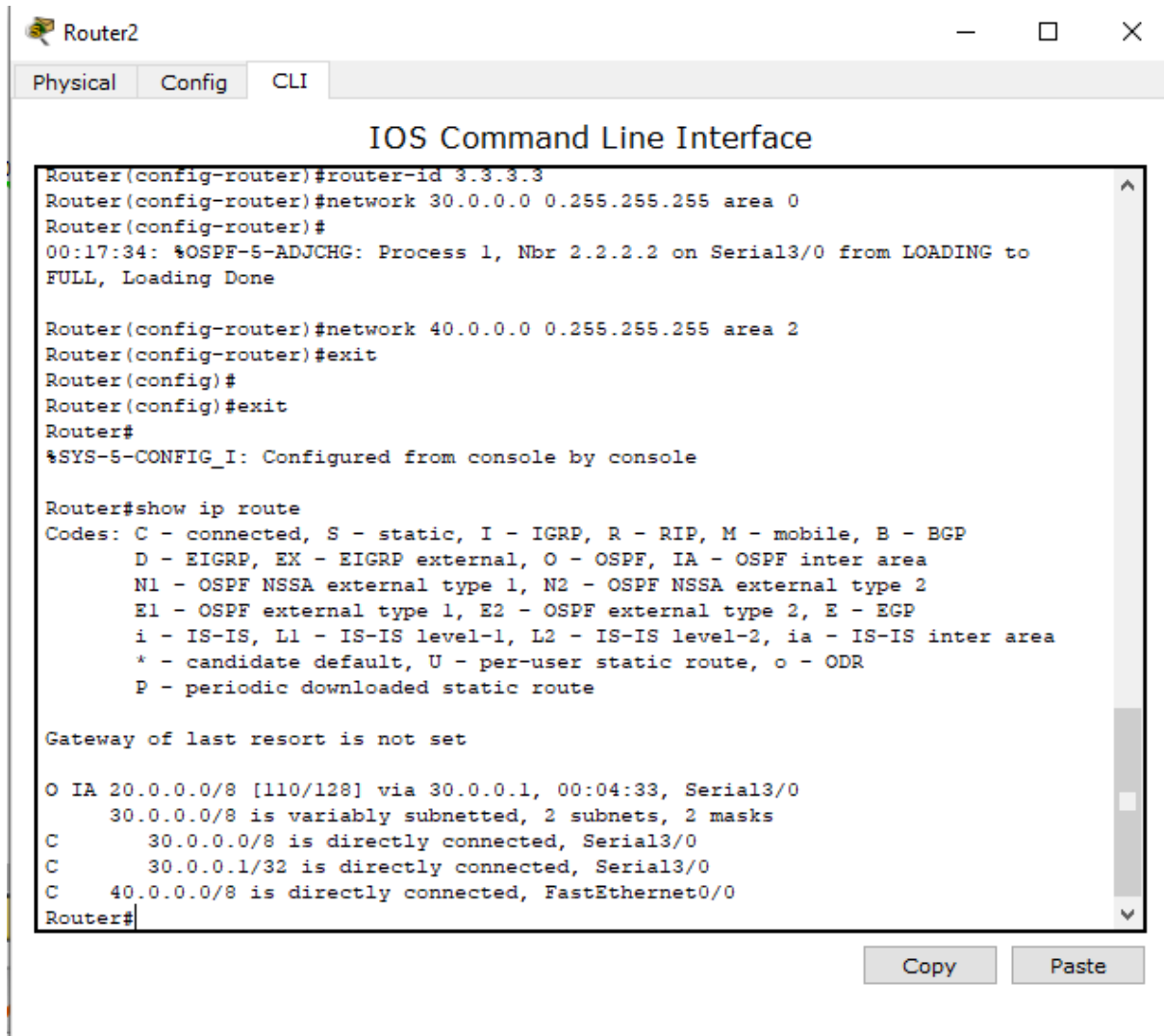
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       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

C      10.0.0.0/8 is directly connected, FastEthernet0/0
      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C      20.0.0.0/8 is directly connected, Serial2/0
C      20.0.0.2/32 is directly connected, Serial2/0
O IA 30.0.0.0/8 [110/128] via 20.0.0.2, 00:03:12, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:00:44, Serial2/0
Router#
```

At the bottom right of the window, there are two buttons: "Copy" and "Paste".





The screenshot shows a Cisco Router2 CLI window with three tabs: Physical, Config, and CLI. The CLI tab is active, displaying the IOS Command Line Interface. The user has configured the router ID as 3.3.3.3, enabled OSPF area 0 with network 30.0.0.0/8, and area 2 with network 40.0.0.0/8. The router has loaded the configuration from the console. The 'show ip route' command output shows the routing table with a default gateway of 30.0.0.1 on Serial3/0.

```
Router2
Physical Config CLI
IOS Command Line Interface

Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#
00:17:34: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial3/0 from LOADING to
FULL, Loading Done

Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#
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

O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:04:33, Serial3/0
    30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
    C    30.0.0.0/8 is directly connected, Serial3/0
    C    30.0.0.1/32 is directly connected, Serial3/0
    C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

Copy Paste

Loopback

Router0

Physical Config CLI

### IOS Command Line Interface

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

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
    20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    20.0.0.0/8 is directly connected, Serial2/0
C    20.0.0.2/32 is directly connected, Serial2/0
O IA 30.0.0.0/8 [110/128] via 20.0.0.2, 00:03:12, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:00:44, Serial2/0
Router#
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface loopback 0

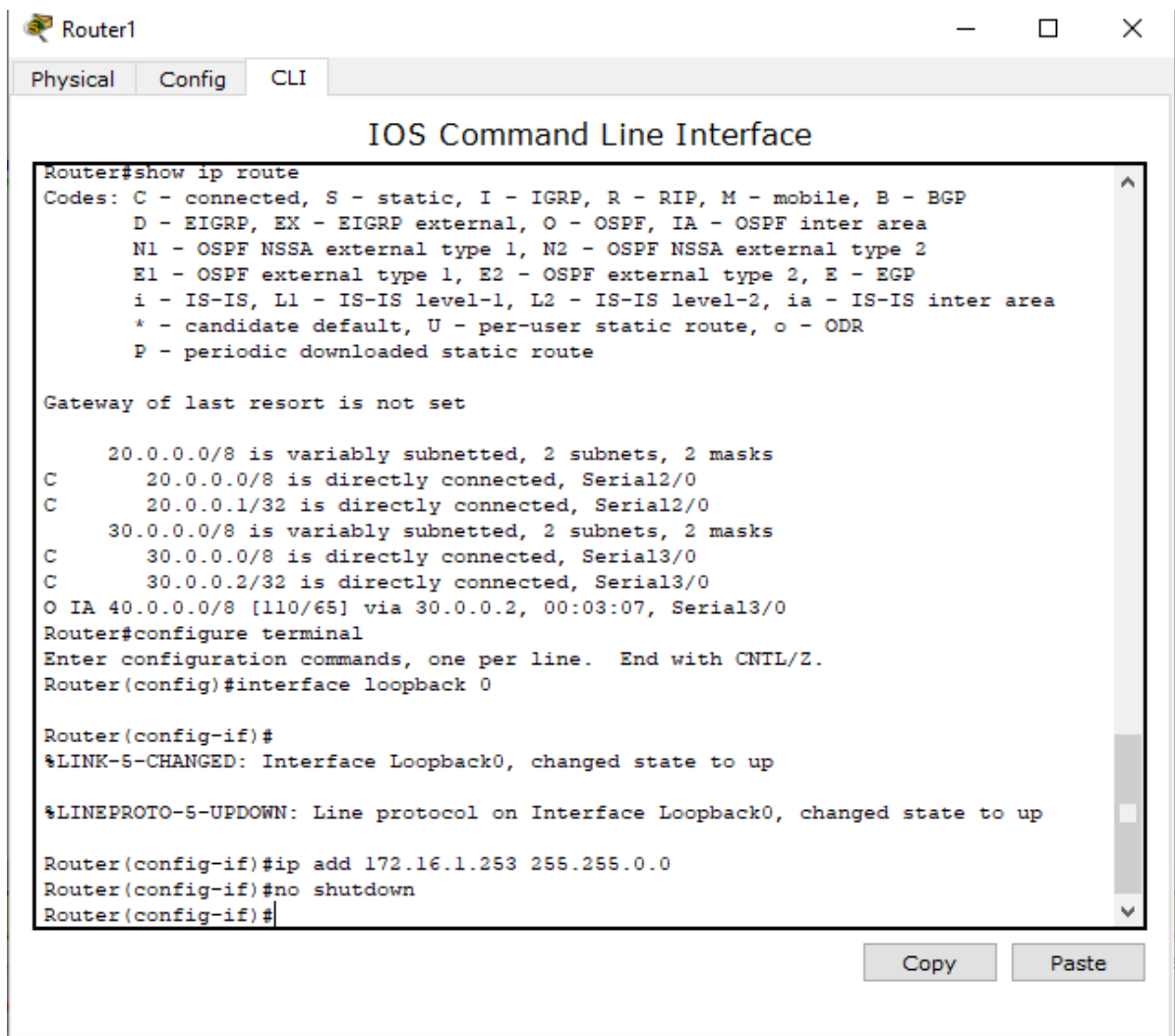
Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

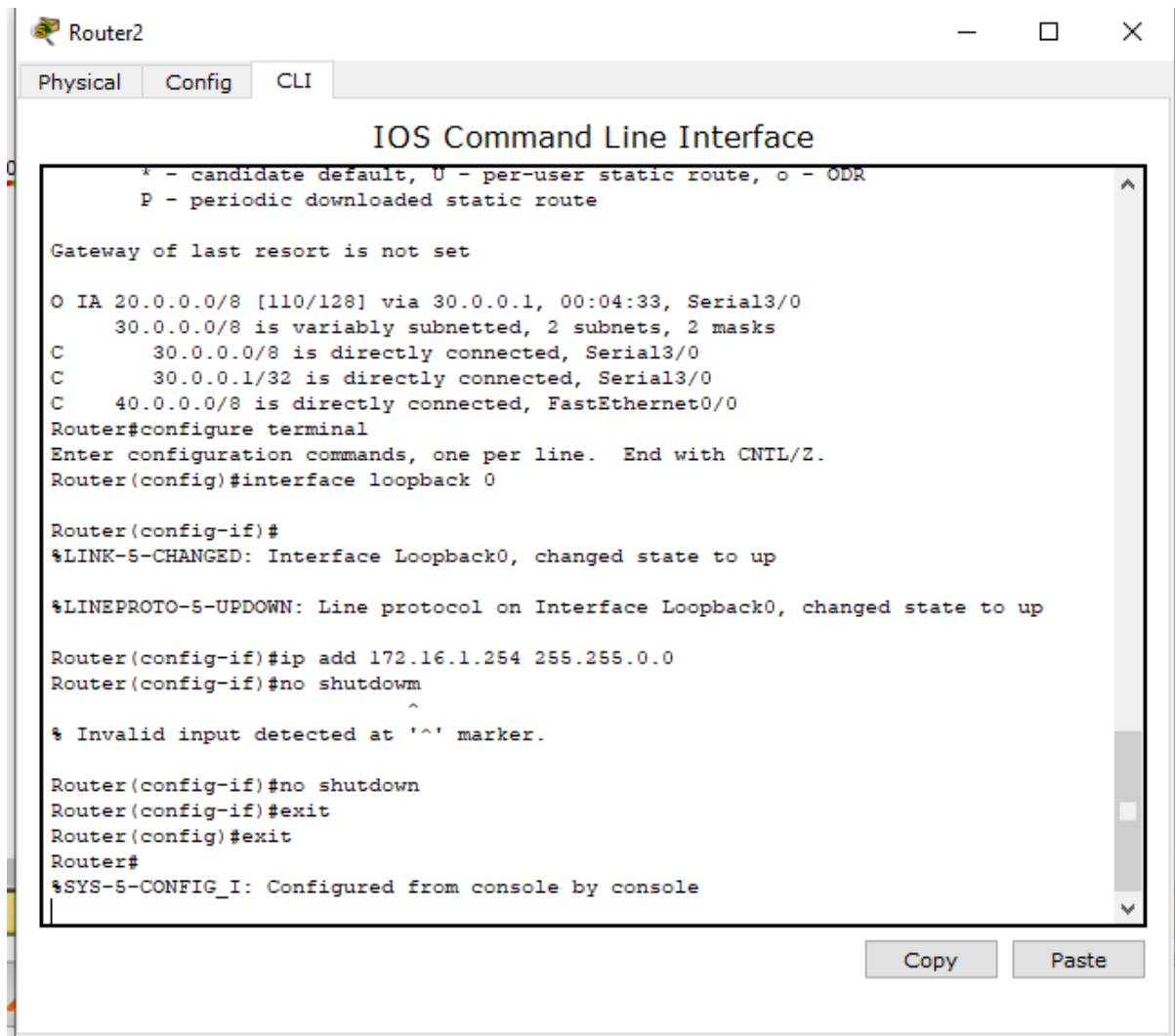
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

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

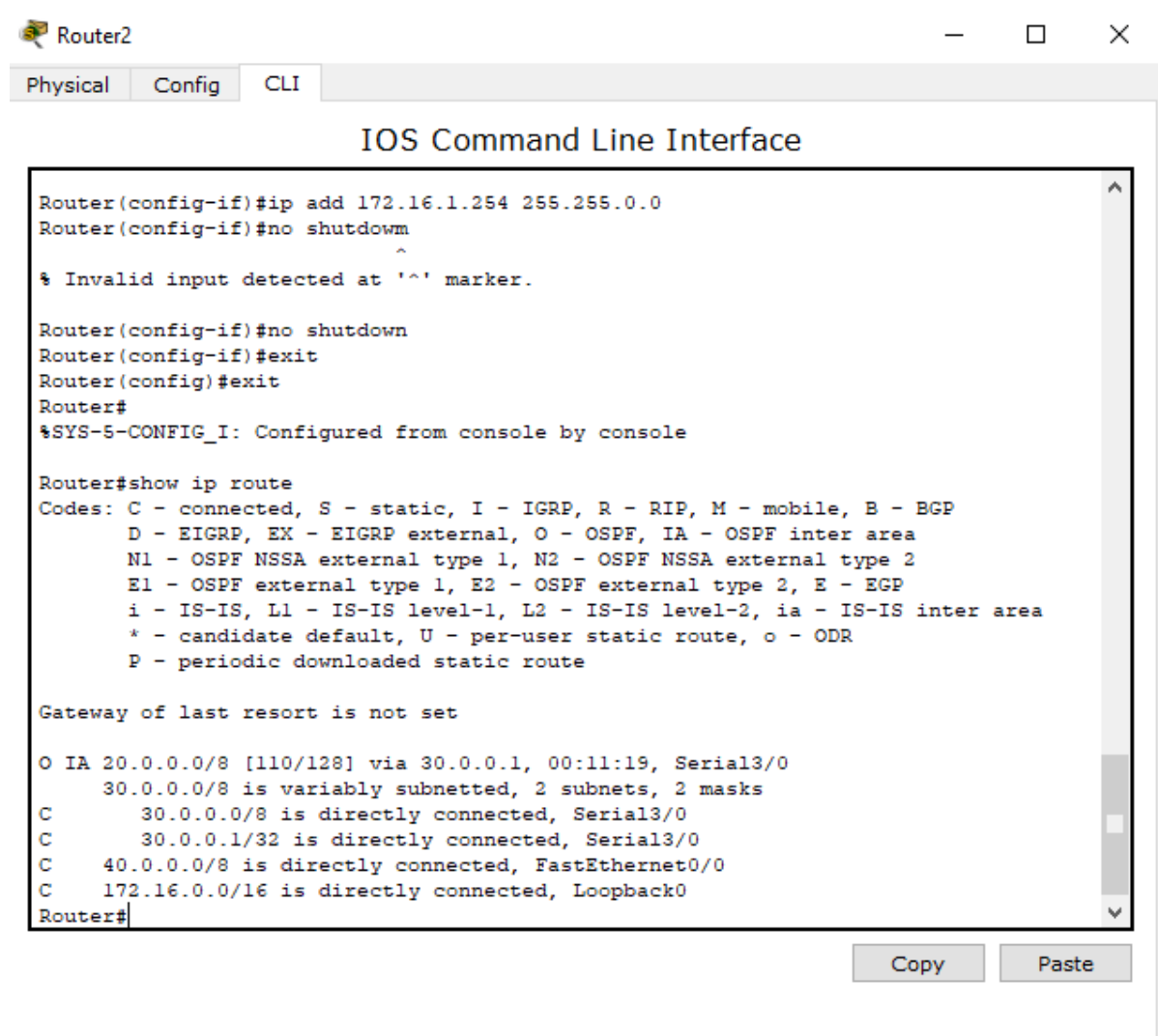
Copy Paste







Show ip route for R2



```
Router2
Physical Config CLI
IOS Command Line Interface

Router(config-if)#ip add 172.16.1.254 255.255.0.0
Router(config-if)#no shutdown
^
% Invalid input detected at '^' marker.

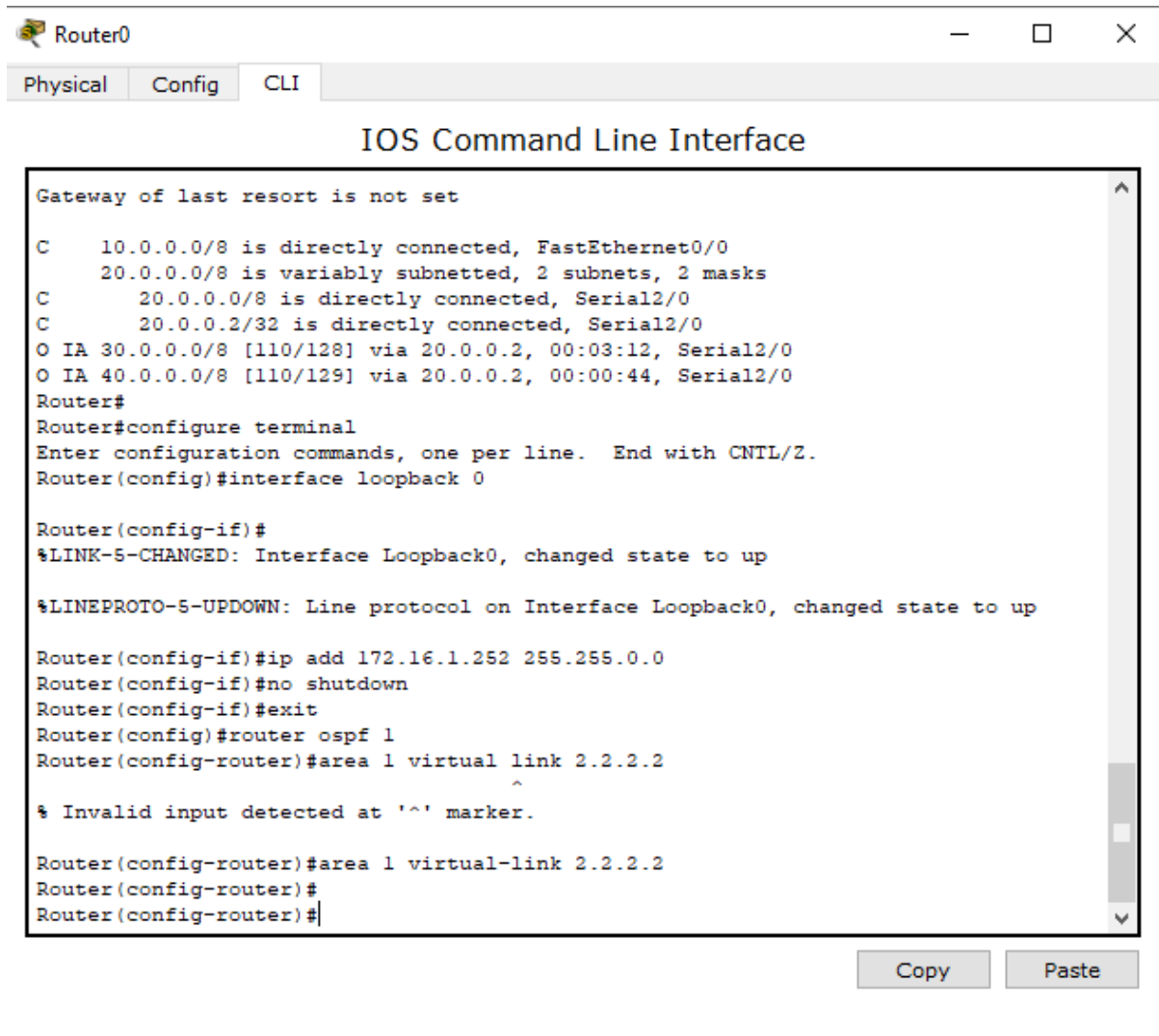
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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 not set

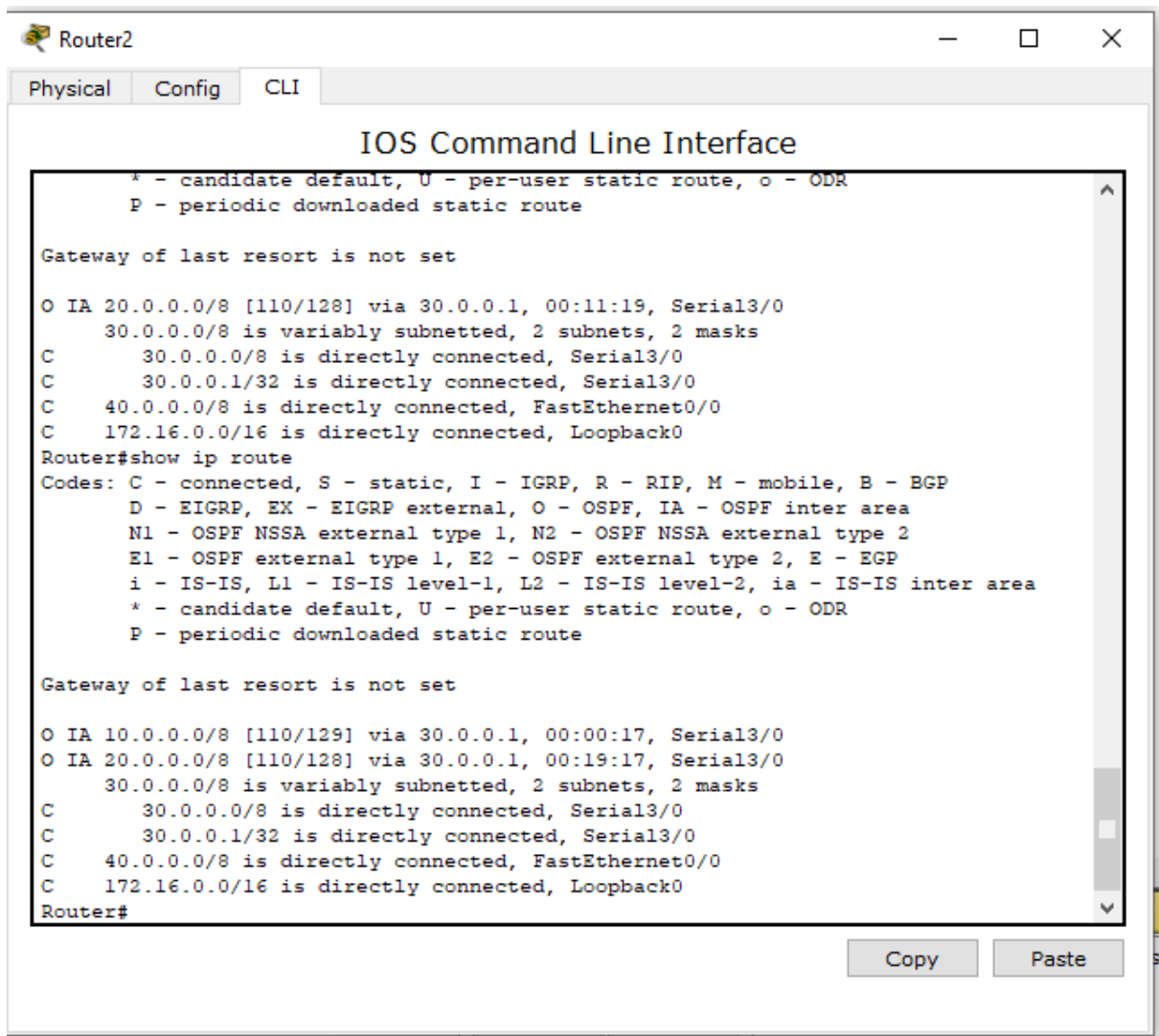
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:11:19, Serial3/0
    30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C     30.0.0.0/8 is directly connected, Serial3/0
C     30.0.0.1/32 is directly connected, Serial3/0
C     40.0.0.0/8 is directly connected, FastEthernet0/0
C    172.16.0.0/16 is directly connected, Loopback0
Router#
```

Copy Paste

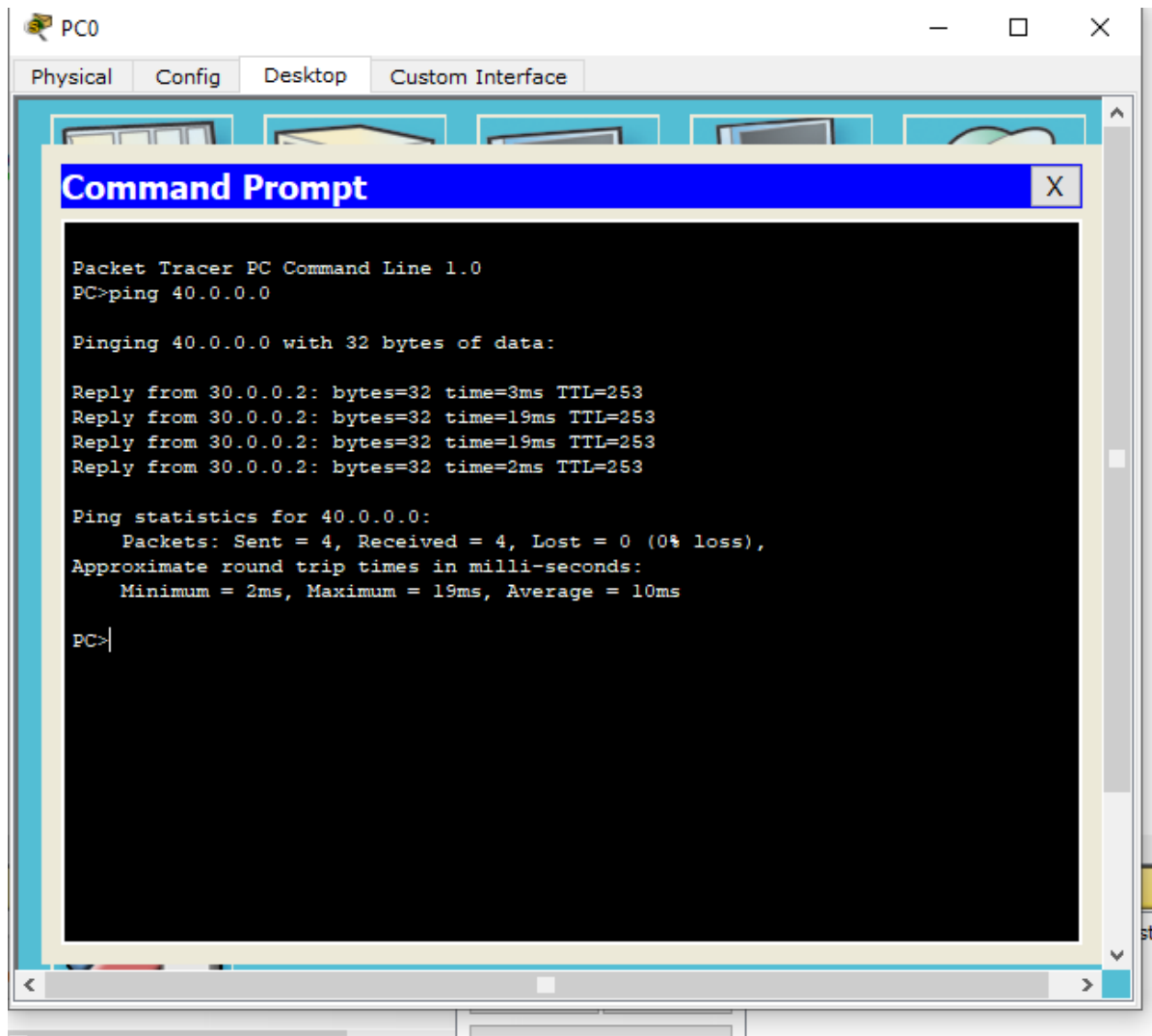


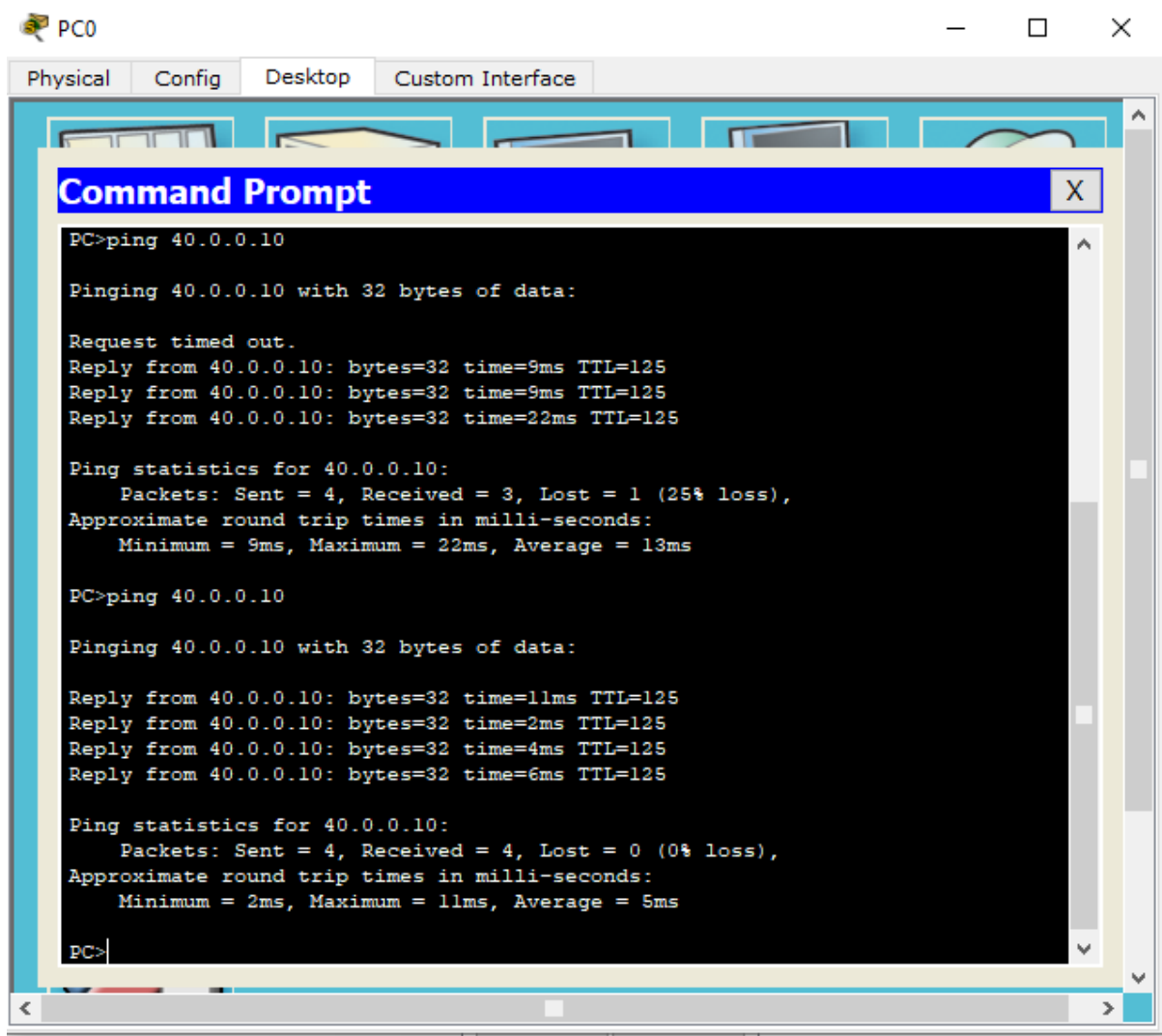
Similarly do for R1 you may face some disturbance while typing

Show ip route for R2



Ping 40.0.0.0 from 10.0.0.10





## 7) Demonstrate the TTL/ Life of a Packet

Create a topology as shown below with two PCs and three routers.

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

In the simulation mode, send a simple PDU from one PC to another.

Use capture button to capture every transfer.

Click on the PDU during every transfer to see the Inbound and outbound PDU details.

Observe that there is a difference of 1 in TTL when it crosses every router.

The screenshot shows the Packet Tracer interface with a topology of two PCs and three routers. A PDU information window is open for PC0, displaying the following details:

**PDU Information at Device: PC0**

**OSI Model** | **Outbound PDU Details**

**PDU Formats**

**Ethernet II**

0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	128	132	136	140	144	148	152	156	160	164	168	172	176	180	184	188	192	196	200	204	208	212	216	220	224	228	232	236	240	244	248	252	256	260	264	268	272	276	280	284	288	292	296	300	304	308	312	316	320	324	328	332	336	340	344	348	352	356	360	364	368	372	376	380	384	388	392	396	400	404	408	412	416	420	424	428	432	436	440	444	448	452	456	460	464	468	472	476	480	484	488	492	496	500	504	508	512	516	520	524	528	532	536	540	544	548	552	556	560	564	568	572	576	580	584	588	592	596	600	604	608	612	616	620	624	628	632	636	640	644	648	652	656	660	664	668	672	676	680	684	688	692	696	700	704	708	712	716	720	724	728	732	736	740	744	748	752	756	760	764	768	772	776	780	784	788	792	796	800	804	808	812	816	820	824	828	832	836	840	844	848	852	856	860	864	868	872	876	880	884	888	892	896	900	904	908	912	916	920	924	928	932	936	940	944	948	952	956	960	964	968	972	976	980	984	988	992	996	1000	1004	1008	1012	1016	1020	1024	1028	1032	1036	1040	1044	1048	1052	1056	1060	1064	1068	1072	1076	1080	1084	1088	1092	1096	1100	1104	1108	1112	1116	1120	1124	1128	1132	1136	1140	1144	1148	1152	1156	1160	1164	1168	1172	1176	1180	1184	1188	1192	1196	1200	1204	1208	1212	1216	1220	1224	1228	1232	1236	1240	1244	1248	1252	1256	1260	1264	1268	1272	1276	1280	1284	1288	1292	1296	1300	1304	1308	1312	1316	1320	1324	1328	1332	1336	1340	1344	1348	1352	1356	1360	1364	1368	1372	1376	1380	1384	1388	1392	1396	1400	1404	1408	1412	1416	1420	1424	1428	1432	1436	1440	1444	1448	1452	1456	1460	1464	1468	1472	1476	1480	1484	1488	1492	1496	1500	1504	1508	1512	1516	1520	1524	1528	1532	1536	1540	1544	1548	1552	1556	1560	1564	1568	1572	1576	1580	1584	1588	1592	1596	1600	1604	1608	1612	1616	1620	1624	1628	1632	1636	1640	1644	1648	1652	1656	1660	1664	1668	1672	1676	1680	1684	1688	1692	1696	1700	1704	1708	1712	1716	1720	1724	1728	1732	1736	1740	1744	1748	1752	1756	1760	1764	1768	1772	1776	1780	1784	1788	1792	1796	1800	1804	1808	1812	1816	1820	1824	1828	1832	1836	1840	1844	1848	1852	1856	1860	1864	1868	1872	1876	1880	1884	1888	1892	1896	1900	1904	1908	1912	1916	1920	1924	1928	1932	1936	1940	1944	1948	1952	1956	1960	1964	1968	1972	1976	1980	1984	1988	1992	1996	2000	2004	2008	2012	2016	2020	2024	2028	2032	2036	2040	2044	2048	2052	2056	2060	2064	2068	2072	2076	2080	2084	2088	2092	2096	2100	2104	2108	2112	2116	2120	2124	2128	2132	2136	2140	2144	2148	2152	2156	2160	2164	2168	2172	2176	2180	2184	2188	2192	2196	2200	2204	2208	2212	2216	2220	2224	2228	2232	2236	2240	2244	2248	2252	2256	2260	2264	2268	2272	2276	2280	2284	2288	2292	2296	2300	2304	2308	2312	2316	2320	2324	2328	2332	2336	2340	2344	2348	2352	2356	2360	2364	2368	2372	2376	2380	2384	2388	2392	2396	2400	2404	2408	2412	2416	2420	2424	2428	2432	2436	2440	2444	2448	2452	2456	2460	2464	2468	2472	2476	2480	2484	2488	2492	2496	2500	2504	2508	2512	2516	2520	2524	2528	2532	2536	2540	2544	2548	2552	2556	2560	2564	2568	2572	2576	2580	2584	2588	2592	2596	2600	2604	2608	2612	2616	2620	2624	2628	2632	2636	2640	2644	2648	2652	2656	2660	2664	2668	2672	2676	2680	2684	2688	2692	2696	2700	2704	2708	2712	2716	2720	2724	2728	2732	2736	2740	2744	2748	2752	2756	2760	2764	2768	2772	2776	2780	2784	2788	2792	2796	2800	2804	2808	2812	2816	2820	2824	2828	2832	2836	2840	2844	2848	2852	2856	2860	2864	2868	2872	2876	2880	2884	2888	2892	2896	2900	2904	2908	2912	2916	2920	2924	2928	2932	2936	2940	2944	2948	2952	2956	2960	2964	2968	2972	2976	2980	2984	2988	2992	2996	3000	3004	3008	3012	3016	3020	3024	3028	3032	3036	3040	3044	3048	3052	3056	3060	3064	3068	3072	3076	3080	3084	3088	3092	3096	3100	3104	3108	3112	3116	3120	3124	3128	3132	3136	3140	3144	3148	3152	3156	3160	3164	3168	3172	3176	3180	3184	3188	3192	3196	3200	3204	3208	3212	3216	3220	3224	3228	3232	3236	3240	3244	3248	3252	3256	3260	3264	3268	3272	3276	3280	3284	3288	3292	3296	3300	3304	3308	3312	3316	3320	3324	3328	3332	3336	3340	3344	3348	3352	3356	3360	3364	3368	3372	3376	3380	3384	3388	3392	3396	3400	3404	3408	3412	3416	3420	3424	3428	3432	3436	3440	3444	3448	3452	3456	3460	3464	3468	3472	3476	3480	3484	3488	3492	3496	3500	3504	3508	3512	3516	3520	3524	3528	3532	3536	3540	3544	3548	3552	3556	3560	3564	3568	3572	3576	3580	3584	3588	3592	3596	3600	3604	3608	3612	3616	3620	3624	3628	3632	3636	3640	3644	3648	3652	3656	3660	3664	3668	3672	3676	3680	3684	3688	3692	3696	3700	3704	3708	3712	3716	3720	3724	3728	3732	3736	3740	3744	3748	3752	3756	3760	3764	3768	3772	3776	3780	3784	3788	3792	3796	3800	3804	3808	3812	3816	3820	3824	3828	3832	3836	3840	3844	3848	3852	3856	3860	3864	3868	3872	3876	3880	3884	3888	3892	3896	3900	3904	3908	3912	3916	3920	3924	3928	3932	3936	3940	3944	3948	3952	3956	3960	3964	3968	3972	3976	3980	3984	3988	3992	3996	4000	4004	4008	4012	4016	4020	4024	4028	4032	4036	4040	4044	4048	4052	4056	4060	4064	4068	4072	4076	4080	4084	4088	4092	4096	4100	4104	4108	4112	4116	4120	4124	4128	4132	4136	4140	4144	4148	4152	4156	4160	4164	4168	4172	4176	4180	4184	4188	4192	4196	4200	4204	4208	4212	4216	422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Cisco Packet Tracer Student - C:\Users\nanvi\Cisco Packet Tracer 6.2sv\saves\default1.pkt

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

Simulation Panel

Event List

Time(sec)	Last De	At De	Type	Info
0.000	--	PC0	ICMP	
0.000	--	PC0	ICMP	
0.001	PC0	Rout...	ICMP	
0.001	--	PC0	ICMP	

Set Simulation ☒ Constant Delay Captured to: 0.001 s

Back Auto Capture / Play Capture / Forward

Event List Filters - Visible Events

Filters: ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTN, EIGRP, EIGRPv6, FTP, H.323, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPsec, ISAKMP, LACP, NTP, NETFLOW, OSPF, OSPFv6, PAgg, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, SYSLOG, TACACS, TCF, TFTP, Telnet, UDP, VTP

Edit Filters Show All/None

Event List Simulation

Sourc	Destinac	Type	Colo	Time(	Period	Num	Edit	Delete
PC0	PC1	IC...		0.000	N	0	(ed...	(delete)
PC0	PC1	IC...		0.000	N	1	(ed...	(delete)

Time: 00:01:25.695 Power Cycle Devices PLAY CONTROLS: Back Auto

Connections Automatically Choose Connection Type

Toggle PDU List Window

PDU Information at Device: Router1

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

HDLC

FL	AD	CONTR	DATA	FCS	FL
G:	R:	OL:	(VARIABLE)	0x0	G:

IP

0	4	8	16	19	31
4	IHL	DSCP:	TL:	28	
ID:	0x6	0x	0x0		
TTL:	254	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
TYPE:	CODE:	CHECKSUM	
ID:	0x7	SEQ NUMBER:	6

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

Simulation Panel

Event List

Time(sec)	Last De	At De	Type	Info
0.000	--	PC0	ICMP	
0.001	PC0	Rout...	ICMP	
0.001	--	PC0	ICMP	
0.002	PC0	Rout...	ICMP	
0.002	Router1	Rout...	ICMP	

Set Simulation ☒ Constant Delay Captured to: 0.002 s

Back Auto Capture / Play Capture / Forward

Event List Filters - Visible Events

Filters: ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTN, EIGRP, EIGRPv6, FTP, H.323, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPsec, ISAKMP, LACP, NTP, NETFLOW, OSPF, OSPFv6, PAgg, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, SYSLOG, TACACS, TCF, TFTP, Telnet, UDP, VTP

Edit Filters Show All/None

Event List Simulation

Sourc	Destinac	Type	Colo	Time(	Period	Num	Edit	Delete
PC0	PC1	IC...		0.000	N	0	(ed...	(delete)
PC0	PC1	IC...		0.000	N	1	(ed...	(delete)

Time: 00:01:25.696 Power Cycle Devices PLAY CONTROLS: Back Auto

Connections Automatically Choose Connection Type

Toggle PDU List Window

PDU Information at Device: Router2

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

HDLC

FL	AD	CONTR	DATA	FCS	FL
G:	R:	OL:	(VARIABLE)	0x0	G:

IP

0	4	8	16	19	31
4	IHL	DSCP:	TL:	28	
ID:	0x6	0x	0x0		
TTL:	254	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
TYPE:	CODE:	CHECKSUM	
ID:	0x7	SEQ NUMBER:	6

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

Time: 00:01:25.696 Power Cycle Devices PLAY CONTROLS: Back Auto

Scenario 0 New Delete Toggle PDU List Window

PDU Information at Device: Router2

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

HDLCL

FL	AD	CONTR	DATA:	2+x	8+x	6+x	31 bits
G:	R:	OL:	(VARIABLE)		FCS:	FL	G:

IP

4	8	16	32	19	31 bits
0	4	8	16	19	31 bits
ID:	0x6	0x	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
0	8	16	31 bits
TYPE:	0x7	SEQ NUMBER:	6

Simulation Panel

Event List

Time(sec)	Last De	At De	Type	Info
0.000	--	PC0	ICMP	
0.001	PC0	Router1	ICMP	
0.001	--	PC0	ICMP	
0.002	PC0	Router1	ICMP	
0.002	Router1	Router1	ICMP	

Simulation Panel

Event List

Fire	Last Stat	Source	Destination	Type	Color	Time(s)	Period	Num	Edit	Delete
In Progr...	PC0	PC1	IC...	0.000	N	0	(ed...	(delete)		
In Progr...	PC0	PC1	IC...	0.000	N	1	(ed...	(delete)		

File Edit Options View Tools Extensions Help

Logical [Root] New Cluster Move Object Set Tiled Background Viewport

Time: 00:01:25.697 Power Cycle Devices PLAY CONTROLS: Back Auto

Scenario 0 New Delete Toggle PDU List Window

PDU Information at Device: Router3

OSI Model Inbound PDU Details Outbound PDU Details

PDU Formats

HDLCL

FL	AD	CONTR	DATA:	2+x	8+x	6+x	31 bits
G:	R:	OL:	(VARIABLE)		FCS:	FL	G:

IP

4	8	16	32	19	31 bits
0	4	8	16	19	31 bits
ID:	0x6	0x	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
0	8	16	31 bits
TYPE:	0x7	SEQ NUMBER:	6

Simulation Panel

Event List

Time(sec)	Last De	At De	Type	Info
0.001	--	PC0	ICMP	
0.002	PC0	Router1	ICMP	
0.002	Router1	Router1	ICMP	
0.003	Router1	Router1	ICMP	
0.003	Router2	Router1	ICMP	

Simulation Panel

Event List

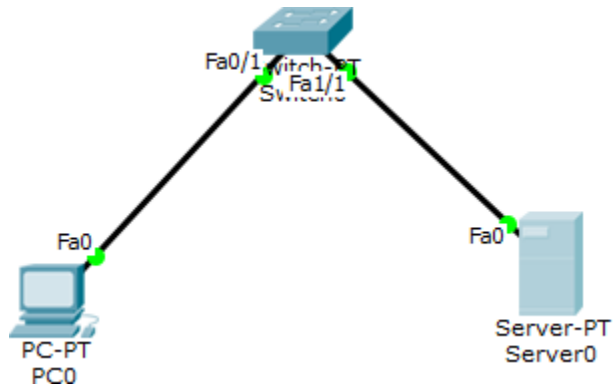
Fire	Last Stat	Source	Destination	Type	Color	Time(s)	Period	Num	Edit	Delete
In Progr...	PC0	PC1	IC...	0.000	N	0	(ed...	(delete)		
In Progr...	PC0	PC1	IC...	0.000	N	1	(ed...	(delete)		



## 8) Configure Web Server, DNS within a LAN.

### DNS

Topology:



Configure ip address of PC-10.0.0.1

Server-10.0.0.2

Go to services in server select dns and add a new name as Vaishnavi Kamath and address as 10.0.0.2 address of your server.

Server0

Physical

Config

Services

Desktop

Custom Interface

SERVICES

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

DNS

DNS Service

☒ On
☐ Off

Resource Records

Name

Type

A Record

Address

Add

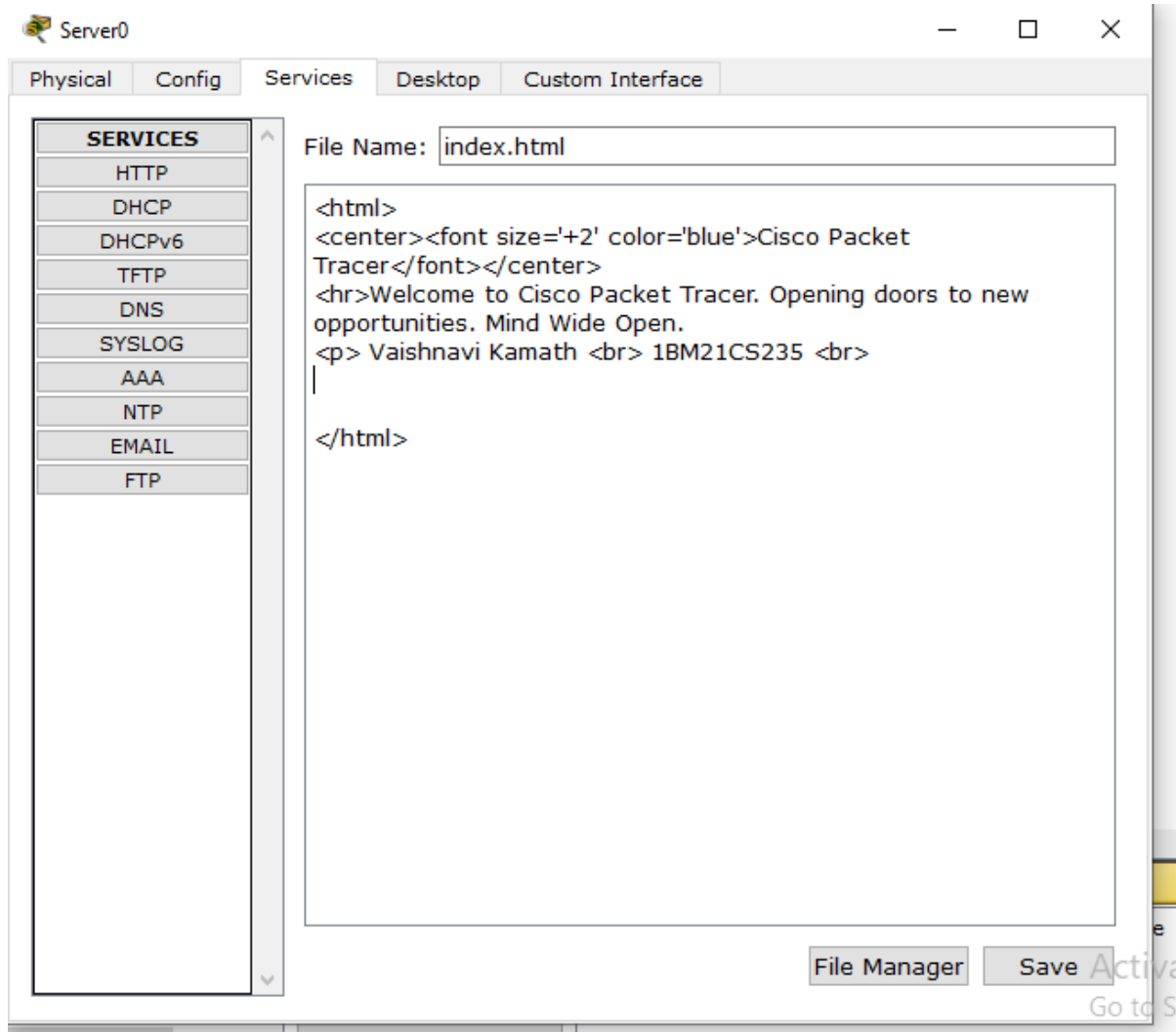
Save

Remove

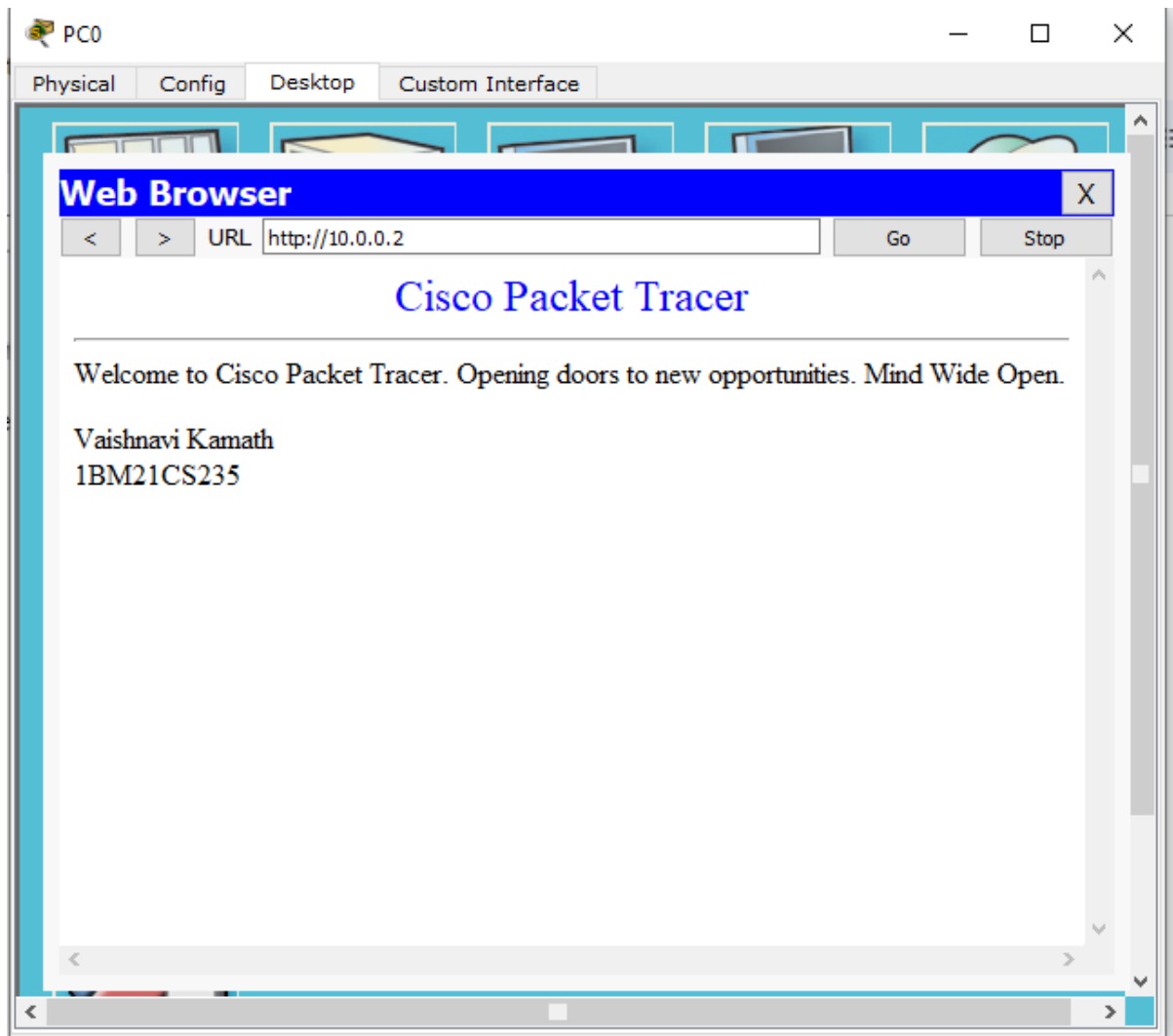
No.	Name	Type	Detail
0	vaishnavi kamath	A Record	10.0.0.2

DNS Cache

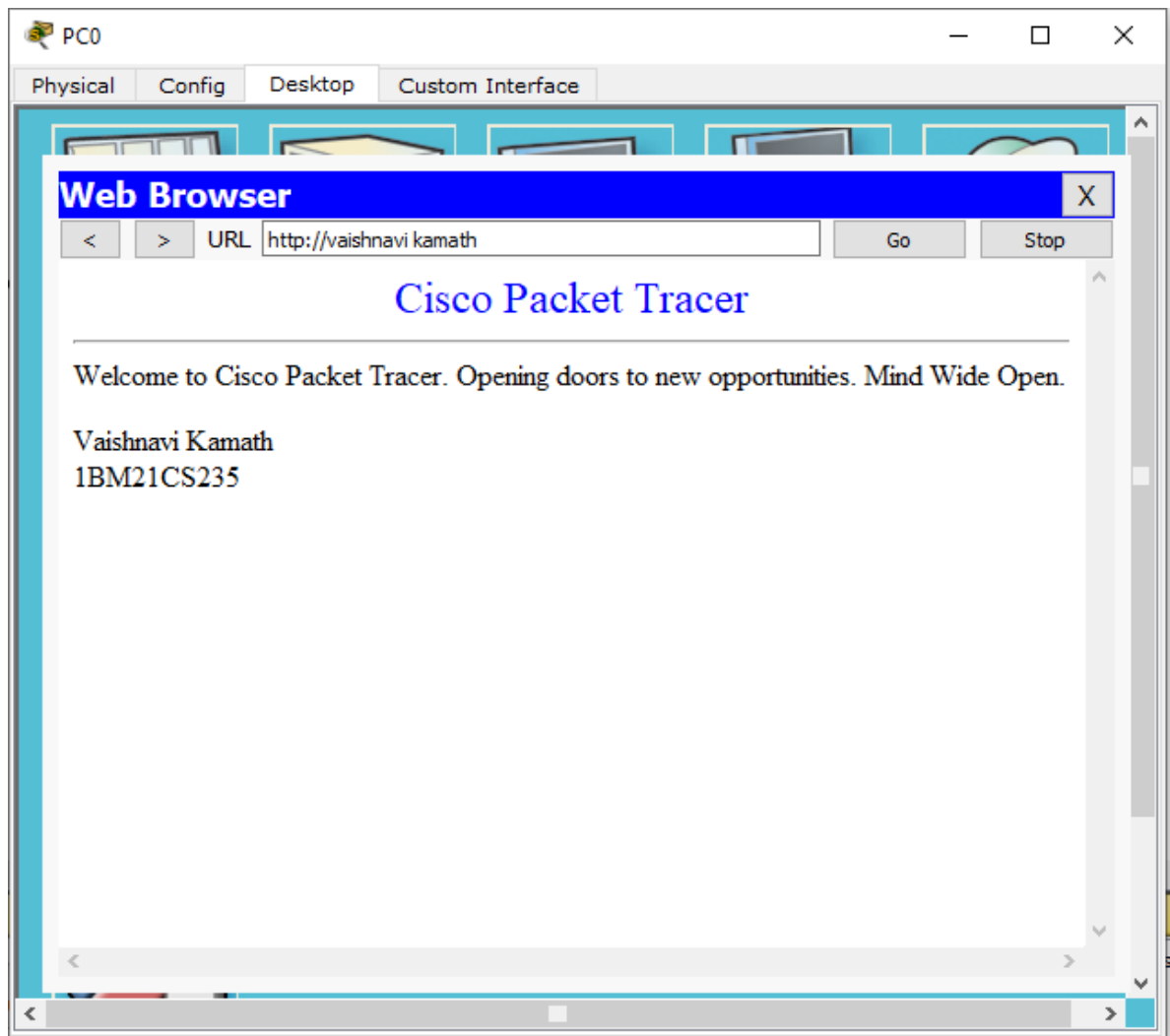
Go to `http index.html` and edit index page as shown below.



In PC go to desktop - Web browser and try to connect to server using server ip address. Output is shown (type 10.0.0.2)



Next type name which was given in server(vaishnavi kamath) and retry to connect. Following output is obtained.

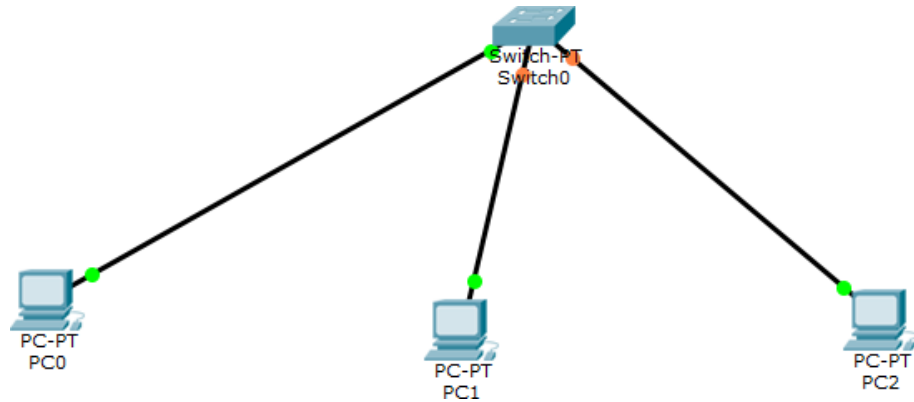




## 9) To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)

ARP

Topology



Configure ip address for pc. No default gateway for switches.

Go to any pc cmd prompt and type as below

## Command Prompt

```
Packet Tracer PC Command Line 1.0
PC>arp -a
No ARP Entries Found
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=0ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128
Reply from 10.0.0.2: bytes=32 time=0ms TTL=128

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

PC>arp -a
    Internet Address      Physical Address      Type
    10.0.0.2              00d0.ffb9.3792       dynamic

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

## Command Prompt

X

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

PC>arp -a

Internet Address	Physical Address	Type
10.0.0.2	00d0.ffb9.3792	dynamic

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=0ms 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 = 1ms, Average = 0ms

PC>arp -a

Internet Address	Physical Address	Type
10.0.0.2	00d0.ffb9.3792	dynamic
10.0.0.3	0000.0c56.799a	dynamic

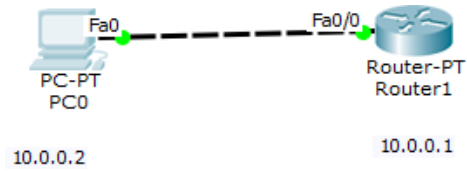
PC>arp -d

PC>arp -a

No ARP Entries Found

PC>

**10) To understand the operation of TELNET by accessing the router in server room from a PC in IT off**



```
Router1
Physical Config CLI

IOS Command Line Interface

32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

--- System Configuration Dialog ---

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

Press RETURN to get started!

Router>enable
Router#config
Configuring from terminal, memory, or network [terminal]? t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname rl
rl(config)#enable secret p1
rl(config)#interface fastethernet 0/0
rl(config-if)#ip address 10.0.0.1 255.0.0.0
rl(config-if)#no shut

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

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

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

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

Copy Paste

enable

config t

hostname R1

enable secret p1

interface fastethernet 0/0

ip address 10.0.0.1 255.0.0.0

no shut

line vty 0 5 --to allow virtual terminal access for 6 users

login

password p0

exit

exit

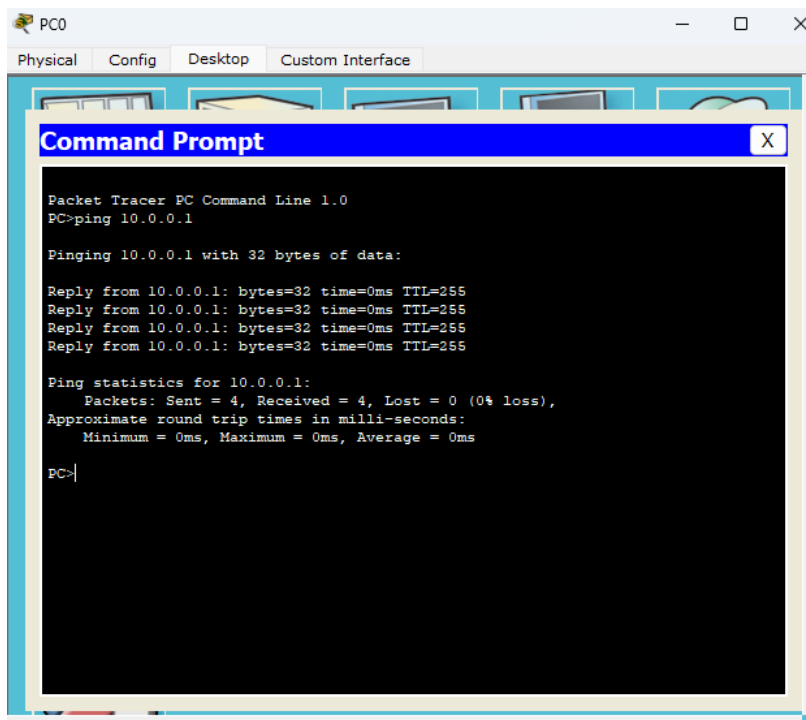
wr – to save changes in router

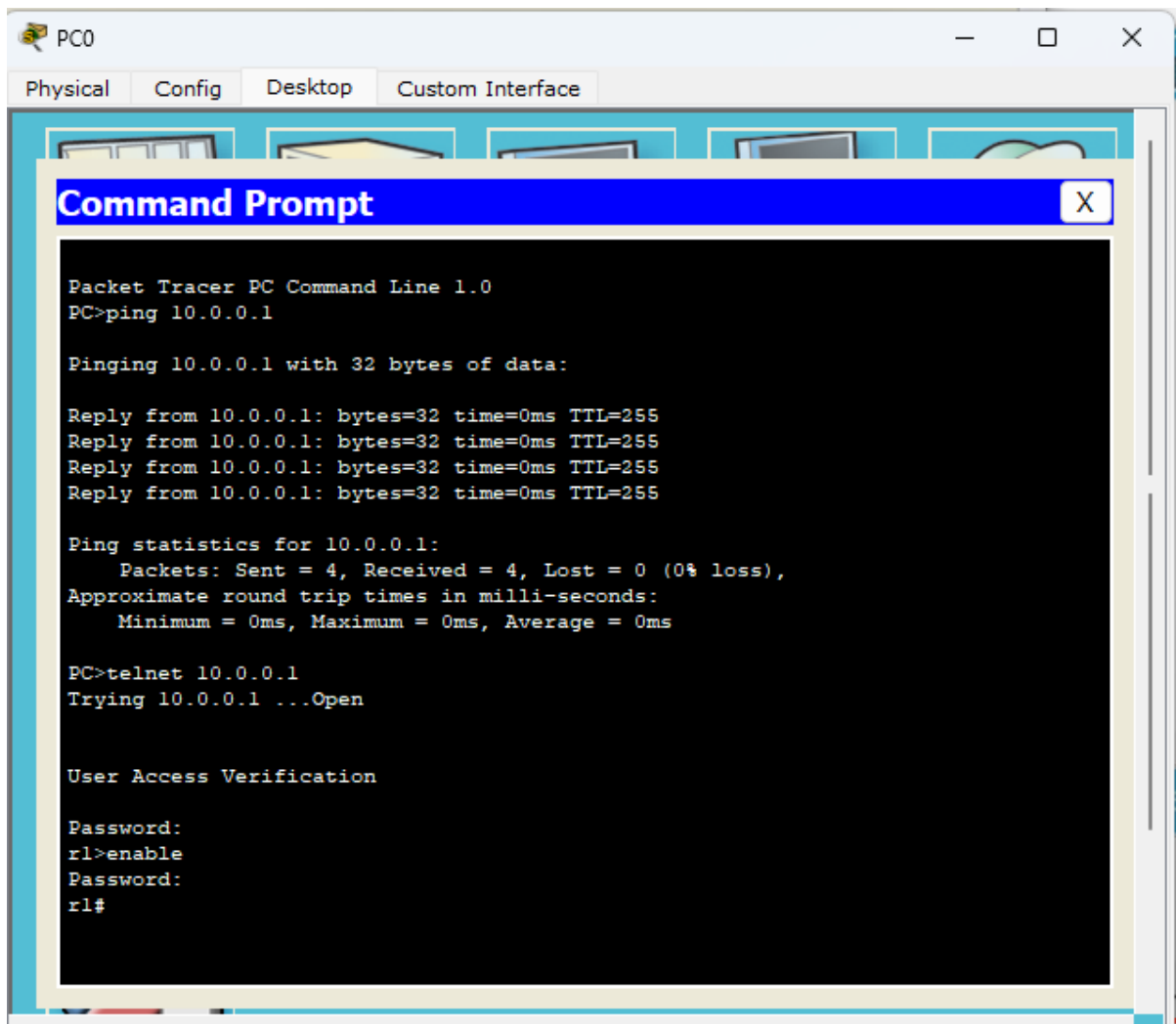
## Commands in PC

In command prompt,

Ping 10.0.0.1

Ping results seen

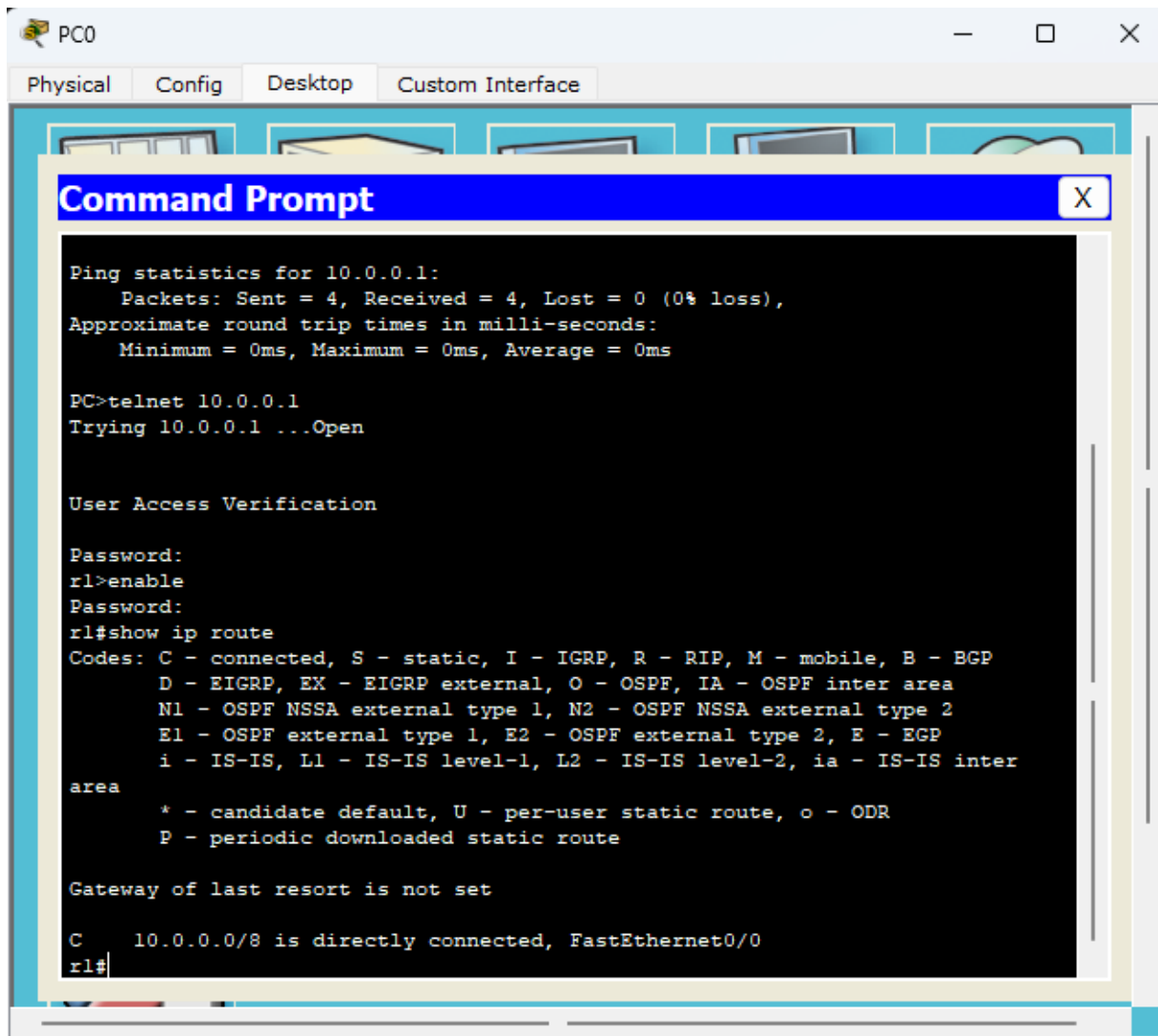




Password for User Access Verification is p0

Password for enable is p1

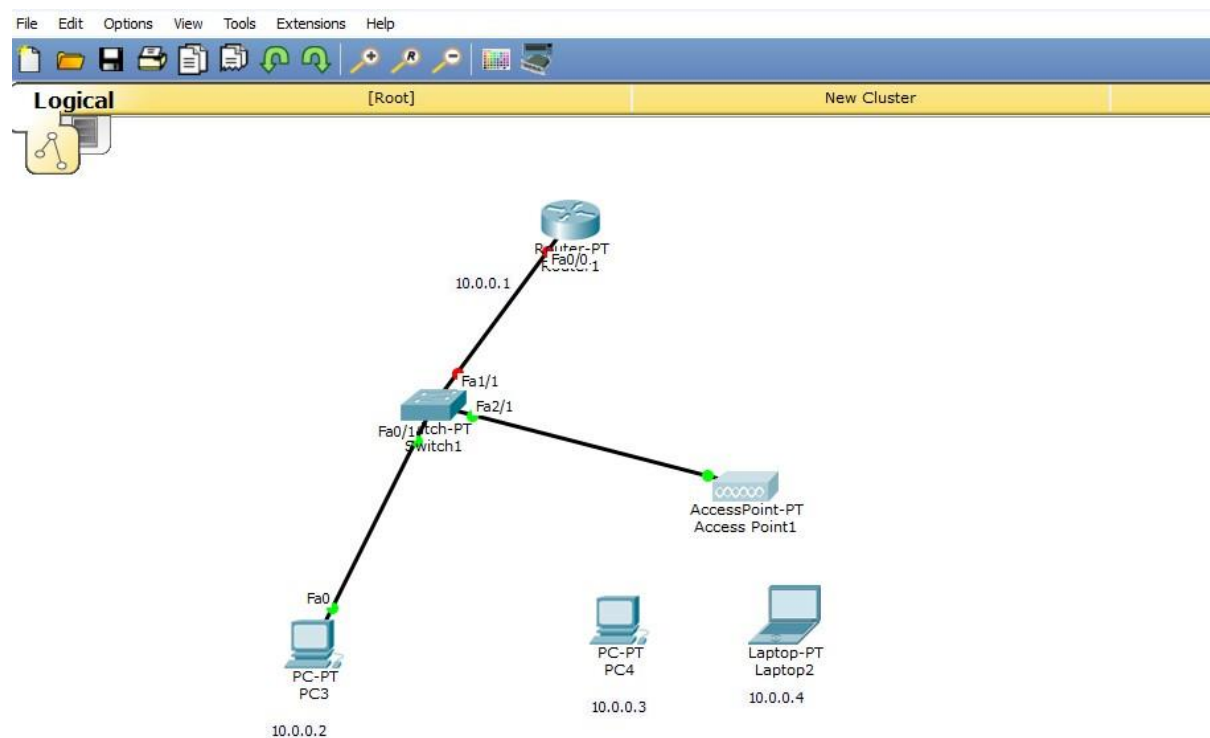
Accessing router CLI from PC



The admin in PC is able to run commands as run in router CLI and see the result from PC.



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

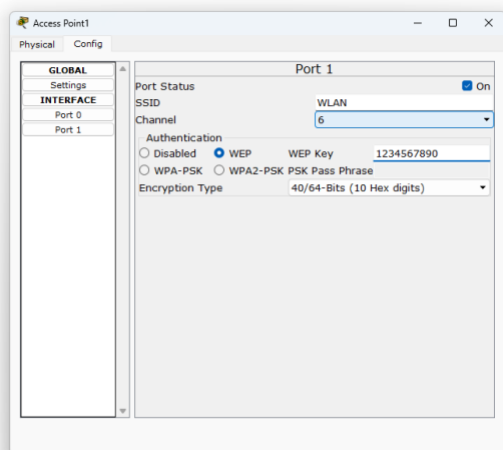


Construct the above topology

Configure PC3 and the Router1 as is normally done

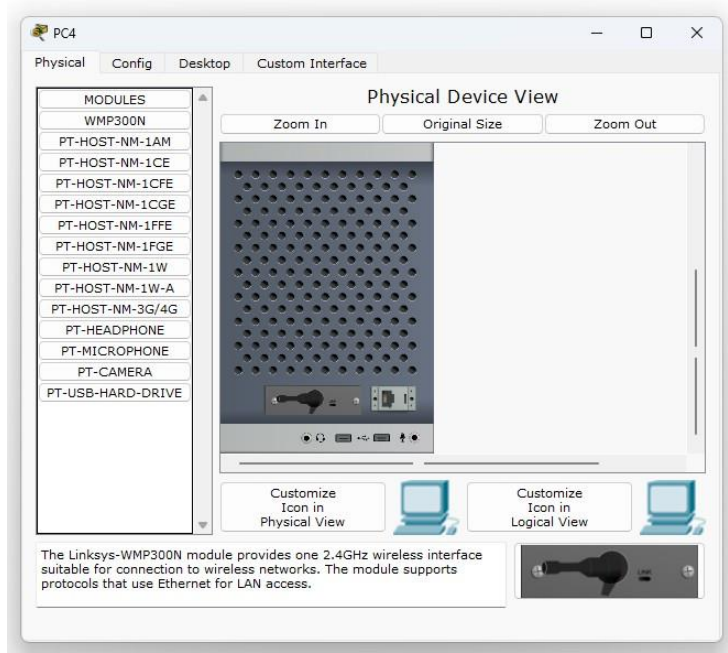
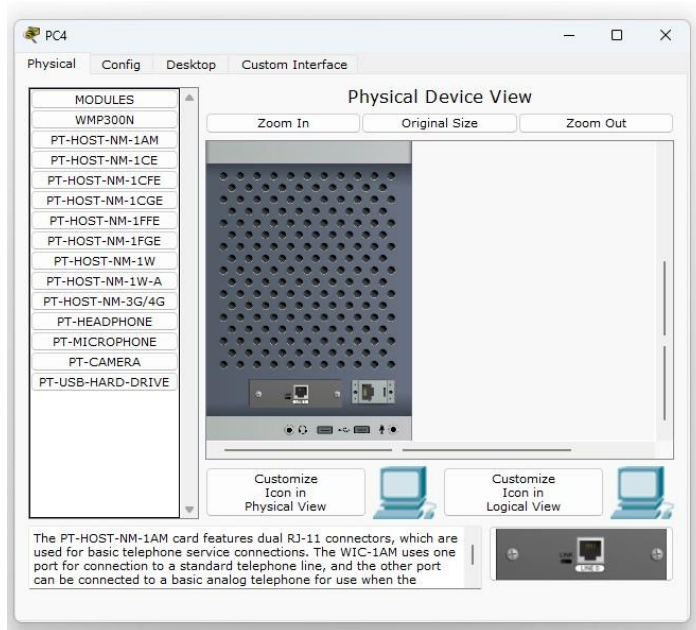
Configure Access Point1- Port1 -> SSID Name- any name(WLAN here)

Select WEP and give any 10 digit hex key – 1234567890 here



Configuring PC4 and Laptop with Wireless standards

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



In the config tab a new wireless interface would have been added. Now configure SSID, WEP, WEP Key, IP address and **Gateway** (as normally done) to the device.

PC4

PhysicalConfigDesktopCustom Interface

GLOBAL

Settings

Algorithm Settings

INTERFACE

Wireless0

Wireless0

Port Status

On

Bandwidth

1 Mbps

MAC Address

0002.166C.E6CB

SSID

WLAN

Authentication

Disabled

WEP

WPA-PSK

WPA2-PSK

WPA

WPA2

WEP Key

1234567890

PSK Pass Phrase

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

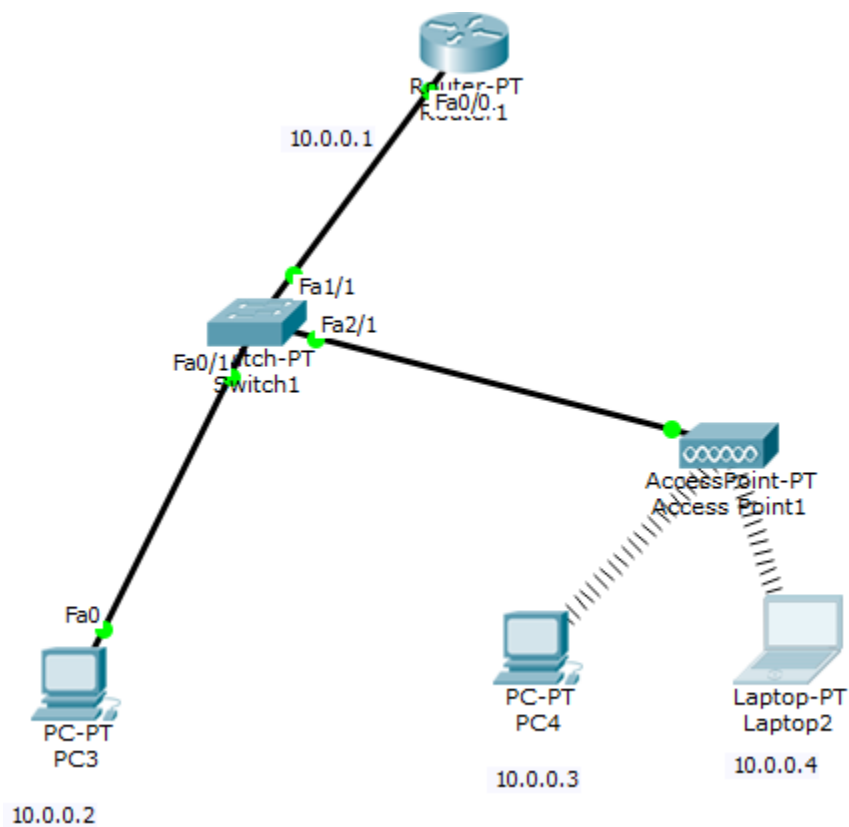
DHCP

Auto Config

Static

67

## Final topology on screen

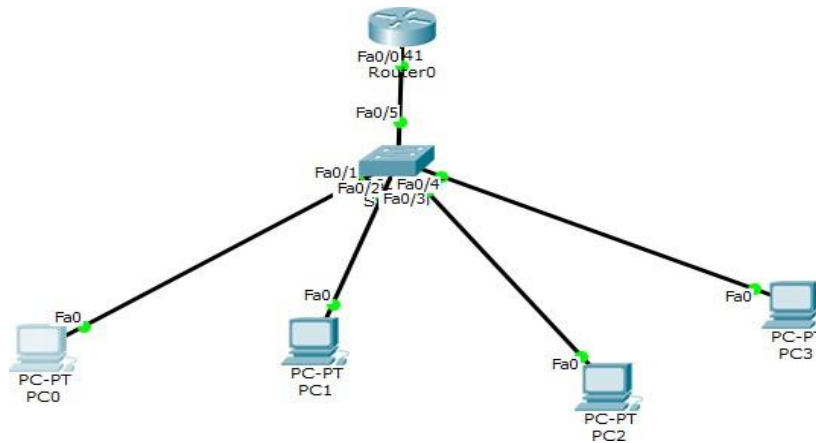


Ping from every device to every other device and see the results

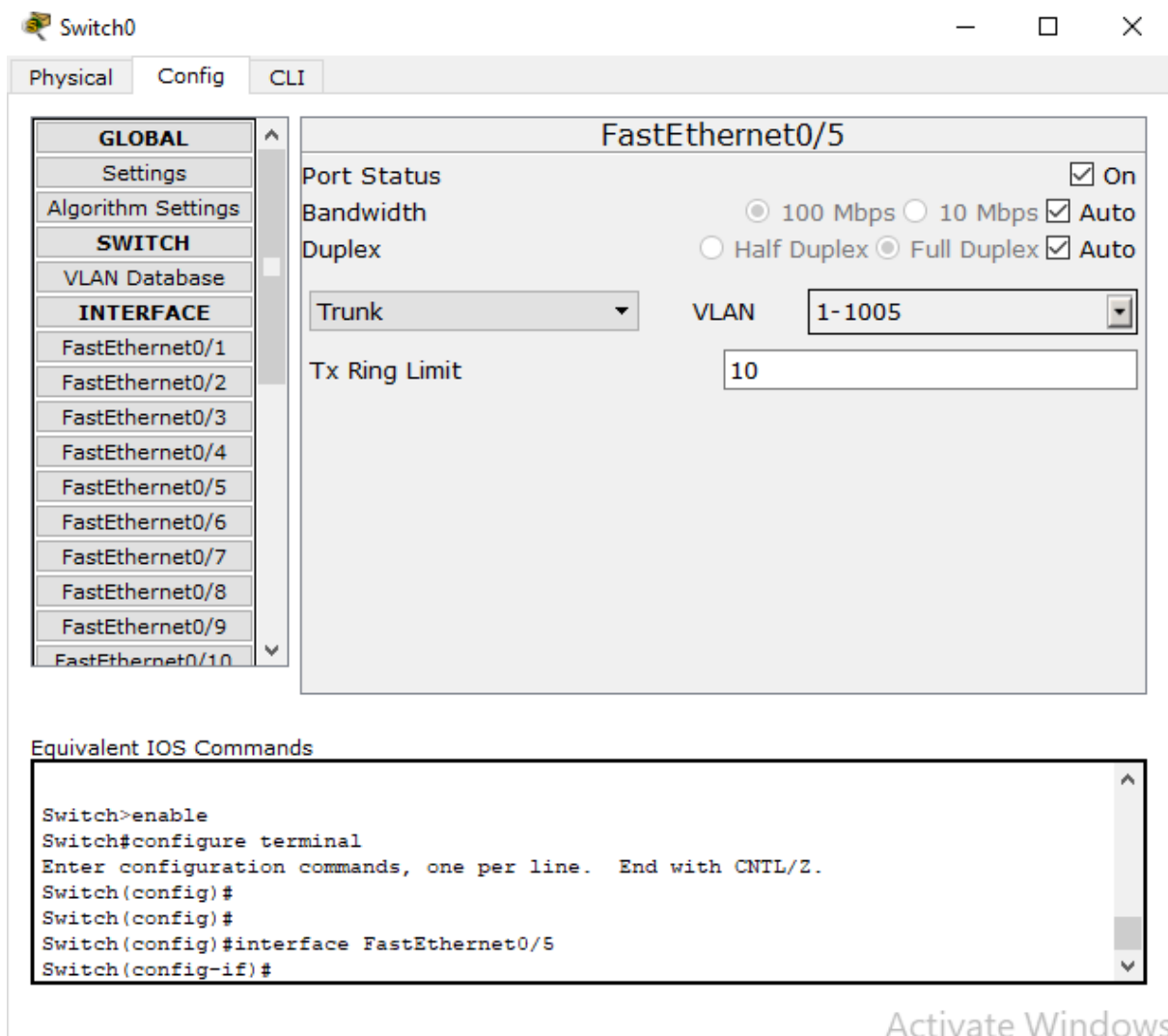
## 12) To construct a VLAN and make the PC's communicate among a VLAN

### VLAN

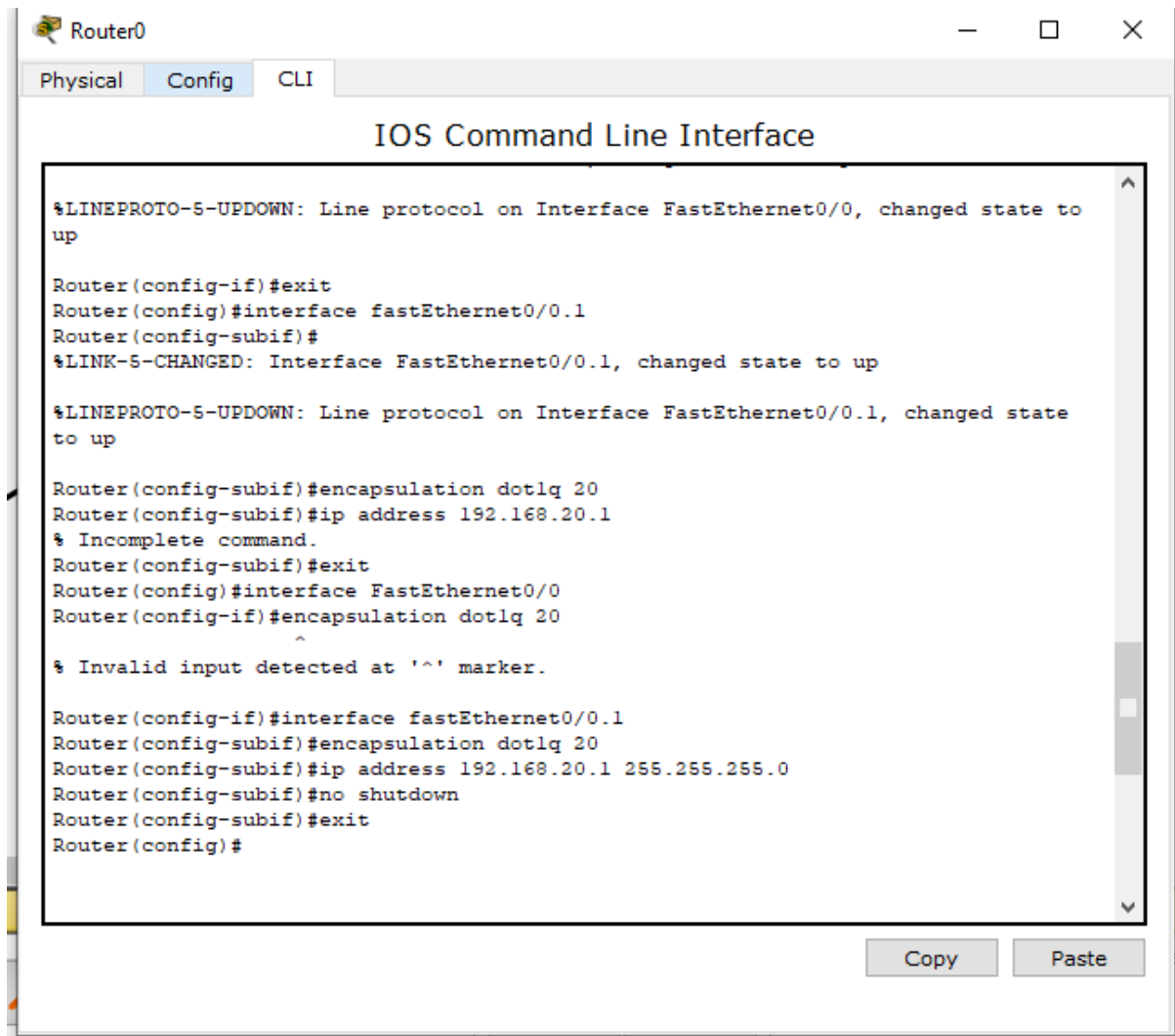
#### TOPOLOGY



1. Connect pc's as shown. Switch-2960 Router-1841
2. Configure IP address and gateway to pc.
3. Go to switch ->config->VLAN database set any VLAN name. But vlan number must be equal to the last but one number of the ip address (this must not be initially configured as the interface address of router) if we have 2 g/w as 192.168.1.1 and 192.168.20.1 and you have configured basically 192.168.1.1 for router interface then vlan number is 20.
4. In switch select the interface which goes to router and set dropdown to trunk



5. The right side sys conn to switch must be selected as vlan 20.  
Go to router and foll commands.



## Command Prompt

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

```
PC>ping 192.168.20.2
```

```
Pinging 192.168.20.2 with 32 bytes of data:
```

```
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
```

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

```
Ping statistics for 192.168.20.2:
```

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

```
Approximate round trip times in milli-seconds:
```

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

```
PC>
```



## CYCLE-II

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

```
#include<stdio.h>
#include<stdlib.h>
#include<unistd.h>
#include<time.h>
#define bkt 512

void bktinp(int a,int b){
    if(a>bkt){
        printf("Bucket overflow");
    }

    else{
        usleep(500000);
        while(a>b){
            printf("Outputted %d \n",b);
            a-=b;
            usleep(500000);
        }

        if(a>0){
            printf("Outputted %d \n",a);
        }
    }
}

void main(){
    int pkt,i,op;
    srand(time(NULL));
```

```

printf("Enter op rate \n");
scanf("%d",&op);
for(i=1;i<=5;i++){
    usleep(rand()%1000000);
    pkt=rand()%1000;
    printf("Pkt size= %d ",pkt);
    bktinp(pkt,op);

}

}

```

```

Enter op rate
30
Pkt size= 975 Bucket overflowPkt size= 181 Outputted 30
Outputted 30
Outputted 30
Outputted 30
Outputted 30
Outputted 30
Outputted 1
Pkt size= 575 Bucket overflowPkt size= 207 Outputted 30
Outputted 30
Outputted 30
Outputted 30
Outputted 30
Outputted 30
Outputted 27
Pkt size= 768 Bucket overflow

...Program finished with exit code 0
Press ENTER to exit console.

```

2) 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.

```
1  from socket import *
2  serverName="127.0.0.1"
3  serverPort=12000
4
5  clientSocket=socket(AF_INET,SOCK_STREAM)
6  clientSocket.connect((serverName,serverPort))
7  sentence=input("Enter file name")
8  clientSocket.send(sentence.encode())
9  filecontents=clientSocket.recv(1024).decode()
10 print("From server \n")
11 print(filecontents)
12 clientSocket.close()
```

```
1  from socket import *
2  serverName="127.0.0.1"
3  serverPort=12000
4  serverSocket=socket(AF_INET,SOCK_STREAM)
5  serverSocket.bind((serverName,serverPort))
6  serverSocket.listen(1)
7  while(1):
8      print("Server is ready to receive")
9      connectionSocket,addr=serverSocket.accept()
10     sentence=connectionSocket.recv(1024).decode()
11     file=open(sentence,'r')
12     l=file.read(1024)
13     connectionSocket.send(l.encode())
14     print("\n Sent contents of "+sentence)
15     file.close()
16     connectionSocket.close()
```

```

PS C:\Users\Vaishnavi Kamath\Desktop\propy> python clientTCP.py
Traceback (most recent call last):
  File "C:\Users\Vaishnavi Kamath\Desktop\propy\clientTCP.py", line 6, in <module>
    clientSocket.connect((serverName,serverPort))
ConnectionRefusedError: [WinError 10061] No connection could be made because the target machine actively refused it
PS C:\Users\Vaishnavi Kamath\Desktop\propy> python ServerTCP.py
Server is ready to receive

Sent contents of ServerTCP.py
Server is ready to receive

```

```

Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Vaishnavi Kamath> cd Desktop/propy
PS C:\Users\Vaishnavi Kamath\Desktop\propy> python clientTCP.py
Enter file nameServerTCP.py
From server

from socket import *
serverName="127.0.0.1"
serverPort=12000
serverSocket=socket(AF_INET,SOCK_STREAM)
serverSocket.bind((serverName,serverPort))
serverSocket.listen(1)
while(1):
    print("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("\n Sent contents of "+sentence)
    file.close()
    connectionSocket.close()

PS C:\Users\Vaishnavi Kamath\Desktop\propy>

```

3) 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.

```
clientUDP.py  serverUDP.py X
C: > Users > yasha > OneDrive > Desktop > python > serverUDP.py > ...
1  from socket import *
2  serverPort = 12000
3  serverSocket = socket(AF_INET, SOCK_DGRAM)
4  serverSocket.bind(("127.0.0.1", serverPort))
5  print ("The server is ready to receive")
6  while 1:
7      sentence,clientAddress = serverSocket.recvfrom(2048)
8
9      file=open(sentence,"r")
10     l=file.read(2048)
11
12     serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
13     print("sent back to client",l)
14     file.close()
```

```
clientUDP.py X
C: > Users > yasha > OneDrive > Desktop > python > clientUDP.py > ...
1  from socket import *
2  serverName = "127.0.0.1"
3  serverPort = 12000
4  clientSocket = socket(AF_INET, SOCK_DGRAM)
5
6  sentence = input("Enter file name")
7  clientSocket.sendto(bytes(sentence,"utf-8"),(serverName, serverPort))
8  filecontents,serverAddress = clientSocket.recvfrom(2048)
9  print ('From Server\n')
10  print(filecontents)
11
12  clientSocket.close()
13
14
```

## OUTPUT

```
Windows PowerShell
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PS C:\Users\yasha> cd C:\Users\yasha\OneDrive\Desktop\python
PS C:\Users\yasha\OneDrive\Desktop\python> python clientUDP.py
Enter file nameserverUDP.py
From Server

b'from socket import *\nserverPort = 12000\nserverSocket = socket(AF_INET, SOCK_DGRAM)\nserverSocket.bind(("127.0.0.1",
serverPort))\nprint ("The server is ready to receive")\nwhile 1:\n    sentence,clientAddress = serverSocket.recvfrom(20
48)\n    \n    file=open(sentence,"r")\n    l=file.read(2048)\n    \n    serverSocket.sendto(bytes(l,"utf-8"),clientAdd
ress)\n    print("sent back to client",l)\n    file.close()\n\n'
PS C:\Users\yasha\OneDrive\Desktop\python> |
```

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\yasha> cd C:\Users\yasha\OneDrive\Desktop\python
PS C:\Users\yasha\OneDrive\Desktop\python> python serverUDP.py
The server is ready to receive
sent back to client from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print ("The server is ready to receive")
while 1:
    sentence,clientAddress = serverSocket.recvfrom(2048)

    file=open(sentence,"r")
    l=file.read(2048)

    serverSocket.sendto(bytes(l,"utf-8"),clientAddress)
    print("sent back to client",l)
    file.close()
```

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

```
#include <stdio.h>

#include <string.h>

// length of the generator polynomial
#define N strlen(gen_poly)

// data to be transmitted and received
char data[28];

// CRC value
char check_value[28];

// generator polynomial
char gen_poly[10];

// variables
int data_length, i, j;

// function that performs XOR operation
void XOR()
{
    // if both bits are the same, the output is 0
    // if the bits are different the output is 1
    for (j = 1; j < N; j++)
        check_value[j] = ((check_value[j] == gen_poly[j]) ? '0' : '1');
}

// Function to check for errors on the receiver side
void receiver()
{
    // get the received data
    printf("Enter the received data: ");
    scanf("%s", data);
    printf("\n.....\n");
    printf("Data received: %s", data);
    // Cyclic Redundancy Check
```

```

    crc();

    // Check if the remainder is zero to find the error
    for (i = 0; (i < N - 1) && (check_value[i] != '1'); i++)
        ;
    if (i < N - 1)
        printf("\nError detected\n\n");
    else
        printf("\nNo error detected\n\n");
}

void crc()
{
    // initializing check_value
    for (i = 0; i < N; i++)
        check_value[i] = data[i];
    do
    {
        // check if the first bit is 1 and calls XOR function
        if (check_value[0] == '1')
            XOR();

        // Move the bits by 1 position for the next computation
        for (j = 0; j < N - 1; j++)
            check_value[j] = check_value[j + 1];

        // appending a bit from data
        check_value[j] = data[i++];
    } while (i <= data_length + N - 1);

    // loop until the data ends
}

int main()

```



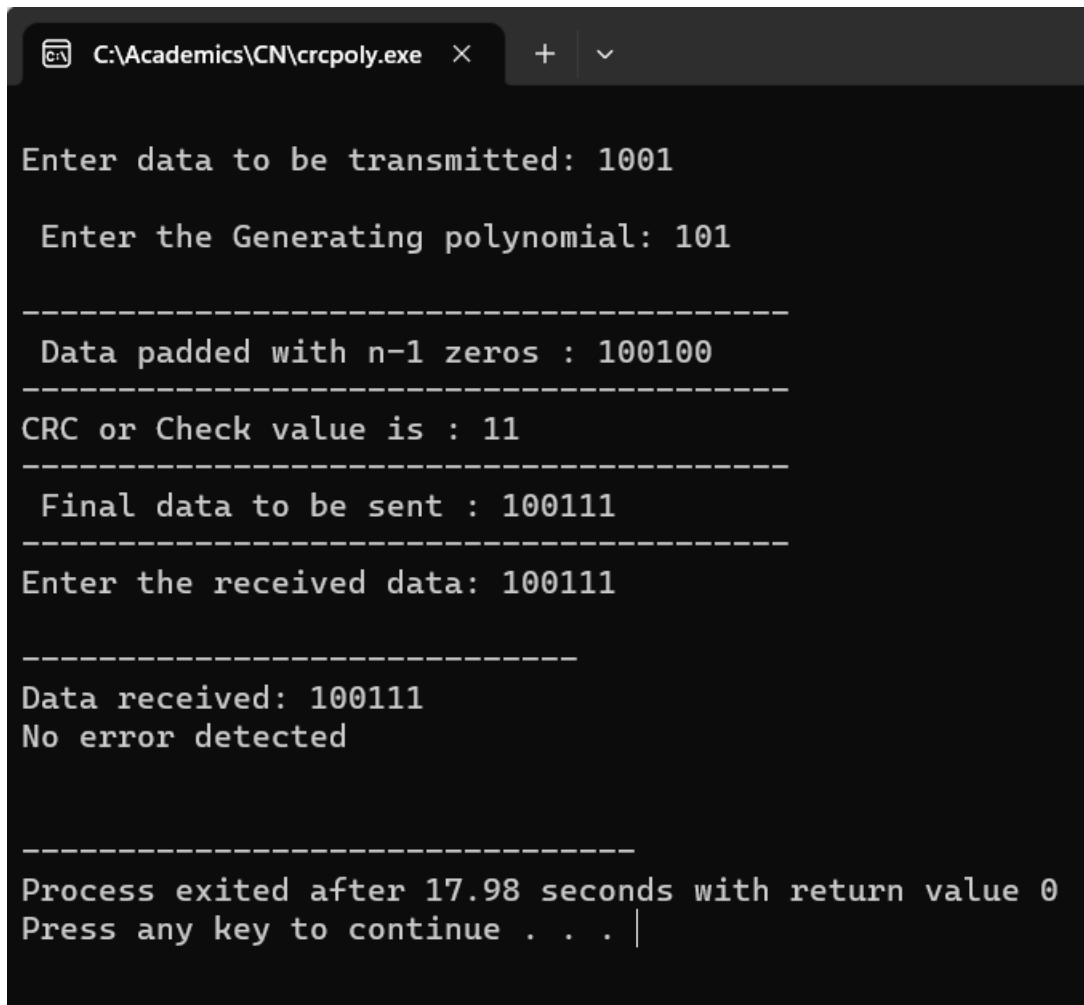
```

{
    // get the data to be transmitted
    printf("\nEnter data to be transmitted: ");
    scanf("%s", data);
    printf("\n Enter the Generating polynomial: ");
    // get the generator polynomial
    scanf("%s", gen_poly);
    // find the length of data
    data_length = strlen(data);
    // appending n-1 zeros to the data
    for (i = data_length; i < data_length + N - 1; i++)
        data[i] = '0';
    printf("\n.....");
    // print the data with padded zeros
    printf("\n Data padded with n-1 zeros : %s", data);
    printf("\n.....");
    // Cyclic Redundancy Check
    crc();
    // print the computed check value
    printf("\nCRC or Check value is : %s", check_value);
    // Append data with check_value(CRC)
    for (i = data_length; i < data_length + N - 1; i++)
        data[i] = check_value[i - data_length];
    printf("\n.....");
    // printing the final data to be sent
    printf("\n Final data to be sent : %s", data);
    printf("\n.....\n");
    // Calling the receiver function to check errors
    receiver();
    return 0;
}

```

}

## OUTPUT



```
C:\Academics\CN\crcpoly.exe × + v

Enter data to be transmitted: 1001

Enter the Generating polynomial: 101

-----
Data padded with n-1 zeros : 100100
-----
CRC or Check value is : 11
-----
Final data to be sent : 100111
-----
Enter the received data: 100111

-----
Data received: 100111
No error detected

-----
Process exited after 17.98 seconds with return value 0
Press any key to continue . . . |
```

```
C:\Academics\CN\crcpoly.exe  ×  +  ∨

Enter data to be transmitted: 1001

Enter the Generating polynomial: 101

-----
Data padded with n-1 zeros : 100100
-----
CRC or Check value is : 11
-----
Final data to be sent : 100111
-----
Enter the received data: 100101

-----
Data received: 100101
Error detected

-----
Process exited after 8.587 seconds with return value 0
Press any key to continue . . . |
```