

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



LAB REPORT

on

Computer Networks

Submitted by

Spoorthi J(1BM21CS218)

in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institution under VTU)

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B. M. S. College of Engineering,

Bull Temple Road, Bangalore 560019

(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled “Computer Networks” carried out by **Spoorthi J(1BM21CS218)**, 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.

Pramita Pai

Assistant Professor
Department of CSE
BMSCE, Bengaluru

Dr. Jyothi S Nayak

Professor and Head
Department of CSE
BMSCE, Bengaluru

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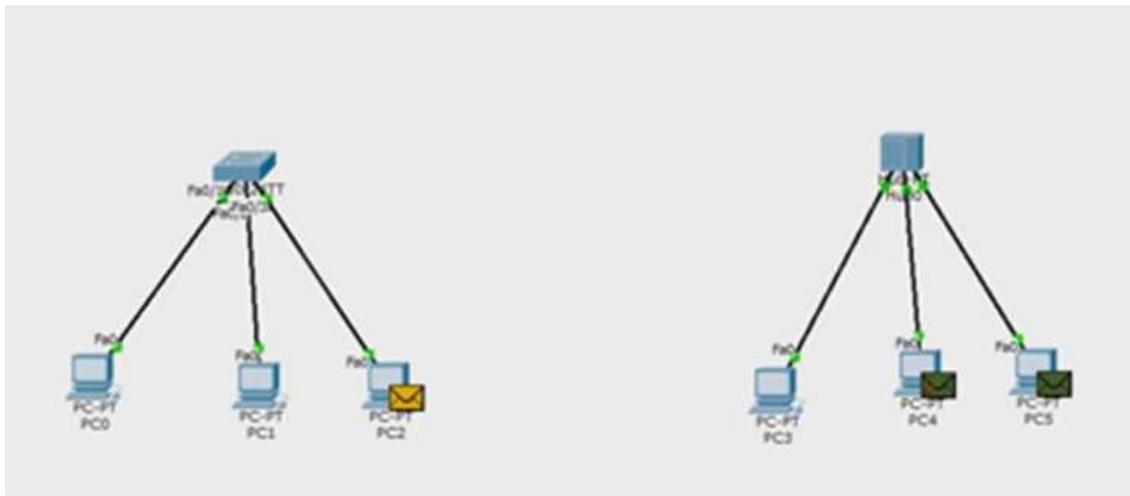
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Course Outcome

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.

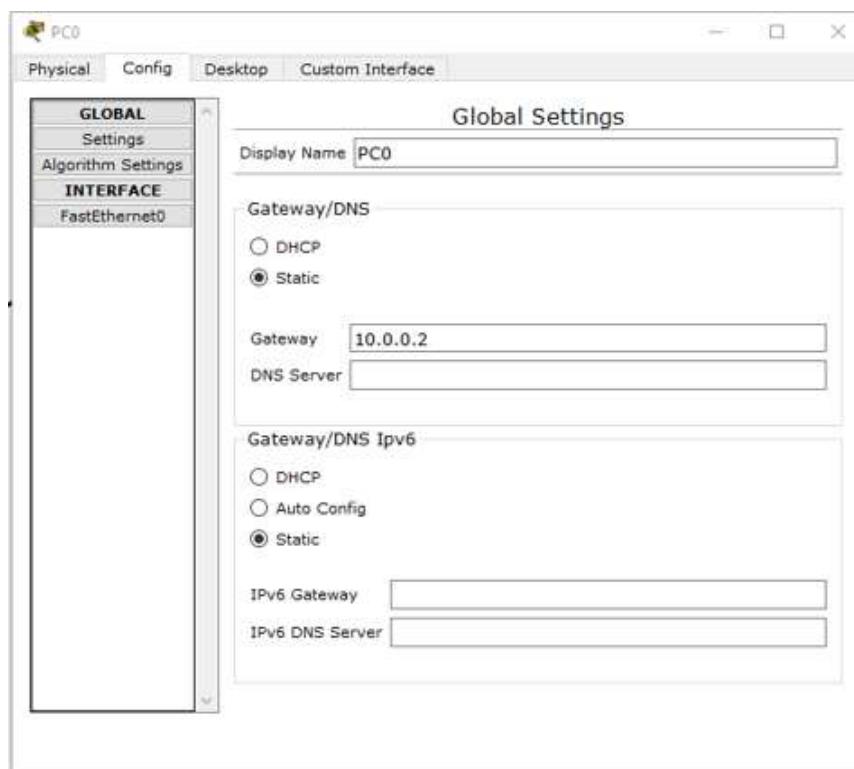
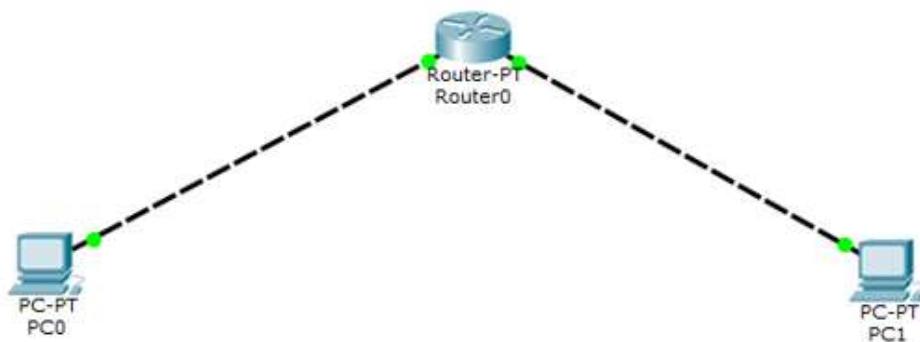
1)Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices.

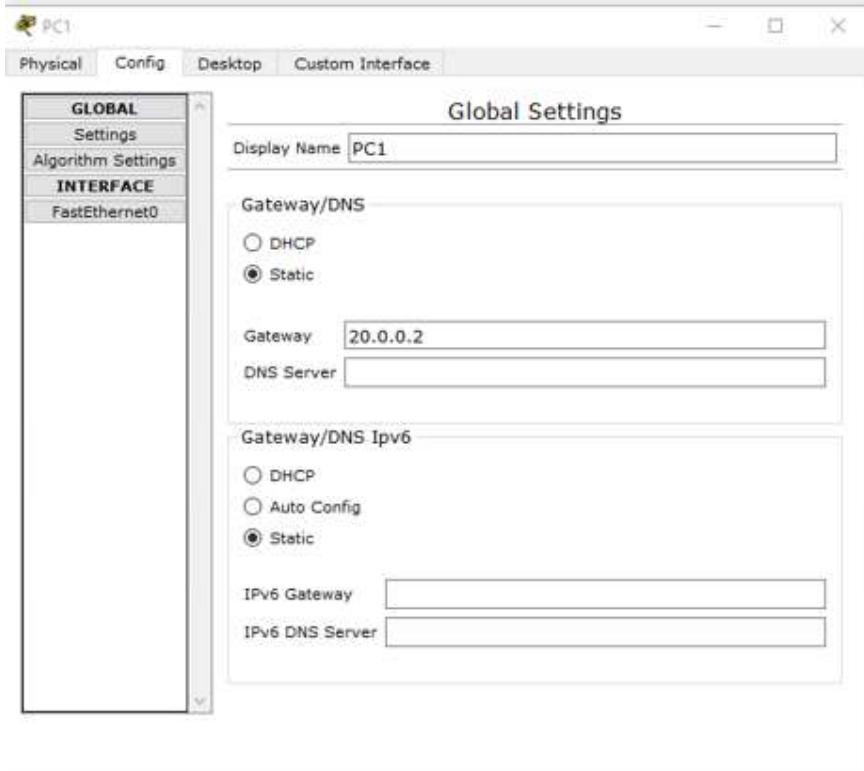
Topology:



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

Topology:





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.

The image shows a window titled "Router0" with three tabs: "Physical", "Config" (which is selected), and "CLI". The main area is titled "IOS Command Line Interface". It displays the following configuration commands:

```
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 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown

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

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

Router(config-if)#exit
Router(config)#interface FastEthernet1/0
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 FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to
up

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

```

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

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 pacter tracer window.

The screenshot shows a Cisco PCO interface window titled "Command Prompt". The window contains two ping commands issued from the prompt "PC>".

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

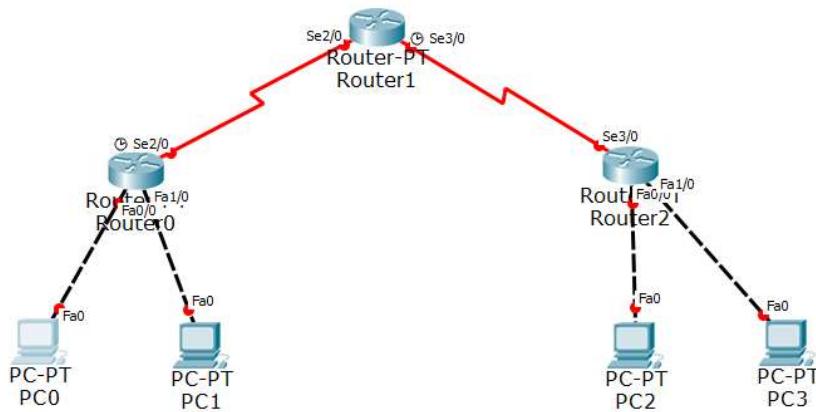
PC>ping 20.0.0.1
Pinging 20.0.0.1 with 32 bytes of data:
Reply from 20.0.0.1: bytes=32 time=1ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127
Reply from 20.0.0.1: bytes=32 time=1ms TTL=127
Reply from 20.0.0.1: bytes=32 time=0ms TTL=127

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

PC>
```

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

```
Router>configure terminal
Enter configuration commands, one per line. End with
CTRL/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

Router2

Physical Config CLI

IOS Command Line Interface

```
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#interface fastEthernet 0/0  
Router(config-if)#ip address 30.0.0.3 255.0.0.0  
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 fastEthernet 1/0  
Router(config-if)#ip address 40.0.0.3 255.0.0.0  
Router(config-if)#no shutdown  
  
Router(config-if)#  
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up
```

Copy Paste

Router0

Physical Config CLI

Serial2/0

GLOBAL	Port Status <input checked="" type="checkbox"/> On
Settings	Duplex <input checked="" type="radio"/> Full Duplex
Algorithm Settings	Clock Rate Not Set
ROUTING	
Static	
RIP	
INTERFACE	
fastEthernet0/0	
fastEthernet1/0	
Serial2/0	
Serial3/0	
fastEthernet4/0	
...	

Equivalent IOS Commands

```
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
```

Router1

Physical Config CLI

IOS Command Line Interface

```
Enter configuration commands, one per line. End with
CTRL/Z.
Router(config)#interface serial2/0
Router(config-if)#ip address 50.0.0.3 255.0.0.0
Router(config-if)#no shutdown

%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 60.0.0.3 255.0.0.0
Router(config-if)#no shutdown

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

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

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

Copy Paste

IP ROUTE COMMANDS

Router0

Physical Config CLI

IOS Command Line Interface

```
to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet1/0, changed state to up

Router(config-if)#exit
Router(config)#
Router(config)#interface Serial2/0
Router(config-if)#ip address 50.0.0.1 255.0.0.0
Router(config-if)#no shutdown

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

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

Router(config-if)#exit
Router(config)#ip route 60.0.0.0 255.0.0.0 50.0.0.3
Router(config)#ip route 30.0.0.0 255.0.0.0 50.0.0.3
Router(config)#ip route 40.0.0.0 255.0.0.0 50.0.0.3
Router(config)#

```

Copy Paste

Router2

Physical Config CLI

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

Router(config-if)#exit
Router(config)#interface Serial3/0
Router(config-if)#ip address 60.0.0.1 255.0.0.0
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 10.0.0.0 255.0.0.0 60.0.0.3
Router(config)#ip route 20.0.0.0 255.0.0.0 60.0.0.3
Router(config)#ip route 50.0.0.0 255.0.0.0 60.0.0.3
Router(config)#

```

Copy Paste

Router1

Physical Config CLI

IOS Command Line Interface

```
Router(config-if)#ip address 60.0.0.3 255.0.0.0
Router(config-if)#no shutdown

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

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

%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 50.0.0.1
Router(config)#ip route 20.0.0.0 255.0.0.0 50.0.0.1
Router(config)#ip route 30.0.0.0 255.0.0.0 60.0.0.1
Router(config)#ip route 40.0.0.0 255.0.0.0 60.0.0.1
Router(config)#

```

Copy Paste

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

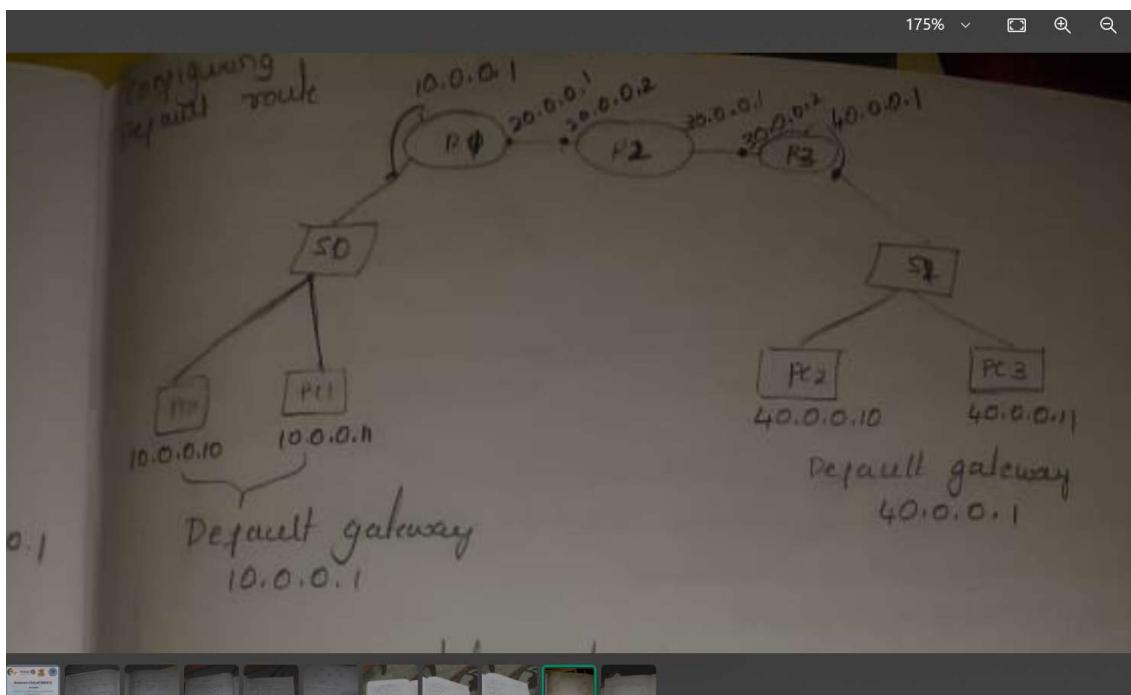
Ping statistics for 30.0.0.1:
  Packets: Sent = 4, Received = 4, Lost = 0 (0%
loss),
Approximate round trip times in milli-seconds:
  Minimum = 2ms, Maximum = 12ms, Average = 6ms

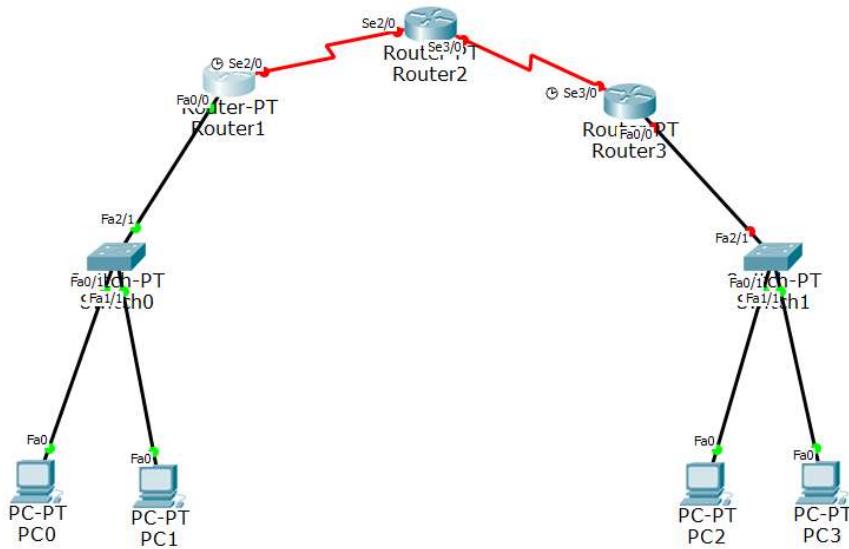
PC>

```

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
CRTL/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

The screenshot shows a window titled "IOS Command Line Interface" for "Router3". The window has tabs for "Physical", "Config", and "CLI", with "Config" selected. The main area displays the following configuration commands:

```
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)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

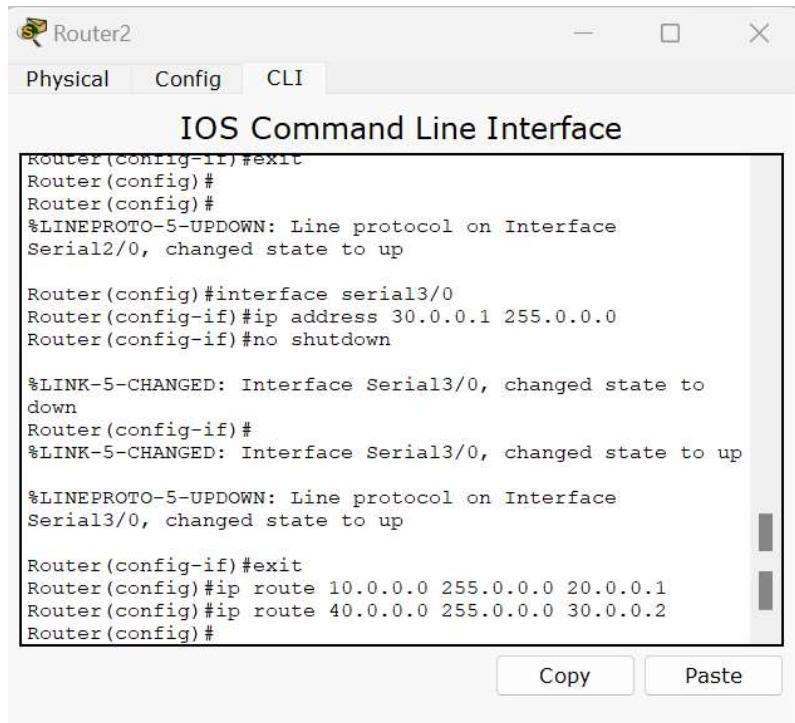
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

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

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

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

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



Router2

Physical Config CLI

IOS Command Line Interface

```
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)#

```

Copy Paste

Default routing for router 1 and 3



Router1

Physical Config CLI

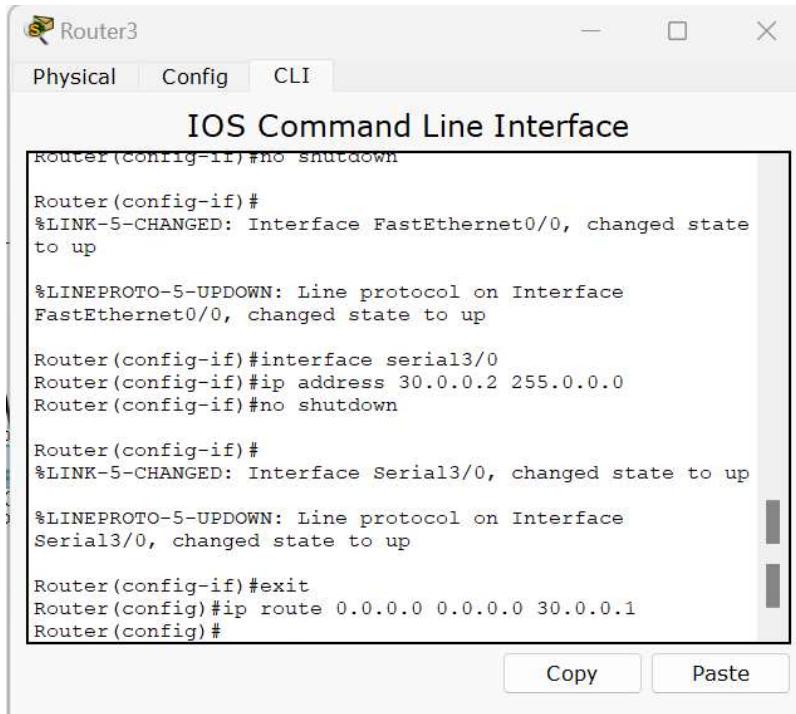
IOS Command Line Interface

```
Press RETURN to get started.

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

```

Copy Paste



The window title is "Router3". The tabs at the top are "Physical", "Config", and "CLI". The main area is titled "IOS Command Line Interface". The command history is as follows:

```
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

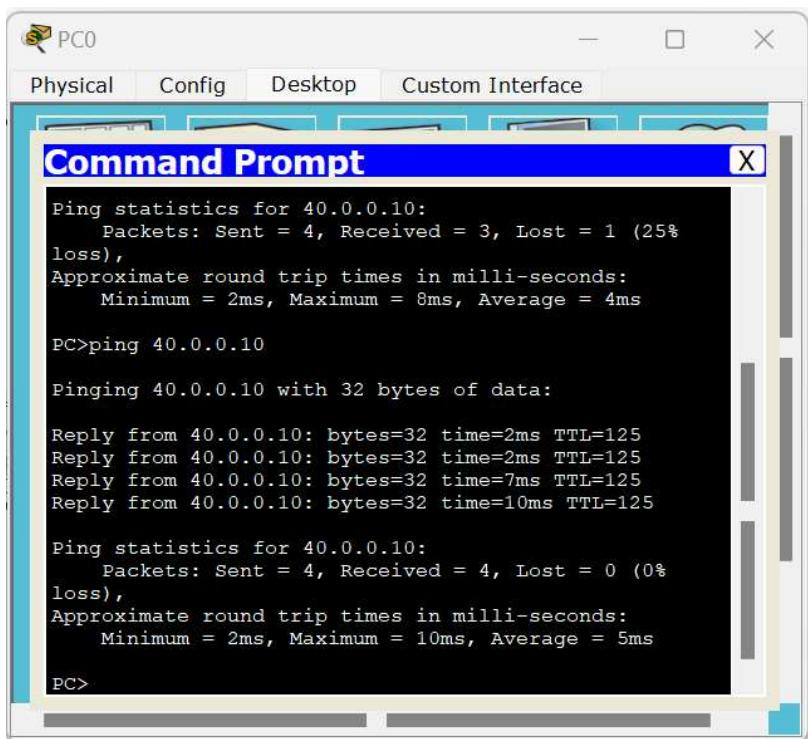
%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial3/0, changed state to up

Router(config-if)#exit
Router(config)#ip route 0.0.0.0 0.0.0.0 30.0.0.1
Router(config)#

```

At the bottom are "Copy" and "Paste" buttons.

Ping from pc0 to pc2



The window title is "PC0". The tabs at the top are "Physical", "Config", "Desktop", and "Custom Interface". A "Command Prompt" window is open, titled "Command Prompt". The command history is as follows:

```
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#
```

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#
```

Router3

Physical Config CLI

IOS Command Line Interface

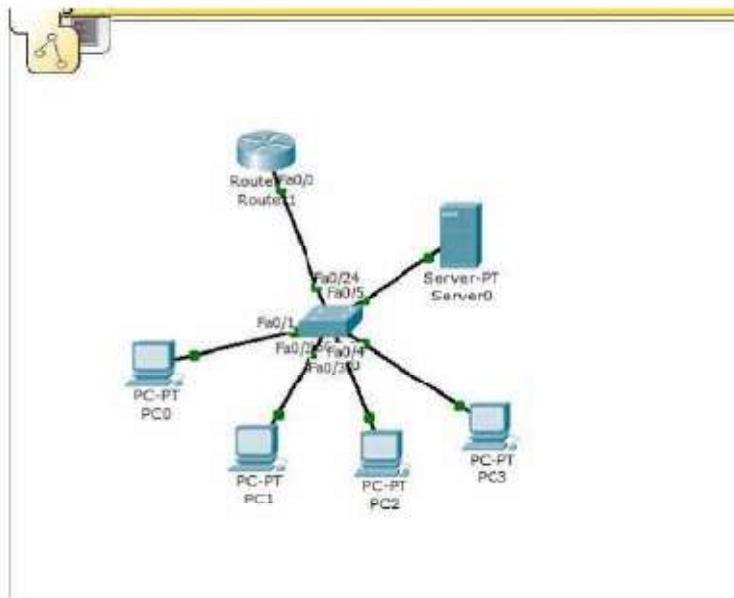
```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M -
mobile, B - BGP
          D - EIGRP, EX - EIGRP external, O - OSPF, IA -
OSPF inter area
          N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
external type 2
          E1 - OSPF external type 1, E2 - OSPF external type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

Copy Paste

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.

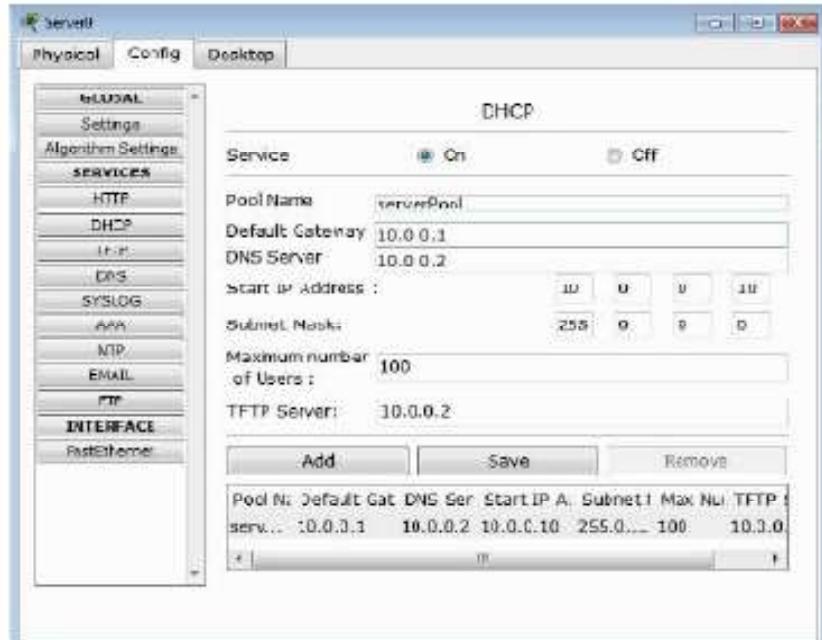
Step 7:DNS server,Just give our server ip address,10.0.0.2.

Step 8:Then just edit start ip address.I am going to give 10.0.0.10 and subnet mask 255.0.0.0

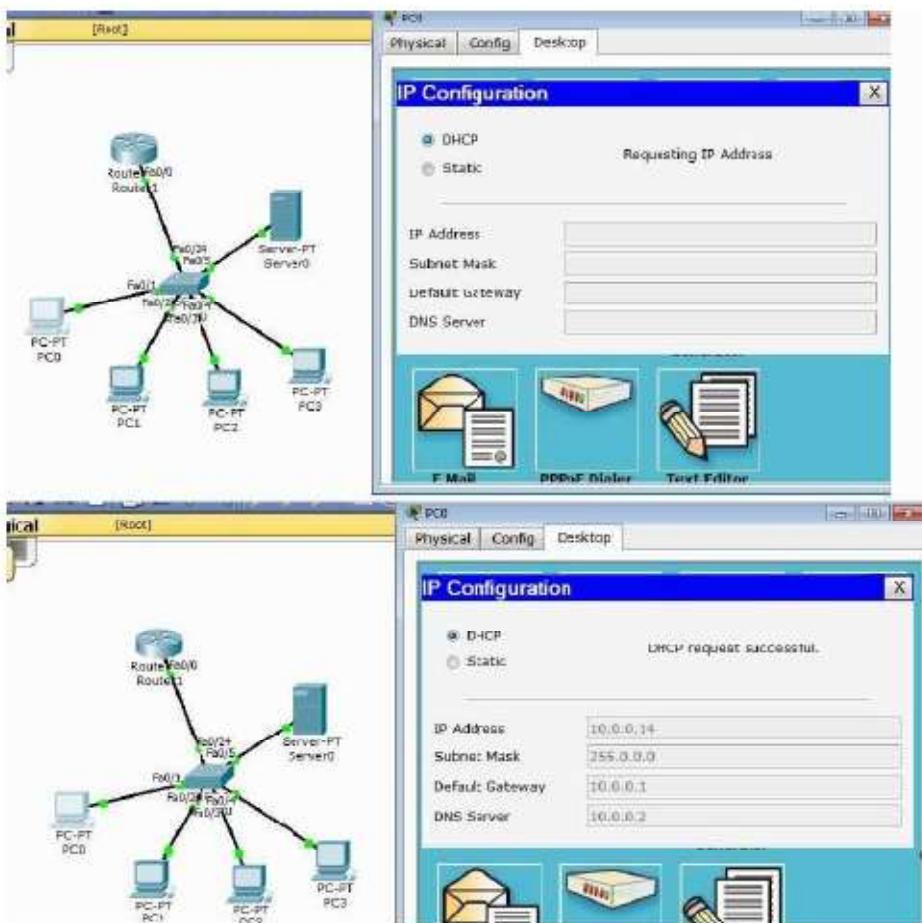
Step 9:In Maximum Number of Users,Here we are using Class A Network so we can use 1,67,77,216 ip address.just give how many ip address you want in this pool.I am going to give 500

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.



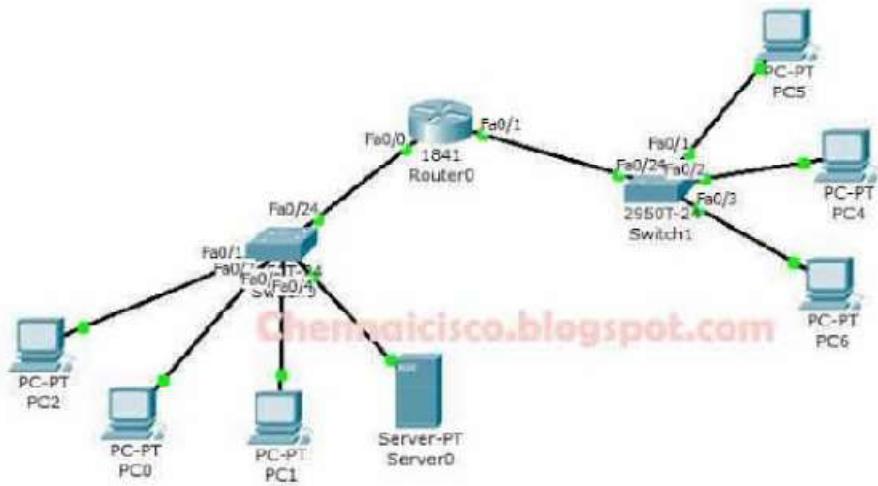
DHCP outside LAN

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.Lets see how to do with help of 'ip helper-address'.

Step 1:Create a topology like this,

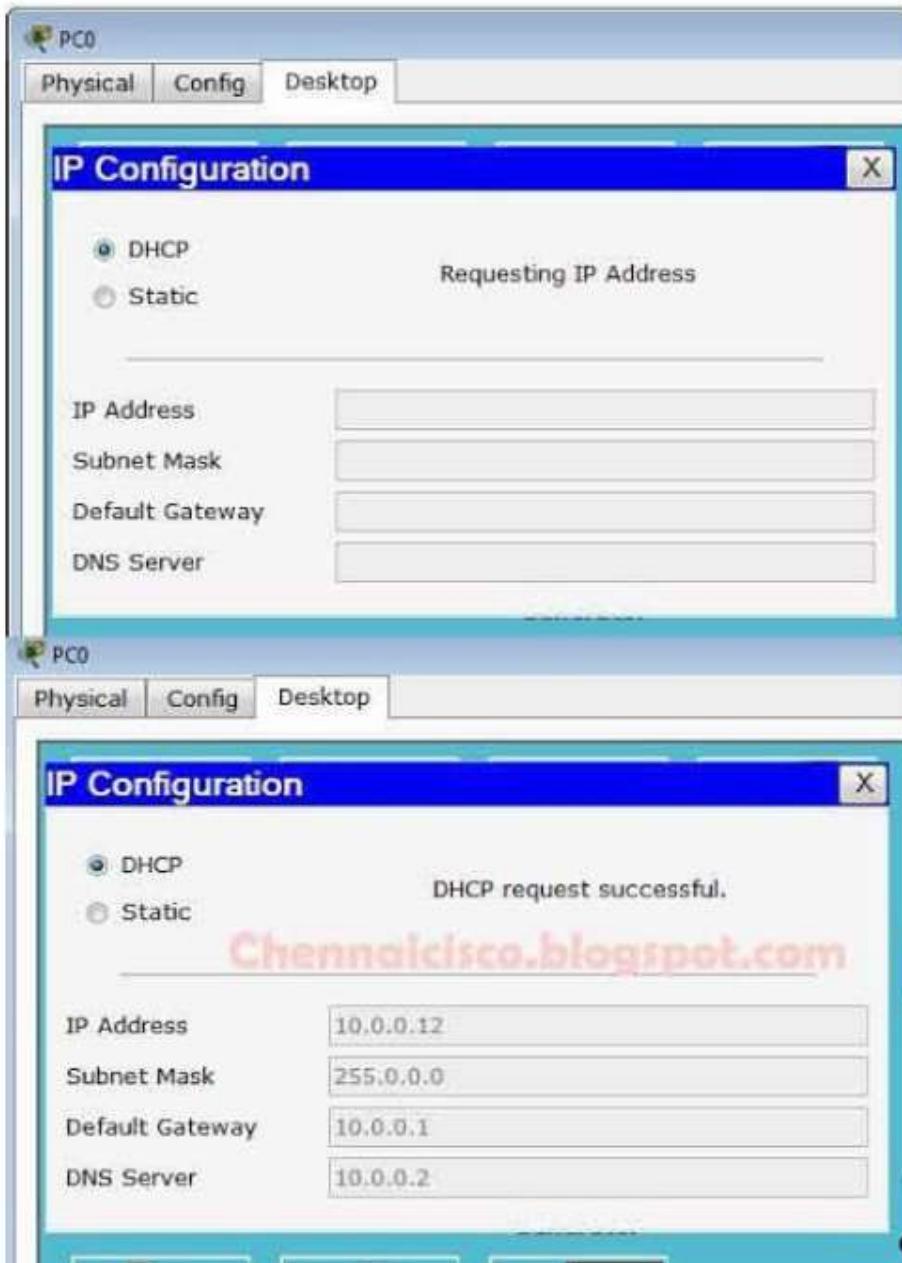
Step 2:Configure the router

```
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.

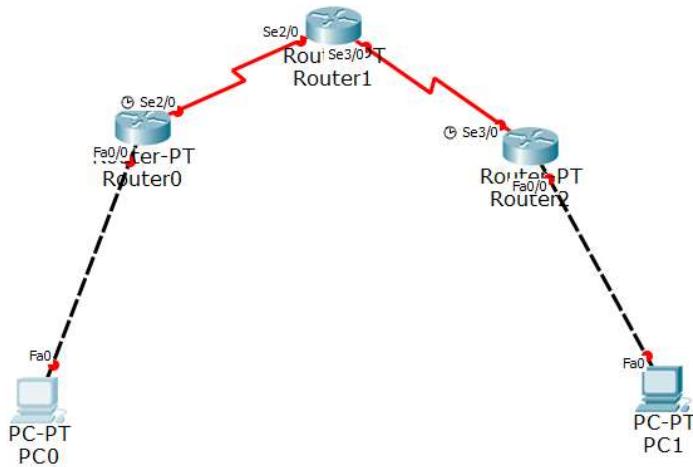
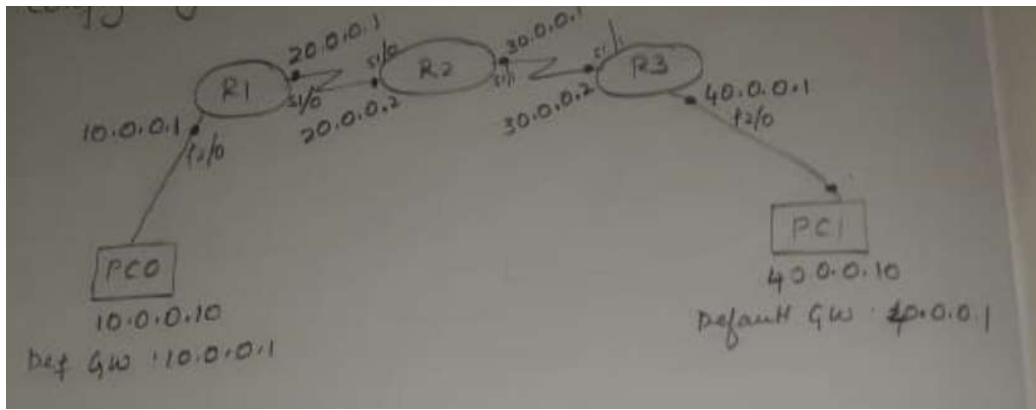
Step 8: Now go to router and give ip helper address under fastethernet0/1, that is server address here our server address is 10.0.0.2. Now we can get ip for this network also In Router, (Global configuration mode)

```
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

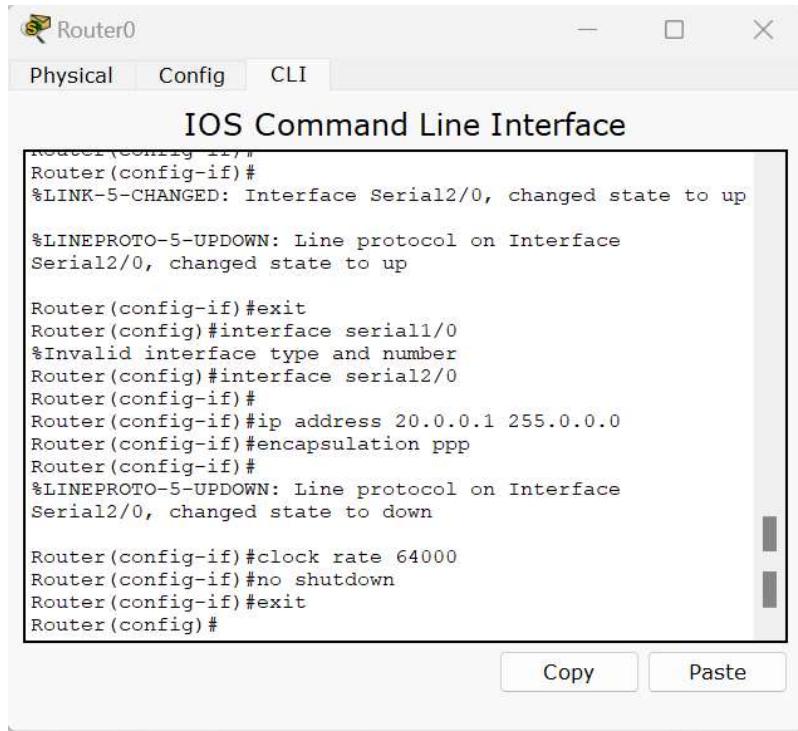
TOPOLOGY



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.



Router0

Physical Config CLI

IOS Command Line Interface

```
Router(config)#
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

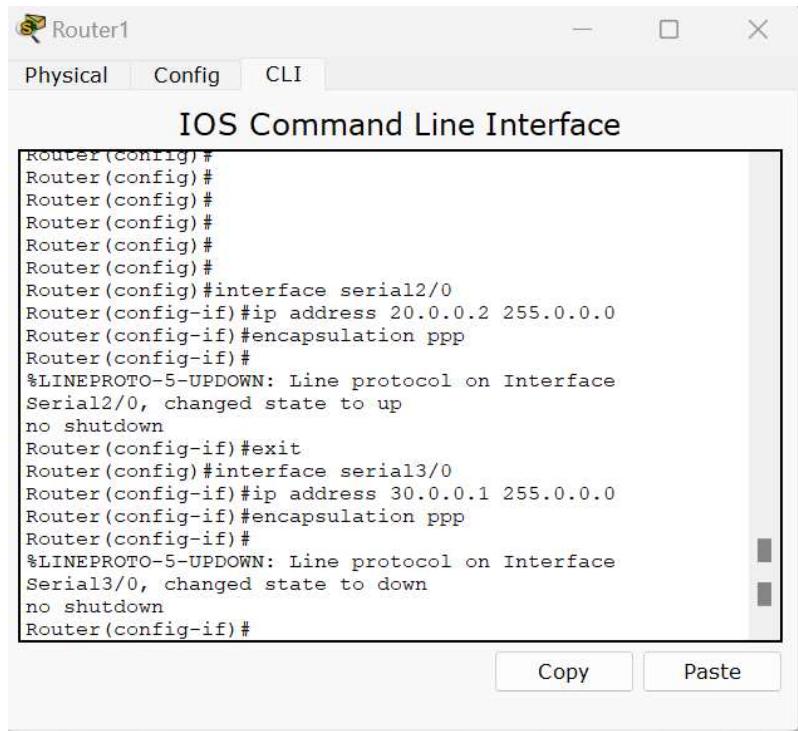
Router(config-if)#exit
Router(config)#interface serial1/0
%Invalid interface type and number
Router(config)#interface serial2/0
Router(config-if)#
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface
Serial2/0, changed state to down

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

```

Copy Paste

No need to give clk rate in second router



Router1

Physical Config CLI

IOS Command Line Interface

```
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#interface serial2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
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)#

```

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Router2

Physical Config CLI

IOS Command Line Interface

```
Router(config)#interface fastEthernet 0/1/2
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#enable
Router#configure terminal
Enter configuration commands, one per line. End with
CTRL/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)#

```

Copy Paste

CONFIGURE RIP

Router0

Physical Config CLI

IOS Command Line Interface

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with
CTRL/Z.
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#exit
Router(config)#

```

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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
CTRL/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

Router2

Physical Config CLI

IOS Command Line Interface

```
MOBILE, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA -
OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
    external type 2
    E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
ia - IS-IS inter area
    * - candidate default, U - per-user static route,
o - ODR
    P - periodic downloaded static route

Gateway of last resort is not set

R    10.0.0.0/8 [120/2] via 30.0.0.1, 00:00:06, Serial3/0
R    20.0.0.0/8 [120/1] via 30.0.0.1, 00:00:06, 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

Router1

Physical Config CLI

IOS Command Line Interface

```
OSPF inter area
    N1 - OSPF NSSA external type 1, N2 - OSPF NSSA
    external type 2
    E1 - OSPF external type 1, E2 - OSPF external type
2, E - EGP
    i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
ia - IS-IS inter area
    * - candidate default, U - per-user static route,
o - ODR
    P - periodic downloaded static route

Gateway of last resort is not set

R    10.0.0.0/8 [120/1] via 20.0.0.1, 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      20.0.0.1/32 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
R    40.0.0.0/8 [120/1] via 30.0.0.2, 00:00:06, Serial3/0
Router#
```

Copy Paste

Router0

Physical Config CLI

IOS Command Line Interface

```
MOBILE, B - EGP
    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 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
R      30.0.0.0/8 [120/1] via 20.0.0.2, 00:00:18, Serial2/0
R      40.0.0.0/8 [120/2] via 20.0.0.2, 00:00:18, Serial2/0
Router#
```

Copy Paste

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 = 12ms, Average = 7ms

PC>ping 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of data:

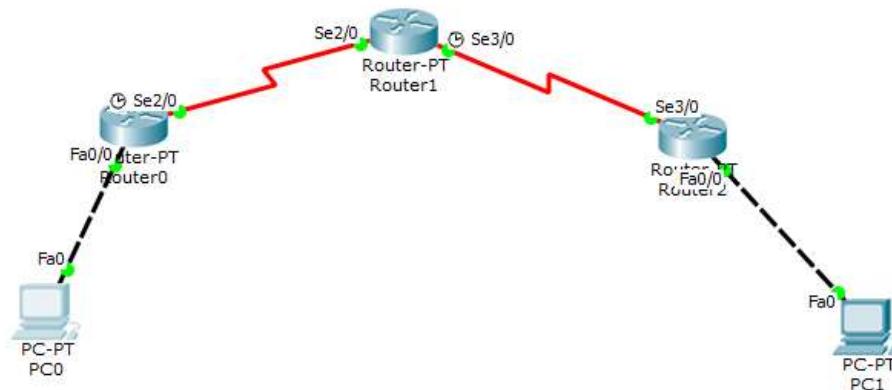
Reply from 40.0.0.10: bytes=32 time=12ms TTL=125
Reply from 40.0.0.10: bytes=32 time=10ms TTL=125
Reply from 40.0.0.10: bytes=32 time=11ms TTL=125
Reply from 40.0.0.10: bytes=32 time=12ms TTL=125

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 12ms, Average = 11ms

PC>
```

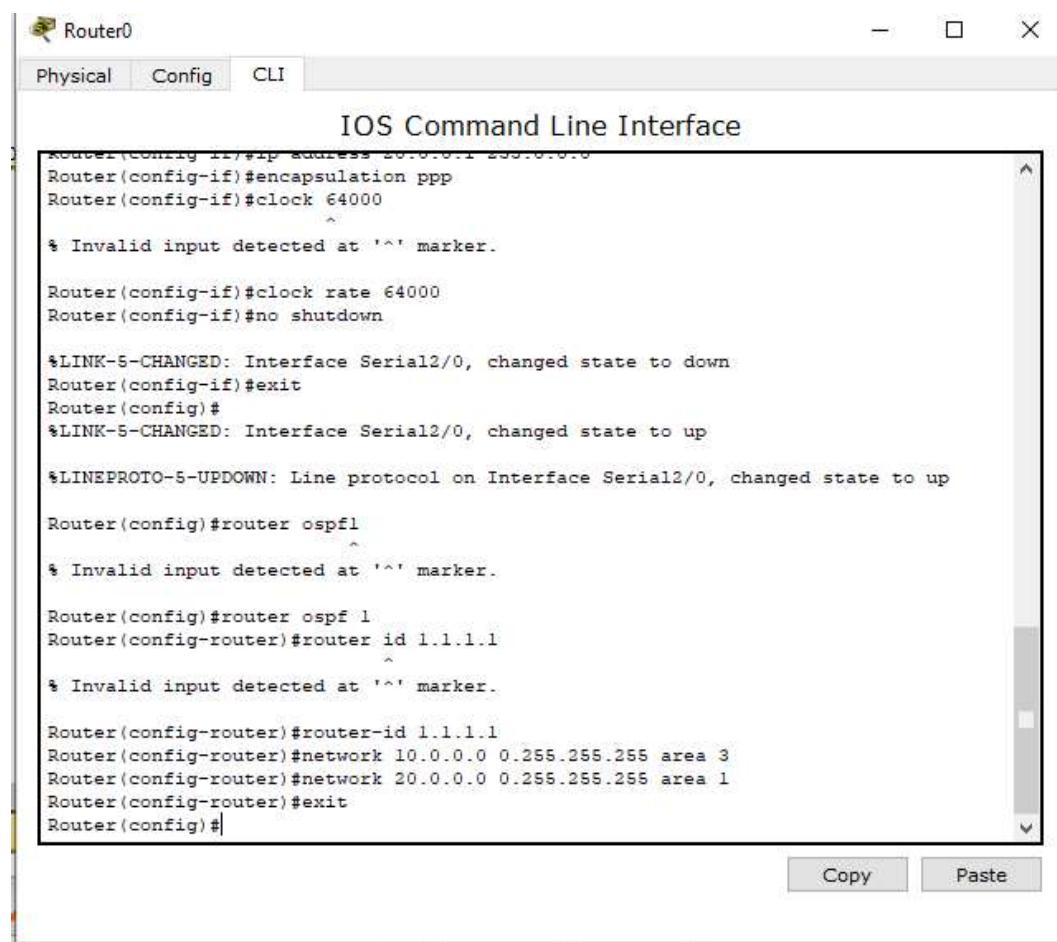
6)Configure OSPF routing protocol

Topology.



1.config rip.

2. Config ospf



The image shows a screenshot of a Windows application window titled "Router0". The window has three tabs at the top: "Physical", "Config" (which is selected), and "CLI". Below the tabs is a title bar "IOS Command Line Interface". The main area contains a command-line session with the following text:

```
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)#

```

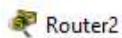
At the bottom right of the CLI window are two buttons: "Copy" and "Paste".

Physical Config

CLI

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)#|
```



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

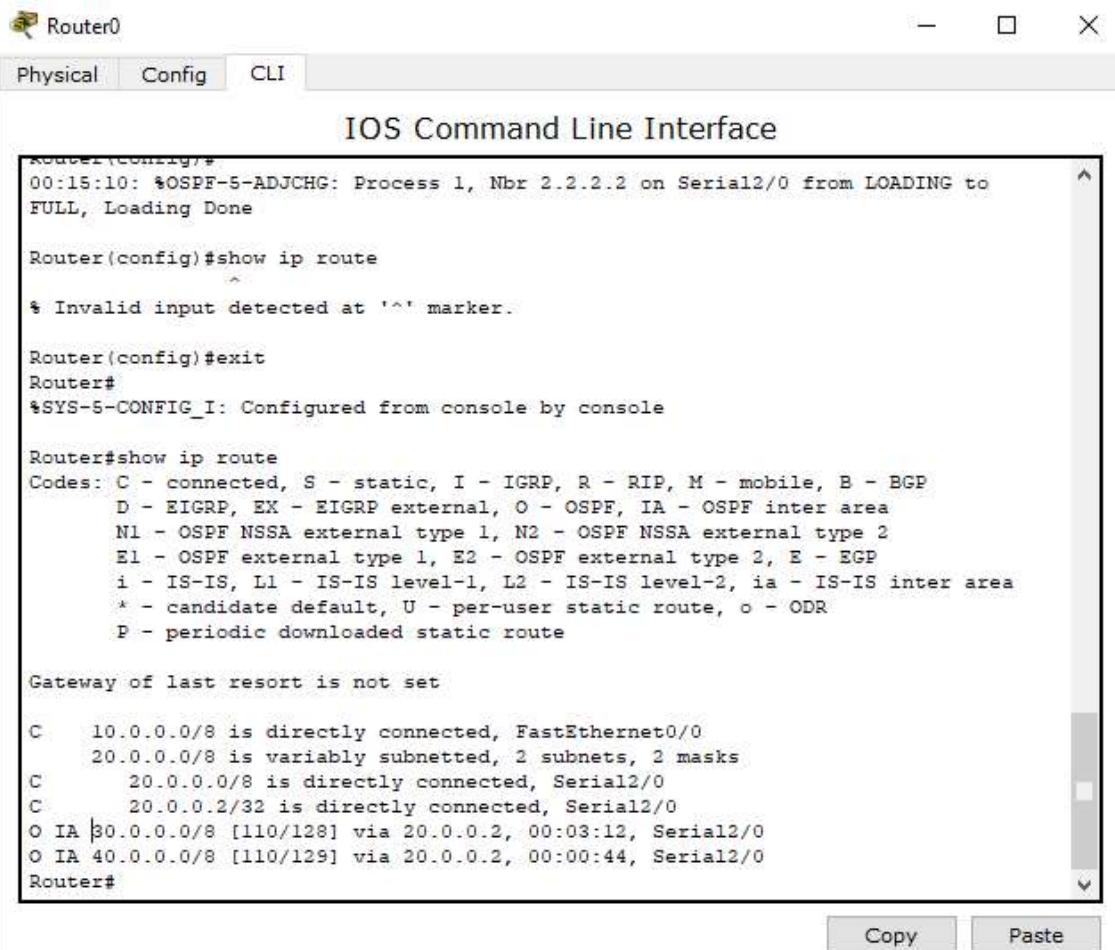
Router(config-if)#
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
xit
Router(config)#router ospf 1
Router(config-router)#router-id 3.3.3.3
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#
00:17:34: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 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 image shows a software window titled "Router0" with a tab bar at the top labeled "Physical", "Config", and "CLI". The "CLI" tab is selected. Below the tabs is the title "IOS Command Line Interface". The main area contains the output of the "show ip route" command. The output shows a single static route to 10.0.0.0/8 via FastEthernet0/0 and two OSPF routes via Serial2/0.

```
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#
```

Copy

Paste

Router1

Physical Config CLI

IOS Command Line Interface

```
Router(config-router)#network 30.0.0.0 0.255.255.255 area 0
Router(config-router)#exit
Router(config)#
00:17:35: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial3/0 from LOADING to
FULL, Loading Done

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

  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, 00:03:07, Serial3/0
Router#
```

Copy Paste

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

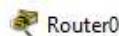
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
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



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)#[
```

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 not set

  20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.0.0.0/8 is directly connected, Serial2/0
C        20.0.0.1/32 is directly connected, Serial2/0
            30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        30.0.0.0/8 is directly connected, Serial3/0
C        30.0.0.2/32 is directly connected, Serial3/0
O IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:03:07, Serial3/0
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 172.16.1.253 255.255.0.0
Router(config-if)#no shutdown
Router(config-if)#

```

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Router2

Physical Config CLI

IOS Command Line Interface

```
* - 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#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 172.16.1.254 255.255.0.0
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
```

Copy Paste

Show ip route for R2

```
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#
```

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Router0

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
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)#exit
Router(config)#router ospf 1
Router(config-router)#area 1 virtual link 2.2.2.2
^
% Invalid input detected at '^' marker.

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

Copy Paste

Similarly do for R1 you may face some disturbance while typing

Show ip route for R2

Router2

Physical Config CLI

IOS Command Line Interface

```
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

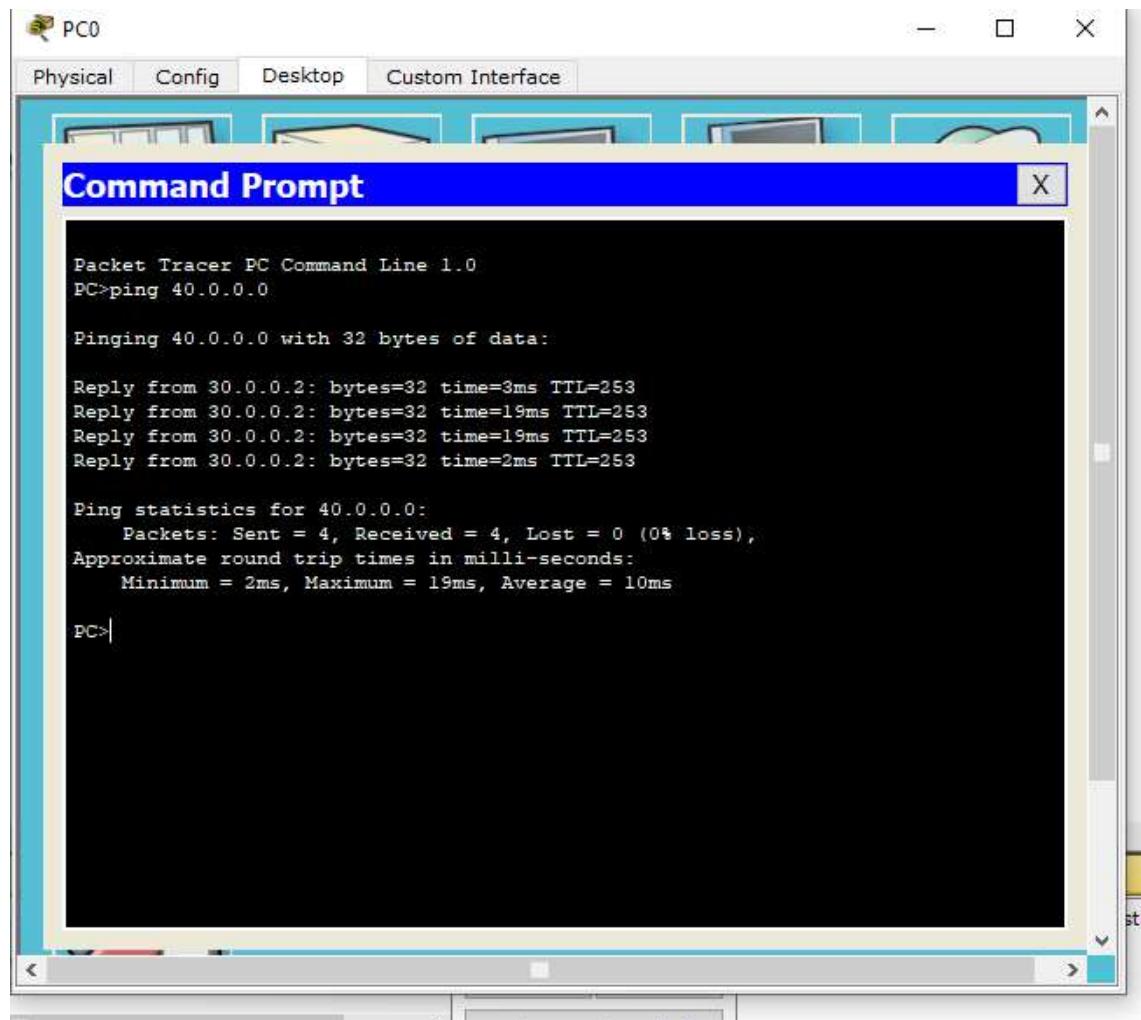
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:11:19, Serial3/0
    30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial3/0
C       30.0.0.1/32 is directly connected, Serial3/0
C       40.0.0.0/8 is directly connected, FastEthernet0/0
C       172.16.0.0/16 is directly connected, Loopback0
Router#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, 00:00:17, Serial3/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:19:17, 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#
```

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Ping 40.0.0.0 from 10.0.0.10



PC0

Physical Config Desktop Custom Interface

Command Prompt

```
PC>ping 40.0.0.10
Pinging 40.0.0.10 with 32 bytes of data:
Request timed out.
Reply from 40.0.0.10: bytes=32 time=9ms TTL=125
Reply from 40.0.0.10: bytes=32 time=9ms TTL=125
Reply from 40.0.0.10: bytes=32 time=22ms TTL=125

Ping statistics for 40.0.0.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 9ms, Maximum = 22ms, Average = 13ms

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=11ms TTL=125
Reply from 40.0.0.10: bytes=32 time=2ms TTL=125
Reply from 40.0.0.10: bytes=32 time=4ms TTL=125
Reply from 40.0.0.10: bytes=32 time=6ms 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 = 11ms, Average = 5ms

PC>
```

7) Demonstrate the TTL/ Life of a Packet

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

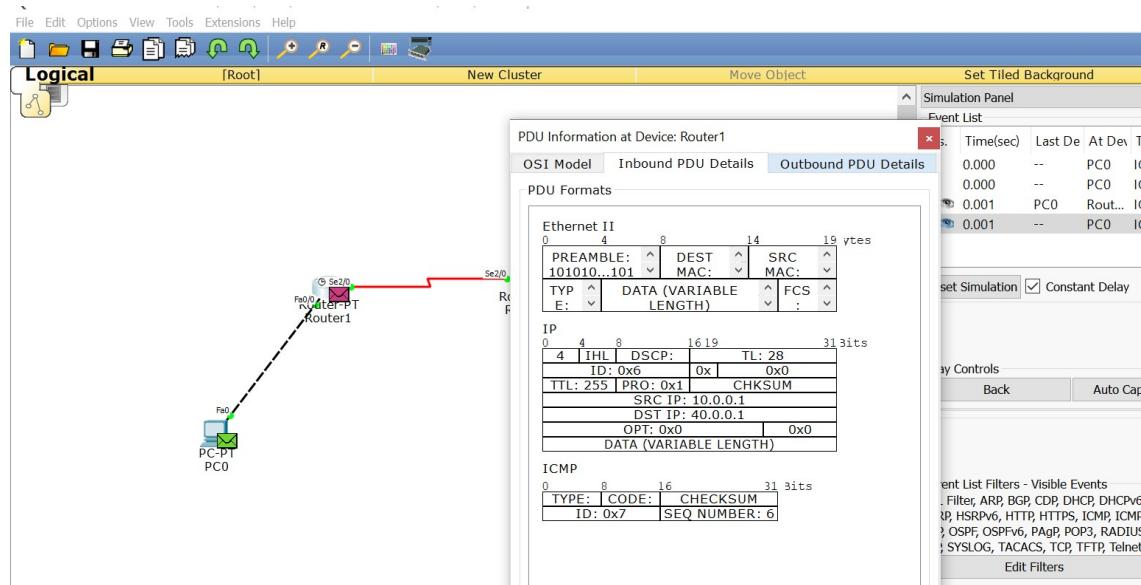
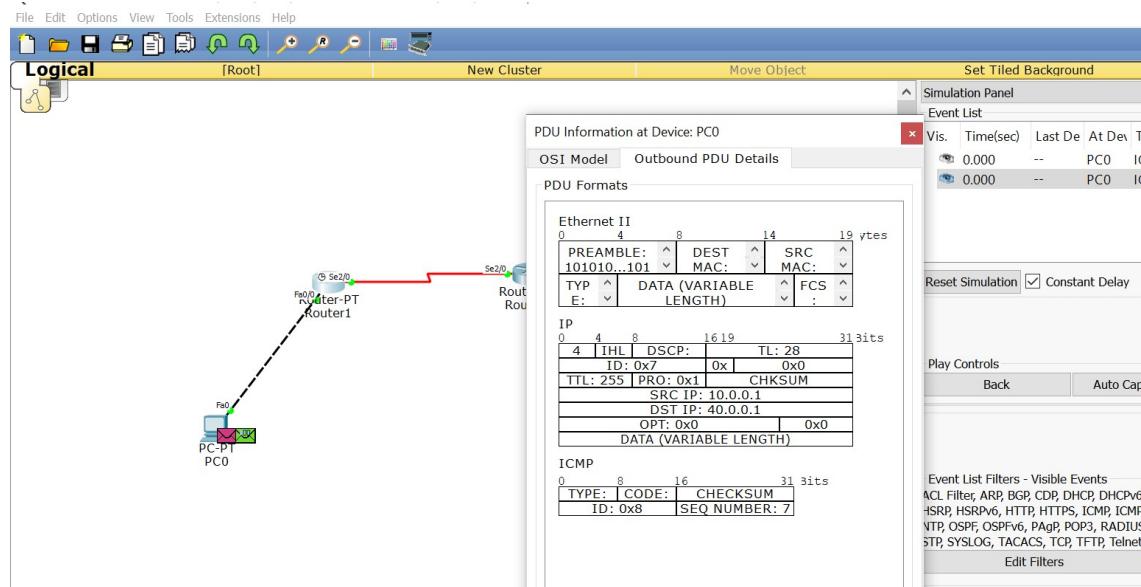
Configure the devices as per static / default / dynamic routing.

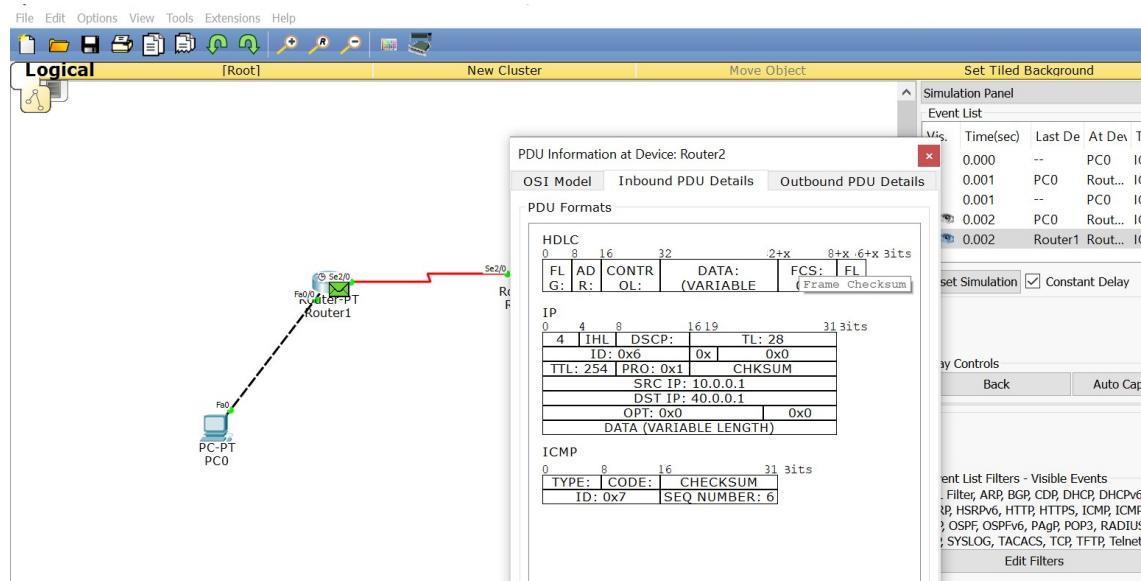
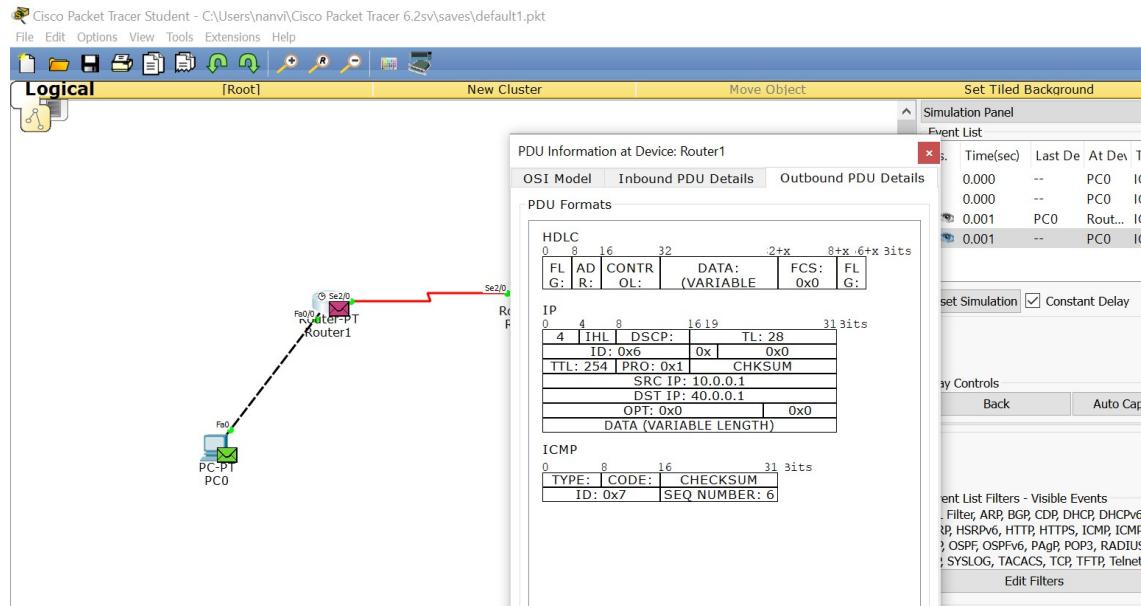
In the simulation mode, send a simple PDU from one PC to another.

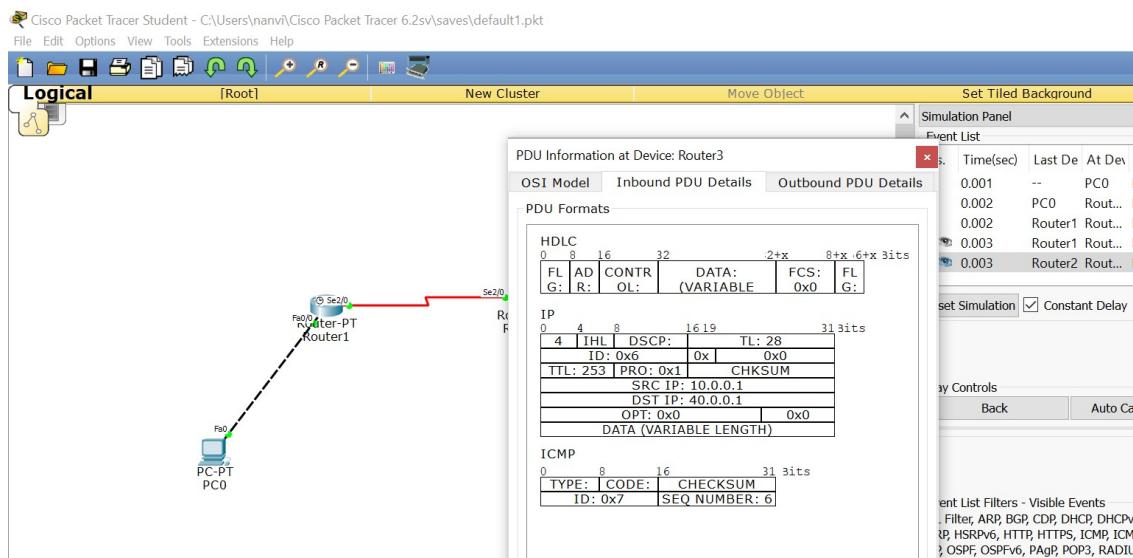
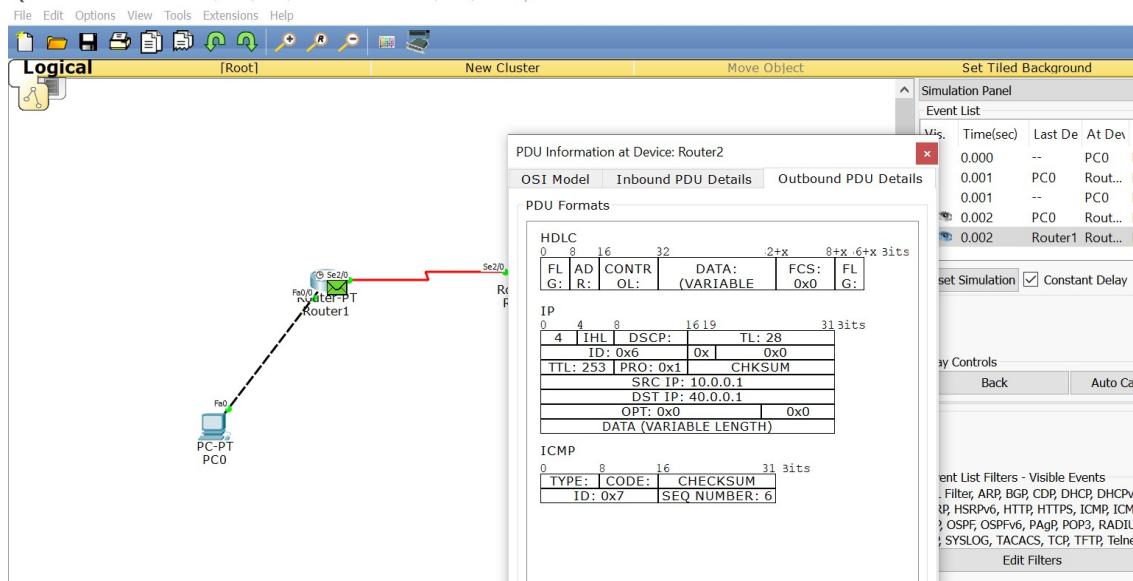
Use capture button to capture every transfer.

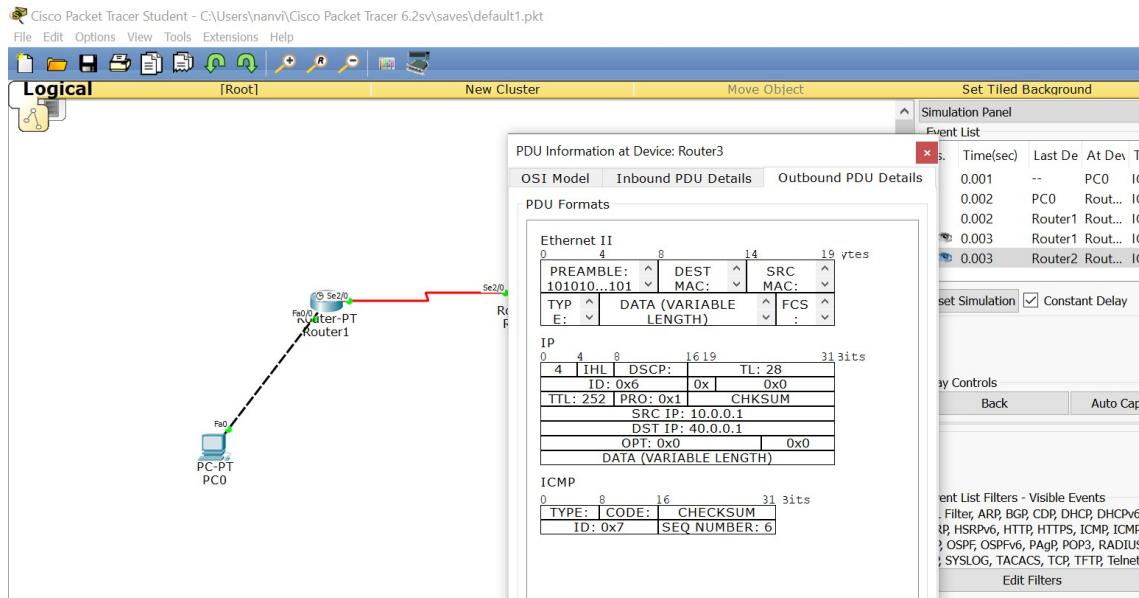
Click on the PDU during every transfer to see the Inbound and outbound PDU details.

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





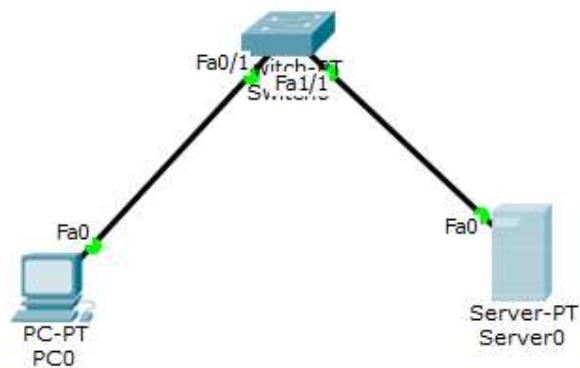




8) Configure Web Server, DNS within a LAN.

DNS

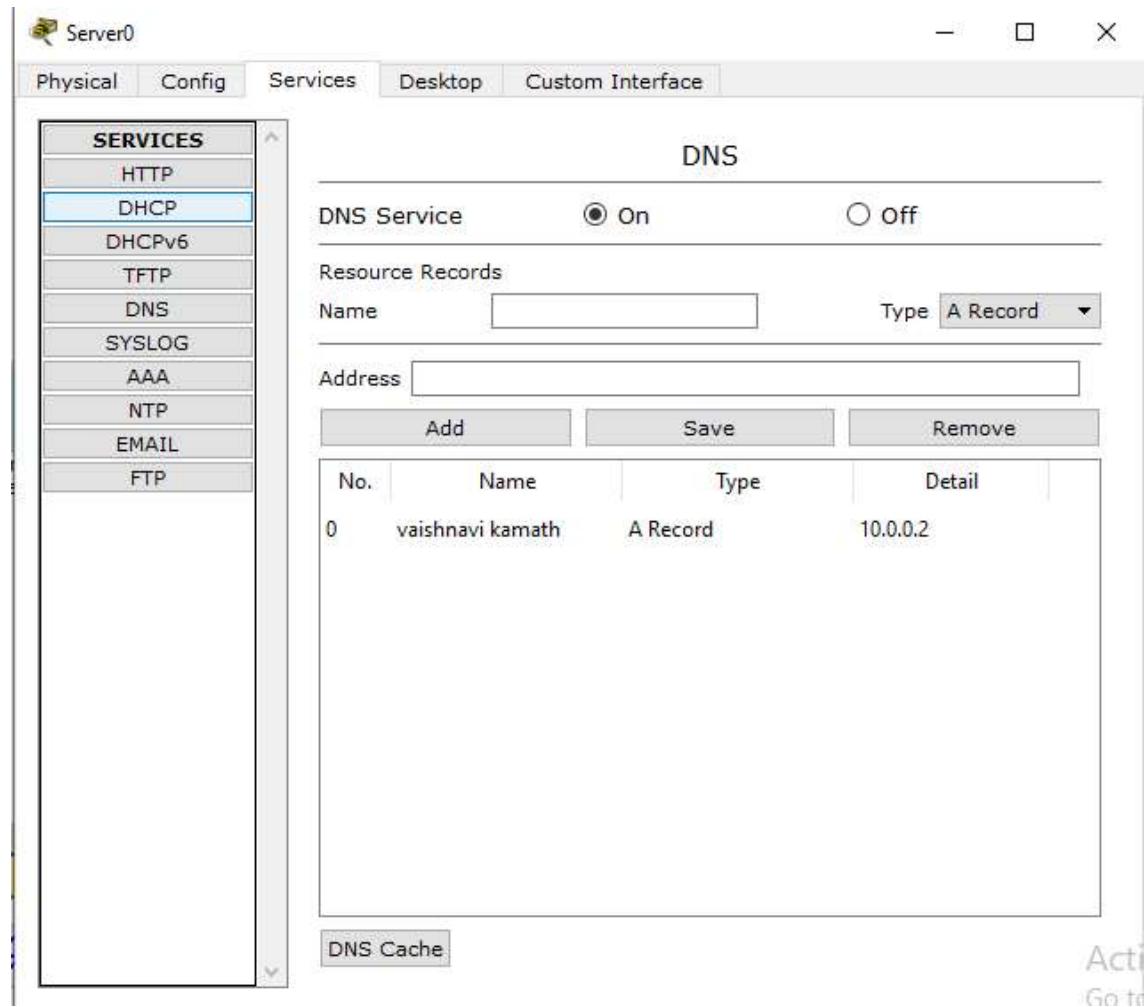
Topology:



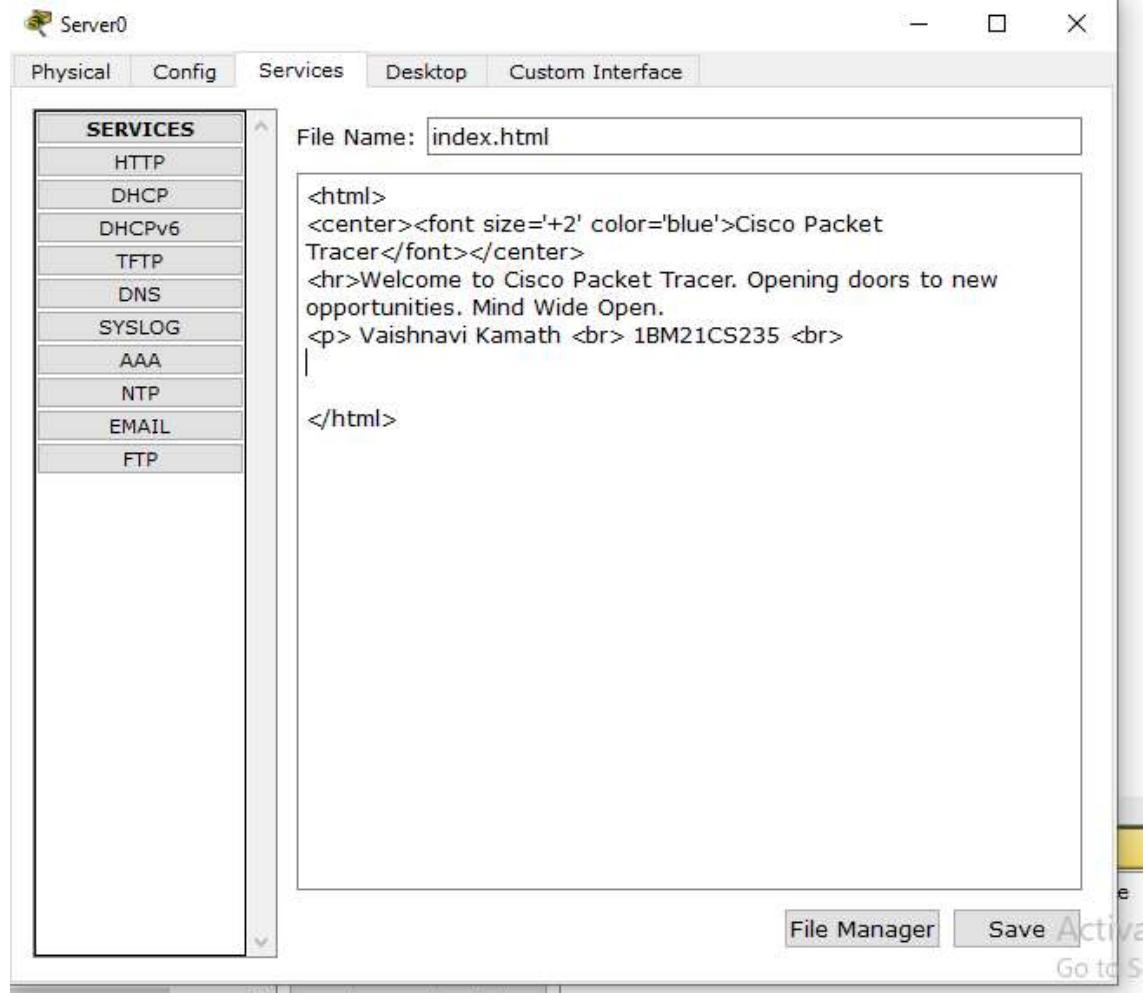
Configure ip address of PC-10.0.0.1

Server-10.0.0.2

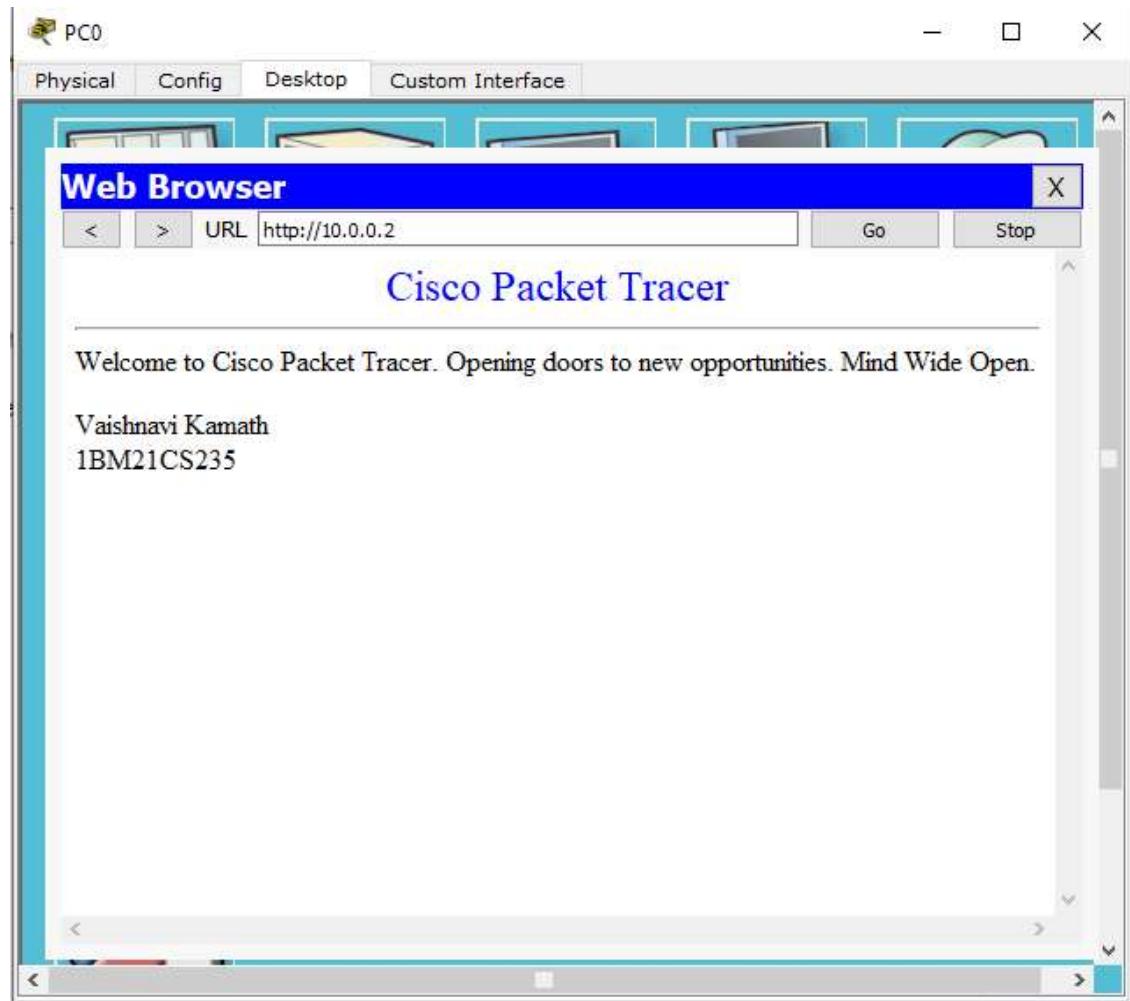
Go to services in server select dns and add a new name as Vaishnavi Kamath and address as 10.0.0.2 address of your server.



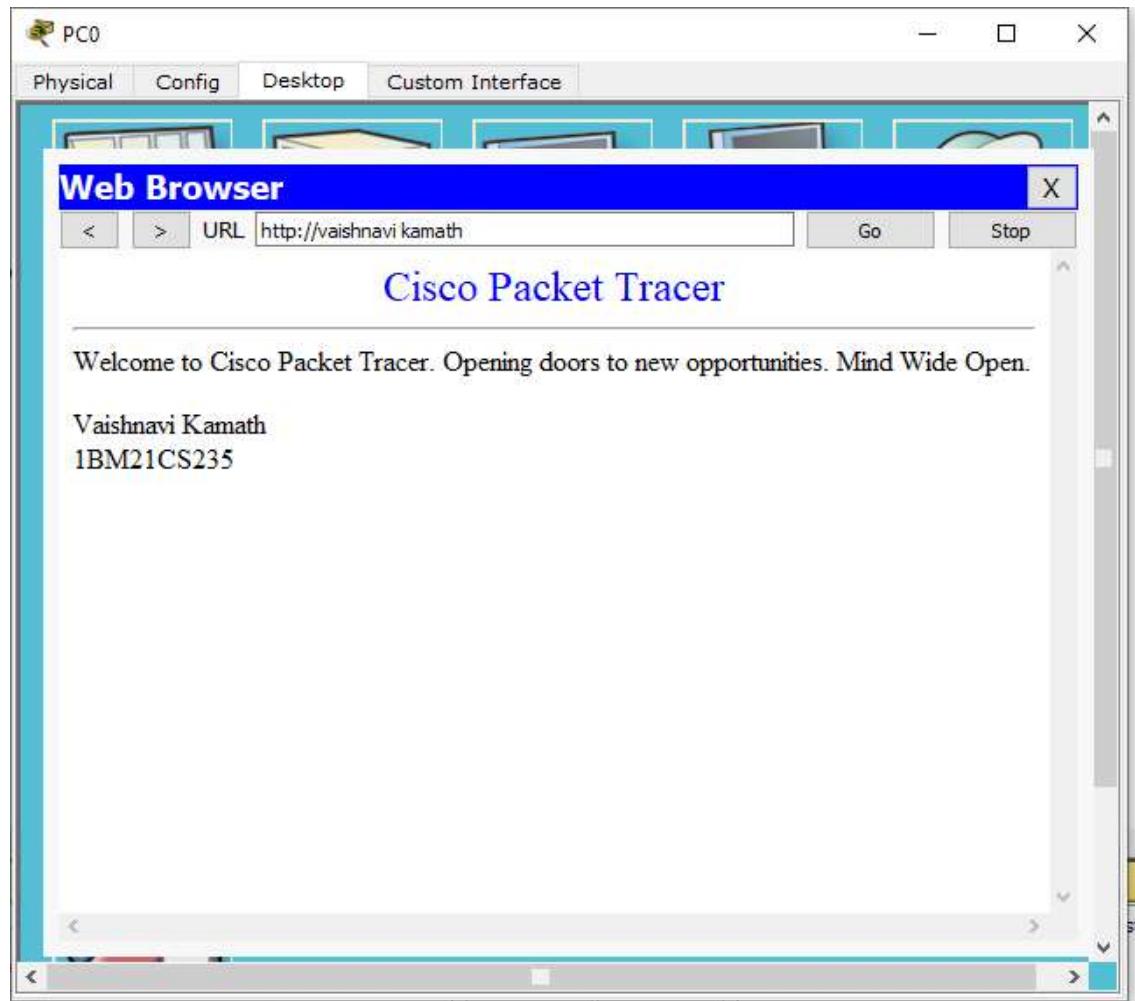
Go to http index.html and edit index page as shown below.



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)



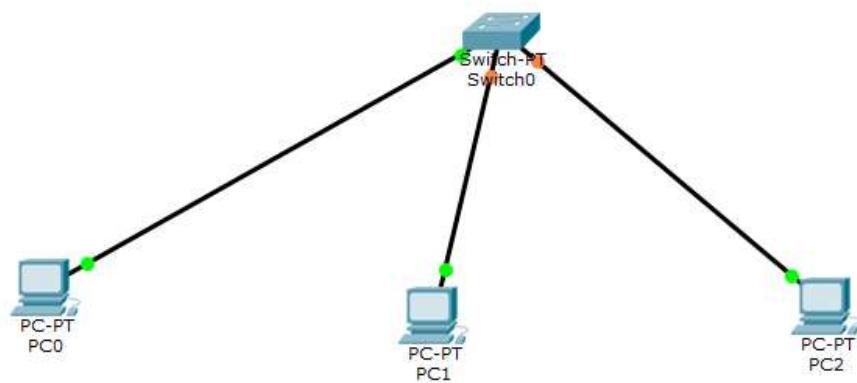
Next type name which was given in server(vaishnavi kamath) and retry to connect. Following output is obtained.



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

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

PC>arp -a
  Internet Address      Physical Address      Type
  10.0.0.2                00d0.fffb9.3792    dynamic

PC>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

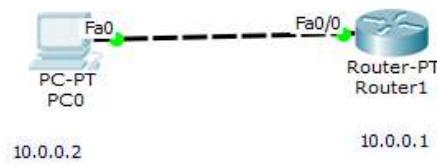
Reply from 10.0.0.3: bytes=32 time=1ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128

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.fffb9.3792    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 r1
r1(config)#enable secret p1
r1(config)#interface fastethernet 0/0
r1(config-if)#ip address 10.0.0.1 255.0.0.0
r1(config-if)#no shut

r1(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

r1(config-if)#line vty 0 5
r1(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
r1(config-line)#password p0
r1(config-line)#
r1(config-line)#exit
r1(config)#exit
r1#
%SYS-5-CONFIG_I: Configured from console by console

r1#wr
Building configuration...
[OK]
r1#
```

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

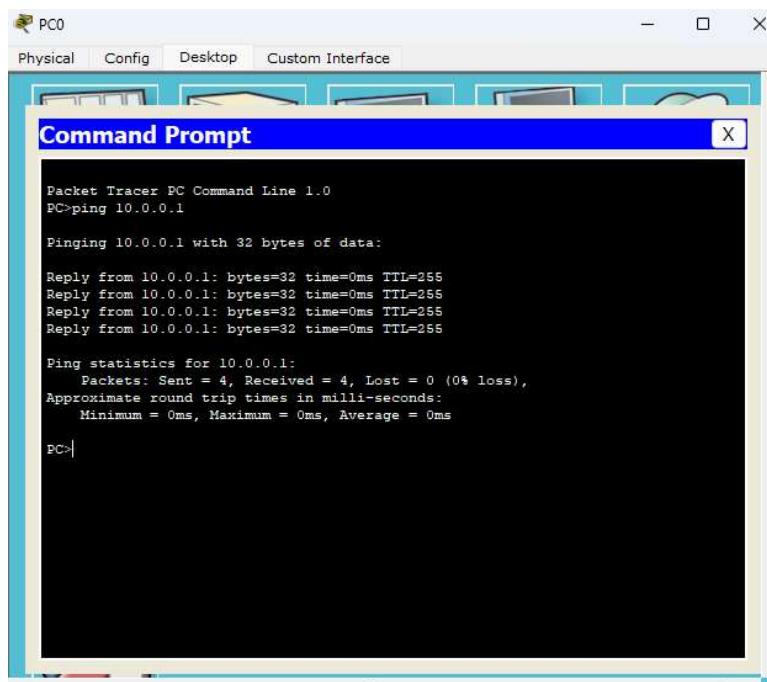
wr – to save changes in router

Commands in PC

In command prompt,

Ping 10.0.0.1

Ping results seen



```
PC0
Physical Config Desktop Custom Interface

Command Prompt X

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=0ms 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 = 0ms, Average = 0ms

PC>telnet 10.0.0.1
Trying 10.0.0.1 ...Open

User Access Verification

Password:
rl>enable
Password:
rl#
```

Password for User Access Verification is p0

Password for enable is p1

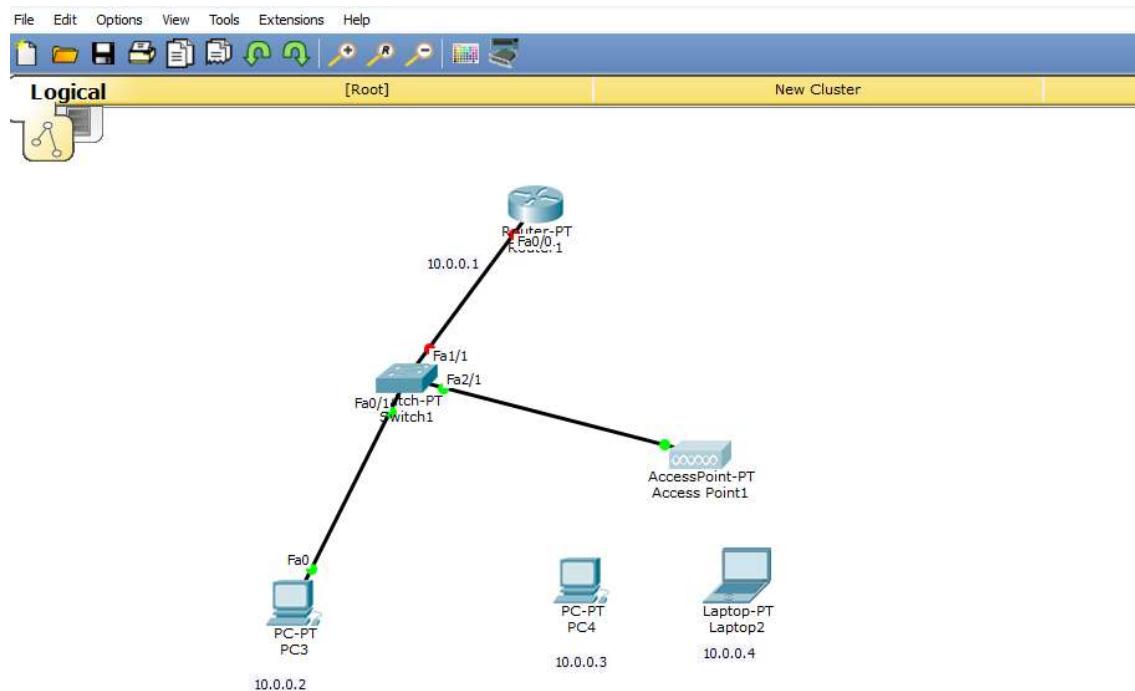
Accessing router CLI from PC

The screenshot shows a Cisco Packet Tracer simulation environment. At the top, there's a toolbar with icons for Physical, Config, Desktop, and Custom Interface. Below the toolbar is a row of icons representing different network components like switches and routers. A central window titled "Command Prompt" contains the following text:

```
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 = 0ms, Average = 0ms  
  
PC>telnet 10.0.0.1  
Trying 10.0.0.1 ...Open  
  
User Access Verification  
  
Password:  
rl>enable  
Password:  
rl#show ip route  
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP  
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP  
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter  
area  
      * - candidate default, U - per-user static route, o - ODR  
      P - periodic downloaded static route  
  
Gateway of last resort is not set  
  
C  10.0.0.0/8 is directly connected, FastEthernet0/0  
rl#
```

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.

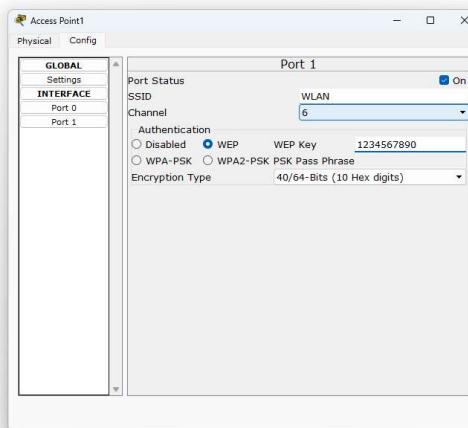


Construct the above topology

Configure PC3 and the Router1 as is normally done

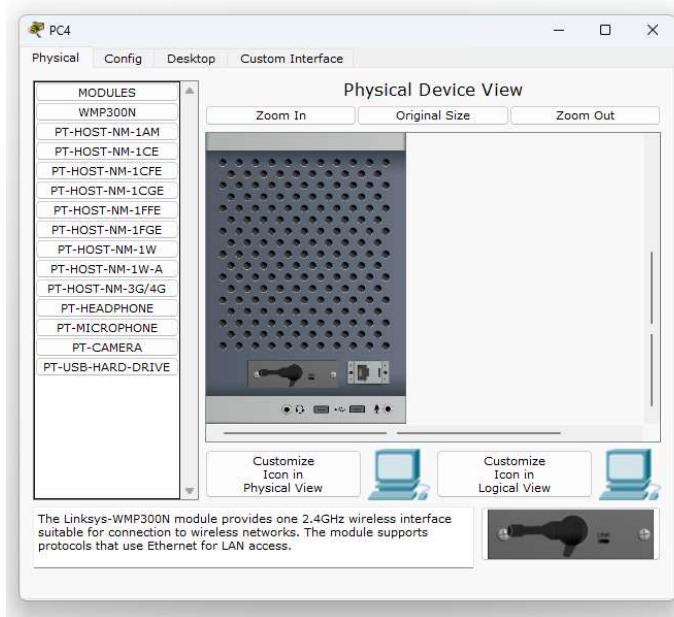
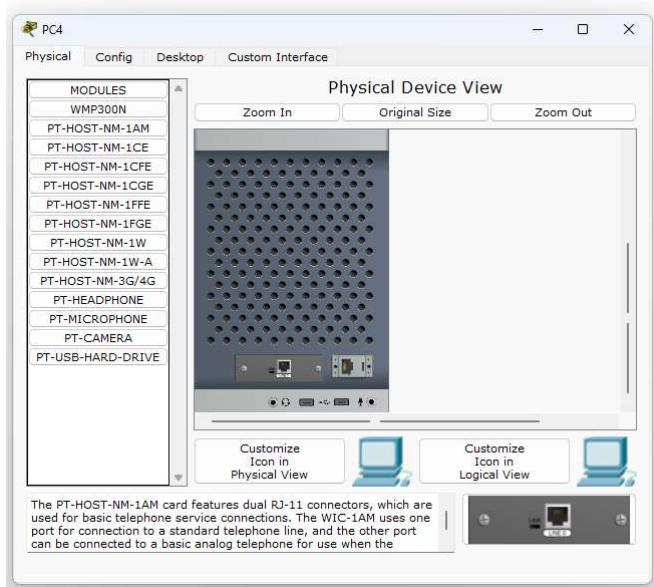
Configure Access Point1- Port1 -> SSID Name- any name(WLAN here)

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

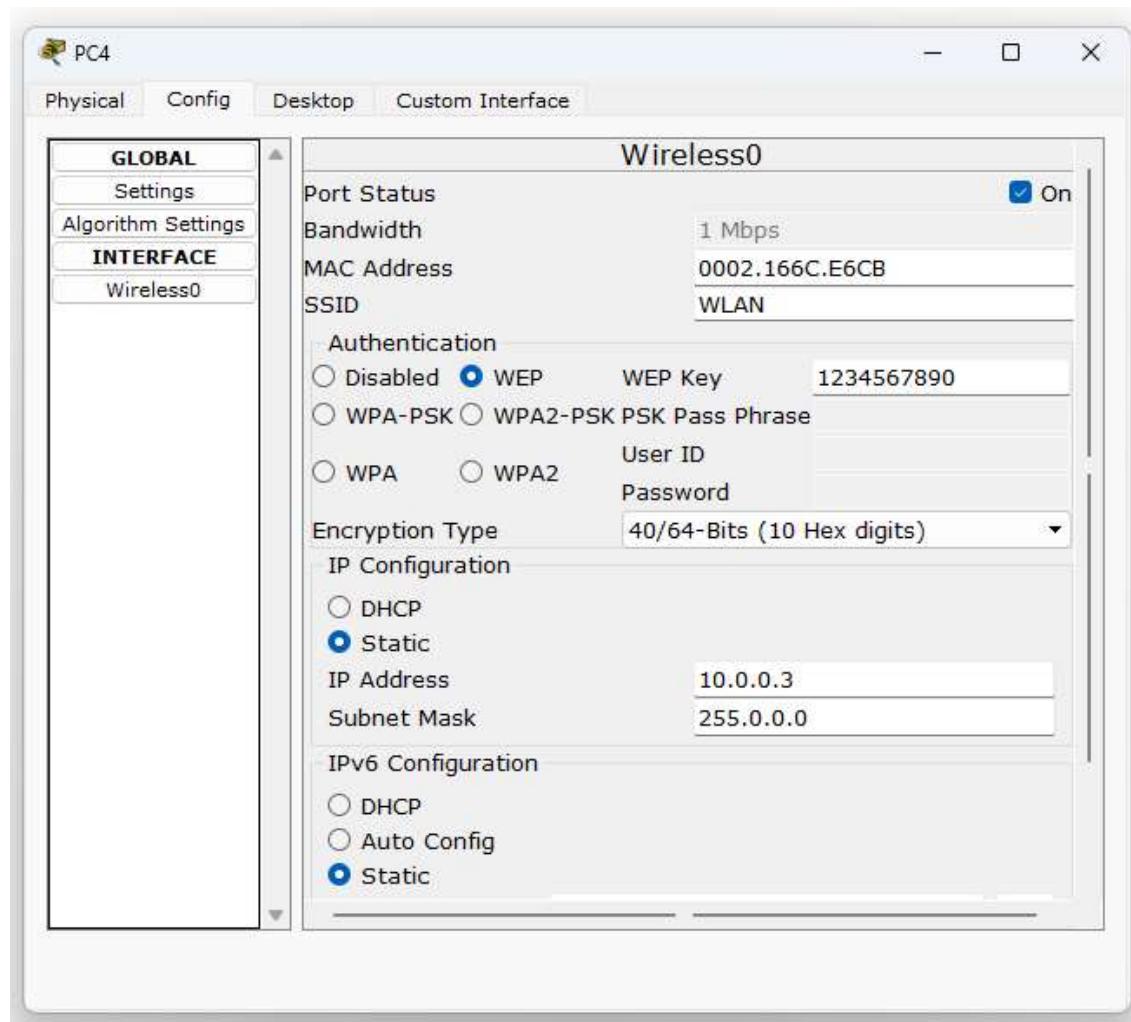


Configuring PC4 and Laptop with Wireless standards

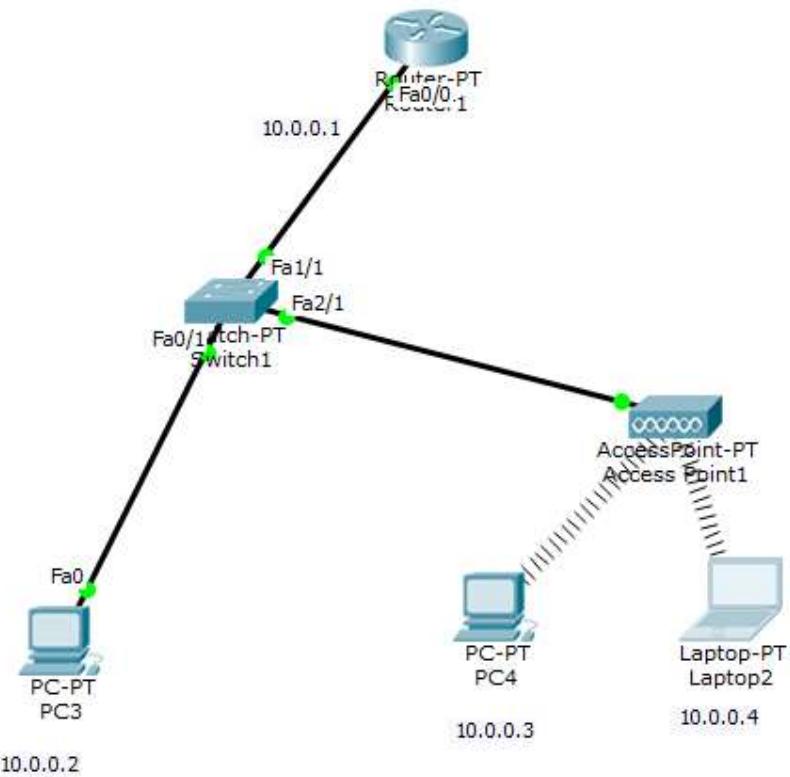
Switch off the device. Drag the existing PT-HOST-NM-1AM to the component listed in the LHS. Drag WMP300N wireless interface to the empty port. Switch On the device.



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.



Final topology on screen

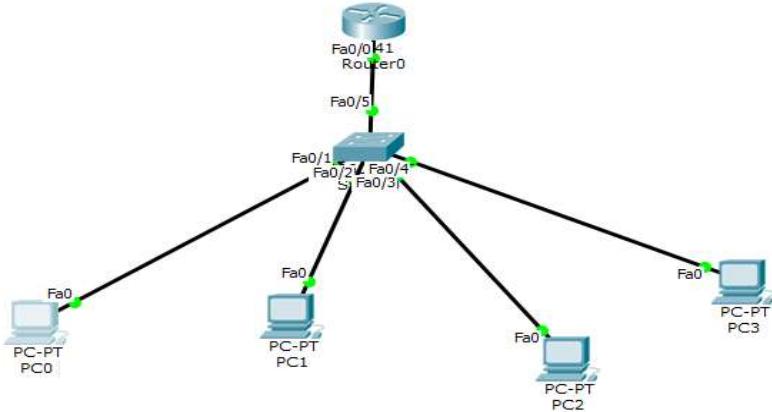


Ping from every device to every other device and see the results

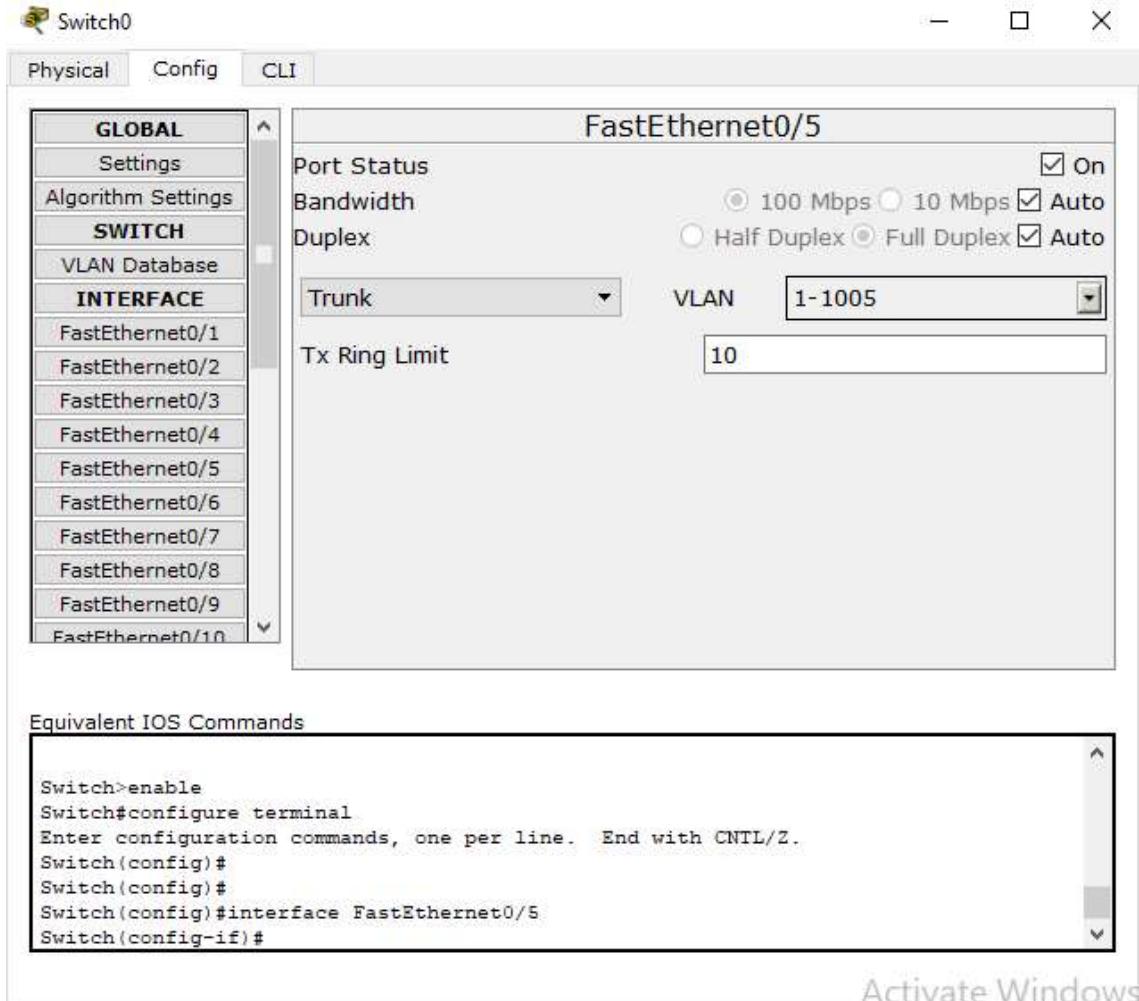
12) To construct a VLAN and make the PC's communicate among a VLAN

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



Activate Windows

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

Router0

Physical Config CLI

IOS Command Line Interface

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

Router(config-if)#exit
Router(config)#interface fastEthernet0/0.1
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
% Incomplete command.
Router(config-subif)#exit
Router(config)#interface FastEthernet0/0
Router(config-if)#encapsulation dot1q 20
^
% Invalid input detected at '^' marker.

Router(config-if)#interface fastEthernet0/0.1
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.20.1 255.255.255.0
Router(config-subif)#no shutdown
Router(config-subif)#exit
Router(config)#

```

Copy Paste

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()
```



D

```
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()
17
```

```
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 x Windows PowerShell x + v
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

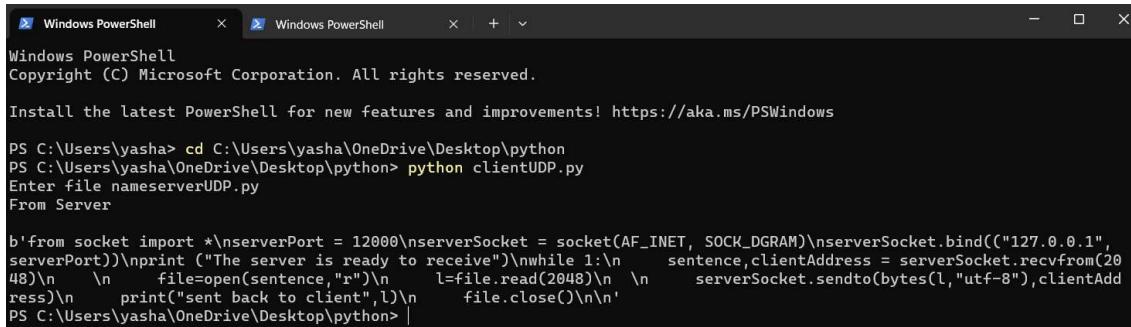
serverUDP.py

```
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

```
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

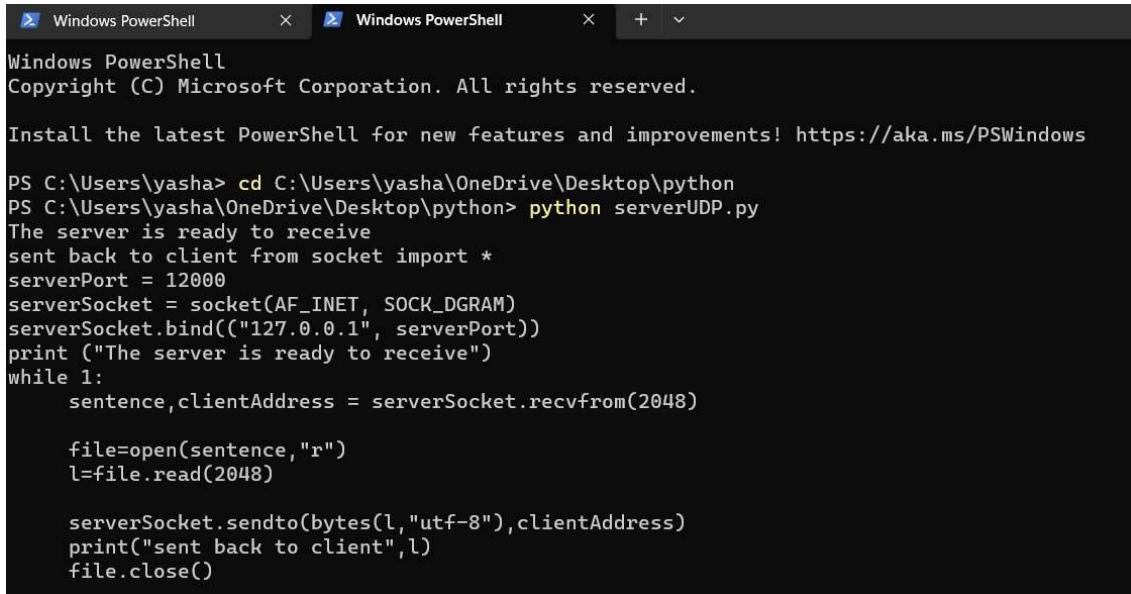


```
Windows PowerShell
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PS C:\Users\yasha> cd C:\Users\yasha\OneDrive\Desktop\python
PS C:\Users\yasha\OneDrive\Desktop\python> python clientUDP.py
Enter file nameserverUDP.py
From Server

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> |
```



```
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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("%os", data);
    printf("\n Enter the Generating polynomial:");
    // get the generator polynomial
    scanf("%os", 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  X + ▾

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 . . . |
```