

Experiment - I

Introduction to Networking And Networking Devices :-

- **Computer Network:-** A network is a set of devices or nodes connected by communication links. A node can be a computer, printer or any other device capable of sending and/or receiving data generated by other nodes on the network.
- **Computer Networking:** Computer Networking is the organization of the communication process among various computing devices or computer system that are linked together to exchange information and share resources. All this communication is governed by the set of rules called Internet Protocol.
- Computer Networking depends upon the theoretical application and practical implementation of fields like computer engineering, computer science, information technology and telecommunication
- **Networking/Intermediate Devices** Many interconnection device are required in a modern network, from the interface that allows a single computer to communicate with other computers via a LAN cable or a telephone line, to the large and complex switching devices that inter connects 2 or more entire networks. The main categories of interconnection devices used in computer networks are :-

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(I) Hubs:- If we talk about network on a large scale hubs required to build a network. All the computer are connected directly to the hub that performs as a centralised device of the network. Where data is sent to the hub it passes or broadcast the data to all ports of the hub and there it is sent to the destination computer on the network. If hub fails to perform its routine function it will halt the working of the entire network until it is put in the normal condition.

(II) Switches:- It's another important device, When we talk about computer network on a broader spectrum. It is used for the same places as hub, but the difference b/w the 2 is that switching table stores the MAC address of every computer connected to it and sends the data to only the requested addresses, unlike hub which broadcast the data to all the ports.

(III) Gateways:- As the name suggest, it is some kind of passing through something. Gateways can be software or also a device. Gateway device connects LAN with the internet. Its basic purpose is to provide security to the network. By using the gateways, incoming or outgoing traffic can be monitored for any malicious activity within the network which can be harmful to integrity.

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(IV) Modem:- It can be 2 types, one modem is, in every computer which we use to connect to the network using our telephone line by dialing to our ISP (Internet Service Provider) and the another one is used to connect to DSL (Digital Subscribers Line) function however are same for both the types of modem. They are used for converting analog to digital signal (modulation) and digital to analog signals (demodulation) so that signals can travel through telephone line.

(V) Router:- It is an intelligent device which routes the data to destination computers, it helps in connecting 2 different logical and physical networks together. In a small network Server is connected to the router along with client for communication is not possible, it is the soul of the network without which distribution of internet and other network data is impossible to the entire network. It works very same when it comes to wireless network using wireless network router. It uses a software known as routing table. It is used to store the source and destination address.

Experiment - 2

Introduction to networking Cabling & connectors.

Networking cables are networking hardware used to connect one network device to other network devices or to connect two or more computers to share printers, scanner etc. Different types of network cables, such as coaxial cables, optical, fibre cable & twisted pair cables, are used depending on Network Physical layer & size.

- **Straight-Through Wired Cables:-**

Straight through refers to cables that have the assignment on each end of the cable. In other words pin 1 connects A goes to pin 1 on connector B, pin 2 to pin 2 etc. Straight through wired cables are most commonly used to connect a host to client. When we talk about Cat 5e patch cables, the straight-through wired Cat 5e patch cable is used to connect computers, printers & other network client device to the router switch or hub.

- **Serial cable:-**

A Serial cable is a cable used to transfer information b/w two device using a serial communication protocol. The form of connections depend on the particular serial port used.

• Cross Over Cable

Not modern cables are example of the category of crossover cables.
A cross over cable going two network devices of the same type,
such as two PCs or two network switches.

The use of Ethernet crossover cables was
common on older local networks years ago when connecting
two PCs directly together externally, Ethernet crossover cables
appear nearly identical to ordinary, the only visible
the order of color coded wires appearing on the cables and
connectors.

As an example you will see that pin 1 on connector A goes to pin 3
on connector B. Pin 2 on connector A goes to pin 6 on connector B.
Crossover cables are most commonly used to connect two hosts directly.

• Roll over wired Cables:-

Roll over wired cables most commonly called manager cables, have
opposite pin assignment on each end of the cables or in other
words it is "rolled over" pin 1 of connector A would be
connected to pin 8 of connector B, pin 2 of connector A would be
connected to pin 7 of connector B, and so on.

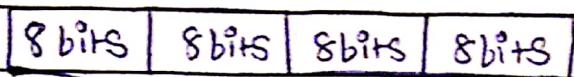
These are most commonly used to connect to a device
console port to make programming changes to the device

Experiment - 3

AIM:- INTRODUCTION TO IP and IPv4 Subnetting

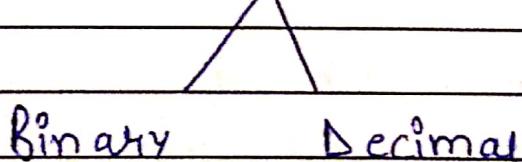
IP Address: Unique identity of an interface in a IP NW in order to send & receive package through postal system, every house needs a unique IP address.

Format :- IP address consist of 32 bits. These bits are divided into 4 section.



32 bits [4 section each of 8 bits.]

2 Notation are used for writing the IP address :-

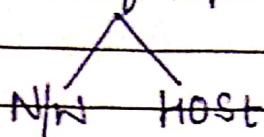


~~IN Binary notation :-~~

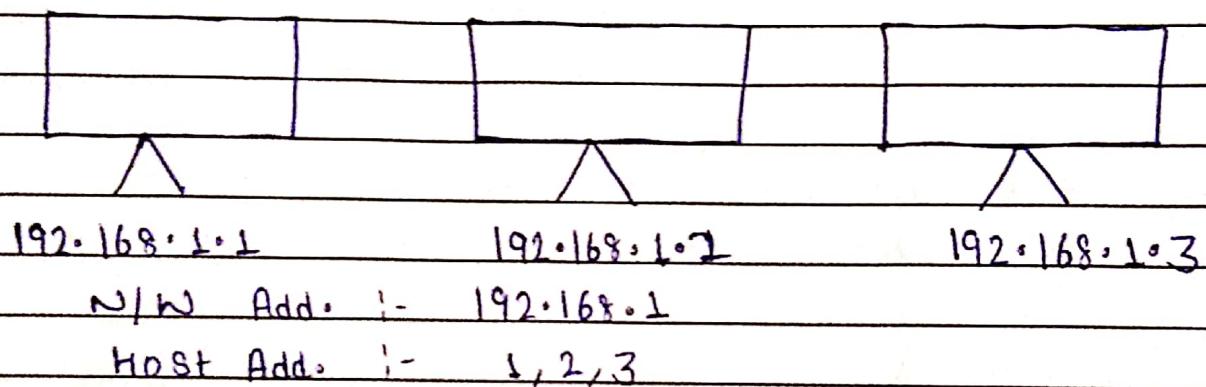
0 0 0 0 1 0 1 0 . 0 0 0 0 1 0 1 0 . 0 0 0 0 1 0 1 0 . 0 0 0 0 1 0 1 0

~~Decimal :- 10 . 10 . 10 . 10~~

Components of IP address



IP addresses are like a postal address whether it is postal address or IP address, it contain 2 addresses, group & individual address. The group address is common for all the members and Individual address is unique for each members.



In an IP address, how many bits are used in network address and how many bits are used in host address is determined by Subnet mask. Just like an IP address, SM is also a 32 bits long address and can be written in both binary & decimal Notation

~~SM in decimal notation~~

255.0.0.0

Binary

11111111.00000000.00000000.00000000

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Decimal :- 255.255.0.0

11111111.11111111.00000000.00000000

255.255.255.0

11111111.11111111.11111111.00000000

⇒ Egs of IP address with subnet Mask are:-

10.10.10.10

255.0.0.0

00001010.00001010.00001010.00001010

11111111.00000000.00000000.00000000

→ 172.168.1.1

255.255.0.0

Classes in IP Addressing:-

A, First bit of the first byte remains off (0)

B First bit of the first byte remains on 3
Second bit of the first byte remains off

C first and second bit of first byte remain on 3 bits off

D first, second, third remain on 3 bytes off

E First, second, third, fourth bit of first byte remain on.

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Class	Starting bits in binary	Decimal value of 1 st octet in range
A	0	0 to 127
B	10	128 to 191
C	110	192 to 223
D	1110	224 to 239
E	11110	240 to 255

Class	Starting Address	Ending Address	Subnet Mask
A	0.0.0.0	127.255.255.255	255.0.0.0
B	128.0.0.0	191.255.255.255	255.255.0.0
C	192.0.0.0	223.255.255.255	255.255.255.0
D	224.0.0.0	239.255.255.255	Not applicable
E	240.0.0.0	255.255.255.255	Not applicable

0.0.0.0 → Represent all the network

127.0.0.0 to 127.255.255.255 → IP range is reserved for loopback testing

224.0.0.0 to 239.255.255.255 → Reserved for multicast

240.0.0.0 to 255.255.255.255 → Reserved for future use

255.255.255.255 → Represent for all hosts.

IP address v/s Network address :-

IP address:- combination of 2 separate addresses,
N/W address & host address.

Network Address:- It is an IP address without host address.
Any IP address is an IP address in which all host bits are turned off.

NOTE :- we can only turn on or off the reserved host bits. we cannot turn off or on Reserved n/w bits.

In class A, B, C first 8, 16, 24 bits are reserved for n/w addresses.

	8 bits	8 bits	8 bits	8 bits
Class A	Network	Host	Host	Host
Class B	Network	Network	Host	Host
Class C	Network	Network	Network	Host

Private IP addresses V/S Public IP addresses
Class A, B & C are defined as private IP address

In Class A \rightarrow 10.0.0.0 to 10.255.255.255

B \rightarrow 172.16.0.0 to 172.31.255.255

C \rightarrow 192.168.0.0 to 192.168.255.255

Except private IP address & reserved IP address, all remaining IP addresses of Class A, B & C are public IP addresses

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Public IP address

Used in public n/w such as Internet. These are maintained & regulated by ICANN / Internet Corporation for Assigned Names & Numbers.

Private IP address

Used in private n/w. They are locally significant & not routable in public n/w.

SUBNETTING:-

Dividing a single large network in multiple smaller n/w's. A single large n/w is first like a town w/out any sectors & street address. In such a town, a postman may take 3 to 4 days in finding a single address. While if town is divided into sectors & streets. We can easily find any address in < one hour.

Subnetting is used to divide a large IP address n/w in smaller IP n/w known as subnets.

~~IPv4 Address~~

IPv4, also known as the fourth version of Internet protocol is the core protocol that routes most of the Internet traffic. This is connectionless protocol, which means that the state of the connection is not preserved and the data is transmitted.

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to the Receiver without ensuring that the recipient is available or not.

IPV4 uses 32 bit addressing which allow total of $4\ 294\ 967\ 296$ (2^{32}) addresses. Some are Reserved for Public and some for Private network.

An IPV4 address (dotted decimal notation)

172.16.254.1

10101100.00010000.1111110.00000001

↓

One byte = Eight bits

↓

Thirty-two bits \rightarrow 4 Byte

IPV4 Header format:-

VER(4)	HLLEN(4)	D/S+Type of service(8)	Total length (16 bits)	Fragmentation offset (13 bits)
				Fragmentation offset (13 bits)
Identification (16 bits)		Flags(3 bits)		
Time to live	Protocol		Header checksum (16 bits)	
		Source IP Address (32) bits		
		Destination IP Address (32) bits		
	OPTION + Padding	(32) bits		

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- 1 Version:- This field defines the version of IP. It is static 4 bit value.
- 2 Header length:- This field defines the length of the datagram header. It is 4 bit value.
- 3 Type of service:- It is 8 bit value. It is used tell the N/W how to treat the IP Packet. These bit are generally used to indicate the quality of service for the IP Packet.
- 4 Packet length:- 16 bit value. It is used to indicate the size of packet. Max size is 65536 byte.
- 5 Identification:- 16 bit field used for reassembling the packet at the destination.
- 6 Flags:- It is 3 bits value. It indicate if the IP packet can be further fragmented or not and if the packet is the last fragment or not of a larger transfer.
- 7 Fragment offset:- 13 bit value used in the reassembly process at the destination.
- 8 Time to live:- 8 bit value indicate how long IP packet exist in N/W.
- 9 Protocol:- 8 bit value telling the type of protocol being used
- 10 Header checksum:- It is 16 bit value. It is used to indicate error in the header only. Every node in the N/W has to check and re-insert a new checksum as the header changes at every node.

Source Address:- 32 bits value representing the IP address of packet final destination.

Options:- Options are not used for every data-gram. They are used for N/W testing and debugging.

Padding:- Variable size bit field. These bits are used to ensure a 32 bit boundary for the header is achieved.

IPv4 Address Classes :-

Class	Address Range	Binary State	Used for
A	0.0.0.0 to 127.255.255.255	0	Very large N/W
B	128.0.0.0 to 191.255.255.255	10	Medium N/W
C	192.0.0.0 to 223.255.255.255	110	Small N/W
D	224.0.0.0 to 239.255.255.255	1110	Multicast
E	240.0.0.0 to 247.255.255.255	1111	experimental

Classless Addressing:-

To reduce the wastage of IP address in a block, we use Sub-netting. What we do is that we use host id bits as net id bits of a classful IP address. We give the IP address and define the number of bits for mask along with it, like, 192.168.1.1/28. Here, subnet mask is found by putting the given number of bits out of 32 as 1, like, in the given address, we need to put 28 out of 32 bits as 1 and

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Host as 0, and so, the subnet mask would be 255.255.255.240

Some Values Calculated in subnetting:-

- 1.) Number of Subnet :- Given bits for mask - No. of bits in subnet mask
- 2.) Subnet address:- AND result of Subnet mask and the given IP address
- 3.) Broad last address:- By Putting the host bits as 1 and retaining the N/W bits as in the IP address
- 4.) No. of hosts per subnet :- $2^{(32 - \text{Given bits})} - 2$
- 5.) First Host ID:- Subnet address + ~~Number of hosts~~ 1
- 6.) Last Host ID:- Subnet Address + Number of hosts

Example :- Given IP Address 172.16.0.0/25 find the No. of Subnet & No. of host per subnet. Also, find first subnet block, Subnet Address, First Host ID, last host id, & Broad last Address

Solution:- This is Class B address. So No. of subnets = $2^{\frac{(25-16)}{8}} = 2^9 = 512$

No. of host per N/W :- $2^{(32-25)} - 2 = 2^7 - 2 = 128 - 2 = 126$

For the first subnet block, we have Subnet Address = 0.0,

First host ID = 0.1, last host id = 0.126 and Broad last Address = 0.127.

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CLASS FULL ADDRESSING →

The 32 bit IP address is divide into five sub-classes .

Class A, B, C, D, E each of these have valid range IP address

Class D, E are reserved for Multicast and Research purpose .

The order of bits in the first octet determine the classes of IP address.

IPv4 address divided into two parts:-

1 Network ID

2 Host ID

Note:- While finding the total number of host IP addresses,
) IP addresses are not counted and are therefore, deducted
 from the total count because the first IP address of
 any NW is the NW Number and whereas the last IP address
 is reserved for broadcast IP .

Class A:- IP address belonging to class A are assigned to the networks that contain a large number of hosts .

- The Network ID is 8 bit long

- The Host ID is 24 bit long

The higher order of bit of the first octet in class A is always set 0 . The remaining 7 bits in first octet are used to determine network ID . The 24 bits of host ID are used to determine the host in any network . The default sub-net mask for class A is 255.0.0.0 . ∵ Class A has total of $2^7 = 128$ N/W ID

$$2^{24} = 16777214 \text{ Host ID}$$

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Class B: IP Address belong to class B are assigned to the N/W that ranges medium sized to larger-sized N/W

- The N/W is 16 bit
 - The Host ID is 16 bit
- The higher order bits of the first octet of IP address of class B are always set to 10. The remaining 14 bits are used to determine N/W ID. The 16 bits are used to determine the host in any N/W. The subnet mask is 255.255.X.X.

Class C: IP address belonging to class C are assigned to small - sized N/W.

- The N/W ID is 24 bit long
- The host ID is 8 bit long

The higher order bits of the first octet of IP address of class C are always set to 110. The Remaining 21 bits are used to determine N/W ID. The 8 bits of host ID is used to determine host in any N/W. The default subnet mask of class C is 255.255.255.X.

Class D: IP address belonging to class D are reserved for multicasting. The ^{higher} 4th order bits of 1st octet of IP address belong to class D always set to 1110. Range 224.0.0.0 to 239.255.255.255

Class E: IP addresses belong to class E are reserved for exp. and Research purpose. Range is 240.0.0.0 - 255.255.255.254 This class have no subnet mask. The high order bit of 1st octet of class E are always set to 1111.

Teacher's Signature :

Shivam
6/02/2019

Experiment :- 4

Aim:- Peer to Peer connections & file sharing.

Material required:-

- 1) LAN cable
- 2) 2 laptop that have lan card port.

Steps:-

- 1.) Connect LAN cable's first end to first laptop and second end to second laptop
- 2.) Now open the N/W sharing center in control panel
→ N/W & Internet → N/W and Sharing center
- 3.) Now select change adapter settings.
- 4.) Now go to the ethernet option then right click and select properties
- 5.) Now select "internet protocol version 4 (TCP/IPv4)" and click on ~~properties~~
- 6.) Now select "use the following IP address"

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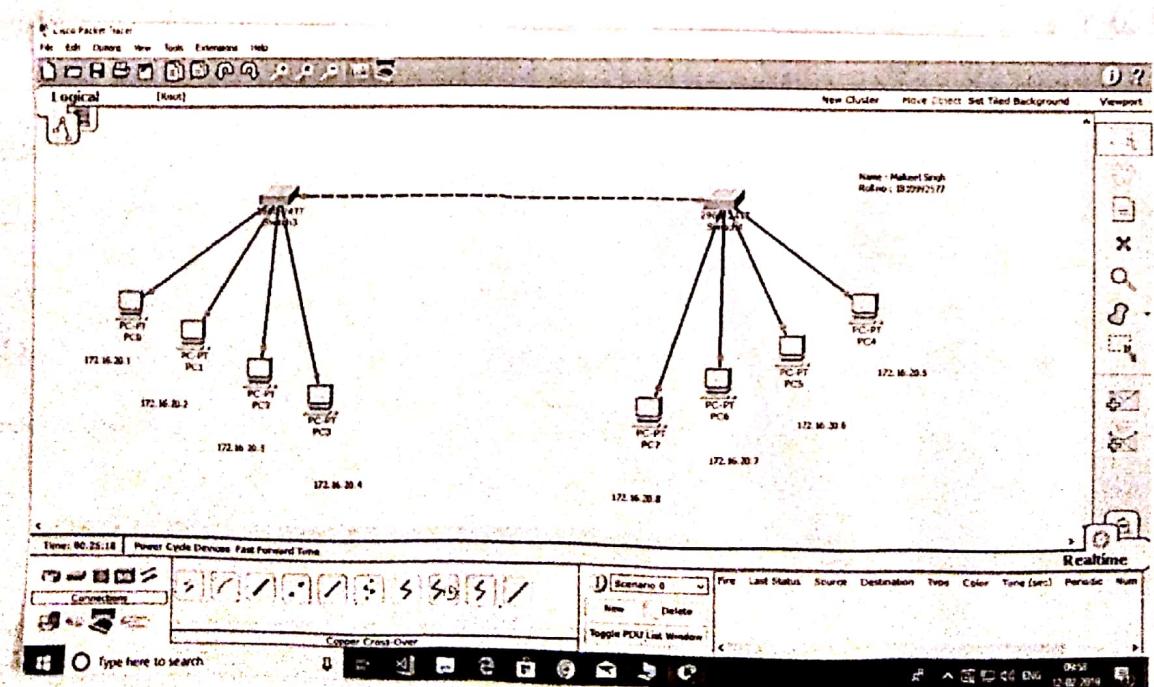
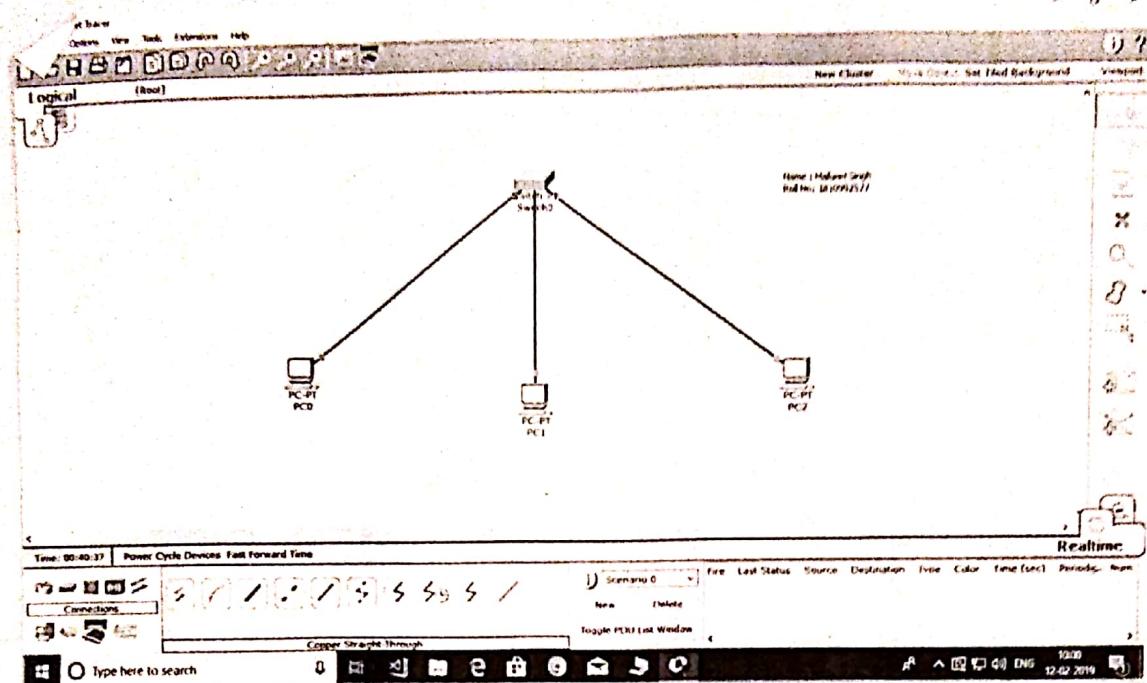
- 7.) While creating an IP address must remember that first three digits should be identical and last one should be unique.

Working on 2nd laptop.

- 1.) Now select the folder/ directory.
- 2.) Then go to the properties of the folder.
- 3.) Now go to "Sharing tab" and select "Share option".
- 4.) Now select everyone option , click on Share.
- 5.) Now go back to the sharing tab & click advanced sharing
- 6.) Now share the folder & checklist on all the permission and Select ~~apply~~
- 7.) Now your computer is on peer to peer connection.

Teacher's Signature :

Himanshi
20/02/2019



Experiment :- 5

Introduction to Packet tracer:-

Cisco packet tracer is a powerful N/E simulator that can be utilized in training for CCNA and CCNP certification Exam by allowing to create Network with an almost unlimited no. of devices & to experience trouble shooting without having to buy real Cisco routers or switches. The purpose of packet tracer is to learn the principles of networking as well as develop Cisco technology specific skills.

Steps:-

Select the End devices and select and drop the "generic" pc on the working area

Now Select the switches & select switch 2960 & drop it on the working area

Now attach the four pc's to one switch & other four pc's to other switch

Now assign the IP address to every pc.

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Double click on PC
↓

Choose desktop tab
↓

IP configuration
↓

Static
↓

Enter IP and press tab

Connect each PC to Switch with the help of "Copper cross-over" wire.

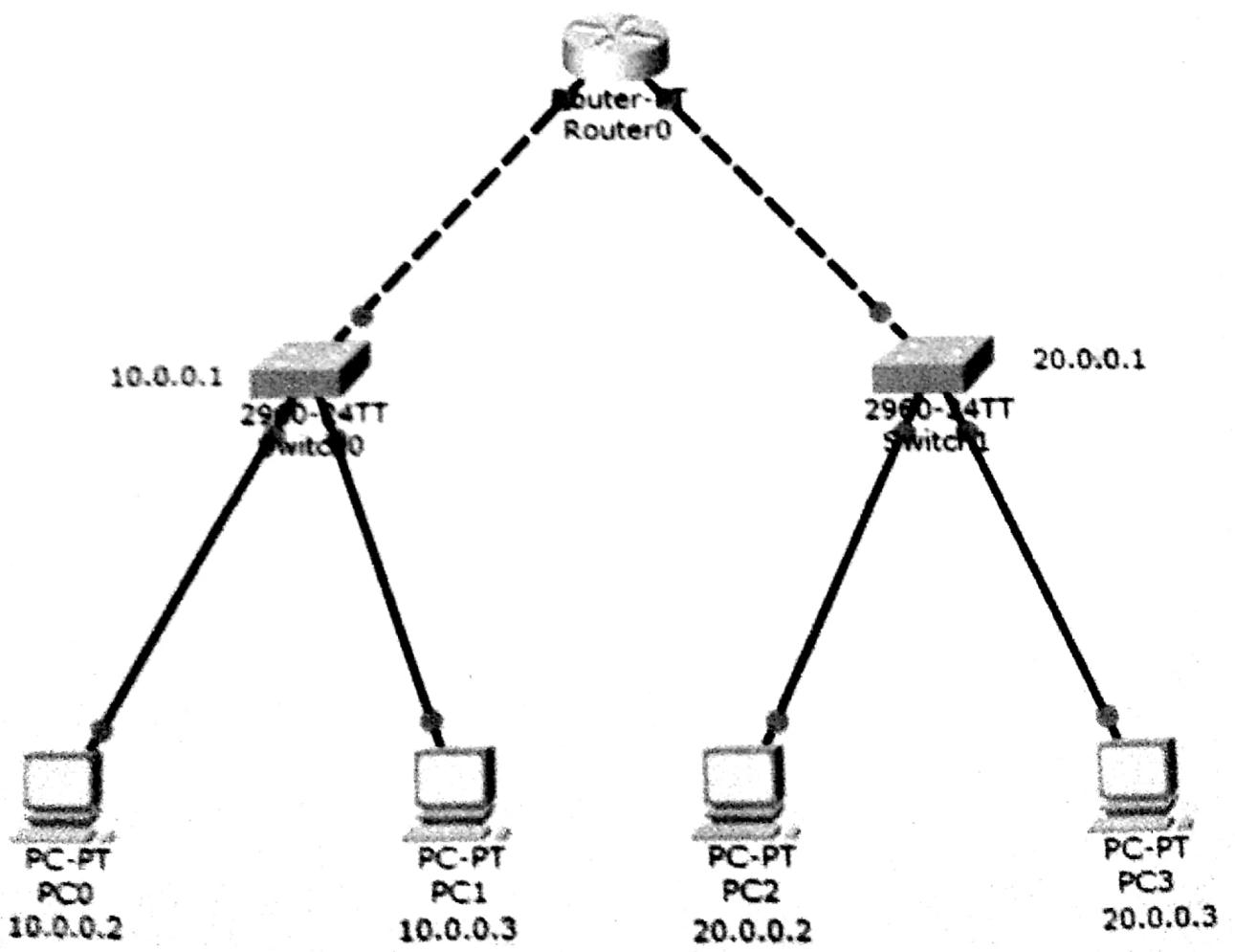
Connections → Copper cross over wire

While connecting wire Select "Fast Ethernet 0" on PC
And fast Ethernet 0/1 on Switch , always select new fast Ethernet 0/1 on switch for new pc

Now connect both the switches with the help of "Copper straight through" wire.

Teacher's Signature:

Jitendra
20/2/2K19



Experiment :- 6

Unit:- Introduction to Router:-

WHAT IS ROUTER ?

This networking device provides interconnection b/w two dissimilar networks. It operates at layer-3 of OSI Stack and take care of routing of packets on routing table. It use IP addressing for routing the packets. It is soul of the network, without which distribution of Internet and other network data to entire N/W is impossible, that's why Router is known as intelligent device.

Benefits or advantages of Routers

- ⇒ It provides connection b/w different network architectures such as ethernet & token ring etc.
- ⇒ It can choose best path across the internetwork using dynamic algorithms.
- ⇒ It provide sophisticated routing, flow control and traffic isolation.
- ⇒ They are configurable which allow n/w manager to make policy based on routing decision.

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```
Router>?
Exec commands:
<1-99>    Session number to resume
connect     Open a terminal connection
disable     Turn off privileged commands
disconnect  Disconnect an existing network connection
enable      Turn on privileged commands
exit        Exit from the EXEC
logout      Exit from the EXEC
ping        Send echo messages
resume      Resume an active network connection
show        Show running system information
ssh         Open a secure shell client connection
telnet      Open a telnet connection
terminal    Set terminal line parameters
traceroute  Trace route to destination
```

```
Router>en
```

```
Router#show version
```

```
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
Image text-base: 0x8000808C, data-base: 0x80A1FECC
```

```
ROM: System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)
```

```
Copyright (c) 2000 by cisco Systems, Inc.
```

```
ROM: PT1000 Software (PT1000-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
```

```
System returned to ROM by reload
```

```
System image file is "flash:pt1000-i-mz.122-28.bin"
```

```
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.
```

```
ROM: PT1000 Software (PT1000-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
```

```
System returned to ROM by reload
```

```
System image file is "flash:pt1000-i-mz.122-28.bin"
```

```
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)
```

```
Configuration register is 0x2102
```

```
Router#show clock
```

```
*0:11:18.16 UTC Mon Mar 1 1993
```

```
Router#clock set 10:0:0 12 march 2019
```

```
Router#show clock
```

```
10:0:14.140 UTC Tue Mar 12 2019
```

```
Router#show history
```

```
en
```

```
show version
```

```
show clock
```

```
clock set
```

```
clock set 10:0:0 12 march 2019
```

```
show clock
```

```
show history
```

```
Router#config t
```

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

```
Router(config)#hostname ccna
```

```
ccna(config)#exit
```

```
ccna#
```

```
*SYS-6-CONFIG_I: Configured from console by console
```

Disadvantage of Router:-

- ⇒ They operates based on routable network protocols
- ⇒ They are expensive compare to other n/w devices
- ⇒ They are slower as they need to analyze data from layer-1 through layer-3
- ⇒ Dynamic Router communications can cause additional n/w overhead. This result into less bandwidth for user data.
- ⇒ They are protocol dependent devices which must understand the protocol they are forwarding.

Types of Router Mode:-

- 1.) User Mode:- User Mode is the first mode a user has access to after logging into the router. It is default mode of the router. The user mode can be identified by the > prompt following Router name. This mode is commonly used to execute only basic commands such as system status. For eg:- [?]
- 2.) Privileged Mode:- As we type enable to user mode, we enter into privilege mode. Most commands of this mode are one time commands, like show or clear commands, which show current configuration status and clear counters on interfaces respectively. For eg:- Show Start up - config etc.

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3) Global configuration mode- As we type `configure terminal` to the privilege mode we enter in to the global. This mode generally used to configure the router ~~or~~ interfaces, and also allow you to make change in running configuration.

For eg:- `int fa 0/0`

- 4 Global configuration mode cleaved as:-
- 1 Interface configuration mode
- 2 Line configuration mode
- 3 Router configuration mode

Commands used in Routers:-

- 1) Router>? \Rightarrow This command is used in user mode. It help us to depict the number of commands in the user mode.
- 2) Router>en This command is used enter in the privileged mode. This mode is signif as Router#
- 3) Router# show version \Rightarrow The show version command gives you the router's configuration register, the last time the router was booted, the version of the IOS, the name of the IOS file

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, the name of the IOS, the model of the router and the router's amount of RAM and Flash.

- 4.) Router# show clock \Rightarrow This command basically display the system clock according first day of Accessing Router.
- 5.) Router# clock set 10:0:0 21 Feb 2019 \Rightarrow Here we use clock set command with current date and time to set it
- 6.) Router# ~~clock~~ show clock \Rightarrow Now this command show date, day, & time according to the clock set command.
-
- 7.) Router# show history \Rightarrow This command display the command history that the no. of commands visited in are router.
- 8.) Router# show flash: \Rightarrow This command display the no. of files, their size and their name/ status acc. to your flash.
- 9.) Router# show running-config \Rightarrow The show running-config command Shows the router switch, or fire wall's current configuration. You

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Change this config when you make changes to the Router.
Keep in mind that config is not saved until you do a copy running - command.

- 11 Router# copy running - configuration startup configuration \Rightarrow This command will save the configuration that is currently being modified (in RAM), also known as the running-config, to the non volatile RAM (NVRAM)
- 10 Router# show startup - config \Rightarrow This command help to show all the running configuration that we have copied in previous step.
- 12 Router# show ip int brief \Rightarrow This command provide tons of useful information about the configuration and status of the IP protocol and its services, on all interfaces.
- 13 Router# config + \Rightarrow It allows to enter in the Global configuration mode from the Privileged mode .
- 14 Router (config)# int fa 0/0 \Rightarrow It allows us to enter in to the particular interface through connection point number.

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15 Router (config)# ip address 10.0.0.1 255.0.0.0 →

This command help us to configure the IP address to particular interface number.

16 Router (config)# no shutdown →

The no shutdown command enables an interface (bring it up). This command must used in interface configuration.

17 Router (config)# hostname CCNA →

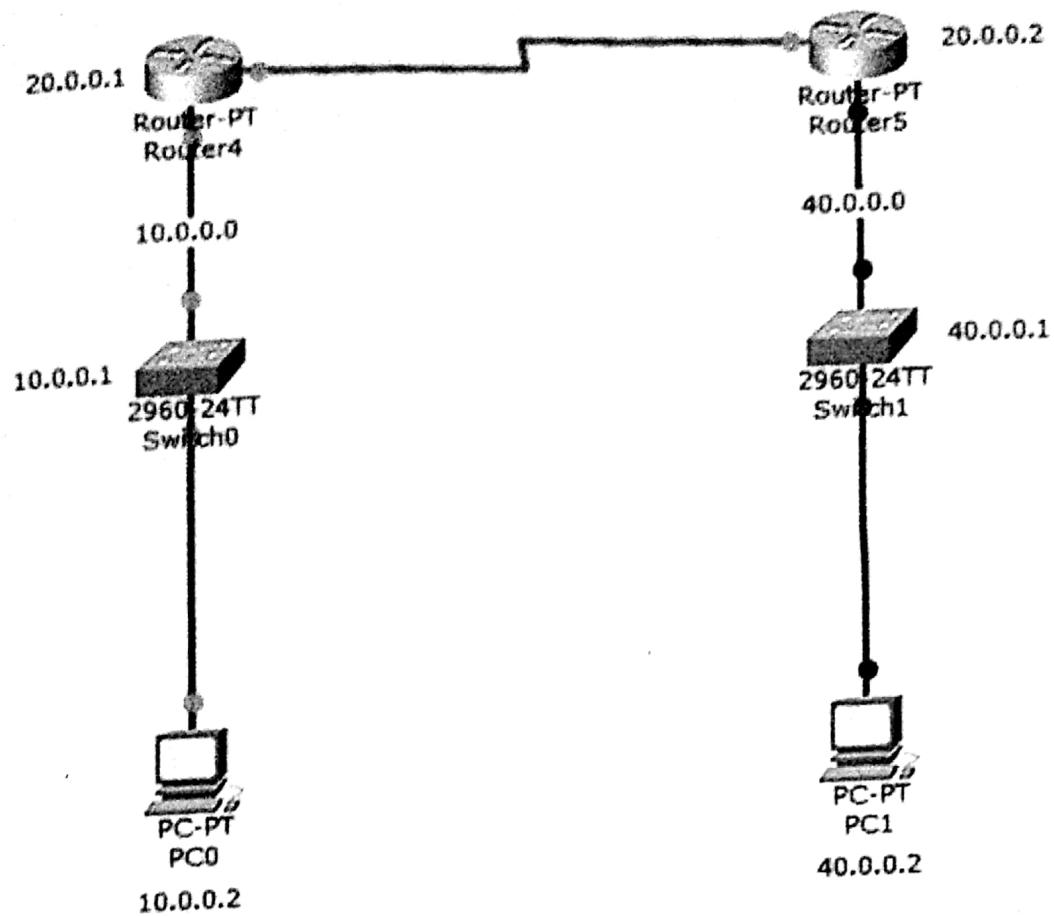
This command is commonly used to change the name of the Router. After execution of this command name that use in command will replace with Router name mentioned before execution of command.

18 CCNA Router (config)# exit → This command will exists us from one mode or submode to previous mode. Like Global $\xrightarrow{\text{exit}}$ Privileged $\xrightarrow{\text{exit}}$ user

19 CCNA# reload → This command reload the whole operating command system to the default mode.

Teacher's Signature:

*Jitendra
09/03/2019*



Command Prompt

```

Packet Tracer PC Command Line 1.0
C:\>ping 40.0.0.2

Pinging 40.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 40.0.0.2: bytes=32 time=1ms TTL=126
Reply from 40.0.0.2: bytes=32 time=2ms TTL=126
Reply from 40.0.0.2: bytes=32 time=2ms TTL=126

Ping statistics for 40.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms
  
```

C:\>

Aim:- Experiment :- 7
INTRODUCTION TO Static ROUTING

WHAT IS STATIC ROUTING?

Static Routing is a type of network routing technique. static routing is not a routing protocol ; instead ,it is the manual configuration and selection of a network route, usually managed by the network administrator . It is employed in the scenarios where the network parameters and environment are expected to remain constant.

Advantages of Static Routing:-

- 1.) Static routing causes very little load on the CPU of the router, and produces no traffic to other routers.
- 2.) Static routing is very easy to configure on a small network
- 3.) Static routing leaves the network administrator with full control over the routing behavior of the N/W

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- 4) NO bandwidth overhead (updates are not shared b/w routers)

Disadvantages of Static Routing :-

- 1.) In many cases, Static routes are manually configured. This inc the potential input mistakes.
- 2.) NO "dynamic" fault tolerance if a link goes down.
- 3) Impractical on large network.
- 4) Infrastructure changes must be manually adjusted.

Various Command used in Static Routing :-

for Router 4

- 1.) Router > en
- 2.) Router # config t
- 3.) Router (config)# int fa 0/0
- 4.) Router (config-if)# ip address 10.0.0.1 255.0.0.0
- 5.) Router (config-if)# no shutdown
- 6.) Router (config-if)# exit
- 7.) Router (config)# exit

Teacher's Signature :

- 8) Router# config +
- 9.) Router (config)# int se2/0 \Rightarrow This serial interface command is ~~bas~~ probably used to connecting two routers. so, different N/W can easily communicate.
- 10.) Router (config)# ip address 20.0.0.1 255.0.0.0
- 11.) Router (config-if)# clock rate ? \Rightarrow clock rate command is to be used in DCE in serial link to configure the clock speed for the link
- 12.) Router (config-if)# clock rate 64000 \Rightarrow When you set clock rate for a serial interface, You are setting the speed of the interface in other words, the bandwidth.
- 13.) Router (config-if)# no shutdown
- 14.) Router (config-if)# exit
- 15.) Router (config)# exit
- 16.) Router # show ip int brief
- 17.) Router# config +
- 17.) Router^(config)# ip route 10.0.0.0 25.0.0.0 20.0.0.1 \Rightarrow This command is used in static routing protocol. It is define the route path of network

Teacher's Signature : _____

IP address and subnet and gateway manually. So it is used to provide the route information of hosts.

18.) Router (config) # exit

19.) Router # show ip route \Rightarrow The show ip route command is used to show the router's routing table. This is the list of all N/W that the router can reach.

20.) Router # show ip protocols \Rightarrow The show ip protocols command is used when a dynamic routing protocol is being run on the device. The output from this command can be used to verify that the routing protocol configuration is being processed as expected.

For Router-5

1.) Router > en

2.) Router # config t

3.) Router (config) # int f0/0

4.) Router (config-if) # ip address 40.0.0.1 255.0.0.0

5.) Router (config-if) # no shutdown

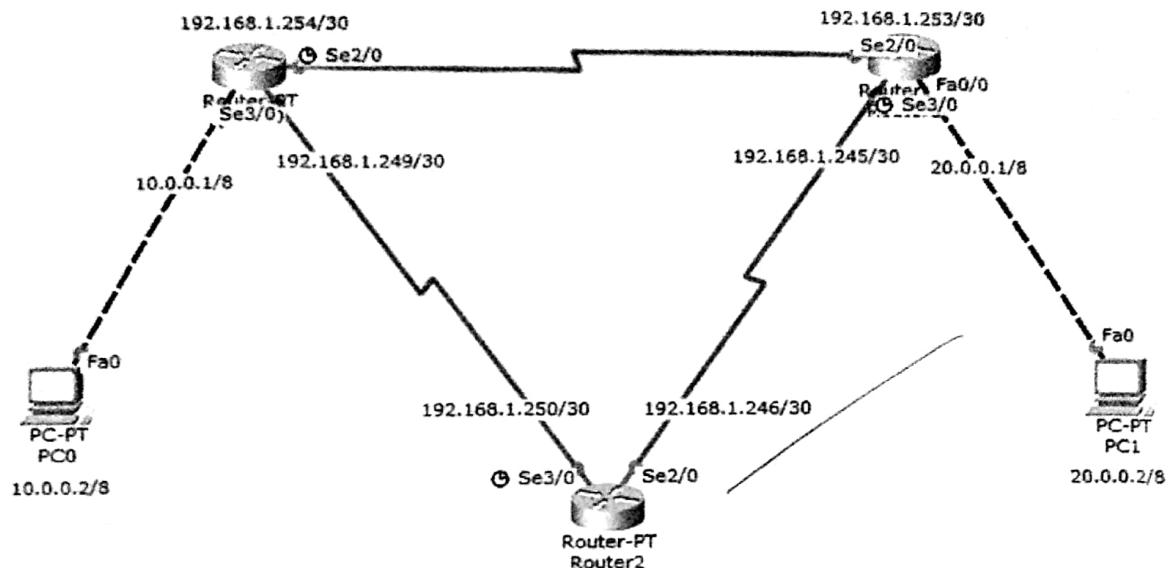
6.) Router (config-if) # exit

7.) Router (config) # int se 2/0

8.) Router (config-if) # ip address 20.0.0.2 255.0.0.0

Teacher's Signature :

- 9.) Router (config-if)# clock rate ?
- 10.) Router (config-if)# clock rate 64000
- 11.) Router (config-if)# no shut down
- 12.) Router (config-if)# exit
- 13.) Router (config)# exit
- 14.) Router# show ip int brief
- 15.) Router# config t
- 16.) Router(config)# ip route 10.0.0.0 255.0.0.0 20.0.0.1
- 17.) Router (config)# exit
- 18.) Router# show ip route
- 19.) Router# show ip protocols



```

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

Pinging 20.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.2: bytes=32 time=1ms TTL=126
Reply from 20.0.0.2: bytes=32 time=5ms TTL=126
Reply from 20.0.0.2: bytes=32 time=3ms TTL=126

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 5ms, Average = 3ms

C:\>tracert 20.0.0.2

Tracing route to 20.0.0.2 over a maximum of 30 hops:
  1  0 ms      0 ms      0 ms      10.0.0.1
  2  6 ms      1 ms      1 ms     192.168.1.253
  3  0 ms      0 ms      1 ms     20.0.0.2

Tracing complete.

```

Experiment - 8

Him- INTRODUCTION TO ROUTING INFORMATION PROTOCOL

WHAT IS RIP?

⇒ Routing Information Protocol is a dynamic routing protocol which uses hop count as a routing metric to find the best path b/w the source and the destination network. It is a distance vector routing protocol which has AD value 120 and works on the application layer of OSI model. RIP uses port number 520.

RIP Versions:-

There are two version of Routing Information Protocol

- 1.) RIP v1 known as classful routing protocol
- 2.) RIP v2 known as classless routing protocol

Difference Between Version 1 and Version 2 of RIP

1.) Update message is sent to local Subnet Broadcast Address.
255.255.255.255

2.) Update message is sent to Multicast Address
224.0.0.9

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- | | |
|---|---|
| 1.) Does not support authentication of update message | 2.) Supports authentication of RIP v2 update messages |
| 3.) V1 does not support VLSM (variable length subnet masking) | 3.) V2 supports VLSM (variable length subnet masking) |
| 4.) RIP v1 is known as Classful Routing Protocol | 4.) RIP v2 is known as classless Routing protocol |

Commands for Router 0

- 1.) Router > en
- 2.) Router # (config)
- 3.) Router (config)# int fa0/0
- 4.) Router (config-if)# ip address 10.0.0.1 255.0.0.0
- 5.) Router (config-if)# no shutdown
- 6.) Router (config-if)# exit
- 7.) Router (config)# int se2/0
- 8.) Router (config-if)# ip address 192.168.1.254 255.255.255.252
- 9.) Router (config-if)# clock rate 1
- 10.) Router (config-if)# clock rate 14000
- 11.) Router (config-if)# no shutdown
- 12.) Router (config-if)# exit
- 13.) Router (config)# int se3/0
- 14.) Router (config-if)# ip address 192.168.1.249 255.255.255.252

Teacher's Signature : _____

- 15 Router (config-if)# clock rate 1
- 16 Router (config-if)# clock rate 64000
- 17 Router (config-if)# no shutdown
- 18 Router (config-if)# exit
- 19 Router (config)# exit

For Router-1

- 1.) Router > en
- 2.) Router #F config t
- 3.) Router (config)# int fa0/0
- 4.) Router (config-if)# ip address 10.0.0.1 255.0.0.0
- 5.) Router (config-if)# no shutdown
- 6.) Router (config-if)# exit
- 7.) Router (config)# int se2/0
- 8.) Router (config-if)# ip address 192.168.1.253 255.255.255.252
- 9.) Router (config-if)# clock rate 1
- 10.) Router (config-if)# clock rate 64000
- 11.) Router (config-if)# no shutdown
- 12.) Router (config-if)# exit
- 13.) Router (config)# int se3/0
- 14.) Router (config-if)# ip address 192.168.2.245 255.255.255.252
- 15.) Router (config-if)# clock rate ?
- 16.) Router (config-if)# (clock rate 64000)
- 17.) Router (config-if)# no shutdown
- 18.) Router (config-if)# exit

Teacher's Signature : _____

for Router - 2

- 1) Router > en
- 2) Router # config
- 3) Router (config-#) # int se3/0
- 4) Router (config-if) # IP address 192.168.1.250 255.255.255.252
- 5) Router (config-if) # clock rate ?
- 6) Router (config-if) # clock rate 14000
- 7) Router (config-if) # no shutdown
- 8) Router (config-if) # exit
- 9) Router (config) # int se2/0
- 10) Router (config-if) # IP address 192.168.1.246 255.255.255.252
- 11) Router (config-if) # clock rate ?
- 12) Router (config-if) # clock rate 14000
- 13) Router (config-if) # no shutdown
- 14) Router (config-if) # exit

=) Configure RIP routing protocol:-

These are 2 steps to configure routing protocol

- 1) enables RIP Routing protocol from global configuration
- 2) It tells RIP Routing Protocol to which D/W you want to advertise.

Router-2

- 1) Router > en
- 2) Router # config
- 3) Router (config) # Router rip

Teacher's Signature : _____

8.2

RIP Timers :-

Router (lrbig) # Router rip

Router (lrbig-route) # net network 192.168.1.0

Router (lrbig-route) # no network 192.168.1.0

Router (lrbig-route) # version? (to enable ver2)

Router (lrbig-route) # no auto summary (by default RIP v2 automatically summarises the routes in their default classfull boundary)

Router (lrbig-route) # Passive interface S3/0 (RIP will not flood last routing update from this interface)

Router (lrbig-route) # timers basic 30 90 180 240

(30° Routing table , 90° invalid timer , 180° Hold timer
90° flush timer , 310° Sleep timer)

Router (lrbig-route) # no router rip (Disable rip routing protocol)

Router (lrbig-route) # exit

Router (lrbig) # exit

Router# debug ip rip (trouble shooting)

Router# show ip rip database (Display RIP database including routes)

Teacher's Signature : _____

Experiment :- 9

Introduction to Various troubleshooting commands

Troubleshooting computer n/w problem is among the most important job description of the n/w administrators and system administrators.

A computer can have different type of problems such as connectivity failure issue, attacked by hacker, due to failure n/w devices or configurations.

The right use of these troubleshooting commands can help a lot in diagnosing and resolving the uncommon n/w problems.

1) Ping:- Ping is most important troubleshooting command and it checks the connectivity with the other computers. By using ping command with format ping IP address. If you get the reply from server connectivity is correct and if you get error message like "Request time out" this means there is some problem in the connectivity with the server.

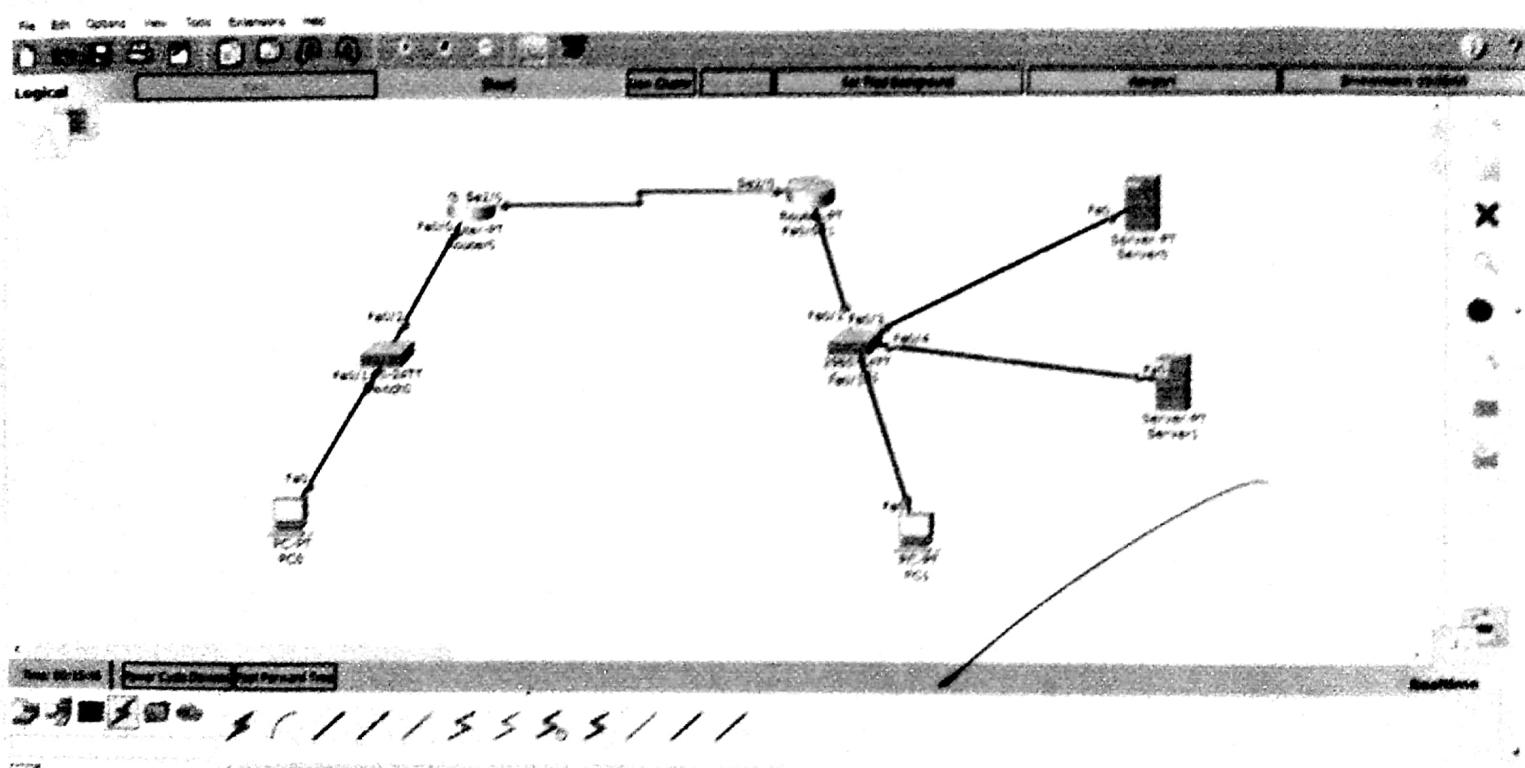
2) Trace route:- It is a command used to determine the path of the remote system. This tool also provide the number of hops and IP address of each hop.
For eg:- If you want to see that how many hops are involved to reach www.yahoo.com and what's the IP address of each hop we use this command.

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3) NetStat:- It is known as Network Statistics. It is a command line n/w utility tools that display n/w connection for TCP routing tables and no. of n/w interface and n/w protocol statistics.

4) IP Config:- IP config is another command in windows. It shows the IP of the computer and also it shows the DNS, DHCP gateway address of the network and subnet mask.

5) NS Lookup:- NS lookup is a TCP/IP based command and it checks domain name aliases, DNS Record operating system information by sending query to the internet Domain Name servers. We can solve the error with help of your n/w server.



Experiment - 10

INTRODUCTION TO DNS :-

WHAT IS DNS ?

Dns is (Domain name server) is a host name to IP address translation Services. DNS is a distributed data base implemented in a hierarchy of name servers. It is an application layer protocol for message exchange b/w clients and servers.

How does DNS work:-

The process of DNS resolution involves converting a hostname into a computer friendly IP address. An IP address is given to each device on the internet, and that address is necessary to find the appropriate internet devices.

When a user want to load a webpage, a translation must occur b/w what a user types in to their web browser and the machine friendly address necessary to locate the webpage.

For Router-0

Router>en

Router# (config) #

Router (config) # int fa 0/0

Router (config-if) # ip address 172.16.10.1 255.255.0.0

Router (config-if) # no shutdown

Router (config-if) # exit

Router (config) # int se 2/0

Router (config-if) # ip address 172.17.10.1 255.255.0.0

Router (config-if) # clock rate 64000

Router (config-if) # bandwidth 64

Router (config-if) # no shutdown

Router (config-if) # exit

Router (config) # router rip

Router (config-router) # network 172.16.10.0

Router (config-router) # network 172.17.10.0

For Router-1

Router>en

Router# (config) #

Router (config) # int fa 0/0

Router (config-if) # ip address 172.18.20.1 255.255.0.0

Router (config-if) # no shutdown

Teacher's Signature : _____

Router (config-i) # exit
 Router (config) # int se2/0
 Router (config-i) # IP address 172.17.10.2 255.255.0.0
 Router (config-i) # clock date 6/1/00
 Router (config-i) # no shutdown
 Router (config-i) # exit

Router (config) # Router ip.

Router (config-Router) # network 172.17.20.0
 Router (config - Router) # network 172.17.10.0

Server 0 :-

- Click on HTTP
- Select index.html (edit)
- Exit the data and save.

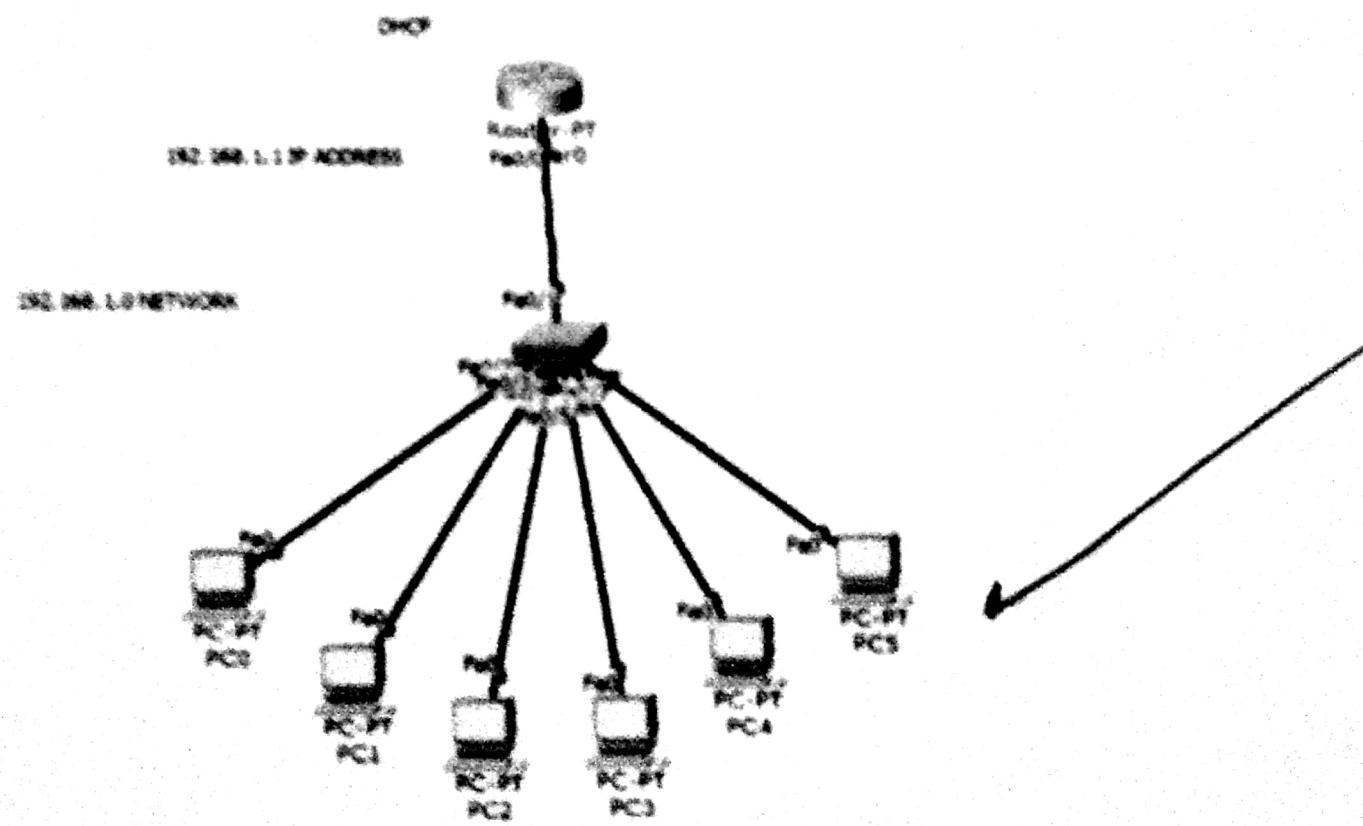
Server 1 :-

- Go to DNS
- Enter name (chittkara.edu.in)
- Address (192.168.20.2)
- Then save.

Server PC-0 :-

- Go to desktop
- Select web browser
- Enter the URL (192.168.20.2)

Teacher's Signature : _____



Experiment - 12

INTRODUCTION TO DHCP :-

Dynamic Host Configuration Protocol:-

DHCP is a n/w management protocol used to dynamically assign an IP address to any device or node on a N/W so they can communicate using IP. DHCP automates and centrally manages these configuration rather than requiring n/w administrators to manually assign IP addresses to all n/w devices. It can be implemented on small local N/W as well as large enterprise N/W.

How DHCP Works:-

DHCP runs at the application layer of the TCP/IP protocol stack to dynamically assign IP address to DHCP clients & to allocate TCP/IP configuration information to DHCP clients. That includes Subnet mask info, default gateway IP address & DNS addresses.

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Advantage of DHCP :-

- It is easy to implement and does automatic assignment of IP addresses to requesting client.
- The implementation does not require any additional costs.
- It simplifies administration of the network.
- It supports multiple subnets.
- It has great benefit to mobile users as valid configuration parameters are automatically obtained from the network.

Disadvantage of DHCP :-

- DHCP can be a single point of failure in network having only one configured DHCP server.
- Client is not able to access the network in the absence of DHCP server.

for Router - 0

Router > en

Router # (config) #

Router (config) # int fa 0/0

Router (config-if) # ip address 192.168.1.1 255.255.255.0

Router (config-if) # no shutdown

Router (config) # ip dhcp?

Router (config) # ip dhcp pool?

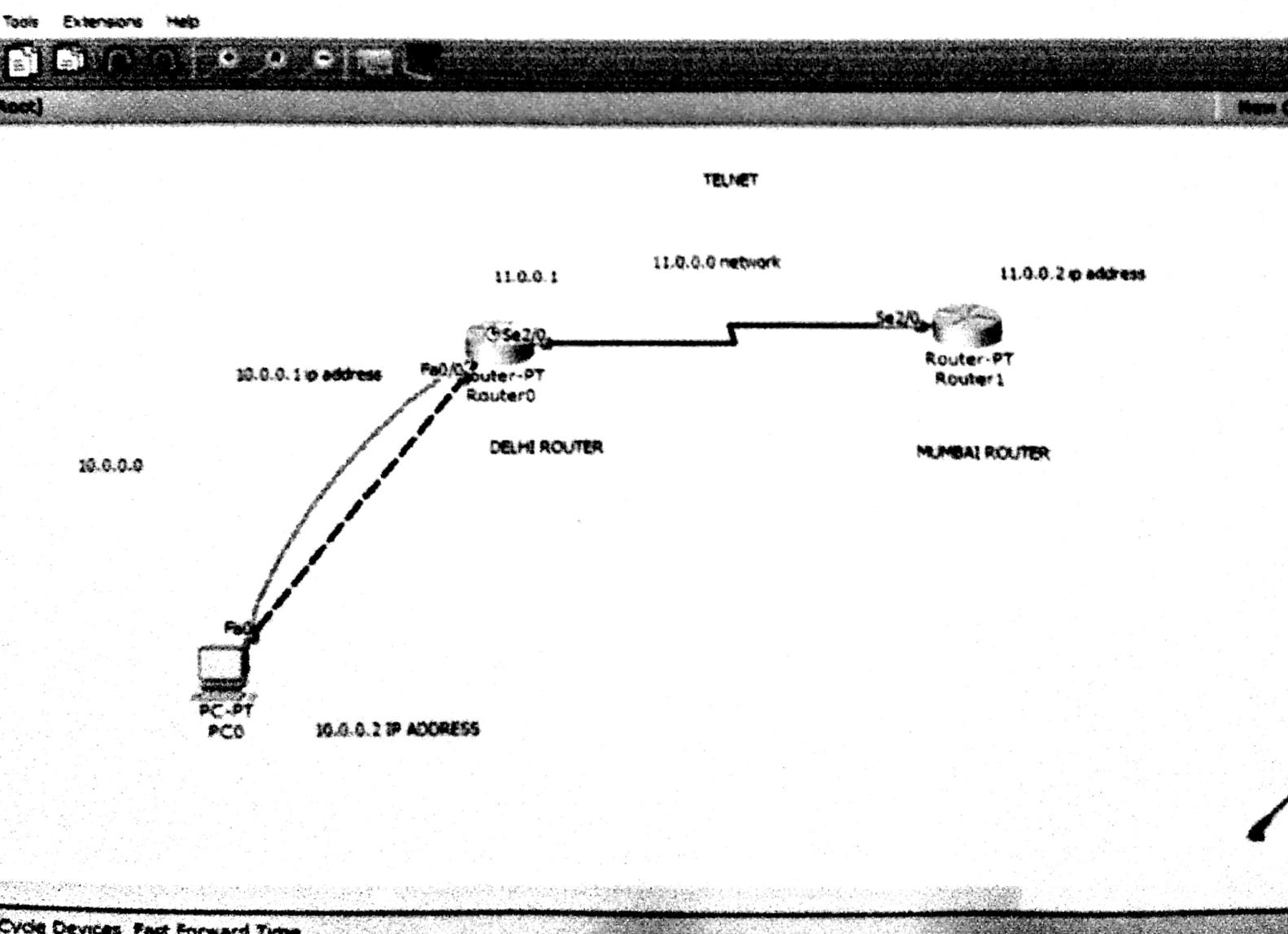
Router (config) # ip dhcp pool bca

Router (dhcp-config) # network 192.168.1.0 255.255.255.0

Router (dhcp-config) # default-router 192.168.1.1

Router (dhcp-config) # dns-server 4.4.4.4

Router (dhcp-config) # exit



Experiment :- 12

Unit- Introduction to telnet:-

Telnet Stands for telephone network. It helps in terminal emulation. It allows telnet client to access the resources of telnet server. It is used for managing the files on the internet. It is used for initial set up of devices like switches. Telnet command is a command that uses the telnet protocol to communicate with a remote device or system.

It is used on both internet & local area network to provide bi directional interactive text oriented communication facility using a virtual communication terminal.

For Router - 0 :-

Router > en

```

Router # config t
Router (config) # int fa 0/0
Router (config-if) # ip address 10.0.0.1 255.0.0.0
Router (config-if) # no shutdown
Router (config-if) # exit
Router (config) # int se 2/0
Router (config) # ip address 11.0.0.1 255.0.0.0
Router (config-if) # clock rate 64000
Router (config-if) # no shutdown
Router (config-if) # exit
Router (config) # route rip
Router (config) # network 10.0.0.0
Router (config) # exit

```

For Router - 1 :-

Router > en

```

Router # config t
Router (config) # int se 2/0
Router (config-if) # ip address 11.0.0.2 255.0.0.0
Router (config-if) # no shutdown
Router (config-if) # exit

```

```
Router (config)# line Router rip  
Router (config-router)# network 11.0.0.0  
Router (config-router)# exit  
Router (config)# line vty 0 15  
Router (config-line)# password cna  
Router (config-line)# line  
Router (config-line)# exit  
Router (config)# enable ?  
Router (config)# enable Seesed Ca
```

PC - O :-

- ping 11.0.0.2
- telnet 11.0.0.2
- ~~password: cna (hidden password)~~
- ~~enable~~
- ~~password: Ca (hidden password)~~
- ~~config +.~~