

# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



## LAB REPORT

on

## COMPUTER NETWORKS

*Submitted by*

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



**B.M.S. COLLEGE OF ENGINEERING**

(Autonomous Institution under VTU)

**BENGALURU-560019**

**JUN-2023 to SEP-2023**

**B. M. S. College of Engineering,  
Bull Temple Road, Bangalore 560019**  
(Affiliated To Visvesvaraya Technological University, Belgaum)  
**Department of Computer Science and Engineering**



**CERTIFICATE**

This is to certify that the Lab work entitled "**COMPUTER NETWORKS**" carried out by **ADITI RAGHUNANDAN (1BM21CS005)**, who is bonafide student of **B. M. S. College of Engineering**. It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2023. The Lab report has been approved as it satisfies the academic requirements in respect of a **Computer Networks - (22CS4PCCON)** work prescribed for the said degree.

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# Index

<b>Sl. No.</b>	<b>Date</b>	<b>Experiment Title</b>	<b>Page No.</b>
1	15/6/23	Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping message.	4
2	22/6/23	Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply	17
3	13/7/23	Configure default route, static route to the Router	42
4	13/7/23	Configure DHCP within a LAN and outside LAN.	54
5	20/7/23	Configure RIP routing Protocol in Routers	67
6	20/7/23	Configure Web Server, DNS within a LAN.	80
7	27/7/23	Configure OSPF routing protocol	90
8	3/8/23	To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP)	103
9	3/8/23	To construct a VLAN and make the PC's communicate among a VLAN	111
10	10/8/23	To construct a WLAN and make the nodes communicate wirelessly.	121
11	10/8/23	To understand the operation of TELNET by accessing the router in server room from a PC in IT office.	134
12	10/8/23	Demonstrate the TTL/ Life of a Packet	139
13	17/8/23	Write a program for error detecting code using CRC-CCITT (16-bits).	154
14	17/8/23	Write a program for congestion control using Leaky bucket algorithm.	159
15	24/8/23	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.	163
16	24/8/23	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.	169
17	31/8/23	Tool Exploration -Wireshark	175

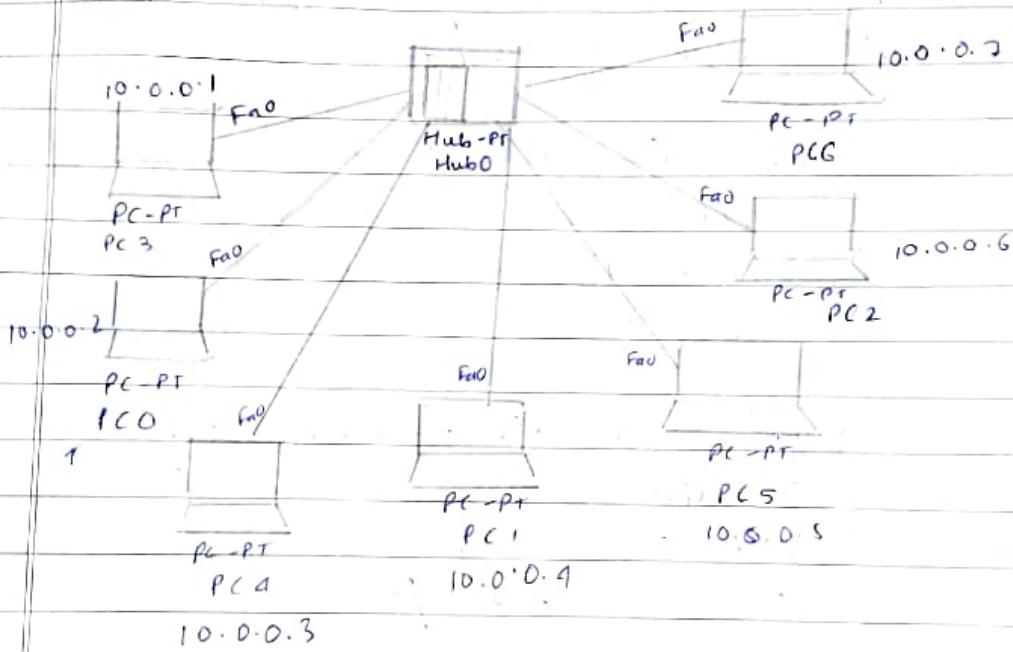
## Experiment - 1

Aim:-

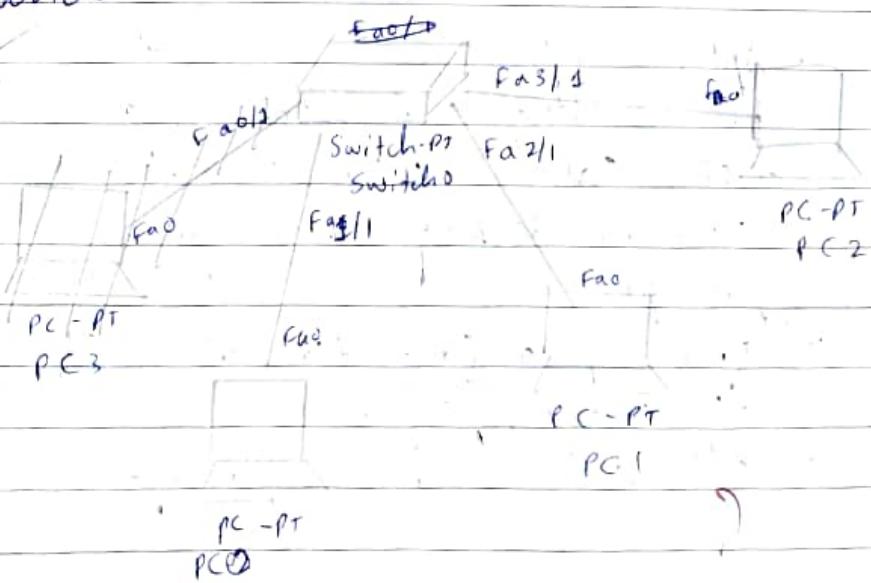
Create a topology and simulate sending a simple PDV from source to destination using hub and switch as connecting devices and demonstrate ping message.

Topology :-

hub :



switch :



### Procedure:

#### Hub :- (Simulation)

- i) connect 7 PCs to 1 hub.
- ii) enable the port by clicking on hub and adding the <sup>extra</sup> port (has to turn off hub first).
- iii) connect the PCs to the hub using the copper straight through cable.
- iv) set the IP address to the PCs.
- v) Add simple PDV to source and destination.
- vi) click on Auto capture / Play.
- vii) observe the packets.

#### Switch :- (simulation)

- i) connect 3 PCs to 1 switch.
- ii) Set the IP addresses to all the PCs.
- iii) connect the PCs to the switch using the copper straight through cable.
- iv) Wait until the signal turns from orange to green.
- v) Add simple PDV to source & destination.
- vi) Click on Auto capture / Play.
- vii) observe the packets.

#### Hub :- (realtime)

- i) After completing the connections of hub of PCs, setting IP addresses, and using copper straight cable, click on the source PC.
- ii) Click on desktop and go to command prompt.
- iii) type ping [destination IP address], here in the experiment, ping 10.0.0.2
- iv) observe the command prompt.

Result (Hub realtime):

Packet Tracer PC command Line 1.0

PC > ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

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

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

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

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

Ping statistics from 10.0.0.2:

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

Approximate round trip times in milli - seconds:

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

PC → PC >

Procedure:-

Result (Switch realtime):

Switch :- (realtime)

- i) After completing the connections of switch  
of PCs, setting IP address, if using  
copper straight through cable, click on  
the source PC, in this exp, PC 0
- ii) click on desktop and go to command  
prompt
- iii) type ping [destination IP], here in the  
experiment, ping 10.0.0.4
- iv) observe the command prompt.

Result (Switch real time):

Packet Tracer PC command Line 1.0

PC > ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4 : bytes=32 time: 0ms TTL=128  
 Reply from 10.0.0.0 : bytes=32 time: 0ms TTL=128  
 Reply from 10.0.0.0 : bytes=32 time: 0ms TTL=128  
 Reply from 10.0.0.0 : bytes=32 time: 0ms TTL=128

Ping statistics for 10.0.0.0 :

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

PC >

Observation (with hub simulation) :

- i) The packet goes from source to hub
- ii) The hub sends it to all the rest PCs.
- iii) The PC's with which the message was intended to show a red ~~etc~~ cross on the message
- iv) The PC's for which it was intended to receives the message f. sends an acknowledgement to the hub which sends it to the <sup>all PCs</sup> source PC.  
& source receives a green tick, restart red.

Observation (switch simulation) :

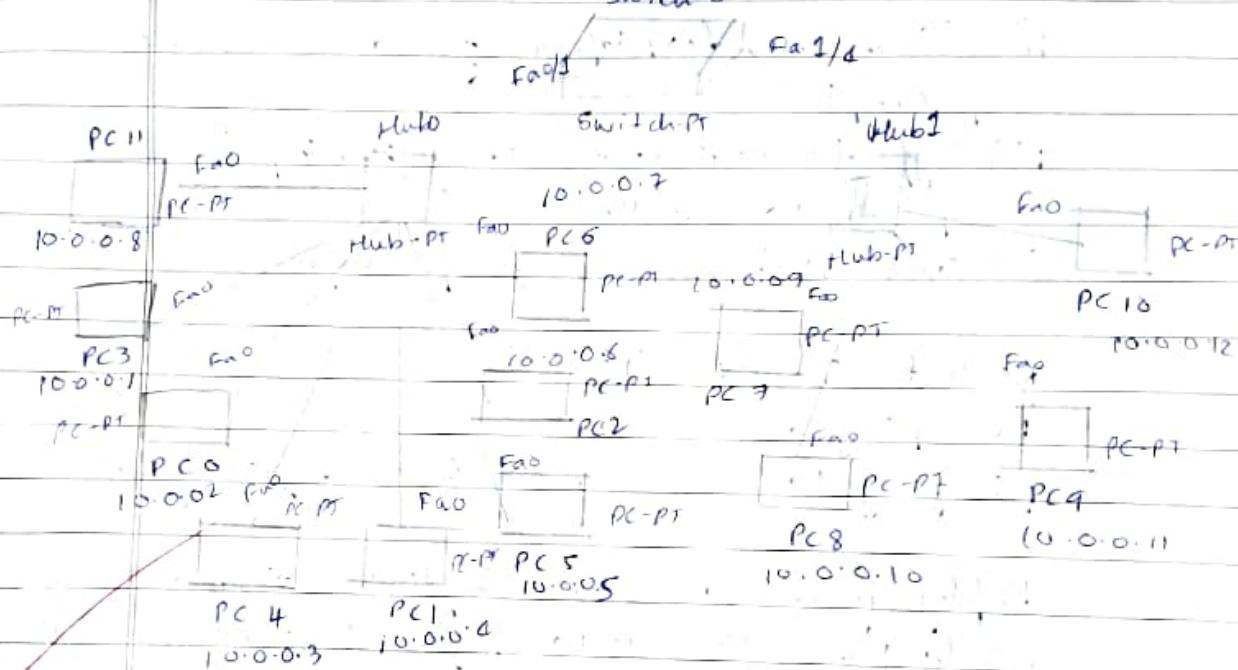
- i) The packet goes from source to switch
- ii) Switch sends it to rest PCs
- iii) The PC's for which the message was intended to show red cross & the one it was intended to receive sends an acknowledgement back that it received message
- iv) The switch relays it back only to the source unlike hub.
- v) sending a message again from same source of destination, the switch would have

learns and sends it only to the destination and not the rest PCs.

Hybrid :-

Topology :-

Switch 0 :-



Procedure :-

simulation

- i) Connect 8 PC's to 1st hub & 4 PC's to 2nd hub
- ii) Set the IP addresses of the PCs
- iii) Connect the 2 hubs to a Switch
- iv) PCs are connected to hub using copper straight through cable
- v) Hubs are connected switch using copper cross over wire
- vi) Wait until the signal on switch turns from orange to green
- vii) Add simple PDU to source of destination, here from PC 11 to PC 10

- viii) click on Auto capture / Play
- ix) observe the packets

realtime:

- i) After connecting all the PC's to hubs to switch and setting IP addresses, click on source PC, here PC0
- ii) click on desktop & go to command prompt
- iii) Type the destination IP address, here ping 10.0.0.10
- iv) observe the command prompt

Result (Real Time):

PC > ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Reply from 10.0.0.10: bytes=32 time=0ms TTL=120

Ping statistics for 10.0.0.10:

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

Approximate round trip times in milli-seconds:

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

PC >

Observation

- i) The packet goes from source to hub
- ii) The hub sends it to rest of the PC's & to the switch
- iii) The switch sends to the other hub which

sends it to rest of PC's

- iii) The PC's which the message wasn't intended to shows a red cross on the message
- iv) the PC's for which it was intended to receive it if sends an acknowledgement to the hub which sends it to rest of the PC's of the switch
- v) the switch relays it to the other hubs which sends it to rest of the PC's
- vi) the source receives the acknowledgement

9/10  
N  
2/6/13

Simulation Panel					
Event List					
Vis.	Time(sec)	Last Device	At Device	Type	Info
	0.002	Hub0	PC2	ICMP	█
	0.002	Hub0	PC6	ICMP	█
	0.003	PC5	Hub0	ICMP	█
🕒	0.004	Hub0	PC3	ICMP	█
🕒	0.004	Hub0	PC0	ICMP	█
🕒	0.004	Hub0	PC4	ICMP	█
🕒	0.004	Hub0	PC1	ICMP	█
🕒	0.004	Hub0	PC2	ICMP	█
🕒	0.004	Hub0	PC6	ICMP	█

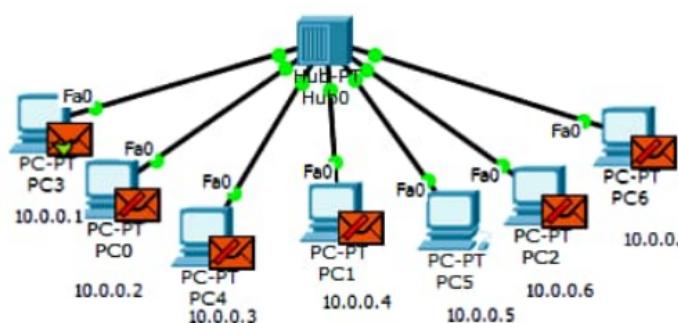
Constant Delay

Captured to: \*  
716.838 s

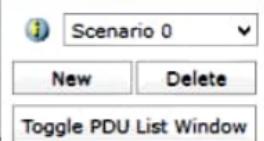
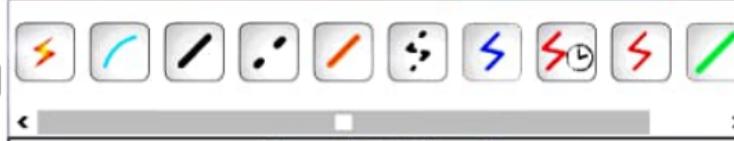
#### Play Controls

#### Event List Filters - Visible Events

ACL Filter, ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTP, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, LACP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP

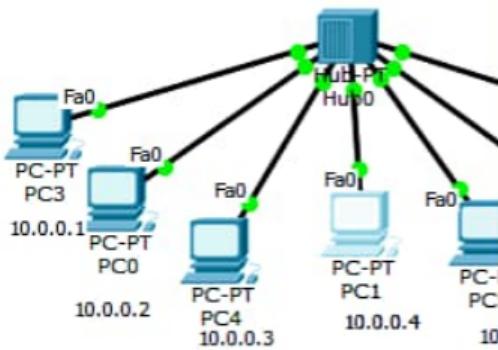


Time: 00:43:08.145 | Power Cycle Devices | PLAY CONTROLS: Back | Auto Capture / Play | Capture / Forward | Event List | Simulation



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
●	Successful	PC3	PC5	ICMP	█	0.000	N	0

Copper Straight-Through



PC1

Physical Config Desktop Custom Interface

## Command Prompt

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

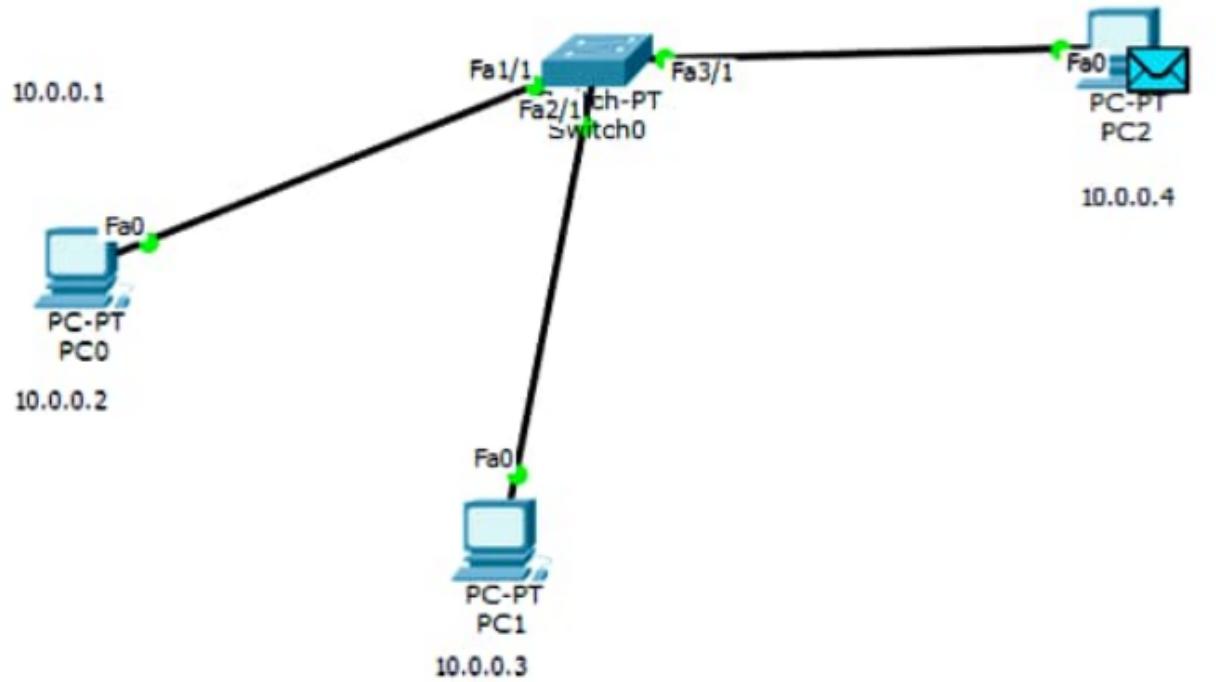
Pinging 10.0.0.2 with 32 bytes of data:

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

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

PC>
```





0.000	--	PC0	ICMP
0.001	PC0	Switch0	ICMP
0.002	Switch0	PC2	ICMP

Constant Delay

Captured to: \*  
0.002 s

#### Play Controls

#### Event List Filters - Visible Events

ACL Filter, ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTP, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, LACP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP



Time: 00:03:21.838

Power Cycle Devices

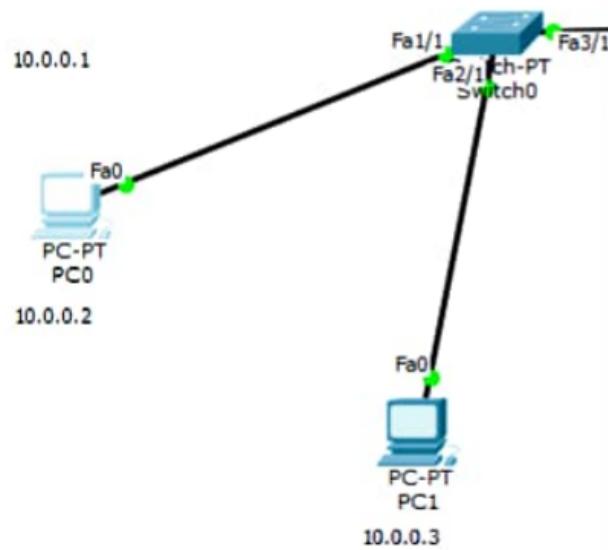
PLAY CONTROLS: Back

Auto Capture / Play

Capture / Forward

Event List

Simulation



PC0

Physical Config Desktop Custom Interface

## Command Prompt

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

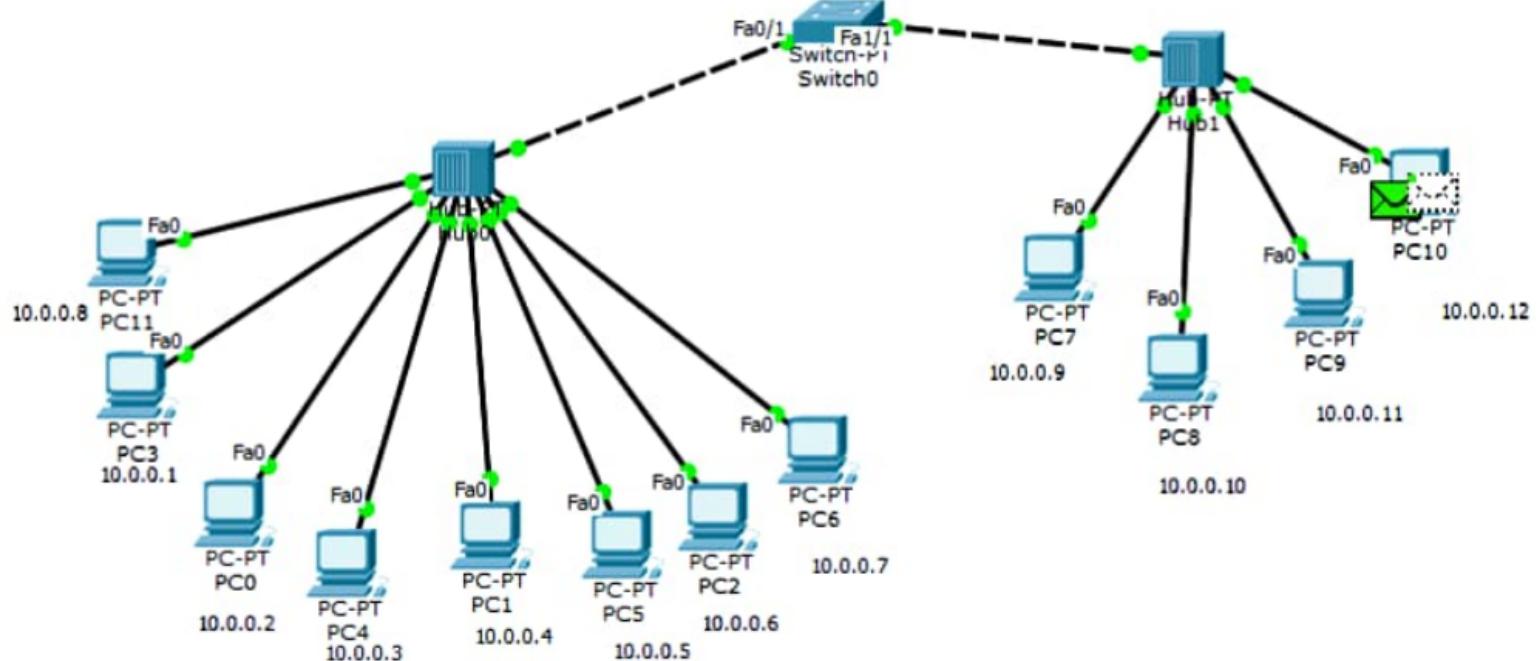
Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=1ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128
Reply from 10.0.0.4: bytes=32 time=0ms TTL=128

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

PC>
```





Simulation Panel				
Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.002	Hub0	PC2	ICMP
	0.002	Hub0	PC6	ICMP
	0.002	Hub0	Switch0	ICMP
	0.003	Switch0	Hub1	ICMP
	0.004	Hub1	PC7	ICMP
	0.004	Hub1	PC8	ICMP
	0.004	Hub1	PC9	ICMP
	0.004	Hub1	PC10	ICMP
	0.005	PC10	Hub1	ICMP

Constant Delay

Capturing...

#### Play Controls

Back

Auto Capture / Play

Capture / Forward

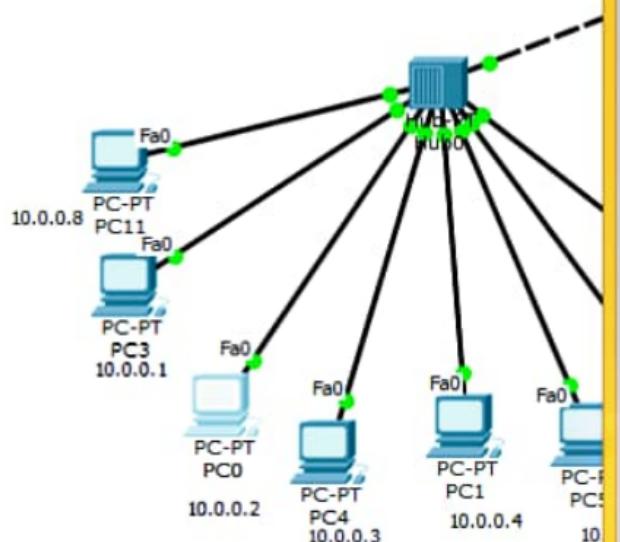
#### Event List Filters - Visible Events

ACL Filter, ARP, BGP, CDP, DHCP, DHCPv6, DNS, DTP, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPSec, ISAKMP, LACP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP

Edit Filters

Show All/None





PC0

Physical Config Desktop Custom Interface

Command Prompt X

```
Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Reply from 10.0.0.10: bytes=32 time=0ms TTL=128
Reply from 10.0.0.10: bytes=32 time=1ms TTL=128
Reply from 10.0.0.10: bytes=32 time=0ms TTL=128
Reply from 10.0.0.10: bytes=32 time=1ms TTL=128

Ping statistics for 10.0.0.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

PC>
```



Realtime

Color Time(sec) Periodic Num Edit Delete

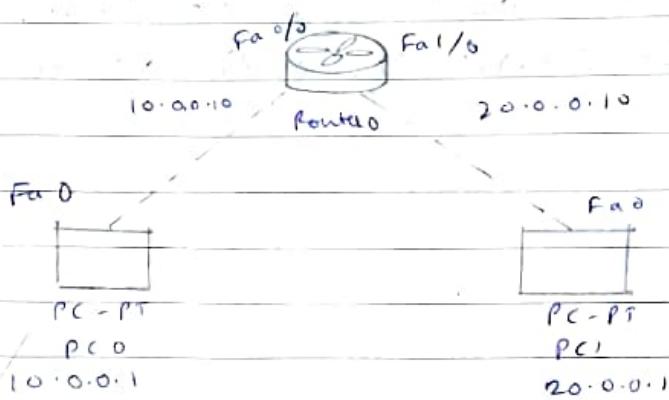


2/26/13

## Experiment - 2

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

Topology :- (single router)



### Procedure:

- Select the PC's, set its IP address & then set the particular gateway.
- Select the router & place it, connect the PC's to it through the copper cross over cable.
- Select the router, go to CLI. Run the following commands

Router>enable

Router# config terminal

Enter configuration commands, one per line.

End with  $\text{CTRL}+\text{Z}$

Router(config)# interface fastethernet 0/0

Router(config-if)# ip address 10.0.0.10 255.0.0.0

Router(config-if)# no shutdown

Router(config-if) #

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

%LINEPROTO-5-UPDOWN: Line protocol on interface Fast Ethernet 0/0, changed state to up

Router(config)# exit

Router(config) # interface fast ethernet 1/0

Router(config-if) # ip address 20.0.0.10 255.0.0.0

Router(config-if) # no shutdown

Router(config-if) #

%LINK-5-CHANGED: Interface Fast Ethernet 1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on

Interface Fast Ethernet 1/0, changed state to up

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, E - 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 ~~per~~ <sup>per</sup> static route,  
o - o/p R

P - periodic downloaded static route

Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, FastEthernet 9

C 20.0.0.0/8 is directly connected, FastEthernet 10  
ROUTER

### Result:

- Go to the PC from where the message has to be sent. Click on desktop & go to command prompt here P00

Result:

P C > 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=1ms TTL=127

Ping statistics for 20.0.0.1:

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

Approximate round trip times in milli-seconds:

Minimum=0ms, Maximum=12ms, Average=4ms

P C > 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

Ping statistics for 20.0.0.1:

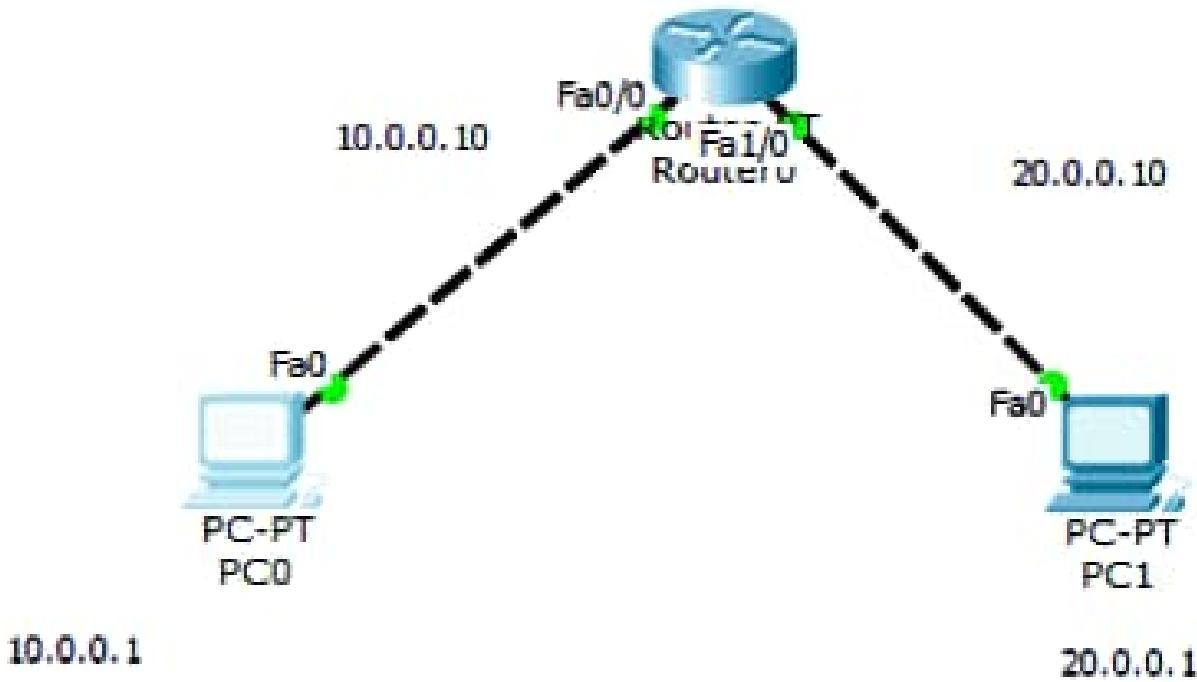
Packet: sent = 4, received = 0, Lost = 0 (0% loss)

An approximate round trip times in milli-seconds:

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

Observation:-

- i) At first ping, there is a request timed out and loss of data.
- ii) This means Firewall is blocking connectivity.
- iii) The second ping leads to full transmission without any loss.



Press RETURN to get started!

```
Router>enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#how ip route
^
% Invalid input detected at '^' marker.

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

Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

```
Router#enable
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet1/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
exit
Router(config)#show ip route
      *
% Invalid input detected at '^' marker.

Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
C    20.0.0.0/8 is directly connected, FastEthernet1/0
Router#
```

## Command Prompt

```
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=1ms TTL=127
```

```
Reply from 20.0.0.1: bytes=32 time=12ms 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 = 12ms, Average = 4ms
```

```
PC>ping 20.0.0.1
```

```
Pinging 20.0.0.1 with 32 bytes of data:
```

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

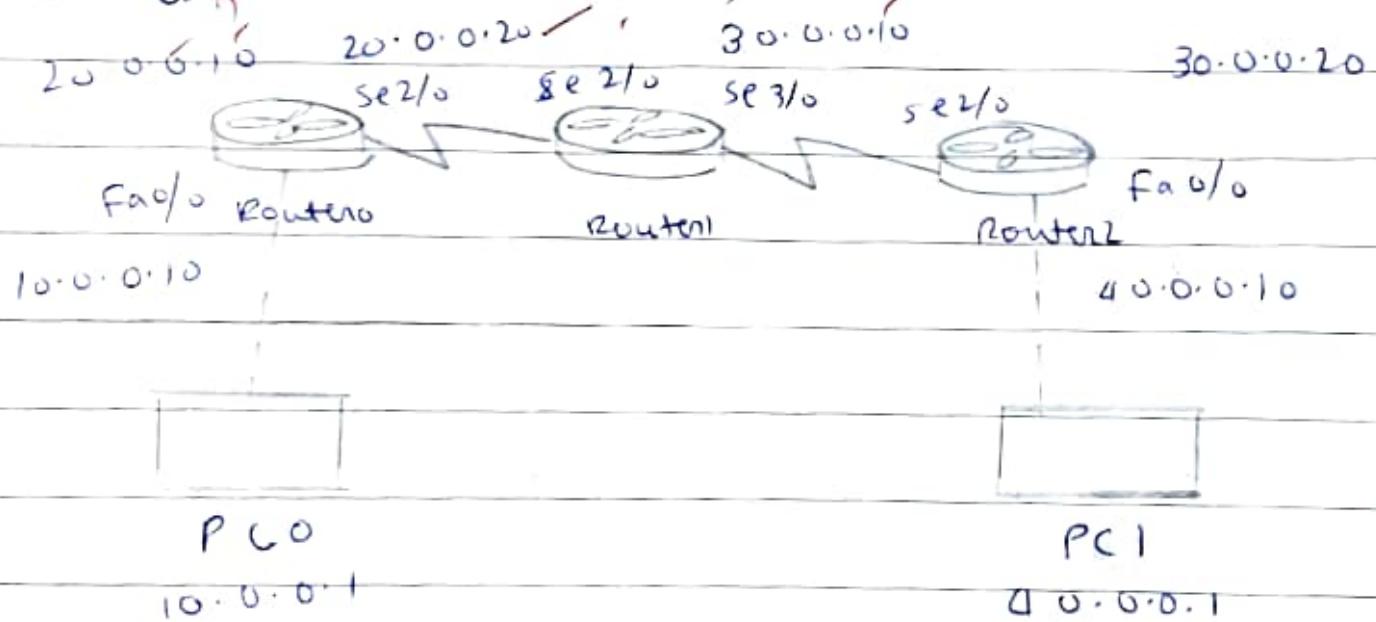
```
Ping statistics for 20.0.0.1:
```

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

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

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

Topology:- (three routers)



Procedure:-

- i) Select the PC's, set its ip address of their particular gateway
- ii) Select 3 routers, place them, connect 2 to the PC's using copper cross over cable & connect the routers to each other using serial DTE

iii) select the routers one by one and run the following commands on their CLI  
 (Router 0)

Router >enable

Router#config t

Enter configuration commands, one per line.  
 End with CNTL/Z.

Router(config)# interface fastethernet 0/0

Router(config-if)# ip address 20.0.0.10 255.0.0.0

Router(config-if)# no shutdown

Router(config-if)#

%LINK-S-CHANGED: Interface Fast Ethernet 0/0,  
 changed state to up

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

Router(config-if)# exit

Router(config)# interface serial 2/0

Router(config-if)# ip address 20.0.0.10 255.0.0.0

Router(config-if)# no shutdown

%LINK-S-CHANGED: Interface serial2/0, changed  
 state to down

Router(config-if)# exit

Router(config)# exit

Router#

%SYS-5-CONF-3: configured from console by  
 console

Router# show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP  
 M - mobile, B - OSPF

D - EIGRP, E X - EIGRP external, O - OSPF,  
IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF  
NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external  
type 2, E - EGP

i - IS-IS, L1 - IS-IS Level-1, L2 - IS-IS  
level-2, ia - IS-IS inter area

\* - candidate default, U - per-user static  
route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

C 10.0.0.0/8 is directly connected  
FastEthernet0/0

(Router 1)

Router > enable

Router # config +

Enter configuration commands, one per line.

End with (CTRL)/Z

Router(config)# interface serial 2/0

Router(config-if)# ip address 20.0.0.20 255.0.0.0

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)# interface serial3/0

Router(config-if) # ip address 30.0.0.10 255.0.0.0  
Router(config-if) # no shutdown

%LINK-S-CHANGED: Interface serial3/0,  
changed state to down

Router(config-if) # exit

Router(config) # exit

(Router 2)

Router > enable

Router # config t

Enter configuration commands, one per line. End with  
CTRL/Z.

Router(config) # interface serial2/0

Router(config-if) # ip address 30.0.0.20 255.0.0.0

Router(config-if) # no shutdown

Router(config-if) #

%LINK-S-CHANGED: Interface serial2/0, changed  
state to up

%LINEPROTO-S-UPDOWN: Line protocol on interface  
serial2/0, changed state to up

Router(config-if) # exit

Router(config) # interface fastethernet0/0

Router(config-if) # ip address 100.0.0.10 255.0.0.0

Router(config-if) # no shutdown

Router(config-if) #

%LINK-S-CHANGED: Interface fastethernet0/0,  
changed state to up

%LINEPROTO-S-UPDOWN: Line protocol on  
Interface Fast Ethernet0/0, changed state to up

Router(config-if)# exit

Result:-

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 10.0.0.10: Destination host unreachable

Ping statistics for 40.0.0.1:

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

PC>

Procedure

- Now since the destinations are unreachable, go back to the CLI's to connect the routes

(Router#)

Router# config t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)# ip route 30.0.0.0 255.0.0.0 20.0.0.20

Router(config)# ip route 40.0.0.0 255.0.0.0 20.0.0.20

Router(config)# exit

Router#

%SYS-S-CONFIG-I: configured from console by user

Router# show ip route

Codes:

Gateway of last resort is not set

( 10.0.0.0/8 is directly connected, FastEthernet0/0 )

c 20.0.0.0/8 is directly connected, serial2/0  
 S 32.0.0.0/8 [1/0] via 20.0.0.20  
 S 40.0.0.0/8 [1/0] via 20.0.0.20

## (Router1)

Router# config t

Router(config)# exit

Router(config)# ip route 10.0.0.0 255.0.0.0 20.0.0.10

Router(config)# ip route 40.0.0.0 255.0.0.0 20.0.0.20

Router(config)# exit

Router# show ip route

Code:

Gateway of last resort is not set

S 10.0.0.0/8 [1/0] via 20.0.0.10

c 20.0.0.0/8 is directly connected, serial2/0

c 30.0.0.0/8 is directly connected, serial3/0

S 40.0.0.0/8 [1/0] via 30.0.0.20

## Router#

## (Router2)

Router# config t

Router(config)# ip route 10.0.0.0 255.0.0.0 30.0.0.10

Router(config)# ip route 20.0.0.0 255.0.0.0 30.0.0.10

Router#

Router# show ip route

Code:

Gateway of last resort is not set

S 10.0.0.0/8 [1/0] via 30.0.0.10

S 20.0.0.0/8 [1/0] via 30.0.0.10

c 30.0.0.0/8 is directly connected, serial2/0

c 40.0.0.0/8 is directly connected, ~~FastEthernet0/0~~  
FastEthernet0/0

## Router#

## Result (from PC 1)

PC > Ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1 bytes=32 time=1ms TTL=128

Ping statistics for 10.0.0.1:

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

Approximate round trip min in milliseconds:

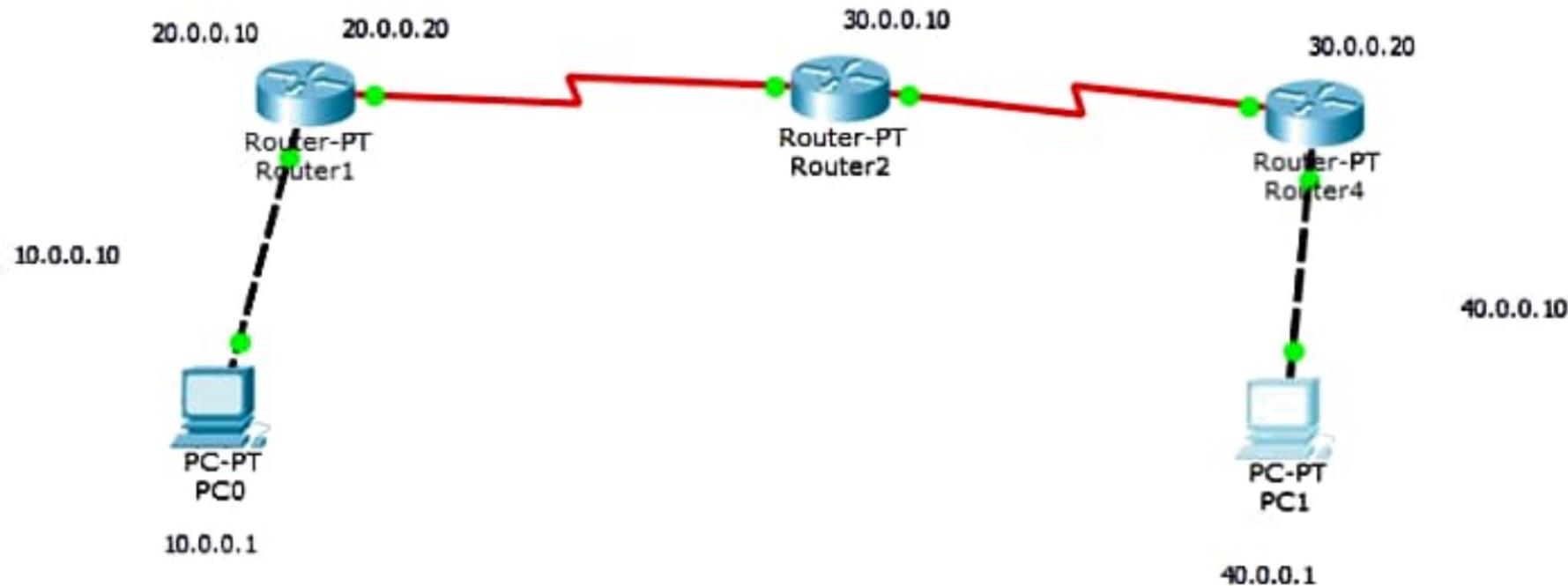
Minimum = 1 ms, Maximum = 10 ms Average = 0 ms

PC >

Observation:

After setting the routes, the host becomes  
reachable if the message is sent without  
any loss.

10.0



## IOS Command Line Interface

Press RETURN to get started!

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

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

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

Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

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

Press RETURN to get started!

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

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

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#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    20.0.0.0/8 is directly connected, Serial2/0
Router#
```

## IOS Command Line Interface

```
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.20 255.0.0.0
Router(config-if)#no shut

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

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

Router(config)#interface fastethernet0/0
Router(config-if)#ip address 40.0.0.10 255.0.0.0
Router(config-if)#no shut

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

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

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

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

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    30.0.0.0/8 is directly connected, Serial2/0
C    40.0.0.0/8 is directly connected, FastEthernet0/0
Router#
```

Physical Config Desktop Custom Interface

## Command Prompt

Open the PC command line

Packet Tracer PC Command Line 1.0

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data:

Reply from 10.0.0.10: Destination host unreachable.

Ping statistics for 40.0.0.1:

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

PC>

Physical    Config    CLI

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 30.0.0.0 255.0.0.0 20.0.0.20
Router(config)#ip route 40.0.0.0 255.0.0.0 20.0.0.20
Router(config)#exit
Router#
SYS-5-CONFIG_I: Configured from console by console
```

```
Router#show ip route
```

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

Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, FastEthernet0/0  
C 20.0.0.0/8 is directly connected, Serial2/0  
S 30.0.0.0/8 [1/0] via 20.0.0.20  
S 40.0.0.0/8 [1/0] via 20.0.0.20

```
Router#
```

## Router 2

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.0
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.20
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.10
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

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

C 40.0.0.0/8 is directly connected, FastEthernet0/0

Router#config t Router 4

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#ip route 10.0.0.0 255.0.0.0 30.0.0.10

Router(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.10

Router(config)#exit

Router#

%SYS-5-CONFIG\_I: Configured from console by console

Router#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP

D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area

\* - candidate default, U - per-user static route, o - ODR

P - periodic downloaded static route

Gateway of last resort is not set

S 10.0.0.0/8 [1/0] via 30.0.0.10

S 20.0.0.0/8 [1/0] via 30.0.0.10

C 30.0.0.0/8 is directly connected, Serial2/0

C 40.0.0.0/8 is directly connected, FastEthernet0/0

Router#



PC1



Physical Config Desktop Custom Interface

## Command Prompt



Packet Tracer PC Command Line 1.0

PC>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=15ms TTL=125

Reply from 10.0.0.1: bytes=32 time=8ms TTL=125

Reply from 10.0.0.1: bytes=32 time=16ms TTL=125

Reply from 10.0.0.1: bytes=32 time=3ms TTL=125

Ping statistics for 10.0.0.1:

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

Approximate round trip times in milli-seconds:

Minimum = 3ms, Maximum = 16ms, Average = 10ms

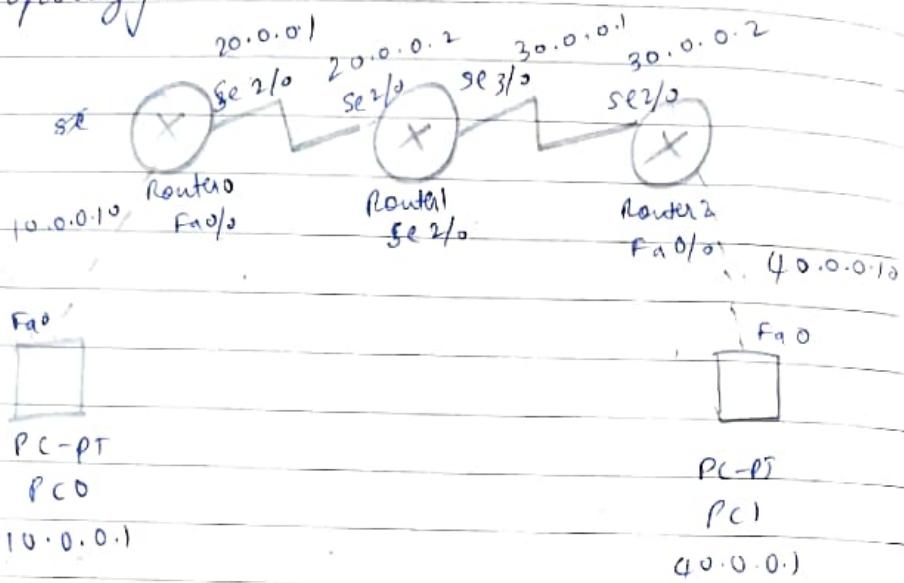
PC>

13/7/23

## Experiment - 3

Configure default route, static route to PC, Router

Topology :-



Procedure:-

- Select the PC's, set their ip addresses & gateways
- Select the 3 routers plan of connect them to PC using copper crossover wire
- The routers are connected using serial DTE/DB9
- Now run the following commands on the particular routers

(Router 0) → Default routing.

Router > enable

Router # config #

Enter configuration commands, one per line. End with Router (config)# interface fastethernet 0/0 (INTL/2)  
Router (config-if)# ip address 10.0.0.10 255.0.0.0

Router(config-if) # no shut

Router(config-if) #

%LINK-S-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-S-UPDOWN: Line protocol on Interface Fast Ethernet 0/0, changed state to up

Router(config-if) # exit

Router(config) # interface serial 2/0

Router(config-if) # ip address 20.0.0.1 255.0.0.

Router(config-if) # no shut

%LINK-S-CHANGED: Interface serial2/0, change state to down

Router(config-if) # exit

Router(config) # exit

Router#

%SYS-S-CONFIG-I: configured from console by <sup>copy to</sup>

Router# config +

Enter configuration commands, one per line. End with <sup>ctrl/Z</sup>

Router(config)# ip route 0.0.0.0 0.0.0.0 20.0.0.2

Router(config)# exit

Router#

%SYS-S-CONFIG-I: configured from console by <sup>copy to</sup>

(Router) → static Routing

Router>enable

Router# config +

Enter configuration commands, one per line. End with <sup>ctrl/Z</sup>

Router(config)# interface serial 2/0

Router(config-if) # ip address 20.0.0.2 255.0.0.0  
 Router(config-if) # no shut

Router(config-if) #

% LINE-S-CHANGED: Interface serial 2/0, changed to up

Router(config-if) # exit

Router(config) # interface serial 3/0

Router(config-if) # ip address 30.0.0.1 255.0.0.0

Router(config) # no shut

% LINE-S-CHANGED: Interface serial 3/0, changed to down

Router(config-if) # exit

Router(config) # exit

Router#

% SYS-S-CONFIG-I: configured from console by user

Router# config t

Enter configuration commands, one per line. End with  with (NMTU)

Router(config) # ip route 10.0.0.0 255.0.0.1 20.0.0.1

Router(config) # ip route 40.0.0.0 255.0.0.2 30.0.0.2

Router(config) # exit

Router#

% SYS-S-CONFIG-I: configured from console by user

/ (Router-2) → Default routing

Router> enable

Router# config t

Enter configuration commands, one per line. End with  with (NMTU)

Router(config) # interface serial 2/0

Router(config-if) # ip address 30.0.0.2 255.0.0.0

Router(config-if) # no shut

Router(config-if)#

%LINK-S-CHANGED: Interface serial 4/0, changed state to up

Router(config-if)# exit

Router(config)#

%LINEPROTO-S-UPDOWN: Line protocol on interface serial 2/0, changed state to up

Router(config)# interface fastethernet 0/0

Router(config-if)# ip address 10.0.0.10 255.0.0.0

Router(config-if)# no shutdown

Router(config-if)#

%LINK-S-CHANGED: Interface FastEthernet 0/0, changed state to up

%LINEPROTO-S-UPDOWN: LINE protocol on interface fastethernet 0/0, changed state to up

Router(config-if)# exit

Router(config)# exit

Router#

%SYS-S-CONFIG-I: Configured from console by user

Router# config t

Enter configuration commands over per line.

End with **CNTL/Z**

Router(config)# ip route 0.0.0.0 0.0.0.0 32.0.0.1

Router(config)# exit

Router#

%SYS-S-CONFIG-I: Configured from console

## Result :

Packet Tracer PC command Line 1.0

PC>ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data :

Request timed out.

Reply from 40.0.0.1 : bytes = 32 time = 2ms TTL=128

Reply from 40.0.0.1 : bytes = 32 time = 2ms TTL=128

Reply from 40.0.0.1 : bytes = 32 time = 6ms TTL=128

Ping statistics for 40.0.0.1 :

packets: sent = 4, received = 3, lost = 1 (25.0% loss)

Approximate round trip times in milli-seconds :

Minimum = 2ms, Maximum = 6ms, Average = 3ms

PC >

Observation :

- i) Default route 0.0.0.0 takes effect when no other route is available for an IP destination address. Default route identifies the gateway IP address to which the router sends all IP packets that it doesn't have a learned route for. It establishes a forwarding rule for packets when no specific address of a next hop host is available from routing table or other routing mechanisms.
- ✓  
10/10  
go/12
- ii) Static routes, we manually add the routes to the routing table, the packet must travel to reach a specific host/network. It is implemented when route selections are limited or only a single default route is available.

## IOS Command Line Interface

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

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

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

Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#no shut

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

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 20.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

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

## IOS Command Line Interface

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#no shut

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

Router(config-if)#exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.1
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.2
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set
```

Physical Config CLI

## IOS Command Line Interface

```
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#no shut

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

Router(config-if)#exit
Router(config)#i
*LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#no shut

*LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.1
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.2
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

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

## IOS Command Line Interface

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#no shut

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

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

Router(config)#interface fastethernet0/0
Router(config-if)#ip address 40.0.0.10 255.0.0.0
Router(config-if)#no shut

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

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

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

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 30.0.0.1
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

## IOS Command Line Interface

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

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

Router(config)#interface fastethernet0/0
Router(config-if)#ip address 40.0.0.10 255.0.0.0
Router(config-if)#no shut

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

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

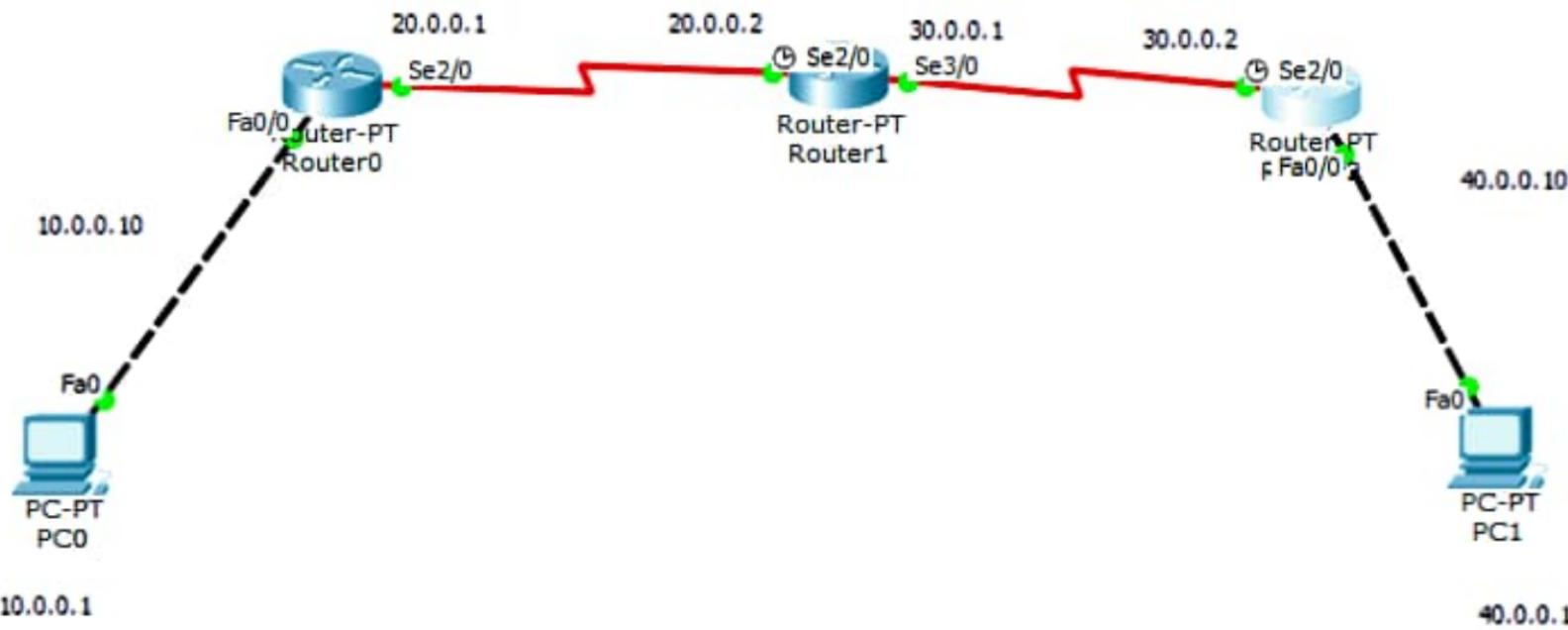
Router(config-if)#exit
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 0.0.0.0 0.0.0.0 30.0.0.1
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is 30.0.0.1 to network 0.0.0.0

C    30.0.0.0/8 is directly connected, Serial2/0
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#
```



Physical

Config

Desktop

Custom Interface

## Command Prompt

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

```
Pinging 40.0.0.1 with 32 bytes of data:
```

```
Request timed out.  
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125  
Reply from 40.0.0.1: bytes=32 time=2ms TTL=125  
Reply from 40.0.0.1: bytes=32 time=6ms TTL=125
```

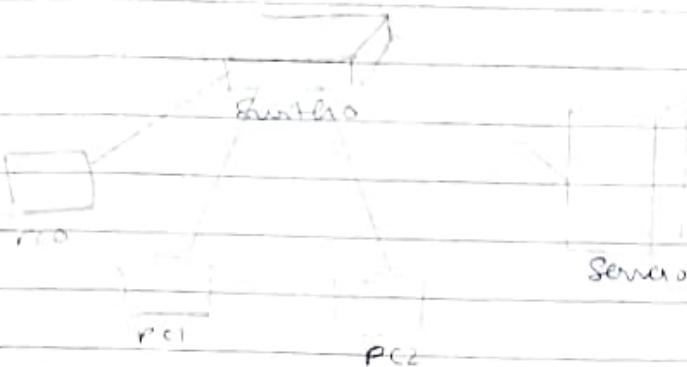
```
Ping statistics for 40.0.0.1:  
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 2ms, Maximum = 6ms, Average = 3ms
```

```
PC>
```

## Experiment - 4

configure DHCP within a LAN and outside LAN

Topology :- (within LAN)



Procedure:-

- i) Select 3 PCs & 1 server & 1 switch  
connect them all to the switch using copper cross over wire, wait for all wires to turn green
- ii) click on server → set gateway (here 10.0.0.1)  
set IP address of subnetwork (10.0.0.1 to 10.0.0.255)
- iii) click on services, click on service on.  
fill in the start IP address (here 10.0.0.2)  
and click on save
- iv) We made this server DHCP inbuilt.
- v) Now go to a PC → <sup>Disktop</sup> IP config (here PC2)
- vi) select DHCP. IP address is allocated automatically. Repeat for all PCs
- vii) Ping a PC from another

Result:- (pinging from PC0, 10.0.0.4 here)

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=2ms TTL=128

Reply from 10.0.0.2 by bytes=32 time=0ms 171.  
 Reply from 10.0.0.2 by bytes=32 time=0ms 171.  
 Reply from 10.0.0.2 by bytes=32 time=0ms 171.

Flow statistics for 10.0.0.2:

Packets: sent=4, received=4, Lost=0(0%)

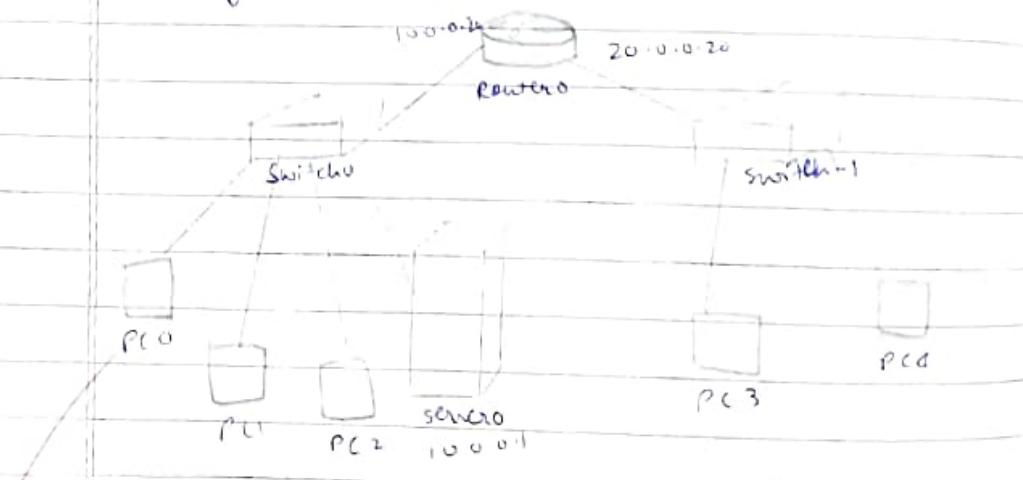
Approximate round trip times in microseconds:

Minimum: 0ms, Maximum: 0ms, Average: 0ms

Observation:-

- The server is made DHCP inhabit of in order to dynamically set the IP address of the PCs.
- Here the systems all appear in the same LAN hence no router is required.
- After the IP address was set, we can ping the other systems using their IP address.

Topology:- (outside the LAN)



Procedure:-

- Add a router, a switch & 2 PCs to the previous configurations
- Connect through copper straight through

wire.

i) configure the router:

Router> enable

Router# config t

Router(config)# interface fastEthernet 0/0

Router(config-if)# ip address 20.0.0.20 255.0.0.0

Router(config-if)# no shutdown

Router(config-if)#

Router(config-if)# exit

Router(config-if)# ip address 10.0.0.20 255.0.0.0

Router(config-if)# no shutdown

Router(config-if)#

Router(config-if)# exit

Router(config)# exit

Router# config t

Router(config)# interface fastEthernet 0/0

Router(config-if)# ip helper-address 10.0.0.1

Router(config-if)# no shutdown

Router(config-if)# exit

Router(config)# exit

Router# show ip route

c 10.0.0.0/8 is directly connected, fastEthernet 0/0

c 20.0.0.0/8 is directly connected, fastEthernet 0/0

iv) Now, click on server → wifig → gateway

10.0.0.20. set the gateway.

v) Click on services tab, DHCP

vi) click on service on.

vii) Enter Default gateway 10.0.0.20

viii) Start IP Address: 10.0.0.2

Subnet mask: 255.0.0.0

ix) Click on save.

x) Now change pool name to ServerPool  
change Default gateway → 20.0.0.20  
start IP address → 20.0.0.2  
Subnet mask → 255.0.0.0

xi) Click on Add to add the new pool.

Poolname Default gateway DNS Server Start IP Address

ServerPool 10.0.0.20 0.0.0.0 20.0.0.2

ServerPool1 20.0.0.20 0.0.0.0 10.0.0.2

Subnet mask Max Users TTL

255.0.0.0 512 0.0.0.0

255.0.0.0 512 0.0.0.0

xii) Now, go to the PC's in new layout →  
desktop → IP configuration → DHCP  
Now see IP address will be generated  
generate IP address for all systems in  
the other LAN.

xiii) Now, ping the 1st LAN from this LAN.

Result: (Pinging from PC A; 20.0.0.2 here)

PC> ping 10.0.0.2

pinging 10.0.0.2 with 32 bytes of data:

Request timed out

Reply from 10.0.0.1 bytes=32 time=0ms TTL=255

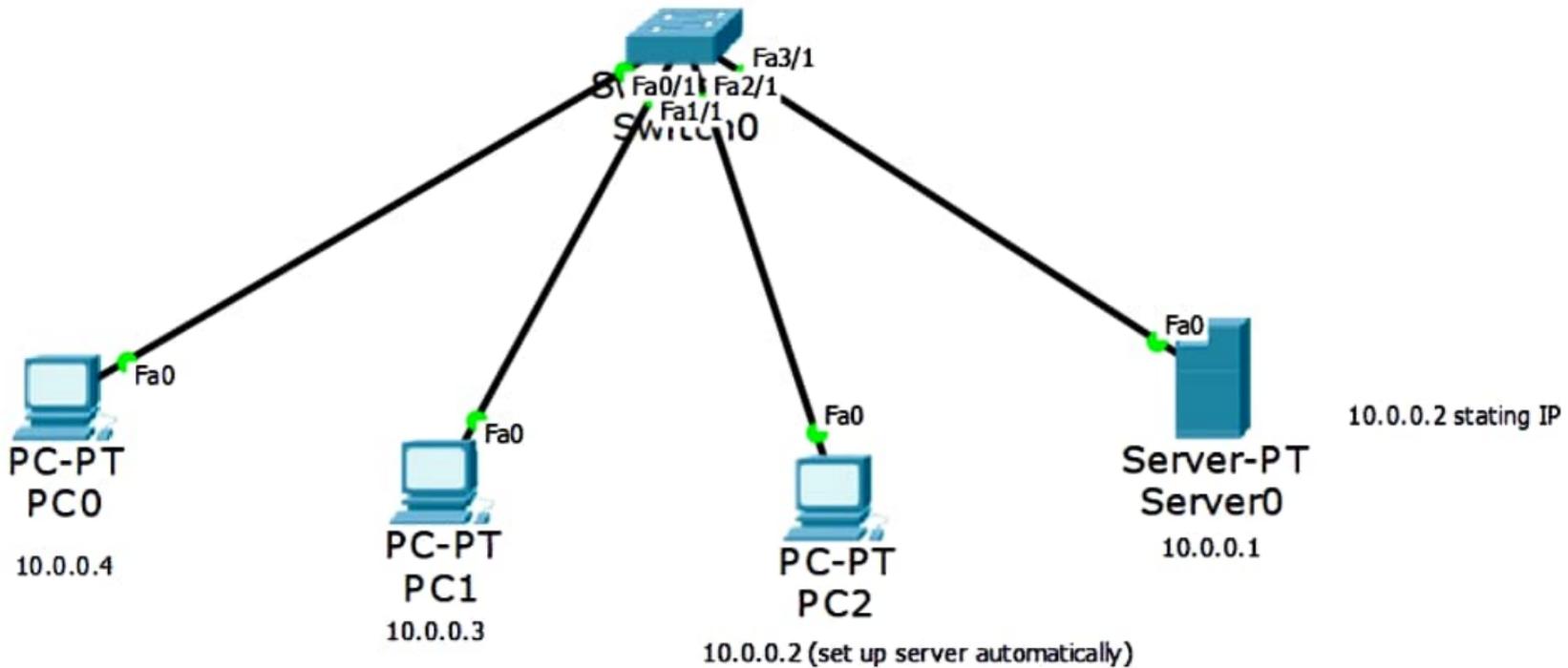
Reply from 10.0.0.2 bytes=32 time=0ms TTL=255

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

Observation:-

- i) The server <sup>DHCP</sup> dynamically sets the IP address of systems from another LAN
- ii) ip helper-address 20.0.0.1 indicates the them to get the IP address from the server whose IP address is 10.0.0.1
- iii) Thus configuring the router to connect both LANs, a server from 1 LAN can set IP address of devices in another LAN.





[Physical](#)[Config](#)[Services](#)[Desktop](#)[Custom Interface](#)**SERVICES**[HTTP](#)[DHCP](#)[DHCPv6](#)[TFTP](#)[DNS](#)[SYSLOG](#)[AAA](#)[NTP](#)[EMAIL](#)[FTP](#)**DHCP****Interface** FastEthernet0 **Service**  On  Off**Pool Name** serverPool**Default Gateway** 10.0.0.20**DNS Server** 0.0.0.0**Start IP Address :** 10 0 0 2**Subnet Mask:** 255 0 0 0**Maximum number of Users :** 512**TFTP Server:** 0.0.0.0[Add](#)[Save](#)[Remove](#)

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



Physical

Config

Desktop

Custom Interface

## Command Prompt

Packet Tracer PC Command Line 1.0

PC>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

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

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

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

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

Ping statistics for 10.0.0.2:

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

Approximate round trip times in milli-seconds:

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

PC>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

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

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

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

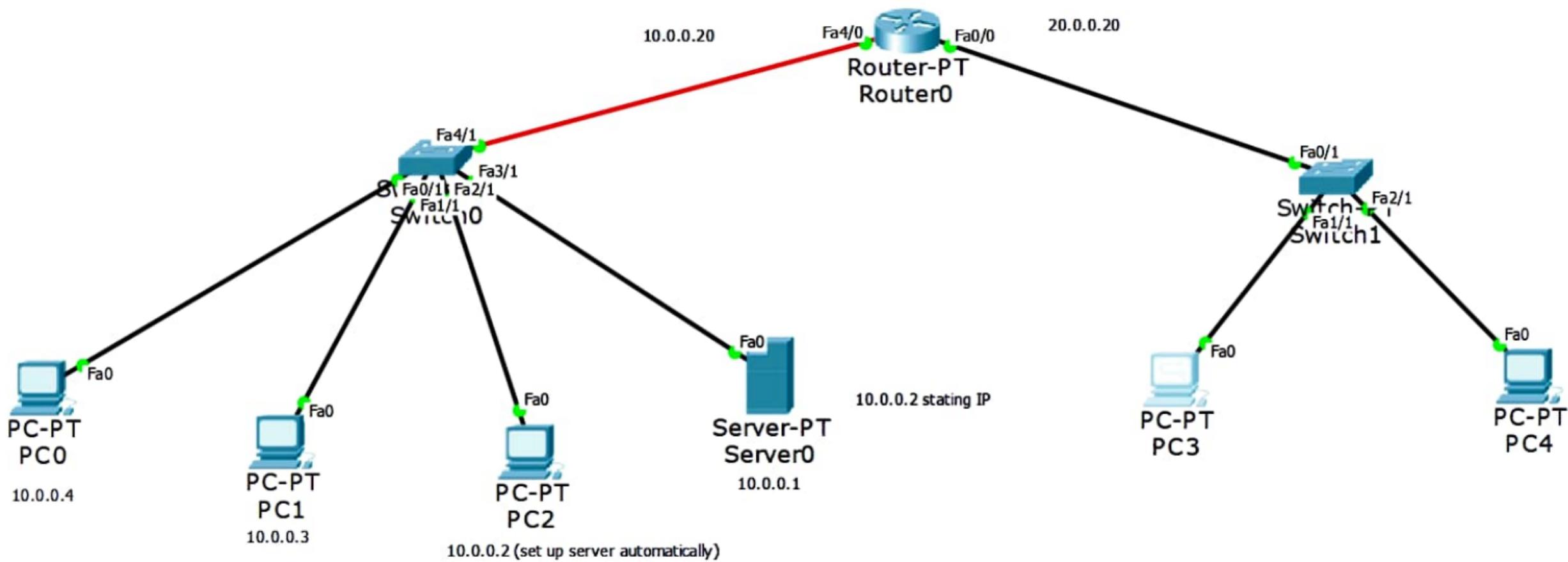
Reply from 10.0.0.3: bytes=32 time=0ms TTL=128

Ping statistics for 10.0.0.3:

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

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 12ms, Average = 3ms



**DHCP**

<b>Interface</b>	FastEthernet0	<b>Service</b>	<input checked="" type="radio"/> On	<input type="radio"/> Off
<b>Pool Name</b>	serverPool			
<b>Default Gateway</b>	10.0.0.20			
<b>DNS Server</b>	0.0.0.0			
<b>Start IP Address :</b>	10 0 0 2 -----			
<b>Subnet Mask:</b>	255 0 0 0 -----			
<b>Maximum number of Users :</b>	512			
<b>TFTP Server:</b>	0.0.0.0			

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

Activate Windows  
Go to Settings to activate Windows.

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet4/0, changed state to up  
exit
```

```
Router(config)#interface fastethernet0/0  
Router(config-if)#ip address 20.0.0.20 255.0.0.0  
Router(config-if)#no shut
```

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

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

```
Router(config)#exit
```

```
Router#
```

```
%SYS-5-CONFIG_I: Configured from console by console  
show ip route
```

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

```
Gateway of last resort is not set
```

```
C      10.0.0.0/8 is directly connected, FastEthernet4/0  
C      20.0.0.0/8 is directly connected, FastEthernet0/0
```

```
Router#config t
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
Router(config)#interface fastethernet0/0  
Router(config-if)#ip helper-address 10.0.0.1  
Router(config-if)#no shut  
Router(config-if)#exit  
Router(config)#exit
```

Physical

Config

Desktop

Custom Interface

## IP Configuration

X

### IP Configuration

DHCP       Static      DHCP request successful.

IP Address      20.0.0.4

Subnet Mask      255.0.0.0

Default Gateway      20.0.0.20

DNS Server      0.0.0.0

### IPv6 Configuration

DHCP  Auto Config  Static

IPv6 Address      /

Link Local Address      FE80::2E0:F7FF:FE6B:D733

IPv6 Gateway

IPv6 DNS Server



WIRELESS

ROUTER

FIREWALL

PC>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

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

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

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

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

Ping statistics for 20.0.0.2:

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

    Approximate round trip times in milli-seconds:

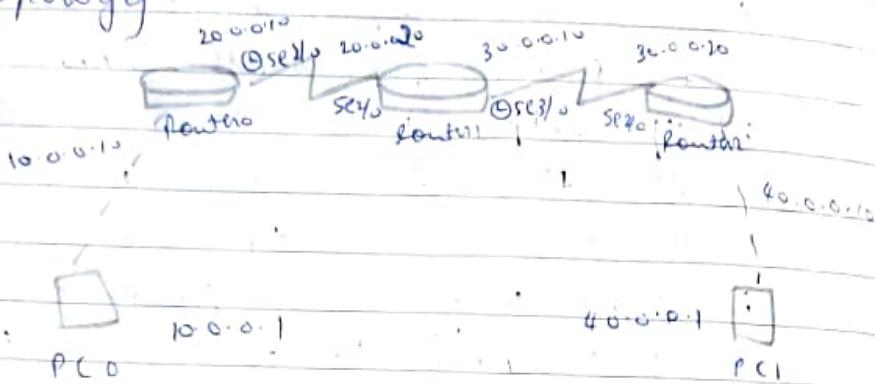
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

20/11/23

## EXPERIMENT -5

Configure RIP routing Protocol in Router

Topology :-



Procedure :-

- i) Select 2 pc's, 3 routers and connect them  
use copper cross over b/w PC & router  
use serial CTE b/w the routers
- ii) Set the IP Address & gateway
- iii) Now In the CLI's of the routers , run the following commands

Router 0

Router> enable

Router# config t

Router(config)# interface fastethernet 0/0

Router(config)# ip address 10.0.0.10 255.0.0.0

Router(config-if)# no shutdown

Router(config-if)#

Router(config-if)# exit

Router(config)# interface serial 2/0

Router(config-if)# ip address 20.0.0.10 255.0.0.0

Router(config-if)# encapsulation PPP

Router(config-if)# clock rate 64000

Router(config-if)# no shutdown

```

Router(config-if)# exit
Router(config)#
Router(config)# router rip
Router(config-router) # network 10.0.0.0
Router(config-router) # network 20.0.0.0
Router(config-router) # no shutdown
Router(config)#

```

## Router 1

```

Router>enable
Router# config t
Router(config)#
Router(config) # interface serial 2/0
Router(config-if) # ip address 20.0.0.20 255.0.0.0
Router(config-if) # encapsulation ppp
Router(config-if) # no shutdown
Router(config-if)#
Router(config-if) # interface serial 3/0
Router(config-if) # ip address 30.0.0.10 255.0.0.0
Router(config-if) # encapsulation ppp
Router(config-if) # clock rate 64000
Router(config-if) # no shutdown
Router(config-if)#
Router(config)#
Router(config) # route rip
Router(config-router) # network 20.0.0.0
Router(config-router) # network 30.0.0.0
Router(config-router)#
Router(config)#
Router# show ip route

```

Gateway of last resort is not set

R 10.0.0.0/8 [120/1] via 20.0.0.10 00:00:70/  
2 msecs

20.0.0.0/8 is variable subnetted, 2 subnets,

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

20.0.0.0/32 is directly connected, serial 2/0

30.0.0.0/8 is variably subnetted, 2 subnets, 2 routes  
 C 30.0.0.0/8 is directly connected, serial 2/0  
     30.0.0.20/32 is directly connected, Serial 3/0  
 R 40.0.0.0/8 (120/1) via 30.0.0.20, 0:00:00:00:00:00  
     Serial 3/0

## Router 2

Router > enable

Router # config +

Router (config) # interface serial 2/0

Router (config-if) # ip address 30.0.0.20 255.0.0.0

Router (config-if) # encapsulation ppp

Router (config-if) # no shutdown

Router (config-if) #

Router (config-if) # exit

Router (config) # interface fastethernet 0/0

Router (config-if) # ip address 40.0.0.10 255.0.0.0

Router (config-if) # no shutdown

Router (config-if) # exit

Router (config) # router rip

Router (config-router) # network 30.0.0.0

Router (config-router) # network 40.0.0.0

Router (config-router) # exit

Router (config) # exit

Result: (Pinging from PC 10.0.0.1)

Ping 40.0.0.1

Pinging 40.0.0.1 with 32 bytes of data

Reply from 40.0.0.1 bytes=32 time=2ms TTL=128  
 Reply from 40.0.0.1 bytes=32 time=2ms TTL=128  
 Reply from 40.0.0.1 bytes=32 time=13ms TTL=128  
 Reply from 40.0.0.1 bytes=32 time=13ms TTL=128

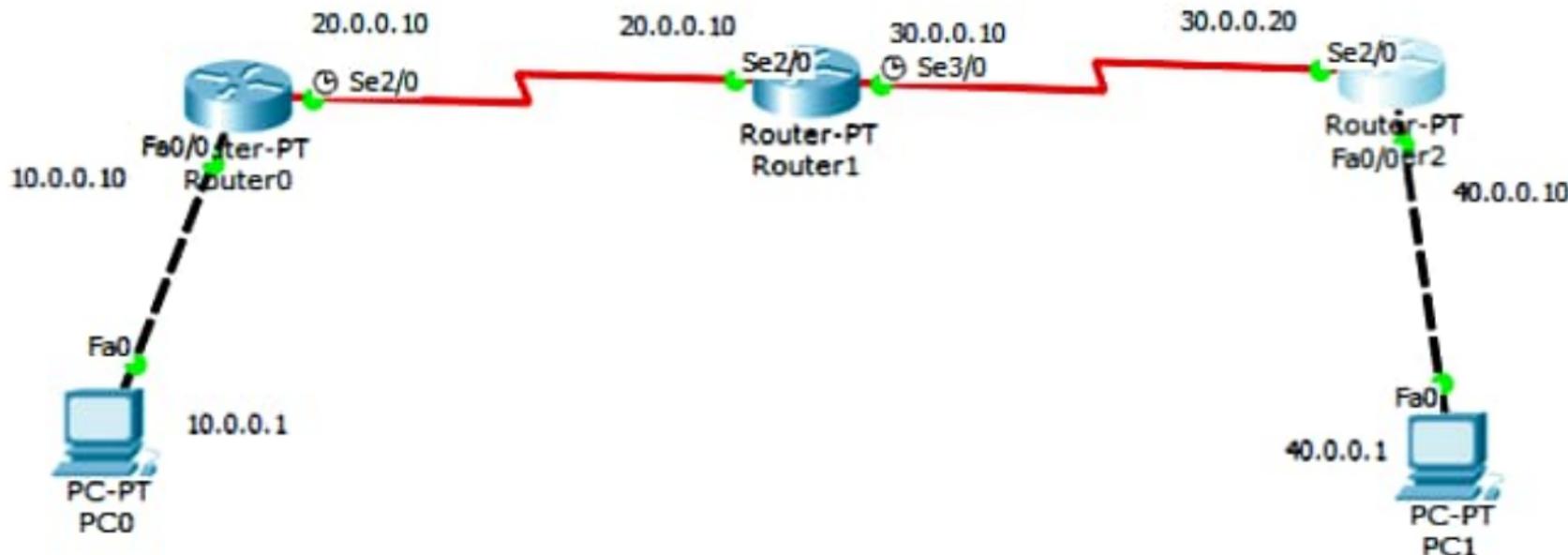
ping statistics for 40.0.0.1

Packets: Sent=4, Received=4, Lost=0(0% loss),  
Approximate round trip times in milliseconds:  
Minimum: 2ms, Maximum: 20ms, Average: 8ms

Observation:-

- i) we add encapsulation ppp to router side which is connected to other routers
- ii) we add clock rate to the side with which the clock starts wire is connected from, ie, side with clock
- iii) RIP Routing information protocol is a distance vector protocol that uses hop count as its primary metric
- iv) RIP defines how routers should share information when moving traffic among an interconnected group of local area networks.

10/10  
N  
27/12/23





```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

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

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

Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#
%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 rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 20.0.0.0
Router(config-router)#no shut
      ^
% Invalid input detected at '^' marker.

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

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

## IOS Command Line Interface

```
Router#config terminal;no show
^
% Invalid input detected at '^' marker.

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

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

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.0.0.0/8 is directly connected, Serial2/0
C        20.0.0.20/32 is directly connected, Serial2/0
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        20.0.0.20/32 is directly connected, Serial2/0
R        30.0.0.0/8 [120/1] via 20.0.0.20, 00:00:12, Serial2/0
R        40.0.0.0/8 [120/2] via 20.0.0.20, 00:00:12, Serial2/0
Router#
```



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

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

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

% Ambiguous command: "e"
Router(config-if)#exit
Router(config)#interface serial 3/0
           ^
% Invalid input detected at '^' marker.

Router(config)#ip address 30.0.0.10 255.0.0.0
           ^
% Invalid input detected at '^' marker.

Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.10 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#clock rate 64000
Router(config-if)#no shut

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

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

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



Router1

Physical Config CLI

## IOS Command Line Interface

ROUTER CONSOLE IS NOW AVAILABLE

Press RETURN to get started.

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

```
Gateway of last resort is not set
```

```
R    10.0.0.0/8 [120/1] via 20.0.0.10, 00:00:20, Serial2/0
      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.0.0.0/8 is directly connected, Serial2/0
C        20.0.0.10/32 is directly connected, Serial2/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        30.0.0.0/8 is directly connected, Serial3/0
C        30.0.0.20/32 is directly connected, Serial3/0
R    40.0.0.0/8 [120/1] via 30.0.0.20, 00:00:26, Serial3/0
Router#
```



```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.20 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut

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

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)#router rip
Router(config-router)#network 30.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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
```



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

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

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)#router rip
Router(config-router)#network 30.0.0.0
Router(config-router)#network 40.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

Gateway of last resort is not set

R    10.0.0.0/8 [120/2] via 30.0.0.10, 00:00:12, Serial2/0
R    20.0.0.0/8 [120/1] via 30.0.0.10, 00:00:12, Serial2/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        30.0.0.0/8 is directly connected, Serial2/0
C        30.0.0.10/32 is directly connected, Serial2/0
C        40.0.0.0/8 is directly connected, FastEthernet0/0
Router#|
```

Physical Config Desktop Custom Interface

## Command Prompt

X

```
PC>ping 40.0.0.1
```

```
Pinging 40.0.0.1 with 32 bytes of data:
```

```
Request timed out.
```

```
Reply from 40.0.0.1: bytes=32 time=15ms TTL=125
```

```
Reply from 40.0.0.1: bytes=32 time=9ms TTL=125
```

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

```
Ping statistics for 40.0.0.1:
```

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

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

```
    Minimum = 2ms, Maximum = 15ms, Average = 8ms
```

```
PC>ping 40.0.0.1
```

```
Pinging 40.0.0.1 with 32 bytes of data:
```

```
Reply from 40.0.0.1: bytes=32 time=20ms TTL=125
```

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

```
Reply from 40.0.0.1: bytes=32 time=13ms TTL=125
```

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

```
Ping statistics for 40.0.0.1:
```

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

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

```
    Minimum = 2ms, Maximum = 20ms, Average = 9ms
```

```
PC>
```

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=3ms TTL=125

Reply from 10.0.0.1: bytes=32 time=16ms TTL=125

Reply from 10.0.0.1: bytes=32 time=11ms TTL=125

Reply from 10.0.0.1: bytes=32 time=2ms TTL=125

Ping statistics for 10.0.0.1:

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

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 16ms, Average = 8ms

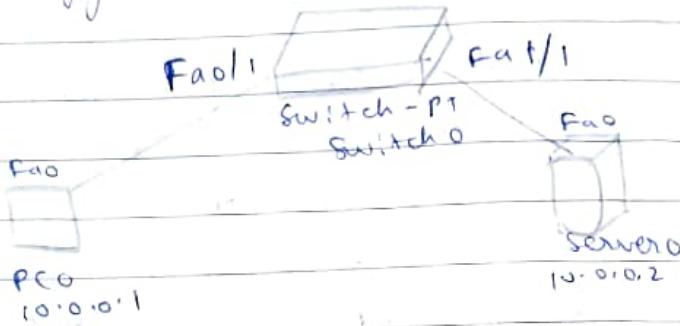
PC>|

70/123

## Experiment - 6

Configure web server, DNS within a LAN

Topology :-



Procedure :-

- i) Connect a PC, router & 1 server using copper straight through wire.
- ii) Set the IP address of PC and server.
- iii) Click on server → services → HTTP
- iv) Click on index.html & change some text to BMS College of Engineering
- v) Click on web browser of PCo which we get from desktop
- vi) Type in `http://10.0.0.2` in URL & press go.
- vii) Notice the changes.
- viii) Now click on servero → services → DNS service on
- ix) Name in Resource records 'bmsece' and address `10.0.0.2` and press Add.
- x) Now click on index.html of other links to make more changes. Make a CV.
- xi) Afterwards, click on PC → desktop → web browser
- xii) In the URL just give domain name `bmscece` and press go.
- xiii) We can notice the changes.

in server, services, DNS,

No	Name	Type	Detail
0	bmscse	A Record	10.0.0.2

Result:

Web Browser

URL: http://BMSECSE

BMS College of Engineering

Addit's CV opening doors to new opportunities. Mind  
quick links: wind open

Language I know

Image page

Image

URL: http://BMSECSE / languages.htm

Languages: HTML, CSS, Java, C, SQL, MongoDB

Bank

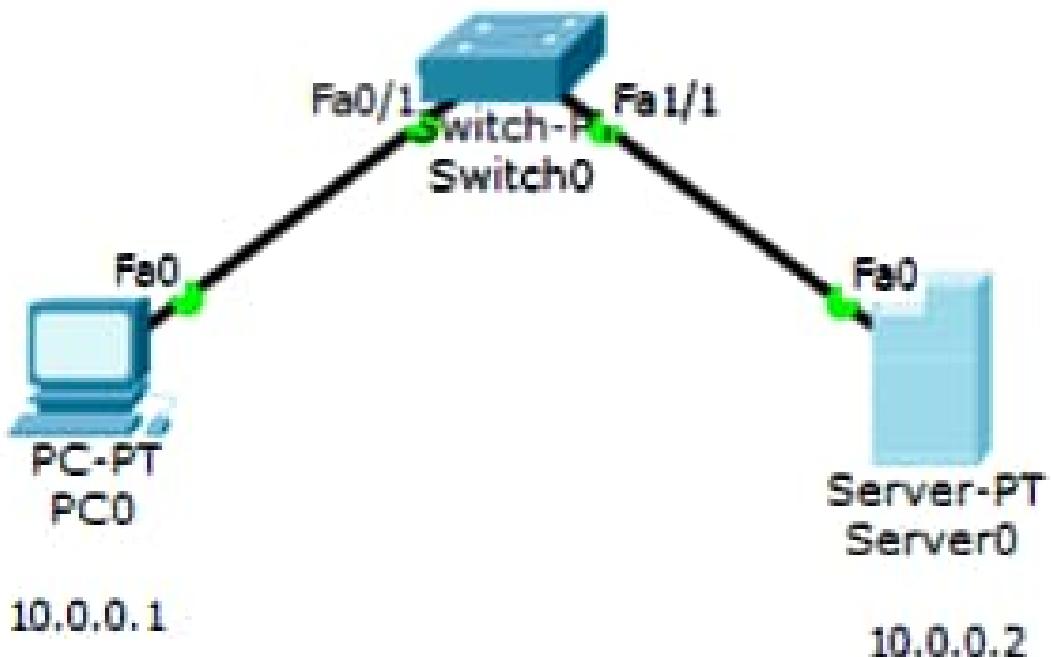
Observation:

DNS → Domain Name System.

i) It turns domain names into IP addresses, which allows browser to get to websites & other internet resources

ii) So in the URL, we can just give the Domain Name instead of IP address

iii) Benefits: can map to a new IP address if the host's IP address changes. They are easier to remember than IP address.





Physical Config

Services

Desktop

Custom Interface

**SERVICES**

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

File Name: index.html

```
<html>
<center><font size='+2' color='blue'>Cisco Packet
Tracer</font></center>
<hr>BMS College of Engineering. Opening doors to new
opportunities. Mind Wide Open.
<p>Quick Links:
<br><a href='helloworld.html'>A small page</a>
<br><a href='copyrights.html'>Copyrights</a>
<br><a href='image.html'>Image page</a>
<br><a href='cscopthologo177x111.jpg'>Image</a>
</html>
```

File Manager

Save



Physical Config Desktop Custom Interface

## Web Browser

X

< > URL  Go Stop

# Cisco Packet Tracer

---

BMS College of Engineering. Opening doors to new opportunities. Mind Wide Open.

### Quick Links:

[A small page](#)

[Copyrights](#)

[Image page](#)

[Image](#)

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

Address

No.	Name	Type	Detail
0	bmscecse	A Record	10.0.0.2

[Physical](#)   [Config](#)[Services](#)[Desktop](#)[Custom Interface](#)**SERVICES**

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

File Name: 

```
<html>
<center><font size='+2' color='blue'>BMS College of
Engineering</font></center>
<hr>Aditi's CV. Opening doors to new opportunities. Mind Wide
Open.
<p>Quick Links:
<br><a href='languages.html'>Languages I know</a>
<br><a href='image.html'>Image page</a>
<br><a href='cscoptlogo177x111.jpg'>Image</a>
</html>
```

[File Manager](#)[Save](#)

[Physical](#)   [Config](#)[Services](#)[Desktop](#)[Custom Interface](#)**SERVICES**

HTTP

DHCP

DHCPv6

TFTP

DNS

SYSLOG

AAA

NTP

EMAIL

FTP

File Name: languages.html

```
<html>
  Languages: HTML, CSS, Java, C, AQL, MongoDB
  <br><a href='index.html'>Back</a>
</html>
```

[File Manager](#)[Save](#)

&lt;

&gt;

URL

http://BMSCECSE

Go

Stop

## BMS College of Engineering

Aditi's CV. Opening doors to new opportunities. Mind Wide Open.

Quick Links:

[Languages I know](#)

[Image page](#)

[Image](#)



Physical Config Desktop Custom Interface

## Web Browser

X



URL

http://BMSCECSE/languages.html

Go

Stop

LAgues: HTML, CSS, Jave, C, AQL, MongoDB

[Back](#)

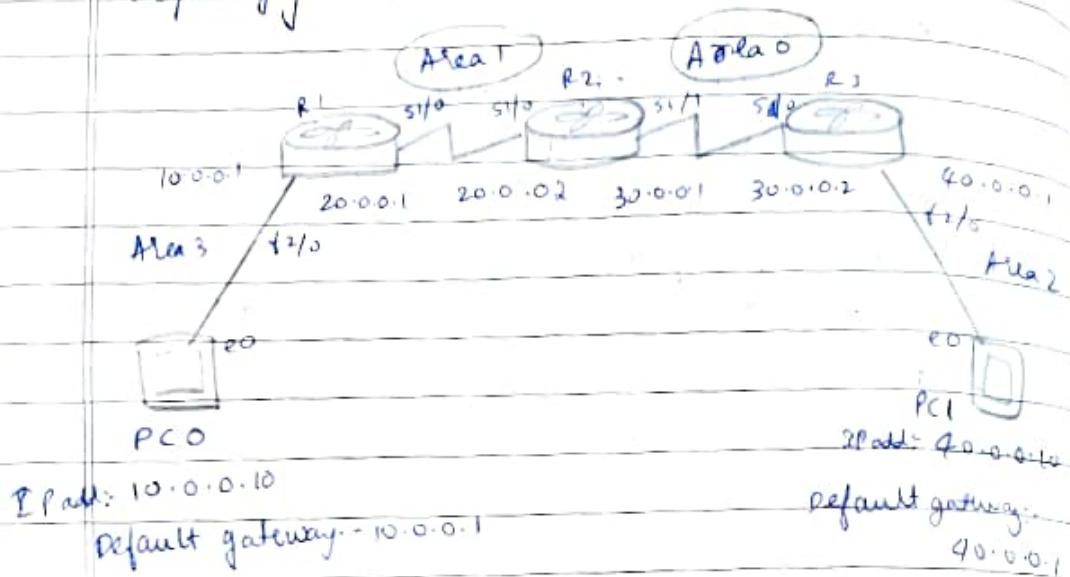
27/7/23

DATE 32

## Experiment - 7

configure OSPF routing protocol

topology :-



### Procedure:-

- Configure the PC's with IP address & a gateway according to the topology seen above
- Configure each of the routers acc. to the IP addresses given, for all 4 router interfaces
- encapsulation ppp and clock rate need to set as done in RIP protocol experiment.

In Router R1,

R1 (config) # router ospf 1

R1 (config-router) # router-id 1.1.1.1

R1 (config-router) # network 10.0.0.0 0.255.255.255 area 1

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

R1 (config-router) # exit

In Router R2,

```
R2(config) # router ospf 1  
R2(config-router) # router-id 2.2.2.2  
R2(config-router) # network 20.0.0.0 0.255.255.255 area 1  
R2(config-router) # network 30.0.0.0 0.255.255.255 area 0  
R2(config-router) # exit
```

In Router R3,

```
R3(config) # router ospf 1  
R3(config-router) # router-id 3.3.3.3  
R3(config-router) # network 30.0.0.0 0.255.255.255 area 0  
R3(config-router) # network 40.0.0.0 0.255.255.255 area 2  
R3(config-router) # exit
```

- i) Now, to keep the routers active we have to configure loopback.

In Router R1

```
R1 # config +  
R1(config)# interface serial 1/0  
R1(config-if) # interface loopback 0  
R1(config-if) # ip address 122.16.1.252 255.255.0.0  
R1(config-if) # no shutdown
```

In Router R2

```
R2(config-if) # interface loopback 0  
R2(config-if) # ip address 122.16.1.253 255.255.0.0  
R2(config-if) # no shutdown
```

B

In Router R3

R3(config-if) # interface loopback0  
R3(config-if) # ip add 172.16.1.254 255.255.255.0  
R3(config-if) # no shut.

- v) create virtual link b/w R1,R2, by this we can have a virtual link to connect to area 0

In router R1,

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

In router R2

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

- v) check show ip route many times.

For router 2

Router# show ip route

O 1A 10.0.0.0/8 via 20.0.0.1, 00:00:00  
serial 0/0

20.0.0.0/8 is variably subnetted, 2 subnets  
2 masks

C 20.0.0.0/8 is directly connected, serial 0/0

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

C 30.0.0.0/8 is directly connected, serial 0/0

C 30.0.0.1/32 is directly connected, serial 0/0  
6 ck 4 10.0.0.0/8 via 30.0.0.2, 00:06:00  
serial 0/0

C 172.16.0.0/16 is directly connected  
loopback 0

Result:

2 ping 40.0.0.10

Pinging 40.0.0.10 with 32 bytes of data:

Reply from 40.0.0.10: bytes = 32 time = 9ms TTL=128  
Reply from 40.0.0.10: bytes = 32 time = 9ms TTL=128  
Reply from 40.0.0.10: bytes = 32 time = 9ms TTL=128  
Reply from 40.0.0.10: bytes = 32 time = 9ms TTL=128

Ping statistics for 40.0.0.10:

Packet: sent = 4, received = 4, lost = 0

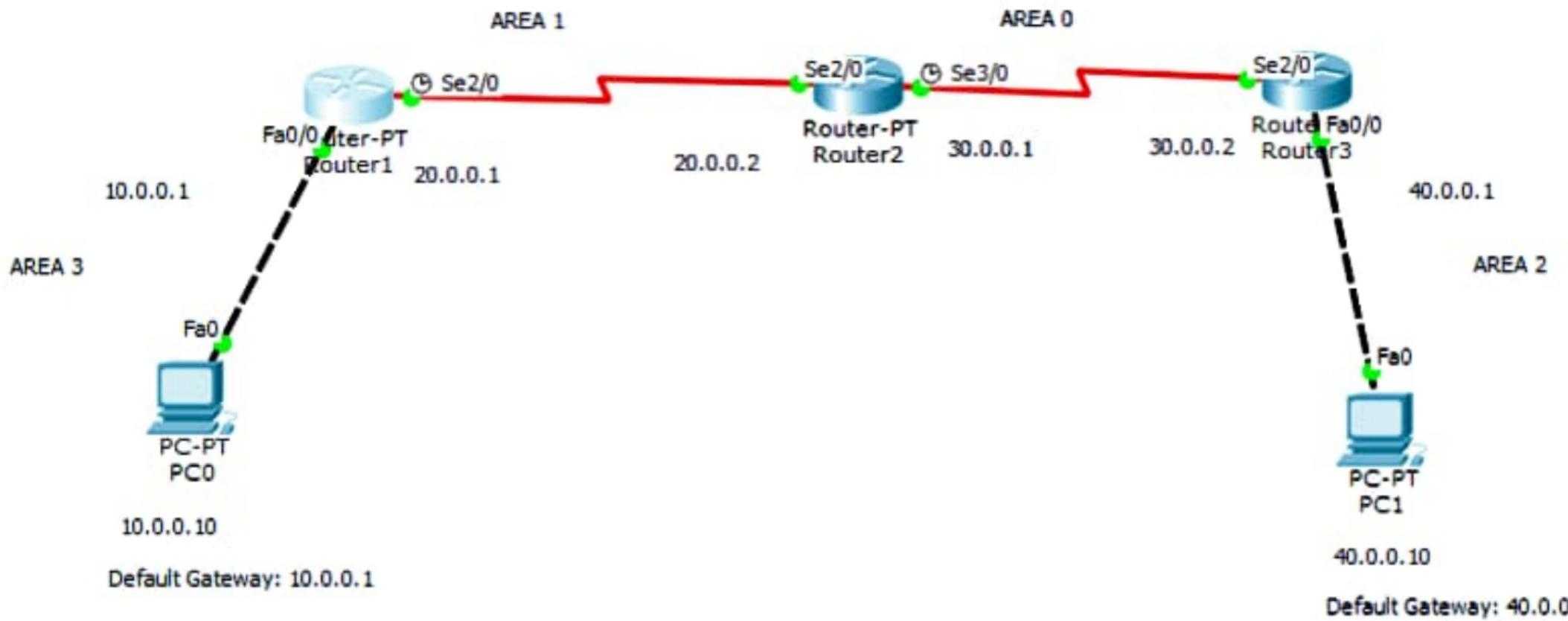
Approximate round trip times in milliseconds:

Minimum = 9ms, Maximum = 12ms, Average = 10ms.

Observation:

- i) OSPF - open shortest Path First is a routing protocol for Internet Protocol networks.
- ii) It uses a link state routing algorithm and falls into the group of interior gateway protocols, operating within a single autonomous system.
- iii) If we don't write encapsulation ppp, the destination host becomes unreachable.

10/10  
N  
2/5/23



```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shut

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

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

Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#encapsulation PPP
Router(config-if)#clock rate 64000
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#
Router(config-if)#exit
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 ospf 1
Router(config-router)#router-id 1.1.1.1
Router(config-router)#network 10.0.0.0 0.255.255.255 area 3
Router(config-router)#network 20.0.0.0 0.255.255.255 area 1
Router(config-router)#exit
Router(config)#
00:14:36: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading Done

Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#interface loopback 0

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

```
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#interface loopback 0

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

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

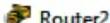
Router(config-if)#ip address 172.16.1.252 255.255.0.0
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#router ospf 1
Router(config-router)#area 1 virtual-link 2.2.2.2
Router(config-router)#
00:26:12: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on OSPF_VL0 from LOADING to FULL, Loading Done

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

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

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        20.0.0.0/8 is directly connected, Serial2/0
C        20.0.0.2/32 is directly connected, Serial2/0
O    30.0.0.0/8 [110/129] via 20.0.0.2, 00:03:32, Serial2/0
O IA 40.0.0.0/8 [110/129] via 20.0.0.2, 00:03:32, Serial2/0
C    172.16.0.0/16 is directly connected, Loopback0
Router#
```



## IOS Command Line Interface

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut

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

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

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#
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)#network 30.0.0.0 0.
00:14:11: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to FULL, Loading Done
255.255.255 area 0
Router(config-router)#
Router(config)#
00:15:26: %OSPF-5-ADJCHG: Process 1, Nbr 3.3.3.3 on Serial3/0 from LOADING to FULL, Loading Done

Router(config)#interface serial 3/0
Router(config-if)#ip address 30.0.0.1 255.0.0.0
Router(config-if)#interface loopback 0

Router(config-if)#

```

## IOS Command Line Interface

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

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

Router(config-if)#ip address 172.16.1.252 255.255.0.0
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#router ospf 1
Router(config-router)#area 1 virtual
00:26:21: %OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not found from 20.0.0.2, Serial2/0
-link 1.1.1.1
00:26:31: %OSPF-4-ERRRCV: Received invalid packet: mismatch area ID, from backbone area must be virtual-link but not found from 20.0.0.2, Serial2/0

Router(config-router)#exit
Router(config)#
00:26:46: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on OSPF_VL0 from LOADING to FULL, Loading Done

Router(config)#
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 10.0.0.0/8 [110/65] via 20.0.0.1, 00:05:24, Serial2/0
  20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    20.0.0.0/8 is directly connected, Serial2/0
C    20.0.0.1/32 is directly connected, Serial2/0
  30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C    30.0.0.0/8 is directly connected, Serial3/0
C    30.0.0.2/32 is directly connected, Serial3/0
O IA 40.0.0.0/8 [110/65] via 30.0.0.2, 00:14:32, Serial3/0
C  172.16.0.0/16 is directly connected, Loopback0
```

## IOS Command Line Interface

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#encapsulation ppp
Router(config-if)#no shut

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

Router(config-if)#exit
Router(config)#int
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
erface fastethernet0/0
Router(config-if)#ip address 40.0.0.1 255.0.0.0
Router(config-if)#no shut

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
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)#netwr
00:15:23: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#interface loopback 0

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

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

Router(config-if)#ip address 172.16.1.254 255.255.0.0
Router(config-if)#no shut
Router(config-if)#exit
```



## IOS Command Line Interface

```
Router(config-router)#
Router(config-router)#netwr
00:15:23: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on Serial2/0 from LOADING to FULL, Loading
Router(config-router)#network 40.0.0.0 0.255.255.255 area 2
Router(config-router)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.2 255.0.0.0
Router(config-if)#interface loopback 0

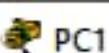
Router(config-if)#
*LINK-5-CHANGED: Interface Loopback0, changed state to up

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

Router(config-if)#ip address 172.16.1.254 255.255.0.0
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#encapsulation ppp
Router(config-if)#exit
Router(config)#exit
Router#
*SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

O IA 10.0.0.0/8 [110/129] via 30.0.0.1, 00:01:16, Serial2/0
O IA 20.0.0.0/8 [110/128] via 30.0.0.1, 00:11:35, Serial2/0
      30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       30.0.0.0/8 is directly connected, Serial2/0
C       30.0.0.1/32 is directly connected, Serial2/0
C       40.0.0.0/8 is directly connected, FastEthernet0/0
C       172.16.0.0/16 is directly connected, Loopback0
Router#
```



PC1

- □ ×

[Physical](#)   [Config](#)   [Desktop](#)   [Custom Interface](#)

## Command Prompt

X

PC&gt;ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Request timed out.

Reply from 10.0.0.10: bytes=32 time=10ms TTL=125

Reply from 10.0.0.10: bytes=32 time=2ms TTL=125

Reply from 10.0.0.10: bytes=32 time=9ms TTL=125

Ping statistics for 10.0.0.10:

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

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 10ms, Average = 7ms

PC&gt;ping 10.0.0.10

Pinging 10.0.0.10 with 32 bytes of data:

Reply from 10.0.0.10: bytes=32 time=11ms TTL=125

Reply from 10.0.0.10: bytes=32 time=21ms TTL=125

Reply from 10.0.0.10: bytes=32 time=2ms TTL=125

Reply from 10.0.0.10: bytes=32 time=20ms TTL=125

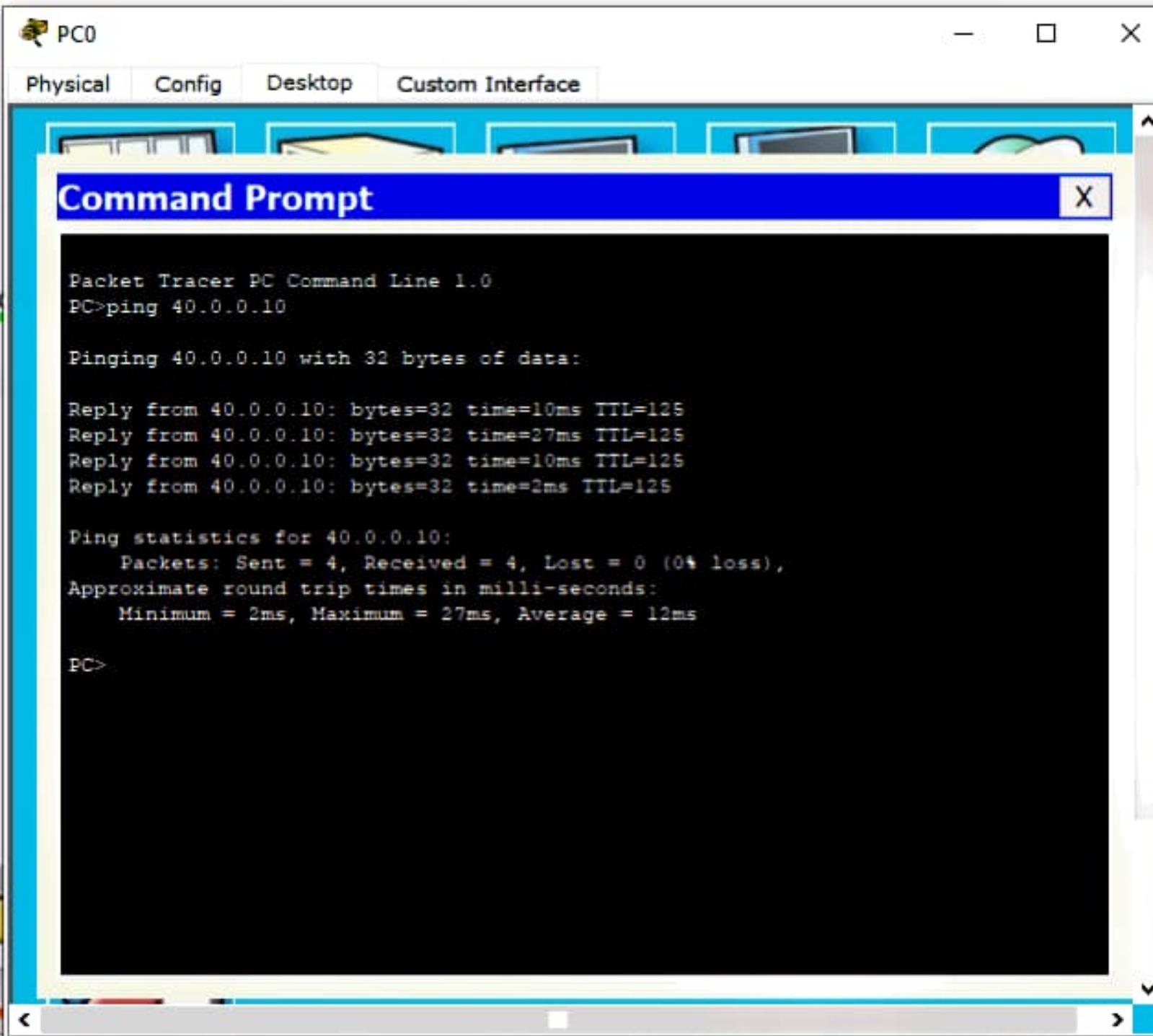
Ping statistics for 10.0.0.10:

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

Approximate round trip times in milli-seconds:

Minimum = 2ms, Maximum = 21ms, Average = 13ms

PC&gt;

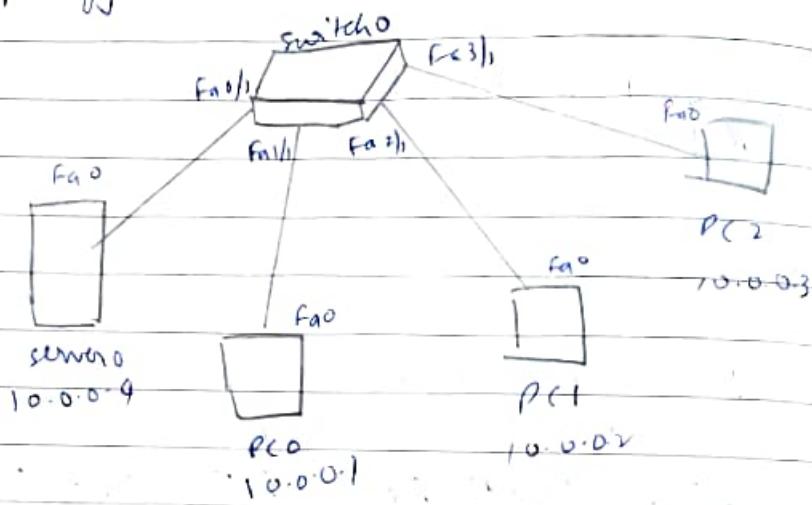


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## Experiment - 8

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

Topology:-



Procedure:-

- i) Set up the topology as shown above, all copper straight through wire
- ii) Set the IP address as shown above
- iii) Click on inspect tool and select the end devices one by one and select the ARP tables.
- iv) Now, click on any end device and  $\rightarrow$  desktop  $\rightarrow$  command prompt  
~~PC1> ping -a~~  
 No ARP entries found  
 This will be the result.
- v) Now ping each device from every other device and observe the changes in the ARP Table.
- vi) After this, go to CLI of switch and type

show mac address-table and observe

Result:

cl (2)

PC > arp - a

No ARP entries found

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=9ms TTL=120

Reply from 10.0.0.1: bytes=32 time=9ms TTL=120

Reply from 10.0.0.1: bytes=32 time=4ms TTL=120

Reply from 10.0.0.1: bytes=32 time=4ms TTL=120

Ping statistics for 10.0.0.1:

Packets: sent = 4, received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 4ms, Maximum = 9ms, Average = 5ms

Now similarly ping all other devices for same result.

PC > arp - a

Internet Address	Physical Address	Type
10.0.0.1	0001.9683.7660	dynamic
10.0.0.4	0090.2B73.E0A4	dynamic
10.0.0.2	0001.9796.E267	dynamic

We get similar results for other devices.

Now in switch (L1),

switch > show mac address-table

## Mac Address Table

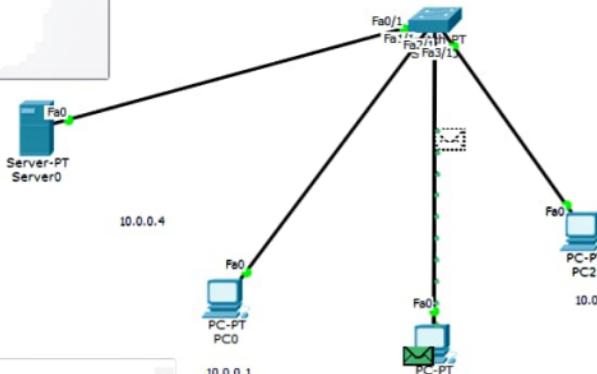
Vlan	Mac Address	Type	Port
1	0001.9683.2660	DYNAMIC	Fa1/1
1	0001.9790.1267	DYNAMIC	Fa2/1
1	0090.2673.1000	DYNAMIC	Fa0/1
1	0010.9349.9156	DYNAMIC	Fa3/1

## Observation:

- i) In the beginning no ARP entries will be found.
- ii) As we start pinging, the entries get added.
- iii) ARP converts an ever-changing Internet Protocol (IP) address to a fixed physical machine address, also known as media access control (MAC) address, in a local-area network (LAN).
- iv) The switch starts recognizing the devices even if it is pinged or received data.

1  
2  
3  
4  
5

Logical		
[Root]		
ARP Table for Server0		
IP Address	Hardware Address	Interface
10.0.0.1	0001.9683.7660	FastEthernet0
10.0.0.2	0001.9796.E267	FastEthernet0
10.0.0.3	00E0.A349.98B4	FastEthernet0



ARP Table for PC0		
IP Address	Hardware Address	Interface
10.0.0.2	0001.9796.E267	FastEthernet0
10.0.0.3	00E0.A349.98B4	FastEthernet0
10.0.0.4	0090.2B73.E0A4	FastEthernet0

ARP Table for PC1		
IP Address	Hardware Address	Interface
10.0.0.1	0001.9683.7660	FastEthernet0
10.0.0.3	00E0.A349.98B4	FastEthernet0
10.0.0.4	0090.2B73.E0A4	FastEthernet0

ARP Table for PC2			
IP Address	Hardware Address	Interface	
10.0.0.1	0001.9683.7660	FastEthernet0	
10.0.0.2	0001.9796.E267	FastEthernet0	
10.0.0.4	0090.2B73.E0A4	FastEthernet0	

Simulation Panel				
Event List				
Vis.	Time(sec)	Last Device	At Device	Type Info
	17.502	--	PC1	ICMP
	17.503	PC1	Switch0	ICMP
	17.504	Switch0	PC0	ICMP
	17.505	PC0	Switch0	ICMP
	17.506	Switch0	PC1	ICMP
	17.510	--	PC2	ICMP
	17.511	PC2	Switch0	ICMP
	17.512	Switch0	PC1	ICMP
	17.513	PC1	Switch0	ICMP

Reset Simulation

 Constant Delay

Capturing...

Play Controls

Event List Filters - Visible Events  
 ACL Filter, ARP, BGP, CDP, DHCP, EIGRP, EIGRPv6, FTP, H.323, HSRP, HSRPv6, HTTP, HTTPS, ICMP, ICMPv6, IPsec, ISAKMP, LACP, NDP, NETFLOW, NTP, OSPF, OSPFv6, PAgP, POP3, RADIUS, RIP, RIPng, RTP, SCCP, SMTP, SNMP, SSH, STP, SYSLOG, TACACS, TCP, TFTP, Telnet, UDP, VTP

Physical Config CLI

## IOS Command Line Interface

```
1 0090.2b73.e0a4 DYNAMIC Fa0/1
1 00e0.a349.98b4 DYNAMIC Fa3/1
```

```
Switch>arp -a
```

```
^|
```

```
% Invalid input detected at '^' marker.
```

```
Switch>show mac address-table
```

```
Mac Address Table
```

Vlan	Mac Address	Type	Ports
----	-----	-----	-----
1	0001.9683.7660	DYNAMIC	Fa1/1
1	0001.9796.e267	DYNAMIC	Fa2/1
1	0090.2b73.e0a4	DYNAMIC	Fa0/1
1	00e0.a349.98b4	DYNAMIC	Fa3/1

```
Switch>show mac address-table
```

```
Mac Address Table
```

Vlan	Mac Address	Type	Ports
----	-----	-----	-----
1	0001.9683.7660	DYNAMIC	Fa1/1
1	0001.9796.e267	DYNAMIC	Fa2/1
1	0090.2b73.e0a4	DYNAMIC	Fa0/1
1	00e0.a349.98b4	DYNAMIC	Fa3/1

```
Switch>
```



PCO



Physical Config Desktop Custom Interface

## Command Prompt



Packet Tracer PC Command Line 1.0

PC>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=8ms TTL=128

Reply from 10.0.0.4: bytes=32 time=4ms TTL=128

Reply from 10.0.0.4: bytes=32 time=4ms TTL=128

Reply from 10.0.0.4: bytes=32 time=4ms TTL=128

Ping statistics for 10.0.0.4:

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

Approximate round trip times in milli-seconds:

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

PC>arp -a

Internet Address	Physical Address	Type
10.0.0.3	00e0.a349.98b4	dynamic
10.0.0.4	0090.2b73.e0a4	dynamic

PC>

## Command Prompt

Packet Tracer PC Command Line 1.0

PC>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=8ms TTL=128

Reply from 10.0.0.4: bytes=32 time=4ms TTL=128

Reply from 10.0.0.4: bytes=32 time=4ms TTL=128

Reply from 10.0.0.4: bytes=32 time=4ms TTL=128

Ping statistics for 10.0.0.4:

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

Approximate round trip times in milli-seconds:

Minimum = 4ms, Maximum = 8ms, Average = 6ms

PC>arp -a

Internet Address	Physical Address	Type
10.0.0.4	0090.2b73.e0a4	dynamic

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=8ms TTL=128

Reply from 10.0.0.1: bytes=32 time=4ms TTL=128

Reply from 10.0.0.1: bytes=32 time=4ms TTL=128

Reply from 10.0.0.1: bytes=32 time=4ms TTL=128

Ping statistics for 10.0.0.1:

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

Approximate round trip times in milli-seconds:

Minimum = 4ms, Maximum = 8ms, Average = 6ms

PC>

## Command Prompt

Packet Tracer PC Command Line 1.0

PC>arp -a

No ARP Entries Found

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=8ms TTL=128  
Reply from 10.0.0.1: bytes=32 time=4ms TTL=128  
Reply from 10.0.0.1: bytes=32 time=4ms TTL=128  
Reply from 10.0.0.1: bytes=32 time=4ms TTL=128

Ping statistics for 10.0.0.1:

  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
  Approximate round trip times in milli-seconds:  
    Minimum = 4ms, Maximum = 8ms, Average = 5ms

PC>arp -a

Internet Address	Physical Address	Type
10.0.0.1	0001.9683.7660	dynamic

PC>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=8ms TTL=128  
Reply from 10.0.0.4: bytes=32 time=4ms TTL=128  
Reply from 10.0.0.4: bytes=32 time=4ms TTL=128  
Reply from 10.0.0.4: bytes=32 time=4ms TTL=128

Ping statistics for 10.0.0.4:

  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
  Approximate round trip times in milli-seconds:  
    Minimum = 4ms, Maximum = 8ms, Average = 5ms

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=8ms TTL=128  
Reply from 10.0.0.2: bytes=32 time=4ms TTL=128  
Reply from 10.0.0.2: bytes=32 time=4ms TTL=128  
Reply from 10.0.0.2: bytes=32 time=4ms TTL=128

Ping statistics for 10.0.0.2:

  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
  Approximate round trip times in milli-seconds:  
    Minimum = 4ms, Maximum = 8ms, Average = 5ms

PC>arp -a

Internet Address	Physical Address	Type
10.0.0.1	0001.9683.7660	dynamic
10.0.0.2	0001.9796.e267	dynamic
10.0.0.4	0090.2b73.e0a4	dynamic

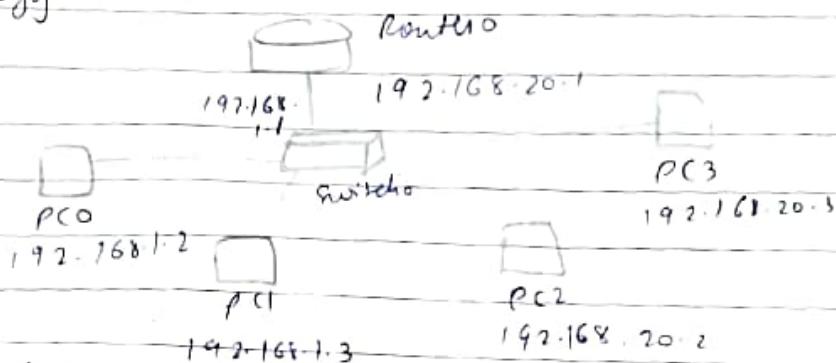
PC>

3/8/23

## Experiment - 9

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

Topology :-



Procedure :-

- i) Set up the topology as shown above, use 1891 router.
  - ii) Add an extra port to the switch as its needed.
  - iii) Use copper straight through wire. set the IP address & gateway & configure the router.
  - iv) In switch → config → VLAN Database, give any VLAN Number, here 20, and VLAN Name NEW → NEWVLAN
  - v) Select add. Select the interface here fastethernet 0/1 (nearest the switch from router) & make it trunk (from Access to Trunk).
  - vi) Look into fast ethernet 2/1 & 3/1 and don't VLAN 1 to 20:NEWVLAN
  - vii) And in Router → ~~VLAN select~~ DATABASE, enter the number and name of the VLAN created. In clt of router.
- Router > enable

~~Router # config~~

~~Router (config) # interface fastethernet 0/0~~

~~Router (config)~~

~~Router (vlan) # exit~~

APPLY completed.

Exiting . . .

~~Router # config~~ +

~~Router (config) # interface fastethernet 0/0~~

~~Router (config-if) # ip address 192.168.1.1 255.255.255.0~~

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

```
Router(config)# interface fastethernet 0/0/1  
Router(config-subif)# encapsulation dot1q 20  
Router(config-subif)# ip address 192.168.20.1 255.255.255.0  
Router(config-subif)# no shutdown  
Router(config-subif)# exit
```

Result: (in PC0)

```
Ping to 192.168.20.3
```

Sending 192.168.20.3 with 32 bytes of data.

Reply from 192.168.20.3: bytes=32 time=0ms TTL=128

Ping statistics for 192.168.20.3

Packets sent = 4, Received = 4, Lost = 0 (0% loss).

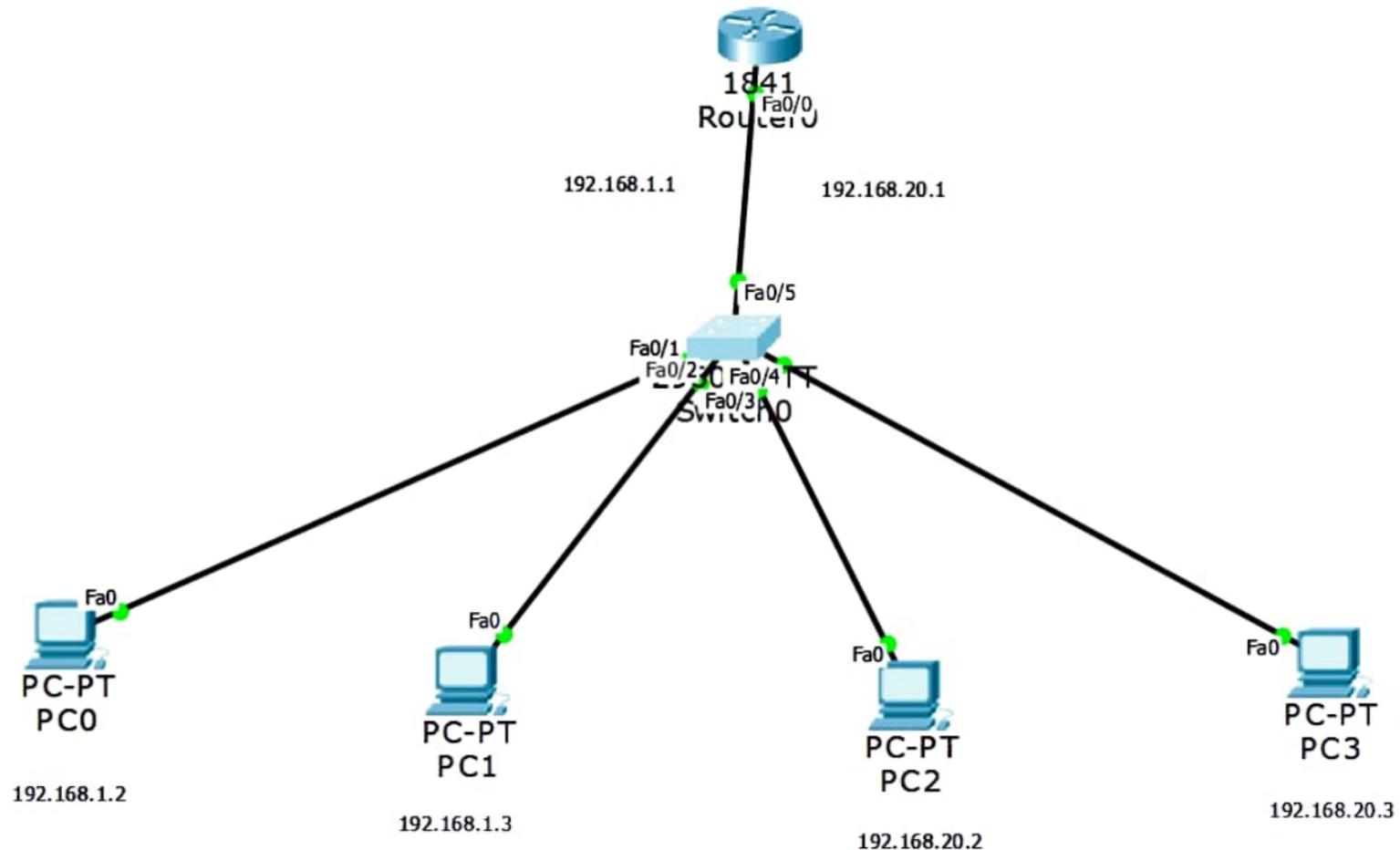
Approximate round trip times in milliseconds:

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

Observations:

1) VLAN → virtual local area network is any broadcast domain that is partitioned and isolated in a computer network at the data link layer

2) It is a virtualized connection that connects multiple devices and network nodes from different LANs into one logical network.







## Physical      Config      CLI

INTERFACE	FastEthernet0/5		
astEthernet0/	Port Status <input checked="" type="checkbox"/> On		
astEthernet0/	Bandwidth <input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto		
astEthernet0/	Duplex <input type="radio"/> Half Duplex <input type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto		
astEthernet0/	Trunk	VLAN	<input type="text" value="1-1005"/>
astEthernet0/	Tx Ring Limit	<input type="text" value="10"/>	<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> 1:default</li> <li><input checked="" type="checkbox"/> 20:NEWVLAN</li> <li><input checked="" type="checkbox"/> 1002:fddi-default</li> </ul>
astEthernet0/			
astEthernet0/1			
astEthernet0/1			

## Equivalent IOS Commands

```
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/6
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/5
Switch(config-if)#

```





## Physical      Config      CLI

INTERFACE	FastEthernet0/1		
astEthernet0/	Port Status <input checked="" type="checkbox"/> On		
astEthernet0/	Bandwidth <input type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto		
astEthernet0/	Duplex <input type="radio"/> Half Duplex <input type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto		
astEthernet0/	Access VLAN <input type="text" value="1"/>		
astEthernet0/	Tx Ring Limit <input type="text" value="10"/>		
astEthernet0/			
astEthernet0/1			
astEthernet0/1			

## Equivalent IOS Commands

```
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/3
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/1
Switch(config-if)#

```

<b>GLOBAL</b>
Settings
Algorithm Settings
<b>ROUTING</b>
Static
RIP
<b>SWITCHING</b>
VLAN Database
<b>INTERFACE</b>
FastEthernet0/0
FastEthernet0/1

**VLAN Number****VLAN Name****VLAN Configuration****Add****Remove****VLAN No****VLAN Name**

1	default
20	NEWVLAN
1002	fddi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

**Equivalent IOS Commands**

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#int fa 0/0.1
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up

Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.20.1 255.255.255.0
Router(config-subif)#no shut
Router(config-subif)#exit
Router(config)#
Router(config)#exit
Router#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.

Router(vlan)#
%SYS-5-CONFIG_I: Configured from console by console
```

--- System Configuration Dialog ---

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

Press RETURN to get started!

```
Router>enable
Router#vlan database
% Warning: It is recommended to configure VLAN from config mode,
as VLAN database mode is being deprecated. Please consult user
documentation for configuring VTP/VLAN in config mode.

Router(vlan)#vlan 20 name NEWVLAN
VLAN 20 modified:
  Name: NEWVLAN
Router(vlan)#exit
APPLY completed.
Exiting...
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa0/5
%Invalid interface type and number
Router(config)#int fa0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shut

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#int fa 0/0.1
Router(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up

Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.20.1 255.255.255.0
Router(config-subif)#no shut
Router(config-subif)#exit
Router(config)#

```

Physical Config Desktop Custom Interface

## Command Prompt



```
PC>ping 192.168.20.2
```

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

```
Request timed out.
```

```
Ping statistics for 192.168.20.2:
```

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

```
PC>ping 192.168.20.2
```

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

```
Request timed out.
```

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

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

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

```
Ping statistics for 192.168.20.2:
```

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

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

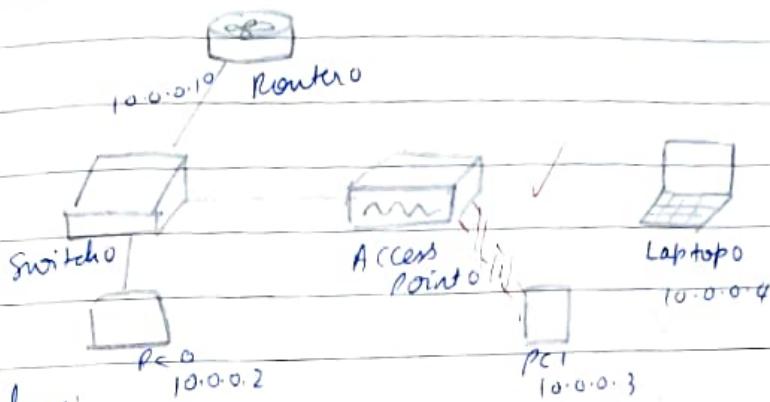
```
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
PC>
```

## Experiment - 10

To construct a WLAN and make the nodes communicate wirelessly.

Topology :-



Procedure:-

- i) construct above topology. use Access point-PT. connect that to router. set the IP address of the PC connected with wire and configure router.
- ii) configure access point → Port 1 → SSID Name - any name (WLAN here). select WEP any give any 10 digit hex key - 1234567890 here.
- iii) To configure PC of Laptop wirelessly, switch off the device. Drag the existing PT-HOST-NM-1AM to the component listed in the LHS. Drag WM P300N wireless interface to the empty port of switch on the device.
- iv) Now, in the config tab, a new wireless interface would have been added, configure SSID, WEP, WEP key, IP address & gateway (as normally done) to the device. Router > enable

Router# config t

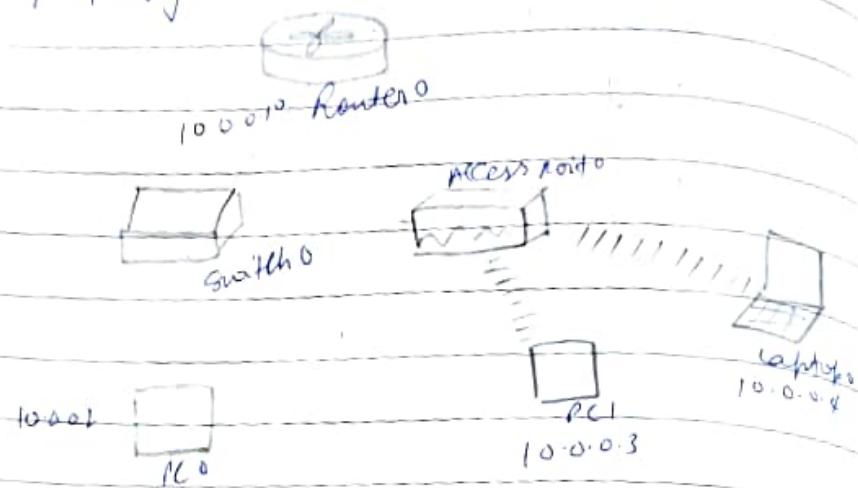
Router(config)# interface fastethernet 0/0

Router(config-if)# ip address 10.0.0.10 255.0.0.0

Router(config-if)# no shut.

# Result :-

## Topology :-



In PC (10.0.0.2)

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=21ms TTL=128

Reply from 10.0.0.3: bytes=32 time=13ms TTL=128

Reply from 10.0.0.3: bytes=32 time=6ms 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:

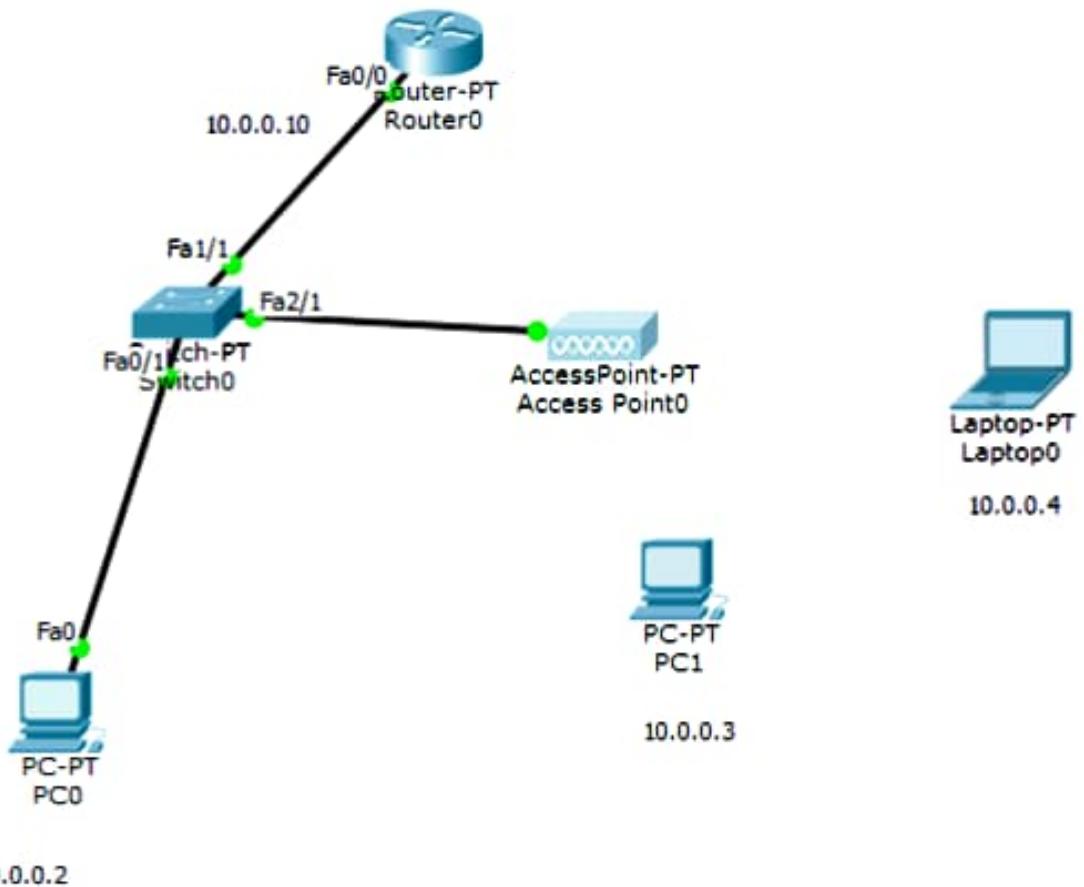
Minimum = 6 ms, Maximum = 21 ms, Average = 12 ms

## Observation:-

1) wireless local area network WLAN is a group of unlocated computers or other devices that form a network based on radio transmission rather than wire connections.

2) after the WLAN is setup, the wired connection appears in the topology from the access point.

2/3/23



[Physical](#)   [Config](#)   [CLI](#)

## IOS Command Line Interface

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

--- System Configuration Dialog ---

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

Press RETURN to get started!

```
Router>enable  
Router#config t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#interface fastethernet 0/0  
Router(config-if)#ip address 10.0.0.10 255.0.0.0  
Router(config-if)#no shut  
  
Router(config-if)#  
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up  
  
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to  
up  
exit  
Router(config)#
```

[Copy](#)[Paste](#)

Access Point0

Physical Config

**GLOBAL**

Settings

**INTERFACE**

Port 0

Port 1

▲ ▼

**Port 1**

Port Status  On

SSID WLAN

Channel 6

Authentication

Disabled  WEP WEP Key 1234567890

WPA-PSK  WPA2-PSK PSK Pass Phrase

Encryption Type 40/64-Bits (10 Hex digits) ▼

Physical Config Desktop Custom Interface

MODULES

WMP300N

PT-HOST-NM-1AM

PT-HOST-NM-1CE

PT-HOST-NM-1CFE

PT-HOST-NM-1CGE

PT-HOST-NM-1FFE

PT-HOST-NM-1FGE

PT-HOST-NM-1W

PT-HOST-NM-1W-A

PT-HOST-NM-3G/4G

PT-HEADPHONE

PT-MICROPHONE

PT-CAMERA

PT-USB-HARD-DRIVE

## Physical Device View

Zoom In

Original Size

Zoom Out



Customize  
Icon in  
Physical View



Customize  
Icon in  
Logical View



The Linksys-WMP300N module provides one 2.4GHz wireless interface suitable for connection to wireless networks. The module supports protocols that use Ethernet for LAN access.



Physical Config Desktop Custom Interface

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

Wireless0

**Wireless0** On

Port Status

54 Mbps

Bandwidth

MAC Address

0090.2B80.8A1B

SSID

WLAN

## Authentication

- Disabled  WEP      WEP Key 1234567890
- WPA-PSK  WPA2-PSK PSK Pass Phrase

- WPA       WPA2

User ID

Password

Encryption Type

40/64-Bits (10 Hex digits) ▾

## IP Configuration

- DHCP

- Static

IP Address

10.0.0.3

Subnet Mask

255.0.0.0

## IPv6 Configuration

- DHCP

- Auto Config

- Static

Laptop0

Physical Config Desktop Custom Interface

### Physical Device View

Zoom In Original Size Zoom Out

MODULES

- WPC300N
- PT-LAPTOP-NM-1AM
- PT-LAPTOP-NM-1CE
- PT-LAPTOP-NM-1CFE
- PT-LAPTOP-NM-1CGE
- PT-LAPTOP-NM-1FFE
- PT-LAPTOP-NM-1FGE
- PT-LAPTOP-NM-1W
- PT-LAPTOP-NM-1W-A
- PT-LAPTOP-NM-3G/4G
- PT-HEADPHONE
- PT-MICROPHONE
- PT-CAMERA
- PT-USB-HARD-DRIVE

The Linksys-WPC300N module provides one 2.4GHz wireless interface suitable for connection to wireless networks. The module supports protocols that use Ethernet for LAN access.



Physical Config Desktop Custom Interface

**GLOBAL**

Settings

Algorithm Settings

**INTERFACE**

Wireless0

**Wireless0**

On

Port Status

48 Mbps

Bandwidth

MAC Address

0030.A3C6.9EE5

SSID

WLAN

Authentication

Disabled  WEP

WEP Key

1234567890

WPA-PSK  WPA2-PSK PSK Pass Phrase

WPA  WPA2

User ID

Password

Encryption Type

40/64-Bits (10 Hex digits)

IP Configuration

DHCP

Static

IP Address

10.0.0.4

Subnet Mask

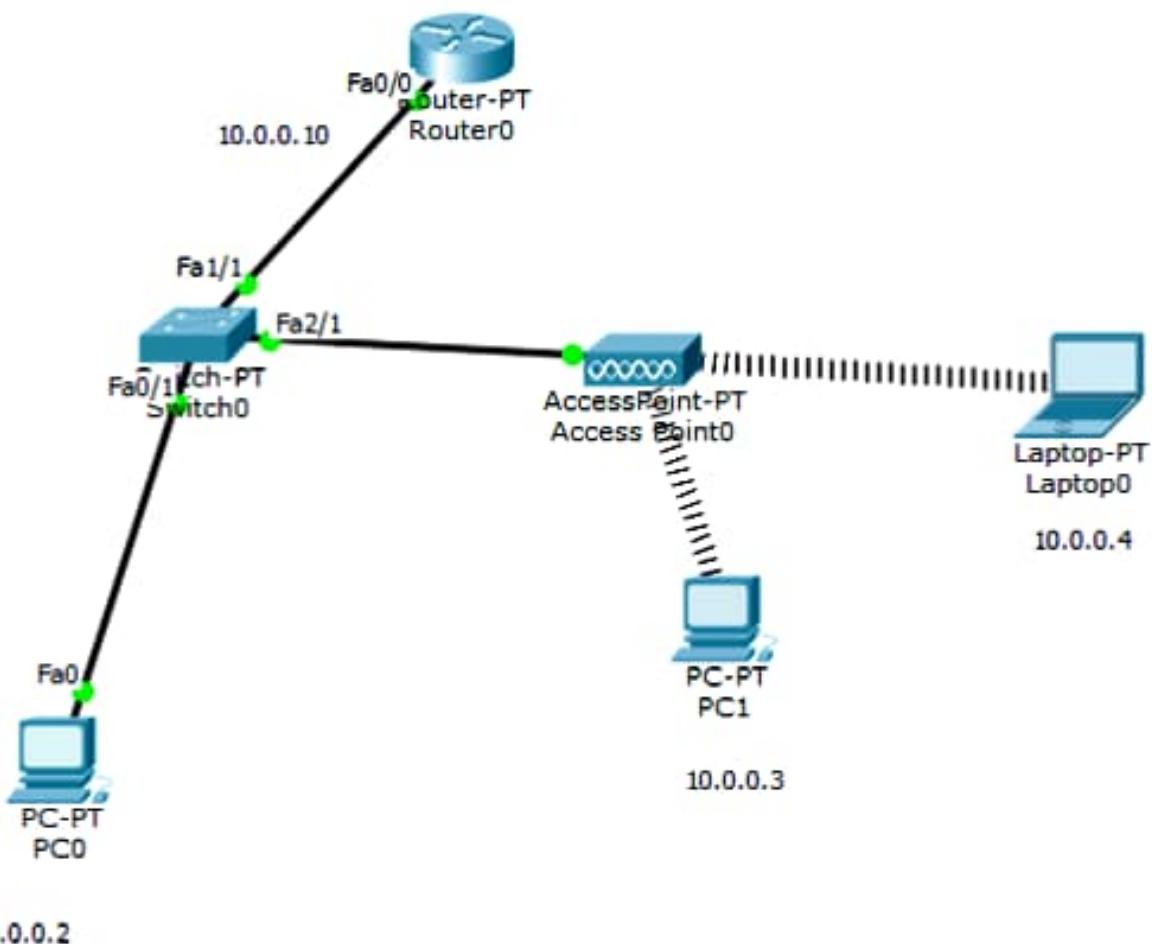
255.0.0.0

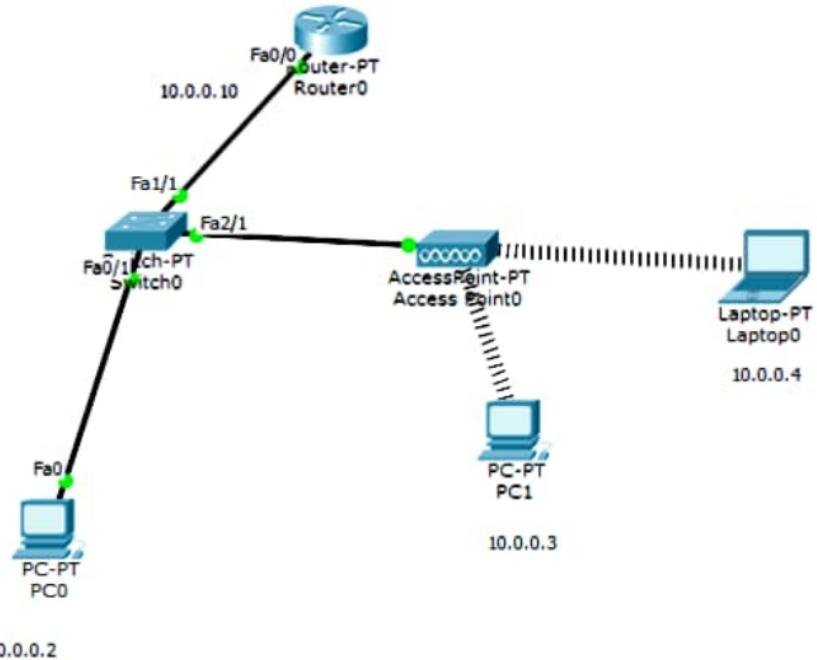
IPv6 Configuration

DHCP

Auto Config

Static





PC0

Physical Config Desktop Custom Interface

## Command Prompt

```

Packet Tracer PC Command Line 1.0
PC>ping 10.0.0.3

Pinging 10.0.0.3 with 32 bytes of data:

Reply from 10.0.0.3: bytes=32 time=21ms TTL=128
Reply from 10.0.0.3: bytes=32 time=13ms TTL=128
Reply from 10.0.0.3: bytes=32 time=6ms TTL=128
Reply from 10.0.0.3: bytes=32 time=8ms 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 = 6ms, Maximum = 21ms, Average = 12ms

PC>ping 10.0.0.4

Pinging 10.0.0.4 with 32 bytes of data:

Reply from 10.0.0.4: bytes=32 time=20ms TTL=128
Reply from 10.0.0.4: bytes=32 time=11ms TTL=128
Reply from 10.0.0.4: bytes=32 time=4ms TTL=128
Reply from 10.0.0.4: bytes=32 time=8ms TTL=128

Ping statistics for 10.0.0.4:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
  Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 20ms, Average = 10ms

```



Physical Config Desktop Custom Interface

## Command Prompt

X

```
Packet Tracer PC Command Line 1.0
```

```
PC>ping 10.0.0.3
```

```
Pinging 10.0.0.3 with 32 bytes of data:
```

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

```
Reply from 10.0.0.3: bytes=32 time=6ms TTL=128
```

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

```
Reply from 10.0.0.3: bytes=32 time=4ms TTL=128
```

```
Ping statistics for 10.0.0.3:
```

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

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

```
    Minimum = 0ms, Maximum = 6ms, Average = 2ms
```

```
PC>ping 10.0.0.4
```

```
Pinging 10.0.0.4 with 32 bytes of data:
```

```
Reply from 10.0.0.4: bytes=32 time=28ms TTL=128
```

```
Reply from 10.0.0.4: bytes=32 time=18ms TTL=128
```

```
Reply from 10.0.0.4: bytes=32 time=14ms TTL=128
```

```
Reply from 10.0.0.4: bytes=32 time=12ms TTL=128
```

```
Ping statistics for 10.0.0.4:
```

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

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

```
    Minimum = 12ms, Maximum = 28ms, Average = 18ms
```

Physical Config Desktop Custom Interface

## Command Prompt

X

```
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=21ms TTL=128
```

```
Reply from 10.0.0.3: bytes=32 time=18ms TTL=128
```

```
Reply from 10.0.0.3: bytes=32 time=14ms TTL=128
```

```
Reply from 10.0.0.3: bytes=32 time=19ms 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 = 14ms, Maximum = 21ms, Average = 18ms
```

```
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=11ms TTL=128
```

```
Reply from 10.0.0.2: bytes=32 time=13ms TTL=128
```

```
Reply from 10.0.0.2: bytes=32 time=12ms TTL=128
```

```
Reply from 10.0.0.2: bytes=32 time=11ms 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 = 11ms, Maximum = 13ms, Average = 11ms
```

```
PC>
```

20/8/23

## Experiment - 11

Q

- To understand the operation of TELNET by accessing the router in server room from a PC in IT Office.

## Topology:

PC  
10.0.0.2Router 1  
10.0.0.1

## Procedure:-

- Configure topology as above. Use copper cross over straight through wire. IP address of PC & gateway and router configuration as normal.

In Router (R1)

Router &gt; enable

Router # config t

router(config) # hostname r1

r1(config) # enable secret r1

r1(config) # interface fastethernet 0/0

r1(config) # ip address 10.0.0.1 255.0.0.0

r1(config-if) # no shutdown

r1(config-if) # line vty 0 5

r1(config-line) # login

1. Login disabled on line 132, until 'password' is set

1. Login disabled on line 133, until 'password' is set

1. Login disabled on line 134, until 'password' is set

1. Login disabled on line 135, until 'password' is set

1. Login disabled on line 136, until 'password' is set

1. Login disabled on line 137, until 'password' is set

r1(config-line) # password p0

r1(config-line) # exit

PTO

11th wr

## Building configuration [OS]

11th

Result: in PC

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 time 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: (typed P2)

r1 > enable

Password: (typed P1)

r1 # show ip route

Codes:

Gateway of last resort is not set

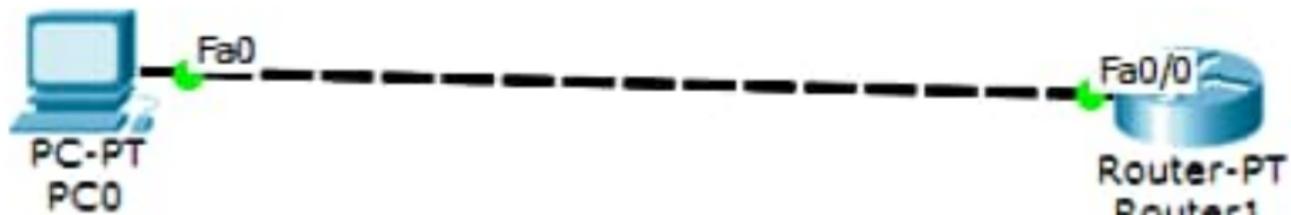
C 10.0.0.0/8 is directly connected, Fastethn

11th

4/0

Observation:-

- i) TELNET is used by terminal emulation programs that allow you to log into a remote host.
- ii) We logged into 10.0.0.1 through 10.0.0.2 device.
- iii) The password when typed isn't visible.



10.0.0.2

10.0.0.1

```
Cisco Internetwork Operating System Software
IOS (tm) PT1000 Software (PT1000-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang
```

```
PT 1001 (PTSC2005) processor (revision 0x200) with 60416K/5120K bytes of memory
.
Processor board ID PT0123 (0123)
PT2005 processor: part number 0, mask 01
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)
```

```
--- System Configuration Dialog ---
```

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

```
Press RETURN to get started!
```

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname rl
rl(config)#enable secret p1
rl(config)#interface 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#
```

## Command Prompt

Packet Tracer PC Command Line 1.0

PC>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time=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:

r1>enable

Password:

r1#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

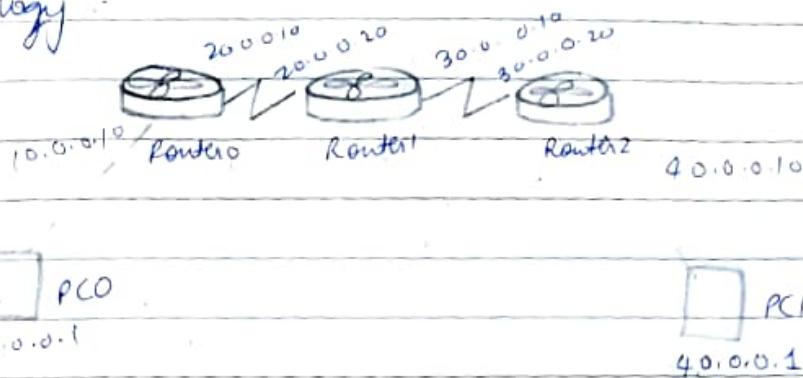
r1#

10/8/23

## Experiment - 12

Demonstrate the TTL/Life of a Packet.

Topology :



Procedure:

- i) Create a 2 pc's and 3 routers configuration.  
use serial DTE b/w routers & copper wires over blwnto PC
- ii) Configure the IP address & gateway of PC & configure routers  
Router>enable (Router 0)

Router# config t

Router(config)# interface fastethernet 0/0

Router(config-if)# ip address 10.0.0.10 255.0.0.0

Router(config-if)# no shutdown

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

Router(config)# ip route 30.0.0.0 255.0.0.0 20.0.0.20

Router(config)# ip route 40.0.0.0 255.0.0.0 20.0.0.20

Router(config)# exit

Router&gt;enable (Router 1)

Router# config t

Router(config)# interface serial 2/0

Router(config-if)# ip address 20.0.0.20 255.0.0.0

Router(config-if)# no shutdown

Router(config-if)# exit

Router(config)# interface serial 3/0

Router(config-if)# ip address 30.0.0.10 255.0.0.0

Router(config-if)# no shutdown

Router(config-if)# exit

PAGE NO.  
DATE

```
Router(config)# ip route 10.0.0.0 255.0.0.0 20.0.0.1  
Router(config)# ip route 40.0.0.0 255.0.0.0 30.0.0.2  
Router(config)# exit  
Router>enable (Router 2)  
Router# config t  
Router(config)# interface serial 2/0  
Router(config-if)# ip address 30.0.0.20 255.0.0.0  
Router(config-if)# no shutdown  
Router(config-if)# exit  
Router(config)# interface fastethernet 0/0  
Router(config-if)# ip address 40.0.0.10 255.0.0.0  
Router(config-if)# no shutdown  
Router(config-if)# exit  
Router(config)# ip route 10.0.0.0 255.0.0.0 30.0.0.1  
Router(config)# ip route 20.0.0.0 255.0.0.0 30.0.0.1
```

- iii) select simulation mode, select simple PDU and select source & destination PCs.
- iv) use capture button to sent PDU, from PC to Router to see routers to PC
- v) click on PDU during every transfer to see the inbound and outbound PDU details. observe the difference in the TTLs

Result :-

PDU information at Device: PC0

outbound PDU details

TTL: 255

PDU information at Device: Router0

Inbound PDU details

TTL: 255

outbound PDU details

TTL: 255

PNV information at Device Router

## Inbound PDU Details

TRL: 254

## outbound PDU details

TTL: 253

PDU information at Device : Router

## Inbound PDU Details

RTL:253

outband PDV details 252 TTL:252

POV information at debris: ~~front~~ pc

## Inband PDU Details

TTL: 252

An example:- for Inbound details of Reorder  
PJO formats

Ethernet II	4	8	16	Bytes 19
Preamble		DEST MAC:	SRC MAC:	
101010...1011		00E0.F939.S3CB	0009.7F03.E0D9	
TYPE: 0x800	DATA (VARIABLE LENGTH)		FCS: 0x8	

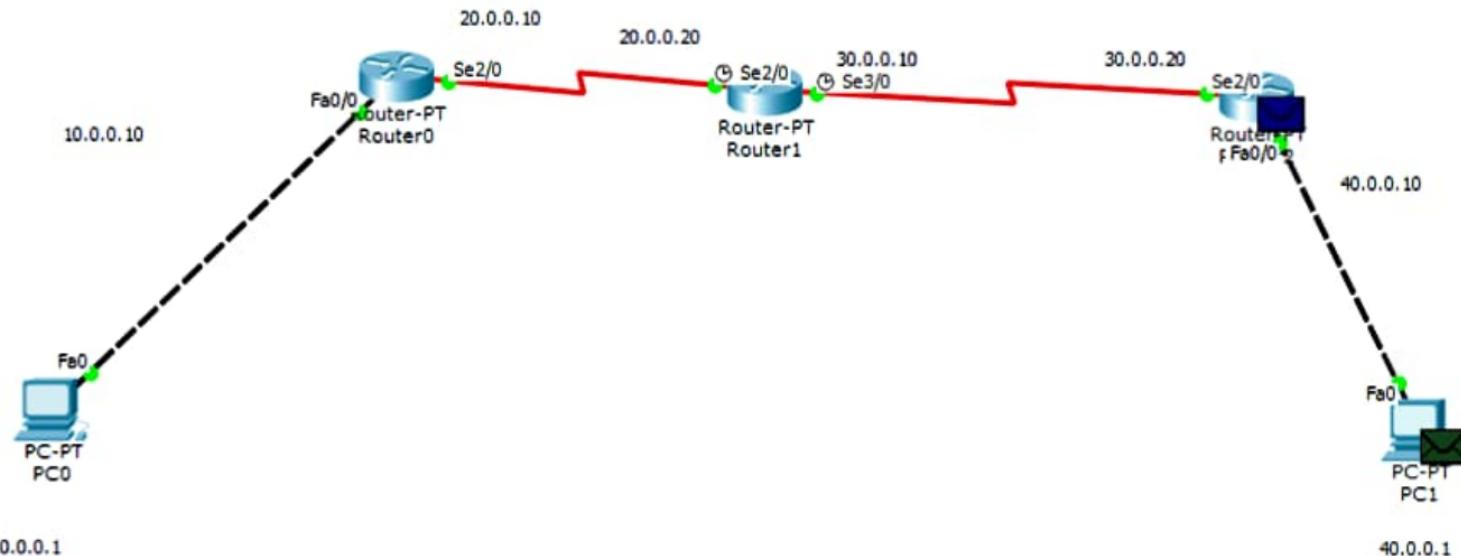
o/p	4	8	16	19	B 31
4	IHL	DSCP:0x0	TL:28		
TTL:255	PRO:0x1	OXO	OXO		
SRC IP: 10.0.0.1		CHKSUM			

DST IP: 40.0.0.1  
OPT: 0x0 0x0  
PATA(VARIABLE LENGTH)

ICMP	8	16	31
TYPE: 0x8	CODE: 0x0	CHECKSUM	
IP: 0x84		SEQ NUMBER: 6	

### Observation:

The TTL is reduced by 1 in every router. Time to live (TTL) is a mechanism which limits the lifespan or lifetime of packets in a computer or network. It is a counter. TTL is set as max TTL  $\rightarrow$  See



```
IOS (tm) PT1000 Software (PT1000-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang
```

```
PT 1001 (PTSC2005) processor (revision 0x200) with 60416K/5120K bytes of memory
Processor board ID PT0123 (0123)
PT2005 processor: part number 0, mask 01
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)
```

--- System Configuration Dialog ---

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

```
Press RETURN to get started!
```

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet 10.0.0.10 255.0.0.0
               ^
% Invalid input detected at '^' marker.

Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

Router(config-if)#exit
Router(config)#interface serial 2/0
Router(config-if)#ip address 20.0.0.10 255.0.0.0
Router(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 30.0.0.0 255.0.0.0 20.0.0.20
Router(config)#ip route 40.0.0.0 255.0.0.0 20.0.0.20
Router(config)#exit
Router#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

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

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

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

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

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

```
Cisco Internetwork Operating System Software
IOS (tm) PT1000 Software (PT1000-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: http://www.cisco.com/techsupport
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Compiled Wed 27-Apr-04 19:01 by miwang
```

```
PT 1001 (PTSC2005) processor (revision 0x200) with 60416K/5120K bytes of memory
.
Processor board ID PT0123 (0123)
PT2005 processor: part number 0, mask 01
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)
```

```
--- System Configuration Dialog ---
```

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

```
Press RETURN to get started!
```

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

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

%LINK-5-CHANGED: Interface Serial3/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 10.0.0.0 255.0.0.0 20.0.0.10
Router(config)#ip route 40.0.0.0 255.0.0.0 30.0.0.20
Router(config)#exit
Router#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

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

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

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
```

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cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, California 95134-1706

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-  
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2 Low-speed serial(sync/async) network interface(s)  
32K bytes of non-volatile configuration memory.  
63488K bytes of ATA CompactFlash (Read/Write)

--- System Configuration Dialog ---

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

Press RETURN to get started!

```
Router>enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface serial 2/0
Router(config-if)#ip address 30.0.0.20 255.0.0.0
Router(config-if)#no shut

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

Router(config-if)#exit
Router(config)#ip route 10.0.0.0 255.0.0.0 30.0.0.10
Router(config)#ip route 20.0.0.0 255.0.0.0 30.0.0.10
Router(config)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

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

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

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

## PDU Information at Device: PC0

## OSI Model      Outbound PDU Details

## PDU Formats

PREAMBLE: 101010...1011	DEST MAC: 00E0.F939.53CB	SRC MAC: 0009.7C05.ED79
TYPE: 0x800	DATA (VARIABLE LENGTH)	FCS: 0x0

IP

0	4	8	16	19	31 Bits
	4	IHL	DSCP: 0x0	TL: 28	
		ID: 0x2	0x0	0x0	
TTL: 255		PRO: 0x1		CHKSUM	
		SRC IP: 10.0.0.1			
		DST IP: 40.0.0.1			
		OPT: 0x0		0x0	
		DATA (VARIABLE LENGTH)			

ICMP

0	8	16	31 Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM	
ID: 0x3		SEQ NUMBER: 2	

# PDU Information at Device: Router0

x

OSI Model    Inbound PDU Details    Outbound PDU Details

## PDU Formats

### Ethernet II

0	4	8	14	19	Byt.
	PREAMBLE: 101010...1011		DEST MAC: 00E0.F939.53CB	SRC MAC: 0009.7C05.E079	
TYPE: 0x800		DATA (VARIABLE LENGTH)		FCS: 0x0	

### IP

0	4	8	16	19	31	Bits
	IHL	DSCP: 0x0		TL: 28		
	ID: 0x1	0x0		0x0		
TTL: 255	PRO: 0x1		CHKSUM			
	SRC IP: 10.0.0.1					
	DST IP: 40.0.0.1					
	OPT: 0x0			0x0		
	DATA (VARIABLE LENGTH)					

### ICMP

0	8	16	31	Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM		
ID: 0x2		SEQ NUMBER: 1		

## PDU Information at Device: Router0



OSI Model    Inbound PDU Details    Outbound PDU Details

### PDU Formats

#### HDLC

0	8	16	32	32+x	48+x	56+x
FLG: 0111 1110	ADR: 0x8f	CONTROL: 0x0	DATA: (VARIABLE LENGTH)	FCS: 0x0	FLG: 0111 1110	

#### IP

0	4	8	16	19	31 Bits
4	IHL	DSCP: 0x0		TL: 28	
		ID: 0x1	0x0	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 Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM	
ID: 0x2		SEQ NUMBER: 1	

# PDU Information at Device: Router1

x

## OSI Model

## Inbound PDU Details

## Outbound PDU Details

### PDU Formats

#### HDLC

0	8	16	32	32+x	48+x	56+x
FLG: 0111 1110	ADR: 0x8f	CONTROL: 0x0	DATA: (VARIABLE LENGTH)	FCS: 0x0	FLG: 0111 1110	

#### IP

0	4	8	16	19	31 Bits
4	IHL	DSCP: 0x0		TL: 28	
		ID: 0xa	0x0	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 Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM	
ID: 0x4		SEQ NUMBER: 6	

# PDU Information at Device: Router1

x

[OSI Model](#)[Inbound PDU Details](#)[Outbound PDU Details](#)

## PDU Formats

### HDLC

0	9	16	32	32+x	48+x	56+x
FLG: 0111 1110	ADR: 0x8f	CONTROL: 0x0	DATA: (VARIABLE LENGTH)	FCS: 0x0	FLG: 0111 1110	

### IP

0	4	8	16	19	31 Bits
4	IHL	DSCP: 0x0		TL: 28	
		ID: 0xa	0x0	0x0	
TTL: 253		PRO: 0x1		CHKSUM	
		SRC IP: 10.0.0.1			
		DST IP: 40.0.0.1			
		OPT: 0x0		0x0	
		DATA (VARIABLE LENGTH)			

### ICMP

0	8	16	31 Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM	
ID: 0x4		SEQ NUMBER: 6	

# PDU Information at Device: Router2

x

OSI Model    Inbound PDU Details    Outbound PDU Details

## 1 PDU Formats

### HDLC

0	8	16	32	32+x	40+x	56+:
FLG: 0111 1110	ADR: 0x8f	CONTROL: 0x0	DATA: (VARIABLE LENGTH)	FCS: 0x0	FLG: 0111 1110	

### IP

0	4	8	16	19	31 Bits
4	IHL	DSCP: 0x0		TL: 28	
	ID: 0xa		0x0	0x0	
TTL: 253	PRO: 0x1		CHKSUM		
	SRC IP: 10.0.0.1				
	DST IP: 40.0.0.1				
	OPT: 0x0		0x0		
	DATA (VARIABLE LENGTH)				

### ICMP

0	8	16	31 Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM	
ID: 0x4		SEQ NUMBER: 6	

# PDU Information at Device: Router2

x

OSI Model    Inbound PDU Details    Outbound PDU Details

## PDU Formats

### Ethernet II

0	4	8	14	19	Byt.
PREAMBLE: 101010...1011	DEST MAC: 0010.111B.DD8E		SRC MAC: 00D0.FF93.1A78		
TYPE: 0x800	DATA (VARIABLE LENGTH)		FCS: 0x0		

### IP

0	4	8	16	19	31	Bits
4	IHL	DSCP: 0x0	TTL: 255			
ID: 0xa	0x0	0x0	CHKSUM			
TTL: 252	PRO: 0x1	SRC IP: 10.0.0.1				
DST IP: 40.0.0.1						
OPT: 0x0			0x0			
DATA (VARIABLE LENGTH)						

### ICMP

0	8	16	31	Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM		
ID: 0x4	SEQ NUMBER: 6			

# PDU Information at Device: PC1

x

## OSI Model

## Inbound PDU Details

## Outbound PDU Details

1

### PDU Formats

#### Ethernet II

0	4	8	14	19	Bytes
PREAMBLE: 101010...1011		DEST MAC: 0010.111B.DD8E		SRC MAC: 00D0.FF93.1A78	
TYPE: 0x800		DATA (VARIABLE LENGTH)		FCS: 0x0	

#### IP

0	4	8	16	19	31 Bits
4	IHL	DSCP: 0x0		TL: 28	
		ID: 0xa	0x0	0x0	
TTL: 252		PRO: 0x1		CHKSUM	
		SRC IP: 10.0.0.1			
		DST IP: 40.0.0.1			
		OPT: 0x0		0x0	
		DATA (VARIABLE LENGTH)			

#### ICMP

0	8	16	31 Bits
TYPE: 0x8	CODE: 0x0	CHECKSUM	
ID: 0x4		SEQ NUMBER: 6	

17/8/23

## CYCLE - 2

write a program for error detecting code using CRC  
CRC (16-bits)  $x^{16} + x^{12} + x^5 + x^3 + 1 \rightarrow G(x)$   
Degree

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

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

```
#define N strlen (division)
```

```
char data [30];
```

```
char rem [30];
```

```
char division [10];
```

```
int dlength, i, j;
```

```
void xor()
```

```
{ for (j=1; j < N; j++)
```

```
    rem[j] = ((rem[j] == division[j]) ? '0' : '1');
```

```
}
```

```
void CRC()
```

```
{ for (i=0; i < N; i++)
```

```
    rem[i] = data[i];
```

```
do
```

```
    if (rem[0] == '1') XOR();
```

```
    for (j=0; j < N-1; j++) rem[j] = rem[j+1];
```

```
    rem[N-1] = data[i++];
```

```
}
```

```
while (i <= dlength + 1);
```

```
}
```

```
void receiver()
```

```
{ printf ("Enter the data to be received: ");
```

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

```
printf ("Data received: %s", data);
```

```
CRC();
```

```
for (i=0; (i < N-1) && (rem[i] == '1'); i++)
```

```
{ if (i == N-1) printf ("\n Error detected in data\n");
```

```
else printf ("\n No error detected in data\n");
```

```
}
```

```

int main()
{
    int i;
    printf("Enter data to be transmitted: ");
    scanf("%s", data);
    printf("\nEnter the divisor: ");
    scanf("%s", divisor);
    dlength = strlen(data);
    for (i = dlength; i < dlength + 1; i++)
        data[i] = '0';
    printf("In Data padded with zeros: %s", data);
    crc();
    printf("\nThe remainder or CRC is: %s", rem);
    for (i = dlength; i < dlength + 1; i++)
        data[i] = rem[i - dlength];
    printf("In Fixed data being sent: %s", data);
    receiver();
    return 0;
}

```

## OUTPUT :

- 1) Enter data to be transmitted : 1001101  
Enter the Divisor: 1011  
Data padded with ~~16~~<sup>16</sup> zeroes : 10011010000000000000  
The remainder of CRC is : 101  
Final data being sent : 100110100000000000001011  
Enter the data being received : 10011010000000000000111  
Data received : 10011010000000000000111  
No error detected in data

2) Enter data to be transmitted: 1001101  
Enter the Divisor: 1011  
Data padded with ~~16~~<sup>16</sup> zeroes : 100110100000000000000000  
The remainder of CRC is : 101  
Final data being sent: 100110100000000000000000111  
Enter the data being received: 100110100000000000000000111  
Data received: 1001101000000000000000001111  
Error detected in data

```
1 #include<stdio.h>
2 #include<string.h>
3 #define N strlen(divisor)
4 char data[28];
5 char rem[28];
6 char divisor[10];
7 int dlength,i,j;
8 void XOR(){
9     for(j = 1;j < N; j++)
10        rem[j] = (( rem[j] == divisor[j])?'0':'1');
11    }
12 }
13
14 void receiver(){
15
16     printf("Enter the received data: ");
17     scanf("%s", data);
18     printf("\n\n");
19     printf("Data received: %s", data);
20
21     crc();
22
23     for(i=0;(i<N-1) && (rem[i]!='1');i++);
24        if(i<N-1)
25            printf("\nError detected\n\n");
26        else
27            printf("\nNo error detected\n\n");
28 }
29
30 void crc(){
31
32     for(i=0;i<N;i++)
33         rem[i]=data[i];
34     do{
35
36         if(rem[0]=='1')
37             XOR();
38
39         for(j=0;j<N-1;j++)
40             rem[j]=rem[j+1];
41
42         rem[j]=data[i++];
43     }
44     while(i<=dlength+16);
45
46 }
47
48 int main()
49 { int c=0;
50
51     printf("\nEnter data to be transmitted: ");
52     scanf("%s",data);
53     printf("\nEnter the Divisor: ");
54     scanf("%s",divisor);
55     dlength=strlen(data);
56     for(i=dlength;i<dlength+16;i++)
57         data[i]='0';
58     printf("\n");
59     printf("\n Data padded with 16 zeros : %s",data);
60     printf("\n");
61     crc();
62     printf("\nCRC or Check value is : %s",rem);
63     printf("\n rem strlen is : %d ", strlen(rem));
64     for(i=dlength+13;i<dlength+16;i++)
65     {
66         //printf("\n %s",data);
67         data[i]= rem[c++];
68     }
69     printf("\n");
70     printf("\n Final data to be sent : %s",data);
71     printf("\n\n");
72
73     receiver();
74     return 0;
75 }
```

Enter data to be transmitted: 1001101

Enter the Divisor: 1011

Data padded with 16 zeros : 100110100000000000000000000

CRC or Check value is : 111

Final data to be sent : 10011010000000000000111

Enter the received data: 10011010000000000000111

Data received: 10011010000000000000111

No error detected

Enter data to be transmitted: 1001101

Enter the Divisor: 1011

Data padded with 16 zeros : 10011010000000000000000000

CRC or Check value is : 111

Final data to be sent : 10011010000000000000111

Enter the received data: 10011000000000000000111

Data received: 10011000000000000000111

Error detected

(27/8/23)

Write a program for congestion control using leaky bucket algorithm.

```
#include <stdio.h>
int main()
{
    int in, out, bsize, n, available = 0;
    printf("Enter the bucket size: ");
    scanf("%d", &bsize);
    printf("Enter the outgoing rate: ");
    scanf("%d", &out);
    printf("Enter the no of inputs: ");
    scanf("%d", &n);
    while (n != 0)
    {
        printf("Enter the incoming packet size: ");
        scanf("%d", &in);
        printf("Incoming packet size %d\n", in);
        if (in <= (bsize - available))
        {
            available += in;
            printf("Bucket buffer size %d out of %d\n", available, bsize);
        }
        else
        {
            printf("Dropped %d no. of packets\n", in - (bsize - available));
            printf("Bucket buffer size %d out of %d\n", available, bsize);
            available = bsize;
        }
        available = available - out;
        printf("After outgoing %d packets left out of %d in buffer\n", available, bsize);
        n--;
    }
}
```

Ques no. 1

Enter the bucket size: 1000

Enter the outgoing rate: 200

Enter the no. of inputs: 6

Enter the incoming packet size: 200

Incoming packet size 200

Bucket buffer size 200 out of 1000

After outgoing 0 packets left out of 1000 in buffer

Enter the incoming packet size: 400

Incoming packet size 400

Bucket buffer size 400 out of 1000 buffer

After outgoing 200 packets left out of 1000 in buffer

Enter the incoming packet size: 450

Incoming packet size 450

Bucket buffer size 450 out of 1000

After outgoing 450 packets left out of 1000 in buffer

Enter the incoming packet size: 500

Incoming packet size 500

Bucket buffer size 500 out of 1000

After outgoing 750 packets left out of 1000 in buffer

Enter the incoming packet size: 100

Bucket buffer size 850 out of 1000

After outgoing 650 packets left out of 1000 in buffer

Enter the incoming packet size: 0

Bucket buffer size 650 out of 1000

After outgoing 450 packets left out of 1000 in buffer

Enter the bucket size: 1000

Enter the outgoing rate: 500

Enter the no. of inputs: 1

Enter the incoming packet size: 2000

Incoming packet size 2000

Dropped 1000 no. of packets

Bucket buffer size 0 out of 1000

After outgoing 500 packets left out of 1000 in buffer

Topic

No.

2) After outgoing 450 packets left out of 1000 in buffer

```
1 #include<stdio.h>
2
3 int main(){
4     int in, out, bsize, n, available = 0;
5     printf("Enter the bucket size: ");
6     scanf("%d", &bsize);
7     printf("Enter the outgoing rate: ");
8     scanf("%d", &out);
9     printf("Enter the no of inputs: ");
10    scanf("%d", &n);
11
12    while (n != 0) {
13        printf("Enter the incoming packet size : ");
14        scanf("%d", &in);
15        printf("Incoming packet size %d\n", in);
16        if (in <= (bsize - available)){
17            available += in;
18            printf("Bucket buffer size %d out of %d\n", available, bsize);
19        } else {
20            printf("Dropped %d no of packets\n", in - (bsize - available));
21            printf("Bucket buffer size %d out of %d\n", available, bsize);
22            available = bsize;
23        }
24        available = available - out;
25        printf("After outgoing %d packets left out of %d in buffer\n", available, bsize);
26        n--;
27    }
28 }
```

```
Enter the bucket size: 1000
Enter the outgoing rate: 200
Enter the no of inputs: 6
Enter the incoming packet size : 200
Incoming packet size 200
Bucket buffer size 200 out of 1000
After outgoing 0 packets left out of 1000 in buffer
Enter the incoming packet size : 400
Incoming packet size 400
Bucket buffer size 400 out of 1000
After outgoing 200 packets left out of 1000 in buffer
Enter the incoming packet size : 100
Incoming packet size 100
Bucket buffer size 300 out of 1000
After outgoing 100 packets left out of 1000 in buffer
Enter the incoming packet size : 300
Incoming packet size 300
Bucket buffer size 400 out of 1000
After outgoing 200 packets left out of 1000 in buffer
Enter the incoming packet size : 2000
Incoming packet size 2000
Dropped 1200 no of packets
Bucket buffer size 200 out of 1000
After outgoing 800 packets left out of 1000 in buffer
Enter the incoming packet size : 200
Incoming packet size 200
Bucket buffer size 1000 out of 1000
After outgoing 800 packets left out of 1000 in buffer
```

24/1/23

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:

ClientTCP.py

```
from socket import *
serverName = "127.0.0.1"
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort))
sentence = input("In Enter file name: ")
clientSocket.send(sentence.encode())
fileContent = clientSocket.recv(1024).decode()
print("In From Server: \n")
print(fileContent)
clientSocket.close()
```

ServerTCP.py

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

OUTPUT:

server side:

The server is ready to receive

client side:

Enter file name: serverTCP.py  
from server:

from socket import \*

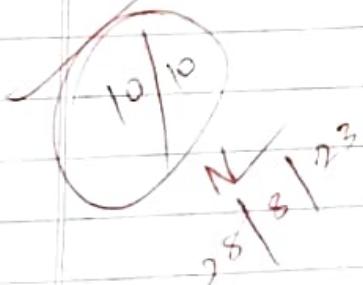
(Code under serverTCP.py is printed as written above)

Server side:

The server is ready to receive

Sent contents of serverTCP.py

The server is ready to receive



File Edit Format Run Options Window Help

```
from socket import*
serverName = '127.0.0.1'
serverPort = 12000
clientSocket = socket(AF_INET, SOCK_STREAM)
clientSocket.connect((serverName, serverPort))
sentence = input("\nEnter file name: ")
clientSocket.send(sentence.encode())
filecontents = clientSocket.recv(1024).decode()
print('\nFrom server:\n')
print(filecontents)
clientSocket.close()
```

File Edit Format Run Options Window Help

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

File Edit Shell Options Window Help

Python 3.7.3 (v3.7.3:ef4ec6ed12, Mar 25 2019, 21:26:53) [MSC v.1916 32 bit (Inte  
1)] on win32

Type "help", "copyright", "credits" or "license()" for more information.

>>>

RESTART: C:/Users/Student/AppData/Local/Programs/Python/Python37-32/ServerTCP.p  
y

The server is ready to receive

Sent contents of ServerTCP.py

The server is ready to receive

File Edit Shell Debug Options Window Help

```
type help, copyright, credits or license() for more information
>>>
RESTART: C:/Users/Student/AppData/Local/Programs/Python/Python37-32/Cl
Traceback (most recent call last):
  File "C:/Users/Student/AppData/Local/Programs/Python/Python37-32/Cl
    clientSocket.connect((serverName, serverPort))
NameError: name 'clientSocket' is not defined
>>>
RESTART: C:/Users/Student/AppData/Local/Programs/Python/Python37-32/Cl

Enter file name: ServerTCP.py

From server:

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

>>>
```

29/8/23

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.

clientUPD.py

```
from socket import *
ServerName = "127.0.0.1"
ServerPort = 12000
clientSocket = socket(AF_INET, SOCK_DGRAM)
Sentence = input("Enter file name: ")
clientSocket.sendto(bytes(Sentence, "UTF-8"), (ServerName, ServerPort))
fileContent, serverAddress = clientSocket.recvfrom(2048)
print("Reply from server: \n")
print(fileContent.decode("UTF-8"))
for i in fileContent:
    print(str(i), end=' ')
clientSocket.close()
clientSocket.close()
```

ServerUPD.py

```
from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print("The server is ready to receive")
while True:
    Sentence, clientAddress = serverSocket.recvfrom(2048)
    sentence = sentence.decode("UTF-8")
    file = open(sentence, "r")
    content = file.read(2048)
    serverSocket.sendto(content, clientAddress)
```

PAGE NO.  
DATE

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

OUTPUT:

Server side

The server is ready to receive

Sent content of sever UDP.py  
The server is ready to receive

client side

Enter file name: sever UDP.py

Reply from server:  
from socket import \*

10/10 (code of sever UDP.py written above is printed)

✓  
S/23  
28

File Edit Format Run Options Window Help

```
from socket import *
serverName = "127.0.0.1"

serverPort = 12000
clientSocket = socket(AF_INET, SOCK_DGRAM)
sentence = input("\nEnter file name: ")
clientSocket.sendto(bytes(sentence, "utf-8"), (serverName, serverPort))
filecontents, serverAddress = clientSocket.recvfrom(2048)
print ('\nReply from Server:\n')
print (filecontents.decode("utf-8"))
clientSocket.close()
```

File Edit Format Run Options Window Help

```
from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print ("The server is ready to receive")
while 1:
    sentence, clientAddress = serverSocket.recvfrom(2048)
    sentence = sentence.decode("utf-8")
    file=open(sentence, "r")
    con=file.read(2048)
    serverSocket.sendto(bytes(con, "utf-8"),clientAddress)
    print ('\nSent contents of ', end = ' ')
    print (sentence)
    file.close()
```

```
= RESTART: C:/Users/Aditi/AppData/Local/Programs/Python/Python311/ServerUDP.py =
The server is ready to receive

Sent contents of  ServerUDP.py
```

```
= RESTART: C:/Users/Aditi/AppData/Local/Programs/Python/Python311/ClientUDP.py =
```

```
Enter file name: ServerUDP.py
```

```
Reply from Server:
```

```
from socket import *
serverPort = 12000
serverSocket = socket(AF_INET, SOCK_DGRAM)
serverSocket.bind(("127.0.0.1", serverPort))
print ("The server is ready to receive")
while 1:
    sentence, clientAddress = serverSocket.recvfrom(2048)
    sentence = sentence.decode("utf-8")
    file=open(sentence,"r")
    con=file.read(2048)
    serverSocket.sendto(bytes(con,"utf-8"),clientAddress)
    print ('\nSent contents of ', end = ' ')
    print (sentence)
    file.close()
```

```
>>
```

3/18/23

## Wireshark

Wireshark, a powerful open-source network protocol analyzer, empowers network professionals to explore and understand the intricacies of data transmission across networks. This tool plays a pivotal role in diagnosing network issues, optimizing performance, and ensuring robust security measures. In this write-up, we delve into the core facilities of Wireshark and highlight its significance in network analysis.

### Functionality overview:

#### i) Packet capture & filtering:

Wireshark's primary function lies in capturing network packets from various interfaces. Its flexible filtering options enable users to capture specific types of traffic based on protocols, source/destination addresses, and even keywords within packet payloads.

#### ii) Real-time Analysis:

Wireshark's real-time monitoring capability is invaluable for observing ongoing network activities. This feature aids in detecting sudden traffic spikes, unusual protocol behavior, and unauthorized network usage.

#### iii) Protocol Analysis:

It decrypts encrypted protocols offering insights into secure communication methods.

- v) Packet Reconstruction: Allows reassemble of fragmented packets.
  - vi) Statistical Information: Presents statistical analysis of captured data.
  - vii) color-coded visualization: Employs color-coded packets to indicate various aspects such as error.
  - viii) customizable display: This tool offers a customizable interface where users can choose which fields to display & how to arrange them.
- Procedure
- i) In the 1<sup>st</sup> window, select ethernet.
  - ii) Filter TCP or any require protocol
  - iii) Click on it, new window opens.
  - iv) Dropdown : Transmission Control Protocol,  
 Src Port : 62148 , Dst Port : 4f3, seq:2,  
 Ack:65, Len:6
  - v) This is available available in the prev window in the left split of screen
  - vi) clicking on dropdown of it, clicking on any of them highlights its counterpart in right split side of screen
  - vii) In cmd, type ipconfig  
 ↗ RESULT:

Windows IP configuration  
 Ethernet adapter Ethernet:

connection-specific DNS suffix. :

Link-local IPv6 Address ... : fe80::be78:f6ff  
 brd ed25:c329%1

IPv4 Address ... : 10.124.2.83

Subnet Mask ... : 255.255.0.0

Default Gateway ... : 10.127.0.11

N  
 1/1/23