PRACTICAL – 1

AIM: Introduction to CISCO Packet Tracer software.

1. Use different types of devices like pc, switches, cables, pc with wireless card.
2. Create basic topologies and assign IP address, subnet mask, DNS, gateway IP address.
3. Test connectivity with ping command.

Introduction:

Cisco Packet Tracer is a powerful network simulation software developed by Cisco Systems. It allows users to design, build, and test network configurations in a virtual environment without the need for physical hardware. It is widely used by students, educators, and professionals for learning networking concepts, practicing Cisco commands, and preparing for certifications like CCNA.

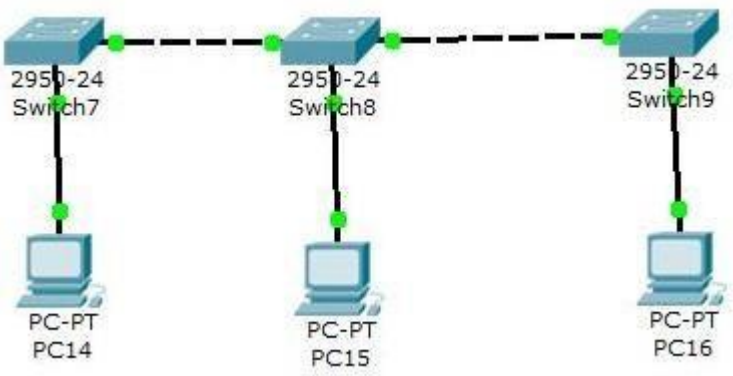
Packet Tracer provides a drag-and-drop interface to connect and configure devices such as routers, switches, PCs, laptops, servers, and more. It supports both wired and wireless networking, giving users a complete environment to simulate real-world networking scenarios.

What is a Network Topology?

A network topology refers to the physical or logical layout of a computer network. It defines how different devices (like computers, switches, routers, etc.) are connected and how data flows between them.

Types of Network Topologies:

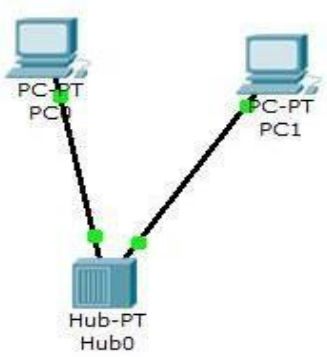
1. Bus Topology
   - All devices are connected to a single central cable (backbone).
   - Data travels in both directions on the cable.
   - Simple and cheap but not reliable (if the cable fails, the whole network goes down).



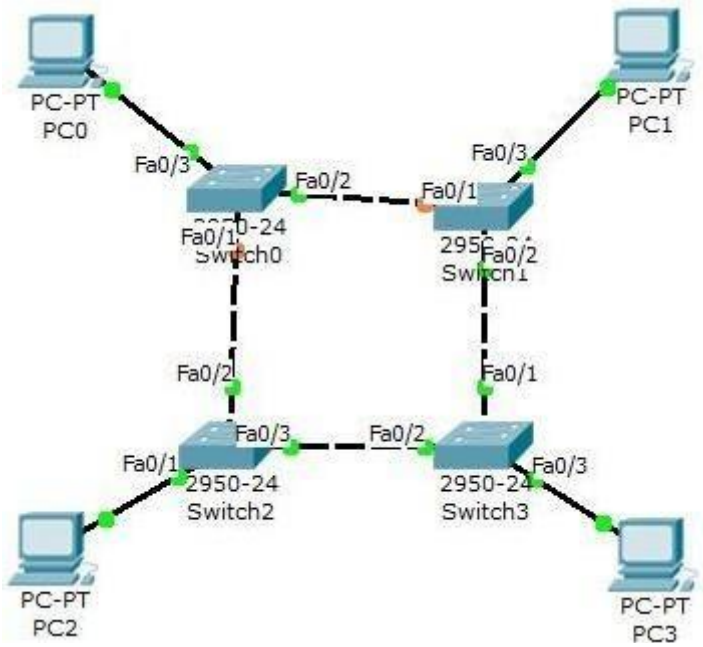
Testing Connectivity:

```
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=156ms TTL=128
Reply from 10.0.0.2: bytes=32 time=93ms TTL=128
Reply from 10.0.0.2: bytes=32 time=94ms TTL=128
Reply from 10.0.0.2: bytes=32 time=93ms 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 = 93ms, Maximum = 156ms, Average = 109ms
```

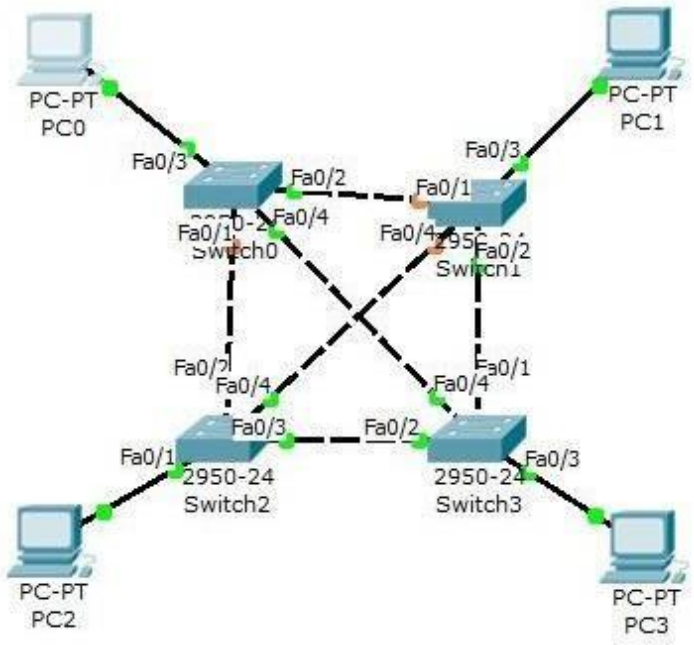
2. Star Topology
   - All devices are connected to a central device like a switch or hub.
   - Most commonly used in LANs.
   - Easy to manage and troubleshoot.
   - If the central switch fails, the whole network is affected.



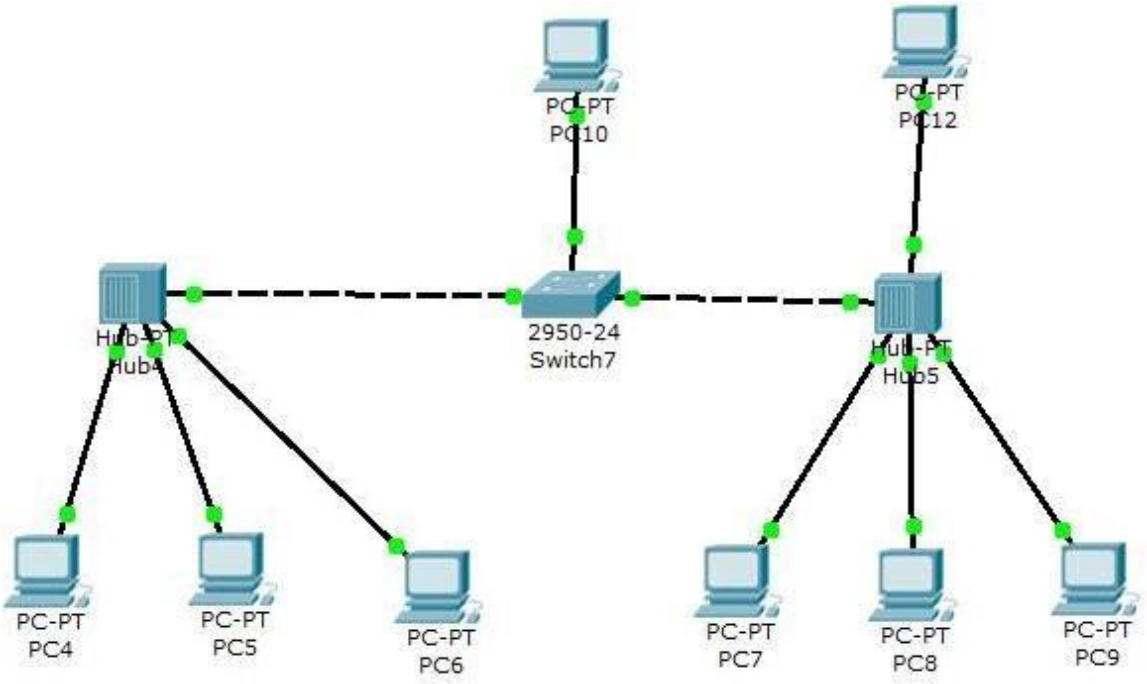
3. Ring Topology
   - Each device is connected to exactly two others, forming a circular path.
   - Data travels in one direction (or both in a dual ring).
   - Less used today because it's difficult to reconfigure or add devices.



4. Mesh Topology
   - Every device is connected to every other device.
   - Provides high redundancy and fault tolerance.
   - Used in critical environments but is expensive to implement.



5. Hybrid Topology
   - Combines two or more different types of topologies.
   - Flexible and reliable depending on how it's designed**.**



PRACTICAL – 2

AIM:

→1. To identify the class of given IP address in dotted decimal notation.

Code:-

```
address of your pc:")
first_term=int(ip.split('.')[0])
print("your ip ip = input("enter the ip address first term:",first_term)
if 0<=first_term<=127:
    print("your pc's ip address of class A")
elif 128<=first_term<=191:
    print("your pc's ip address of class B")
elif 192<=first_term<=223:
    print("your pc's ip address of class C")
elif 224<=first_term<=239:
    print("your pc's ip address of class D")
elif 240<=first_term<=255:
    print("your pc's ip address of class E")
else:
    print("ip address out of range.")
```

Output:-

```
enter the ip address of your pc:10.0.0.81
your ip address first term: 10
your pc's ip address of class A
```

→2. To Find First address, Last address, and No. of address of given IP address in dotted decimal notation with network mask specified using CIDR notation.

Code:-

PRACTICAL – 3

AIM: Study of various networking commands in Windows.

Common Networking Commands

1. ipconfig
   - Displays the current IP configuration of themachine.
   - Usage: ipconfig /all to show detailed Info.

```
PS C:\Users\admin>  ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : OSLAB-34
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
```

2. ping
   - Tests connectivity to a remote host bysending ICMP echo requests.
   - Usage: ping google.com

```
PS C:\Users\admin> ping google.com

Pinging google.com [142.251.42.14] with 32 bytes of data:
Reply from 142.251.42.14: bytes=32 time=13ms TTL=117
Reply from 142.251.42.14: bytes=32 time=13ms TTL=117
Reply from 142.251.42.14: bytes=32 time=13ms TTL=117
Reply from 142.251.42.14: bytes=32 time=12ms TTL=117
```

3. tracert
   - Traces the route packets take to reach a network host.
   - Usage: tracert google.com

```
PS C:\Users\admin> tracert google.com

Tracing route to google.com [142.251.42.14]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  10.0.0.1
  2    <1 ms    <1 ms    <1 ms  202.129.241.233
  3    <1 ms     1 ms    <1 ms  202.129.240.1
  4     1 ms     1 ms     1 ms  202.129.241.246
  5     1 ms     1 ms    <1 ms  202.129.241.254
  6    14 ms    13 ms    12 ms  103.27.170.10
  7    14 ms    13 ms    13 ms  72.14.239.103
  8    14 ms    13 ms    13 ms  209.85.250.139
  9    13 ms    13 ms    13 ms  bom12s19-in-f14.1e100.net [142.251.42.14]

Trace complete.
```

4. netstat
   - Displays active TCP connections, ports on which the computer is listening, and routing tables.
   - Usage: netstat –an

```
PS C:\Users\admin> netstat -an

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            0.0.0.0:0              LISTENING
  TCP    0.0.0.0:445            0.0.0.0:0              LISTENING
  TCP    0.0.0.0:5040           0.0.0.0:0              LISTENING
  TCP    0.0.0.0:7680           0.0.0.0:0              LISTENING
```

5. nslookup
   - Queries DNS to obtain domain name or IP address mapping.
   - Usage: nslookup google.com

```
PS C:\Users\admin> nslookup google.com
Server:  UnKnown
Address:  10.0.0.1

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:82f::200e
          142.251.42.14
```

6. arp
   - Displays and modifies the ARP cache, which maps IP addresses to MAC addresses.
   - Usage: arp–a

```
PS C:\Users\admin> arp -a

Interface: 192.168.56.1 --- 0xb
  Internet Address      Physical Address      Type
  192.168.56.255        ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
```

7. netsh
   - A powerful utility to display or modify network configurations.
   - Usage: netsh interface ip show config

```
PS C:\Users\admin> netsh interface ip show config

Configuration for interface "Ethernet"
    DHCP enabled:                         No
    IP Address:                           10.0.1.184
    Subnet Prefix:                        10.0.0.0/22 (mask 255.255.252.0)
    Default Gateway:                      10.0.0.1
    Gateway Metric:                       256
    InterfaceMetric:                      25
    Statically Configured DNS Servers:    10.0.0.1
                                          8.8.8.8
    Register with which suffix:           Primary only
    Statically Configured WINS Servers:   None
```

8. route
   - Displays or modifies the IP routing table.
   - Usage: route print

```
PS C:\Users\admin> route print
===========================================================================
Interface List
 17...c0 25 a5 a8 03 5c ......Intel(R) Ethernet Connection (14) I219-LM
 11...0a 00 27 00 00 0b ......VirtualBox Host-Only Ethernet Adapter
  1...........................Software Loopback Interface 1
===========================================================================
```

9. getmac
   - Displays the MAC addresses for network interfaces.
   - Usage: getmac

```
PS C:\Users\admin> getmac

Physical Address    Transport Name
=================== ============================================================
C0-25-A5-A8-03-5C   \Device\Tcpip_{CB1DFAB3-D560-4B6F-9F00-415FD3065195}
0A-00-27-00-00-0B   \Device\Tcpip_{A77146EC-1CF2-45F5-9562-EE537BE75008}
```

10. hostname
    - Displays the current computer's hostname.
    - Usage: hostname

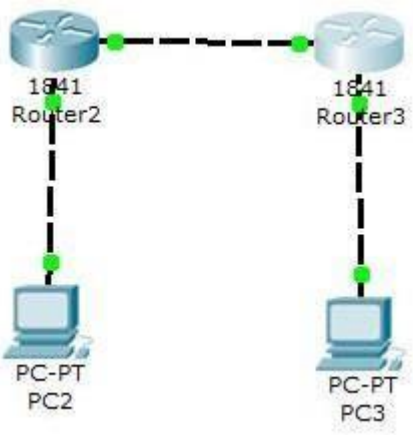
```
PS C:\Users\admin> hostname
OSLAB-34
```

PRACTICAL – 4

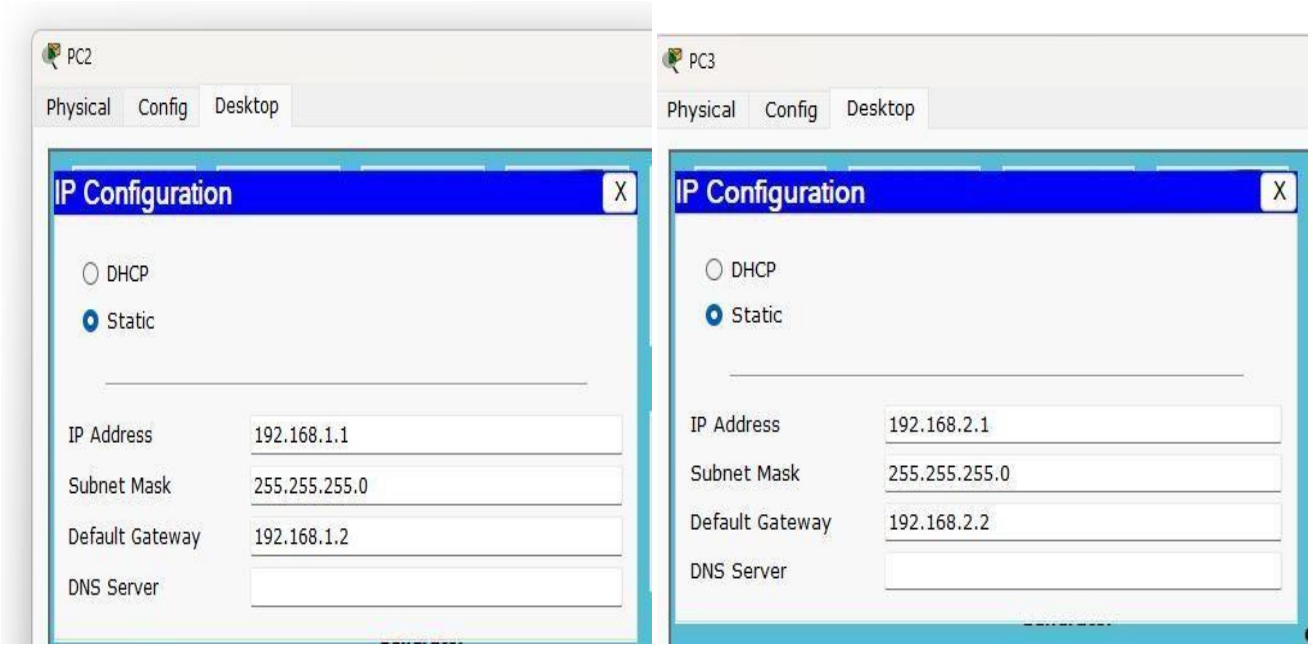
AIM:- Introduction to Default & Static Routing and Configuring the same in CISCO packet tracer.

Introduction of static routing:-

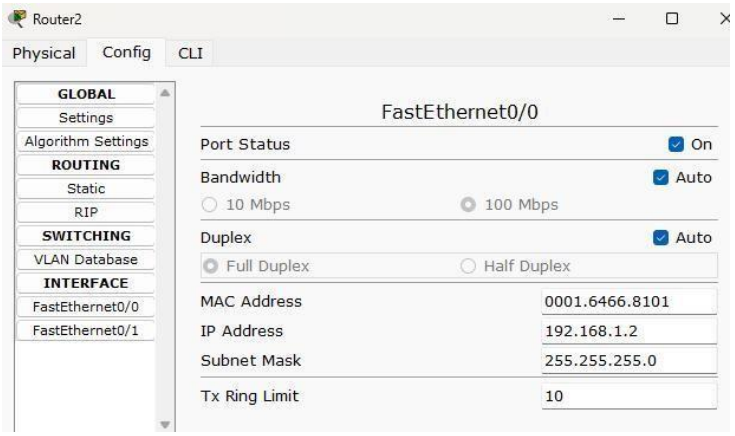
Static routing is a method of routing where network routes are manually configured and entered into a router's routing table by a network administrator. Unlike dynamic routing, which automatically adjusts routes based on network changes, static routing requires manual updates whenever the network topology changes. It is simple to implement and is often used in smaller or more stable networks where route changes are infrequent. Static routes provide greater control and security because the paths are fixed and predictable, but they lack the flexibility and scalability of dynamic routing protocols.



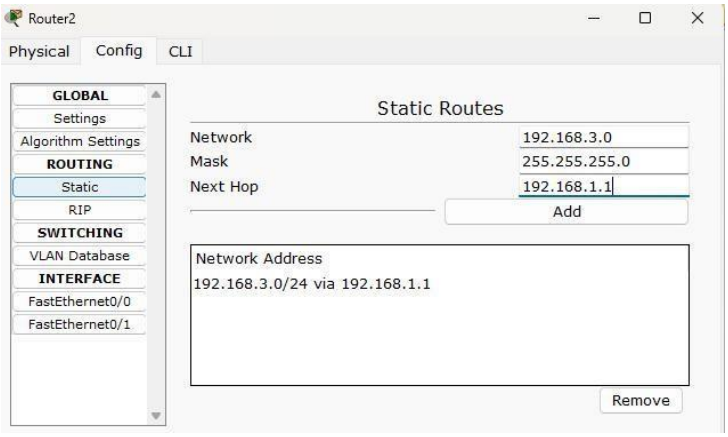
Assigning IP address to the PC'S:-



Assigning IP address to the Router:-



Assigning IP address to the Router for static Routing:-



Output:-

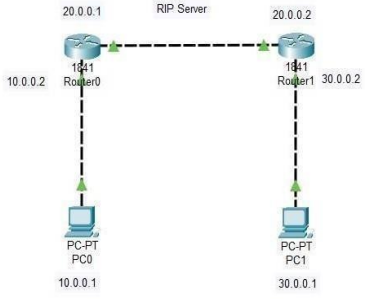
Fire	Last Status	Source	Destination	Type	Color	Time (sec)	Periodic	Num	Edit	Delete
	Successful	PC2	Router2	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC3	Router3	ICMP		0.000	N	1	(edit)	(delete)
	Successful	Router2	Router3	ICMP		0.000	N	2	(edit)	(delete)

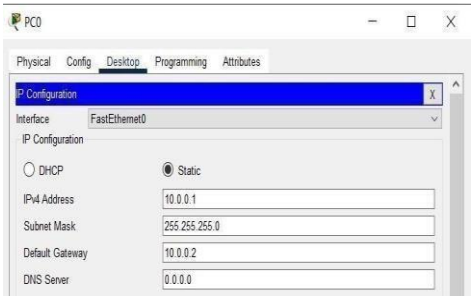
PRACTICAL – 5

AIM:- Introduction to Dynamic Routing and configuring RIP and OSPF in CISCO packet tracer.

RIP:

- Definition: RIP is a distance-vector routing protocol that uses hop count as its metric.
- Functionality: RIP exchanges routing information between neighboring routers to determine the best paths to destinations.
- Characteristics: RIP has a maximum hop count of 15, uses UDP as its transport protocol, and has a routing update interval of 30 seconds.
- Advantages: RIP is simple to configure and suitable for small networks
- Disadvantages: RIP has slow convergence, limited scalability, and is prone to routing loops





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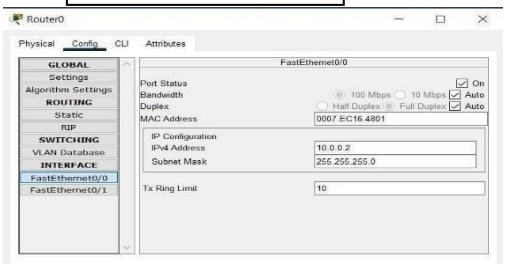
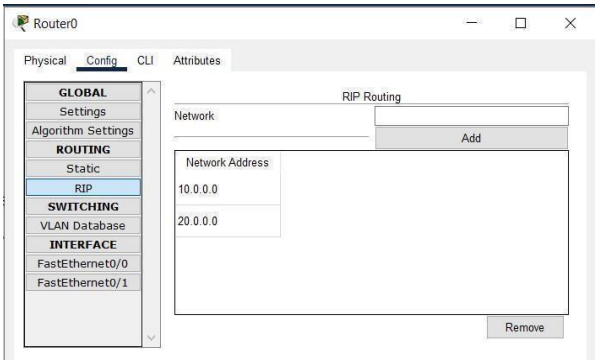
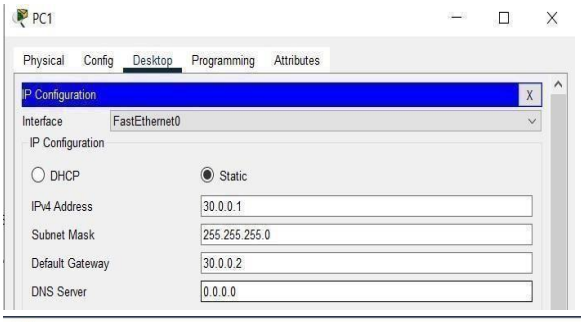
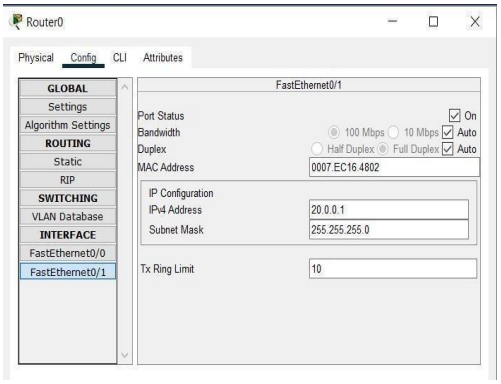
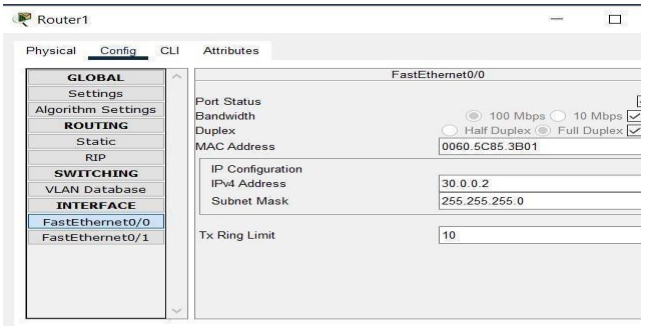
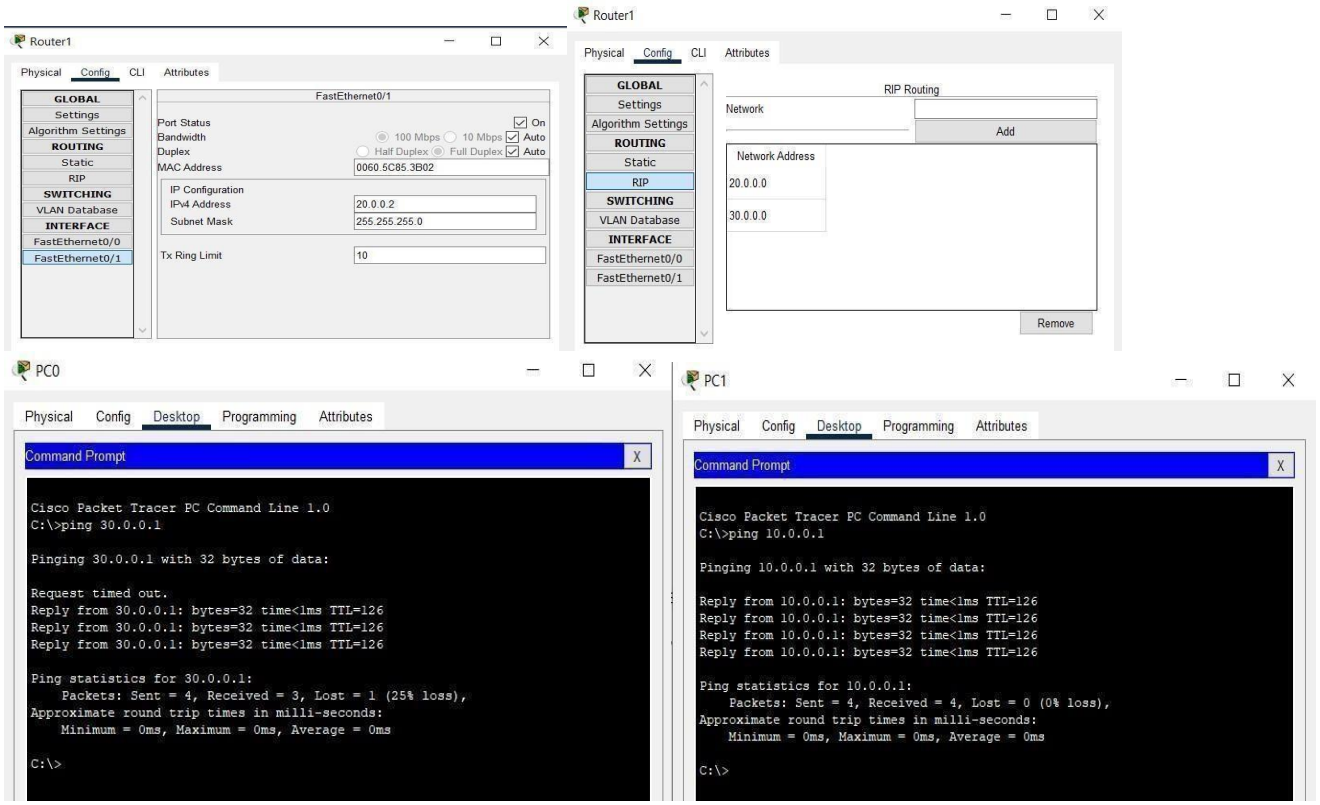






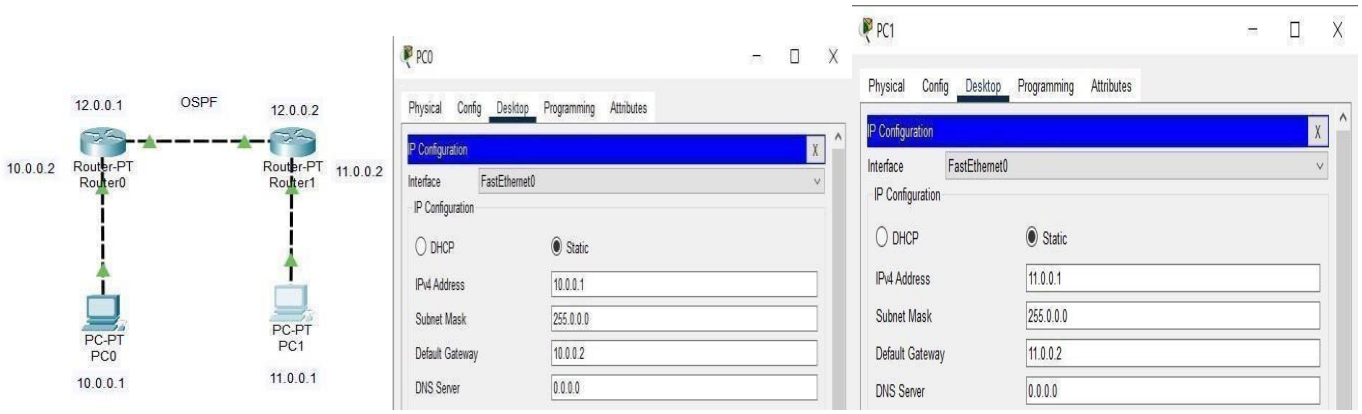






OSPF:

- **Definition:** OSPF is a link-state routing protocol that uses the shortest path first algorithm to determine the best paths to destinations.
- **Functionality:** OSPF exchanges link-state advertisements to build a topological map of the network.
- **Characteristics:** OSPF supports variable-length subnet masks, route summarization, and has fast convergence.
- **Advantages:** OSPF is highly scalable, provides fast convergence, and supports large networks.
- **Disadvantages:** OSPF is complex to configure and requires more resources than RIP.



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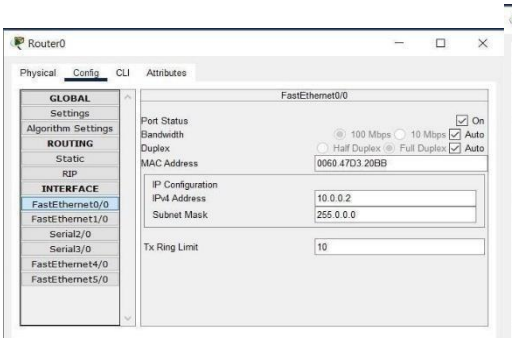
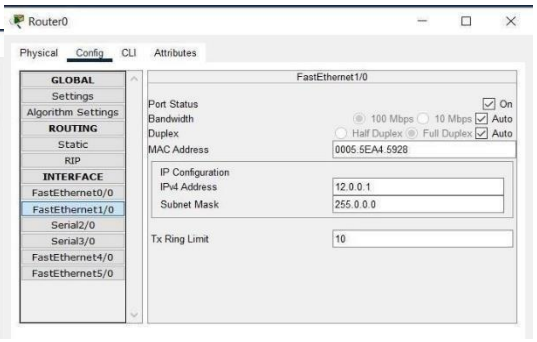
(12302040701165)


Router0
Physical Config CLI Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet0/0
Port Status On
Bandwidth 100 Mbps 10 Mbps Auto
Duplex Half Duplex Full Duplex Auto
MAC Address 0060.47D3.20BB
IP Configuration
IPv4 Address 10.0.0.2
Subnet Mask 255.0.0.0
Tx Ring Limit 10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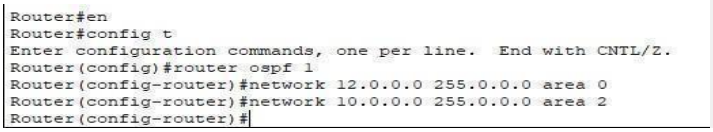
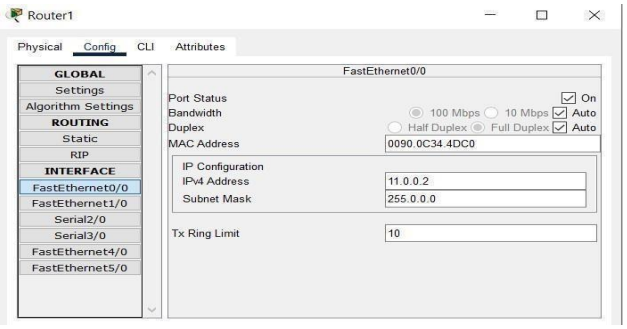
FastEthernet5/0
FastEthernet1/0
Port Status On
Bandwidth 100 Mbps 10 Mbps Auto
Duplex Half Duplex Full Duplex Auto
MAC Address 0005.5EA4.5928
IP Configuration
IPv4 Address 12.0.0.1
Subnet Mask 255.0.0.0
Tx Ring Limit 10


Router#en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#network 12.0.0.0 255.0.0.0 area 0
Router(config-router)#network 10.0.0.0 255.0.0.0 area 2
Router(config-router)#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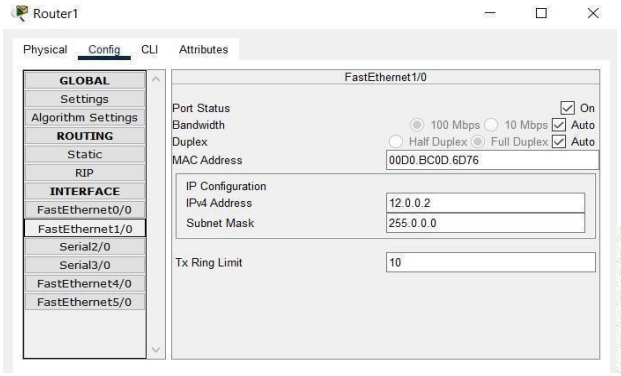
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet0/0
Port Status On
Bandwidth 100 Mbps 10 Mbps Auto
Duplex Half Duplex Full Duplex Auto
MAC Address 0090.0C34.4DC0
IP Configuration
IPv4 Address 11.0.0.2
Subnet Mask 255.0.0.0
Tx Ring Limit 10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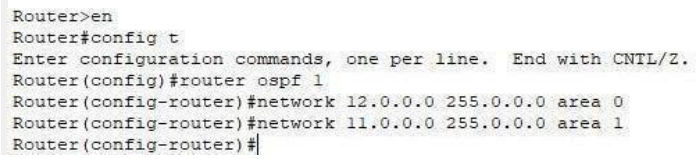
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
FastEthernet1/0
Port Status On
Bandwidth 100 Mbps 10 Mbps Auto
Duplex Half Duplex Full Duplex Auto
MAC Address 00D0.BC0D.6D76
IP Configuration
IPv4 Address 12.0.0.2
Subnet Mask 255.0.0.0
Tx Ring Limit 10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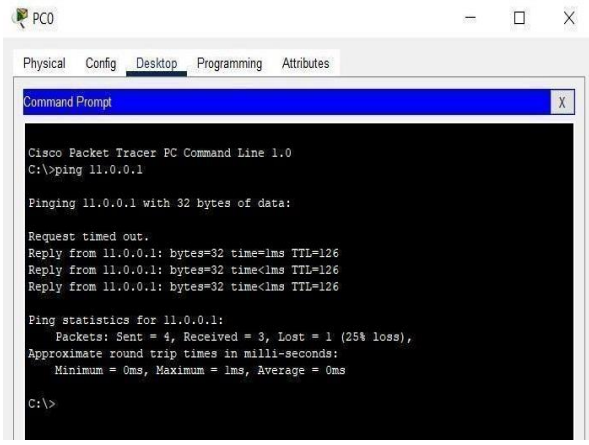
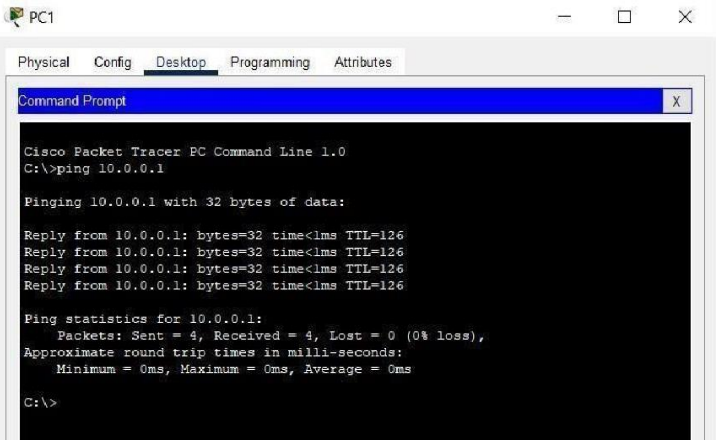
Router(config-router)#


PC0
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 11.0.0.1
Pinging 11.0.0.1 with 32 bytes of data:
Request timed out.
Reply from 11.0.0.1: bytes=32 time=1ms TTL=126
Reply from 11.0.0.1: bytes=32 time<1ms TTL=126
Reply from 11.0.0.1: bytes=32 time<1ms TTL=126
Ping statistics for 11.0.0.1:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>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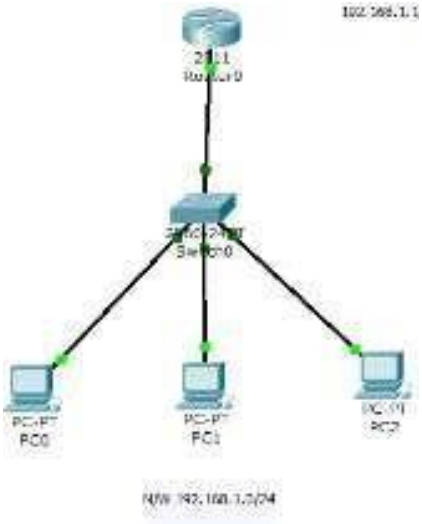
Reply from 10.0.0.1: bytes=32 time<1ms TTL=126
Reply from 10.0.0.1: bytes=32 time<1ms TTL=126
Reply from 10.0.0.1: bytes=32 time<1ms TTL=126
Ping statistics for 10.0.0.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>

PRACTICAL – 6

AIM:- Configure DHCP and DNS Server in CISCO packet tracer.

Configuring DHCP server on a Router:-

1. Build the network topology:



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2. On the router, configure *interface fa0/0* to act as the default gateway for our LAN.

Router>enable Router#config terminal Router(config)# int fa0/0
Router(config-if)#ip add 192.168.1.1
255.255.255.0 Router(config-if)#no shutdown
Router(config-if)#exit

3. Configure DHCP server on the Router. In the server we will define a DHCP pool of IP addresses to be assigned to hosts, a Default gateway for the LAN and a DNS Server.

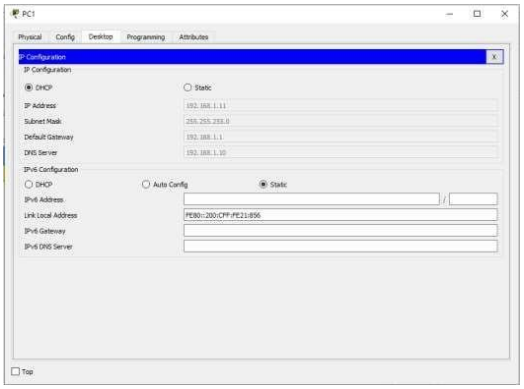
Router(config)#
Router(config)#ip dhcp pool MY_LAN
Router(dhcp-config)#network 192.168.1.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.1.1
Router(dhcp-config)#dns-server 192.168.1.10

We can add ip dhcp excluded-address command to our configuration so as to configure the router to exclude addresses 192.168.1.1 through 192.168.1.10 when assigning addresses to clients. The ip dhcp excluded-address command may be used to reserve addresses that are statically assigned to key hosts.

So add the above command under the global configuration mode. Router(config)#ip dhcp excluded-address 192.168.1.1 192.168.1.10.

4. Now go to every PC and on their IP configuration tabs, enable DHCP. Every PC should be able to obtain an IP address, default gateway and DNS server, as defined in step 2.

For example, to enable DHCP on PC1:
Click PC1->Desktop->IP configuration. Then enable DHCP:

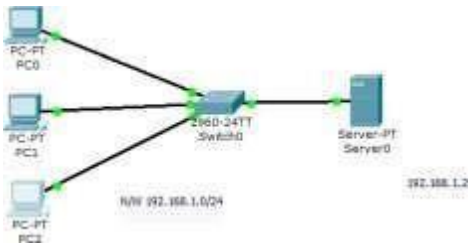


Do this for the other PCs.

You can test the configuration by pinging PC2 from PC1. Ping should succeed.

Now let's do the same thing using a Generic server in place of a router: Configuring DHCP service on a generic server in Packet Tracer.

1. Build the network topology in packet tracer .



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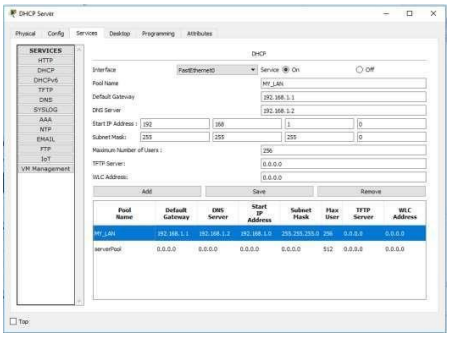
2. Configure static IP address on the server (192.168.1.2/24).

3. Now configure DHCP service on the generic server.
To do this, click on the server, then click on Services tab. You will pick DHCP on the menu. Then proceed to define the DHCP network parameters as follows:

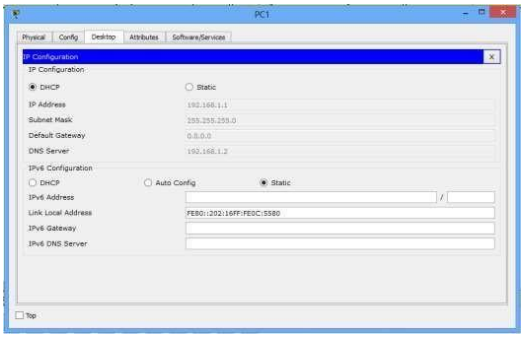
Pool name:
MY_LAN
Default
Gateway:
192.168.1.1
DNS Server: 192.168.1.2
Start IP
Address:
192.168.1.0
Subnet Mask:
255.255.255.0 Maximum Number of users: 256 Click on add then Save. The DHCP entry is included in the list. Here are the configurations.

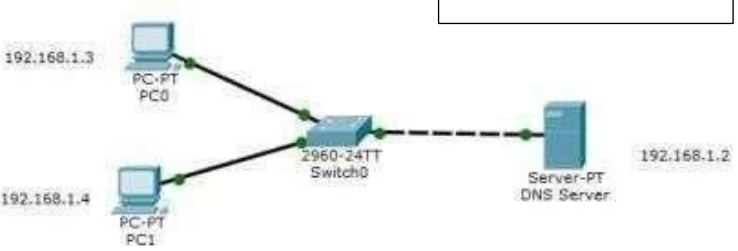


on the server:

Once you've configured everything, turn ON the DHCP service.

Finally, enable DHCP configuration on each PC. The three PCs should get automatically configured. As an example, here is the DHCP configuration on PC1:





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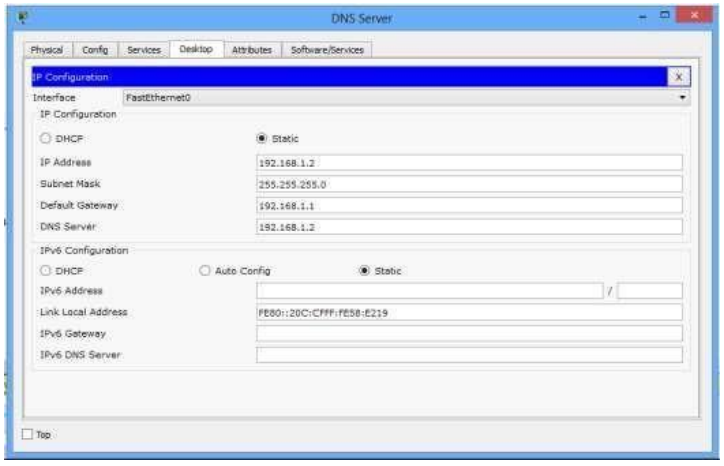
1. **Configure static IP addresses** on the PCs and the server. Server:- IP address: 192.168.1.2 Subnet mask: 255.255.255.0 Default gateway: 192.168.1.1

DNS Server: 192.168.1.2



PC0

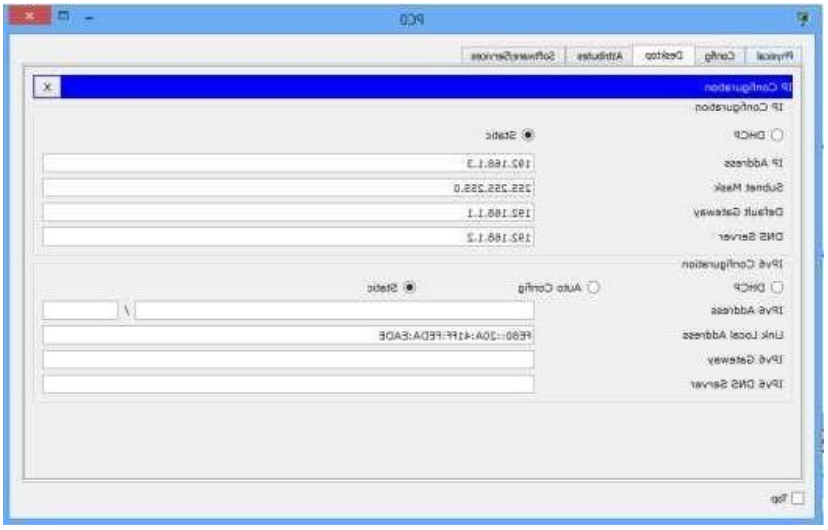
IP add: 192.168.1.3 **Subnet mask:** 255.255.255.0

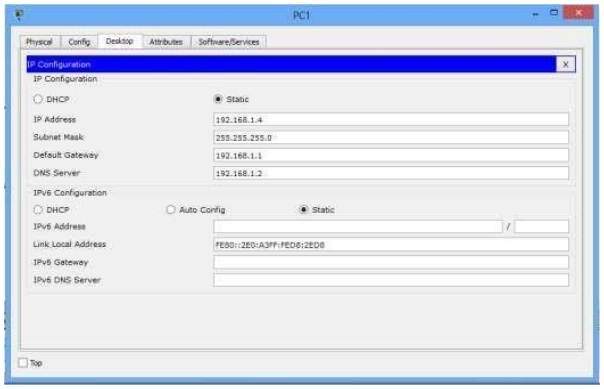
Default gateway: 192.168.1.1 **DNS server:** 192.168.1.2

PC1

IP address: 192.168.1.4 **Subnet mask:** 255.255.255.0

Default gateway: 192.168.1.1 **DNS Server:** 192.168.1.2





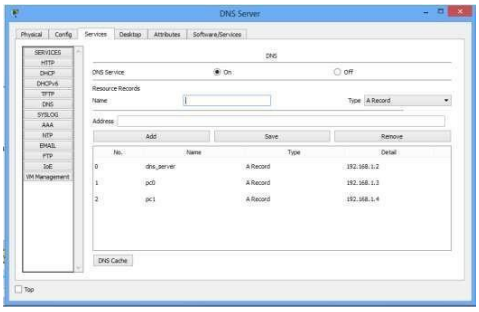
2. Configure DNS service on the generic server.

To do this, click on the server, then Click on **Services** tab. Click on **DNS server** from the menu. First turn **ON** the DNS service, then define **names** of the hosts and their corresponding **IP addresses.**

For example, to specify the DNS entry for PC0: In the **name** and **address** fields, type:

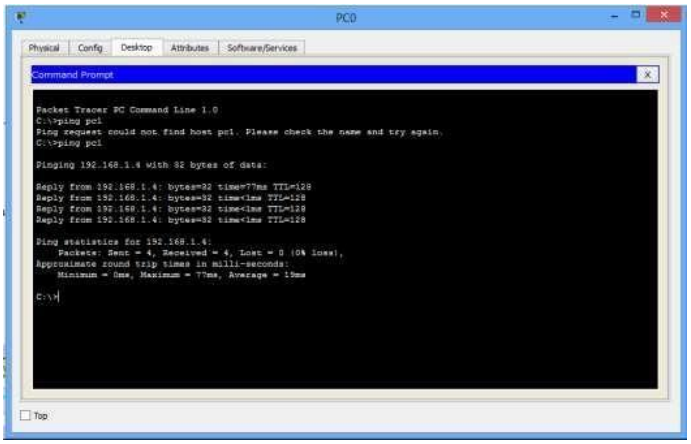
Name: PC0 Address: 192.168.1.3

Click on add then save. Repeat this for the PC1 and the server. Once you're done, your DNS entries will look like this:



Finally,

Test **domain name – IP resolution**. Ping the hosts from one another using their names instead of their IP addresses. If the DNS service is turned on and all IP configurations are okay, then ping should work.



PRACTICAL – 7

AIM:- Configure Web Server and FTP Server in CISCO packet tracer.

Now let's configure a WEB server in Packet Tracer.

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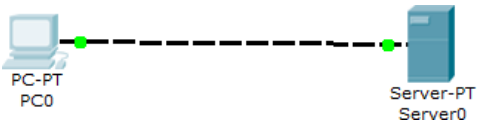
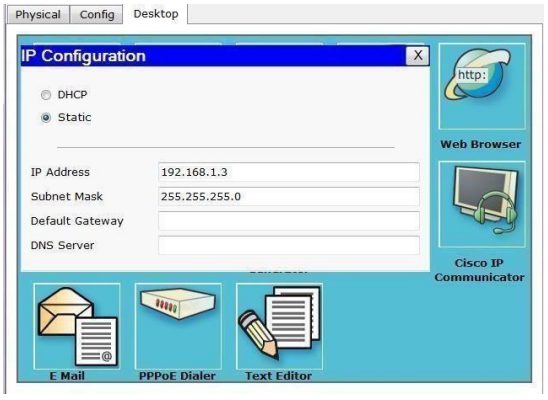
(12302040701165)



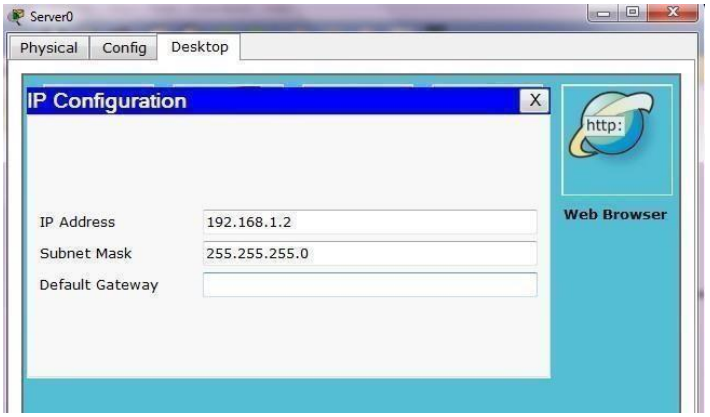
Select PC0 to view configuration window

Set the PC0 IP address clickon it and go to "DESKTOP" tab and look for "IP CONFIGURATION" button it should look like this after inserting 192.168.1.3the subnet mask will select itself.



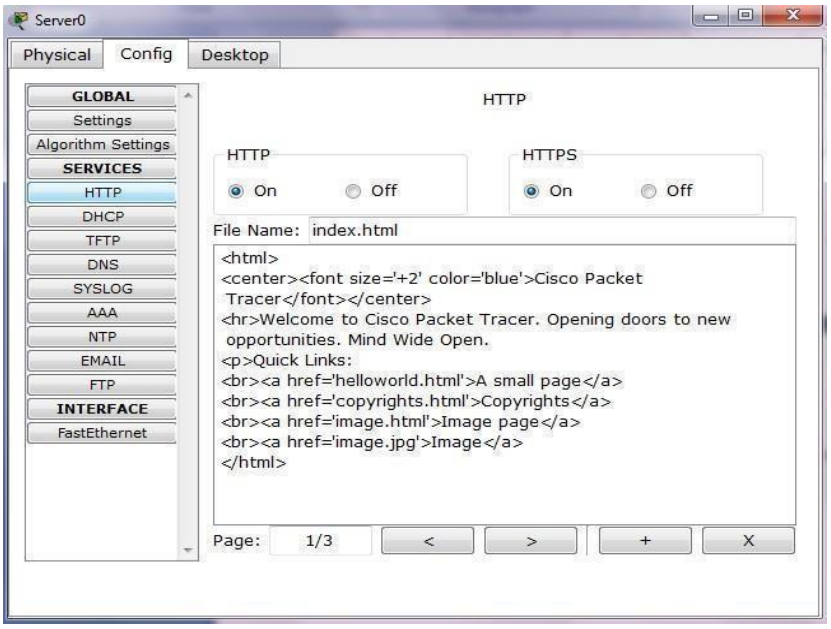
Click on Server0 to view configuration window

Set the Server0 IP address click on it and go to "DESKTOP" Tab and look for "IP CONFIGURATION" button it should look like this after inserting 192.168.1.2 the subnet mask will select itself

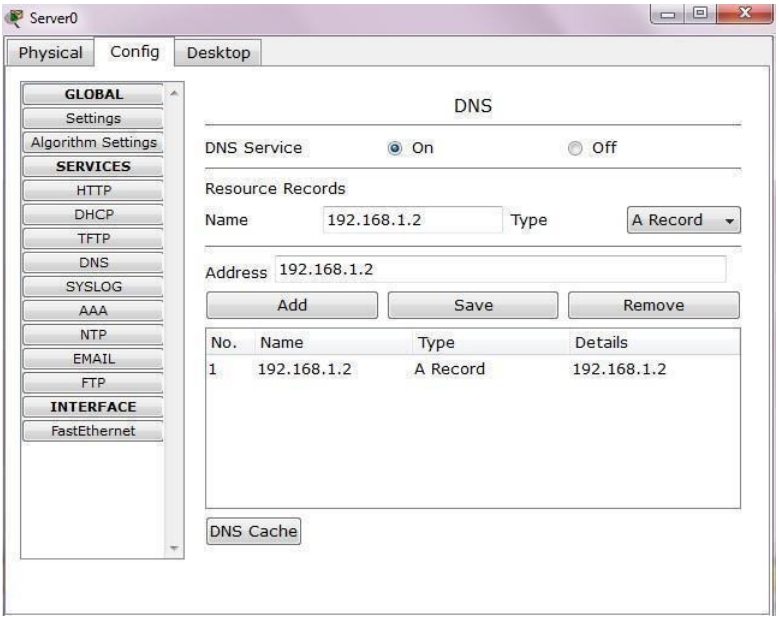


Configure HTTP Service on Server

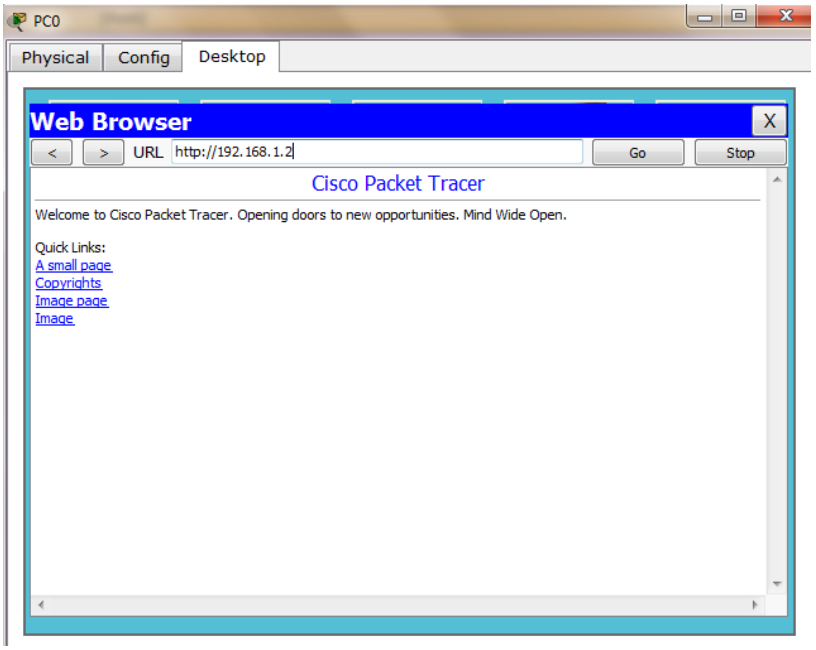
Select HTTP service, Select http service on, Select file name and file content in HTML Code.



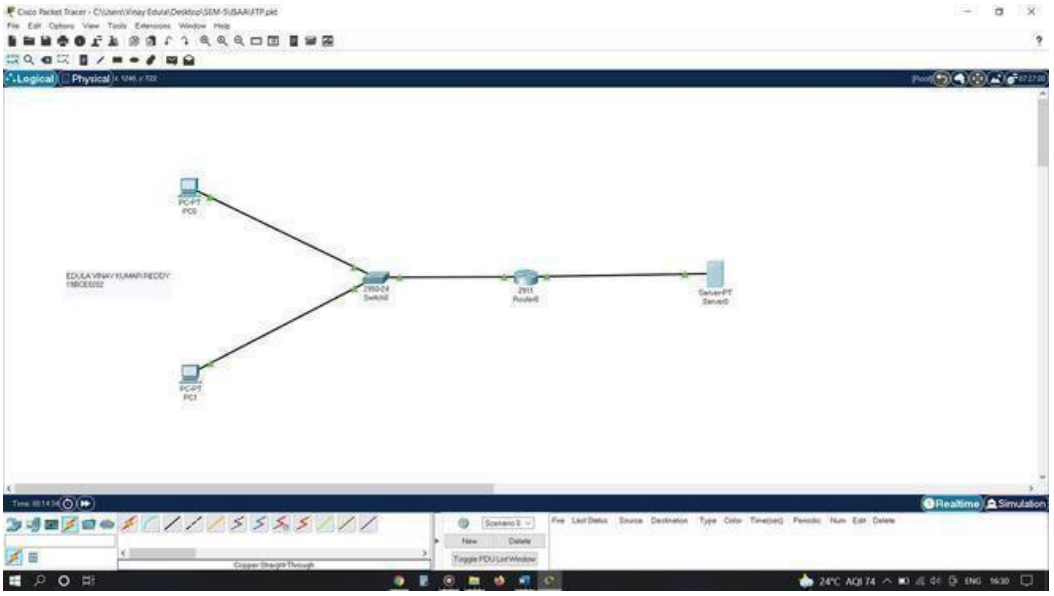
Click Server0 and go to "CONFIG" tab. Look for "DNS" , setthe "Name" into whatever you wish, but if you dont own a domain name just use the same ip adress like me is "192.168.1.2".



click the PC and then go to "DESKTOP" tab then choose "WEB BROWSER". On url box , type the server IP (192.168.1.2) an IP that is given for server.

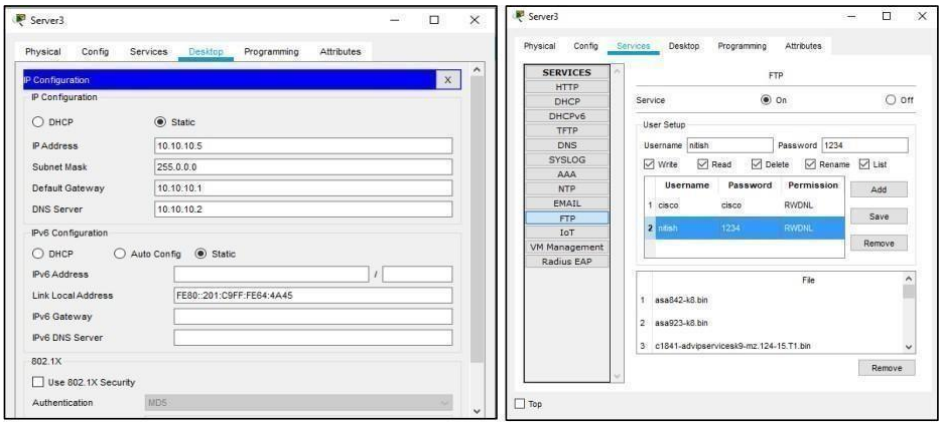


Now let's configure a FTP server in CISCO Packet Tracer.

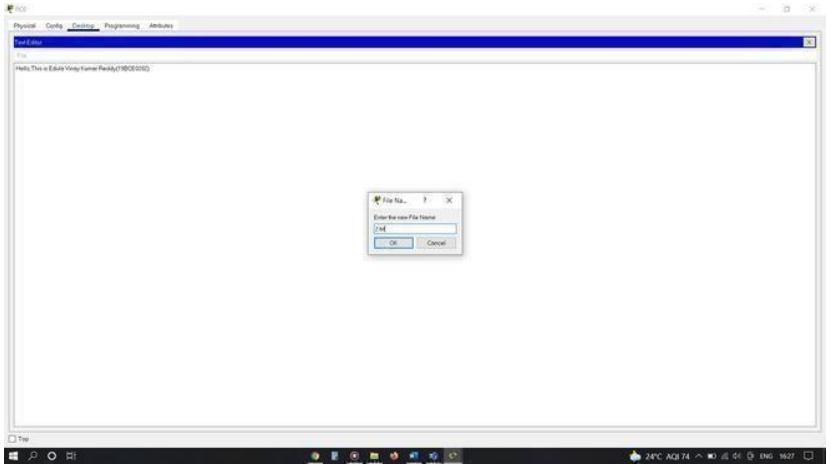


Objectives:

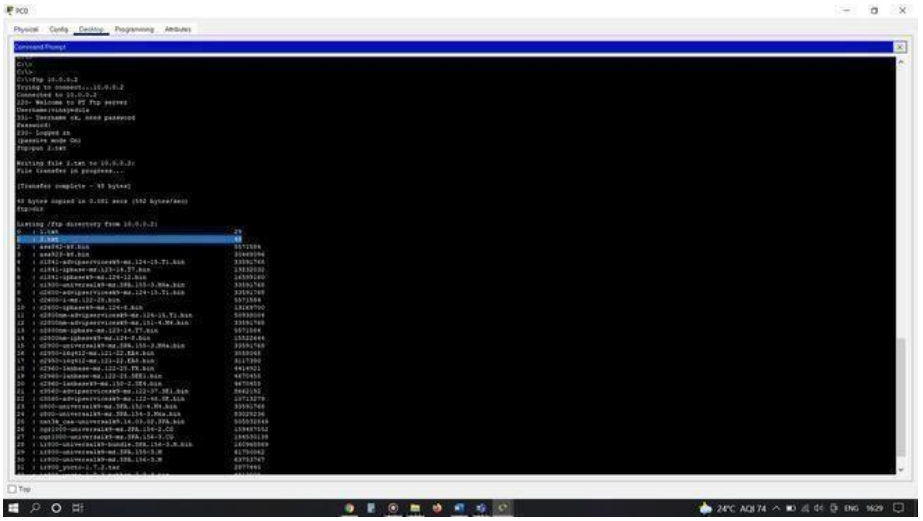
- To Configure FTP Services on Server.
- To Upload a File into the FTP Server from Remote PC.



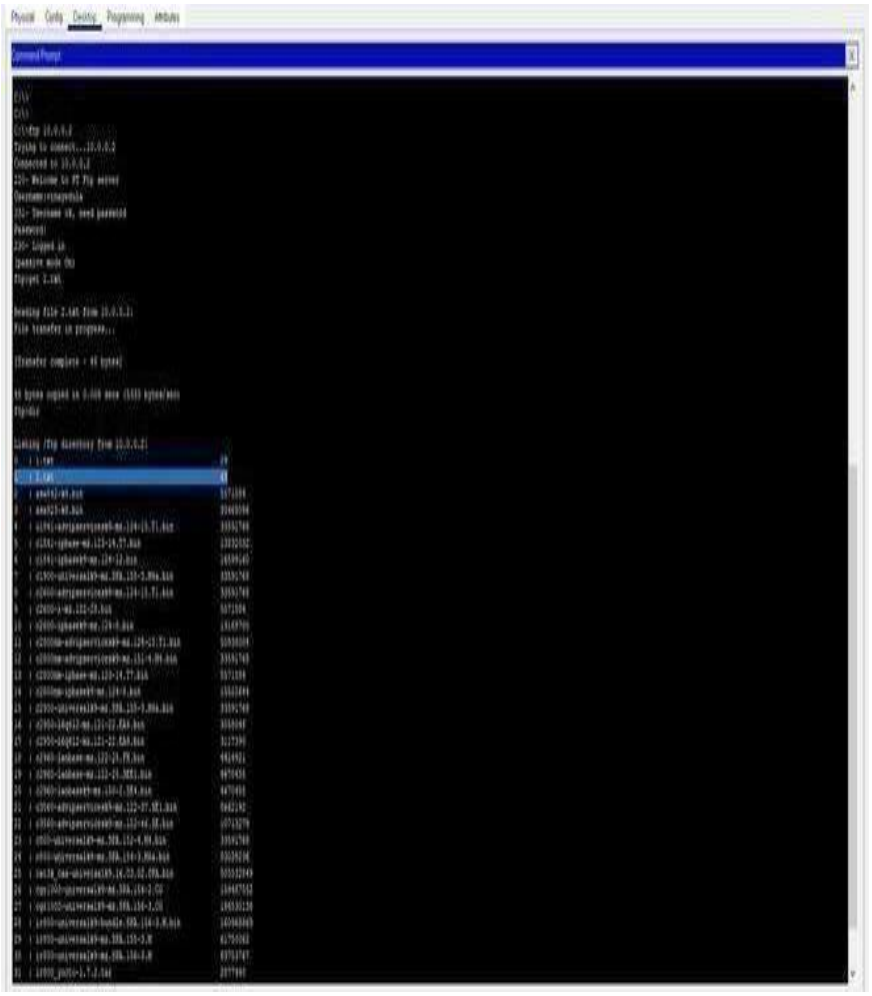
Creating a file named 2.txt for writing(uploading) into FTP Server.



Writing(uploading) the file named 2.txt into FTP Server from PC0using put 2.txt command and verifying this file transfer using dir command.



Reading(Downloading) the file named 2.txt present in FTP Server fromPC1 using get 2.txt commanded verifying this



PRACTICAL – 8

AIM:- Examine Network Address Translation (NAT) in CISCO packet tracer.

Examine NAT processes as traffic traverses a NAT border router. Background / Preparation

In this activity, you will use Packet Tracer Simulation mode to examine thecontents of the IP header as traffic crosses the NAT border router.

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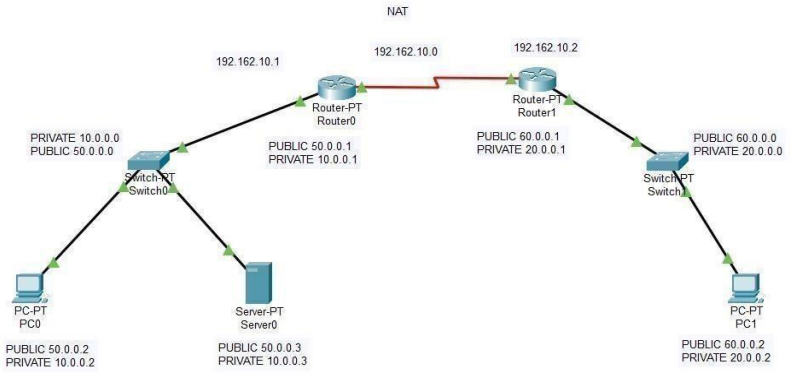
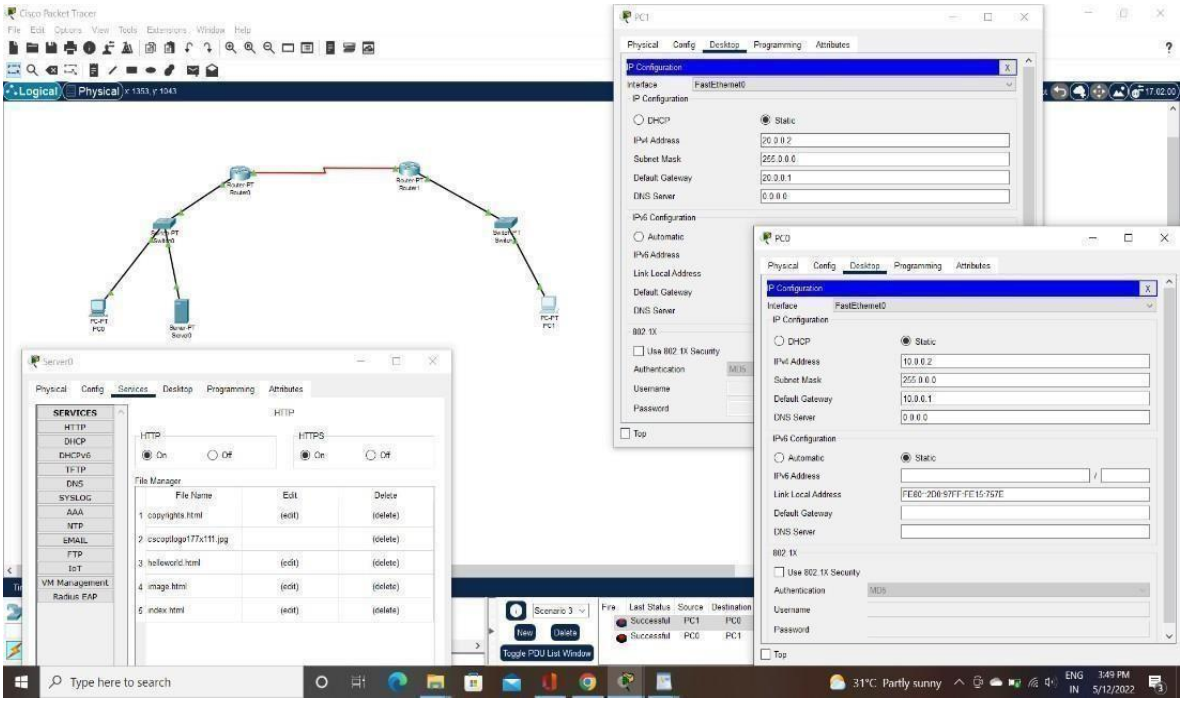
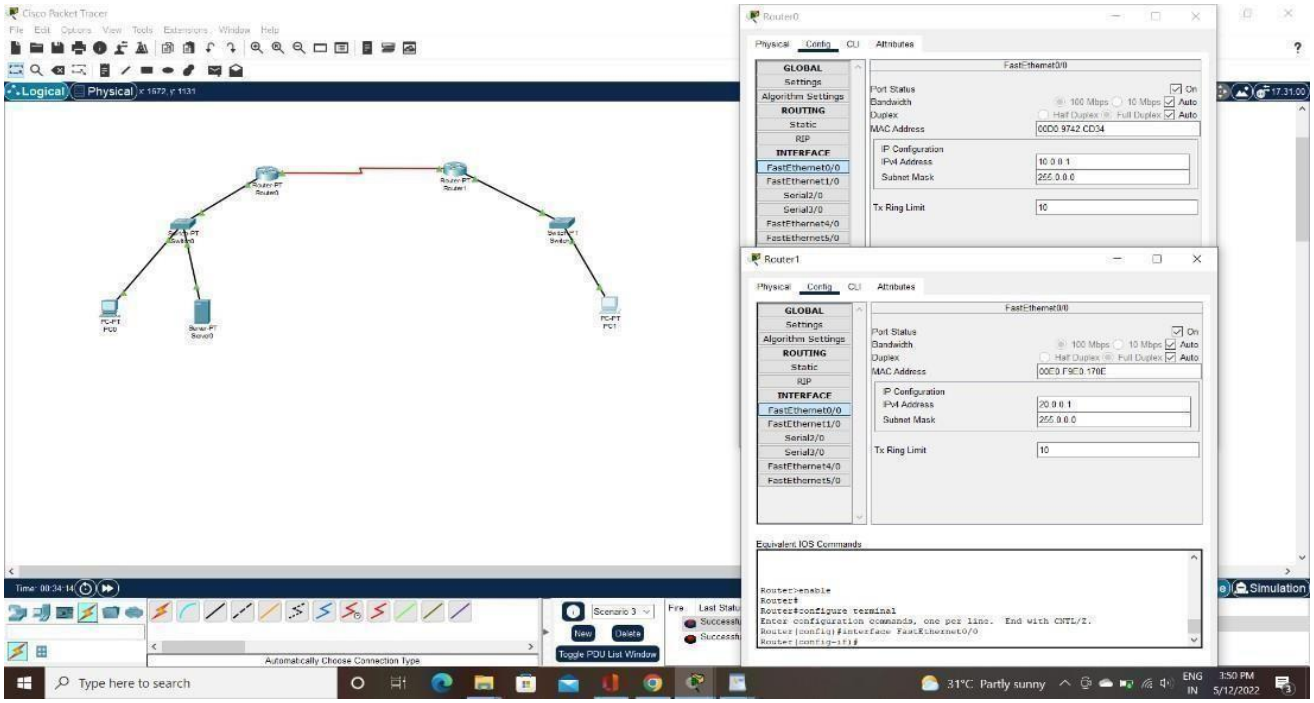


Assign IP address to pc.



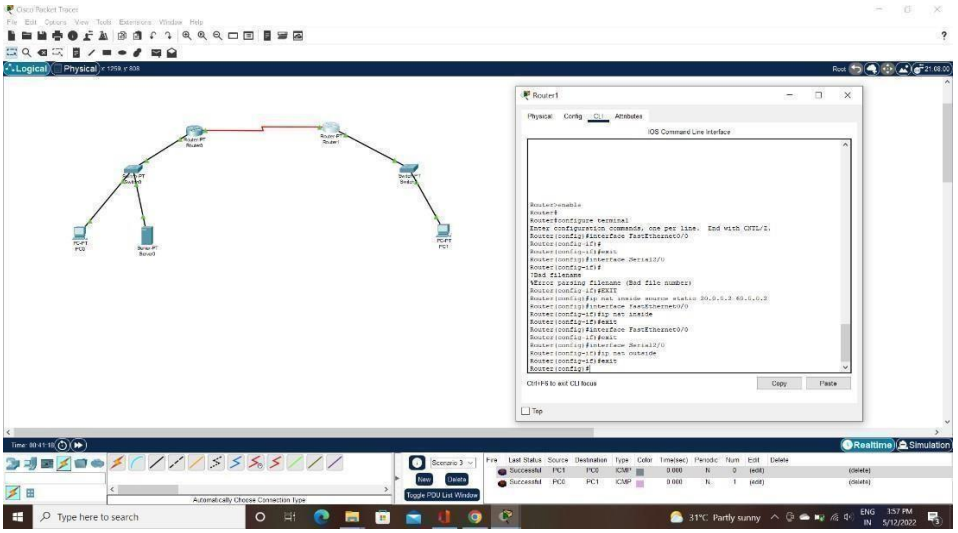
Assign IP address in FastEthernet0/0 of both routers.



Assign IP address in Serial2/0 of both routers.

Later on type the NAT commands in the CLI of both the routers.

```
Router(config-if)#exit
Router(config)#ip nat inside source static 10.0.0.2 50.0.0.2
Router(config)#ip nat inside source static 10.0.0.3 50.0.0.3
Router(config)#
Router(config)#
Router(config)#interface FastEthernet0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#
Router(config)#
Router(config)#interface FastEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet1/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#
Router(config)#
Router(config)#interface FastEthernet1/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface Serial2/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
```



PRACTICAL – 9

AIM:- Introduction to packet capturing using Wireshark.

- Packet capturing

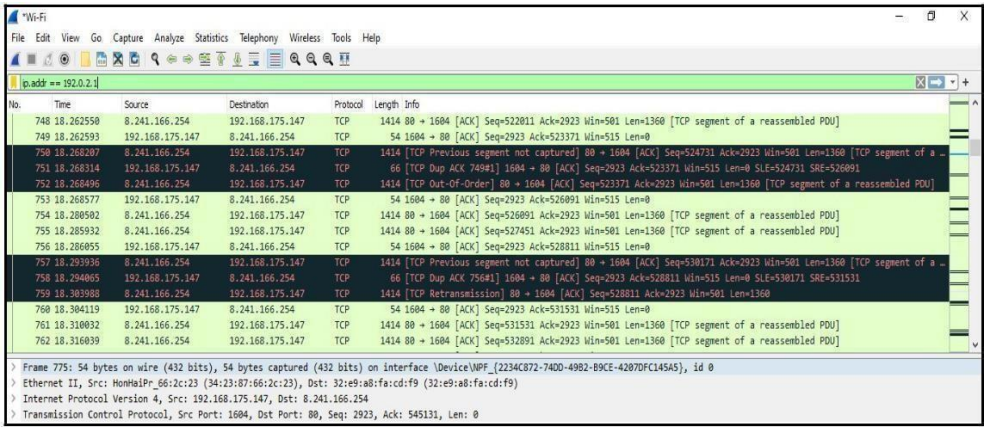
Packet Capture is a networking term for intercepting a data packet that iscrossing a specific point in a data network.

Once a packet is captured in real-time, it is stored for a period of time sothat it can be analyzed, and then either be downloaded, archived or discarded.

A packet capture tool (also called a network analyzer) can be used to capturethis data for analysis.

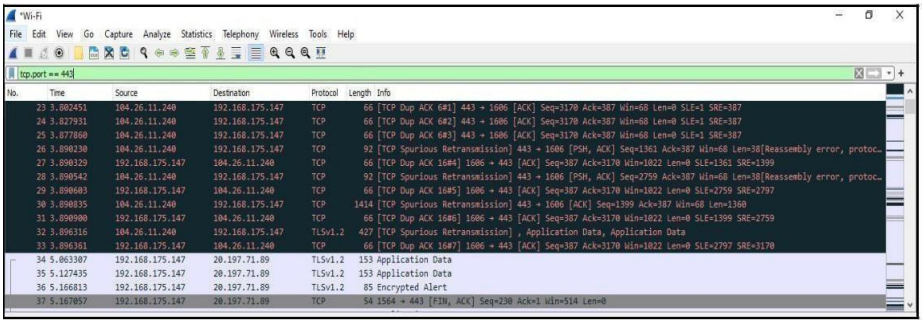
ip.addr == 10.10.1.171:

The following filter can be used to display only packets that have source ordestination IP address of 10.10.1.171.

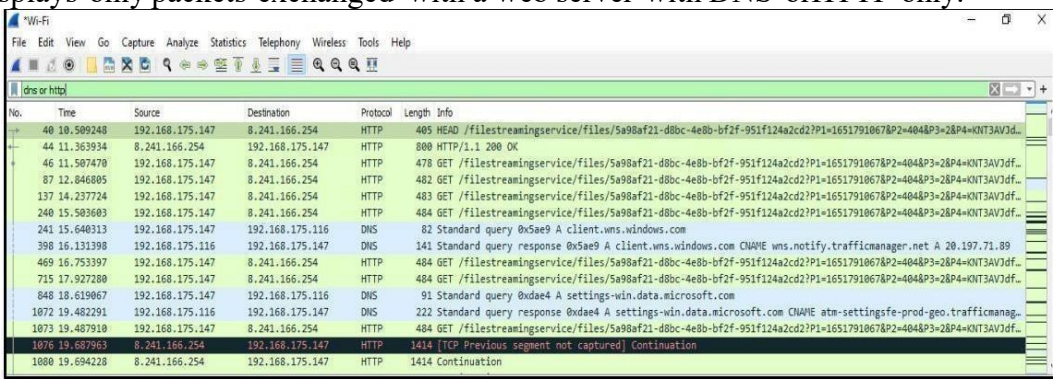


tcp.port == port number:

This filter displays only packets exchanged with a web server (assuming theweb server is using

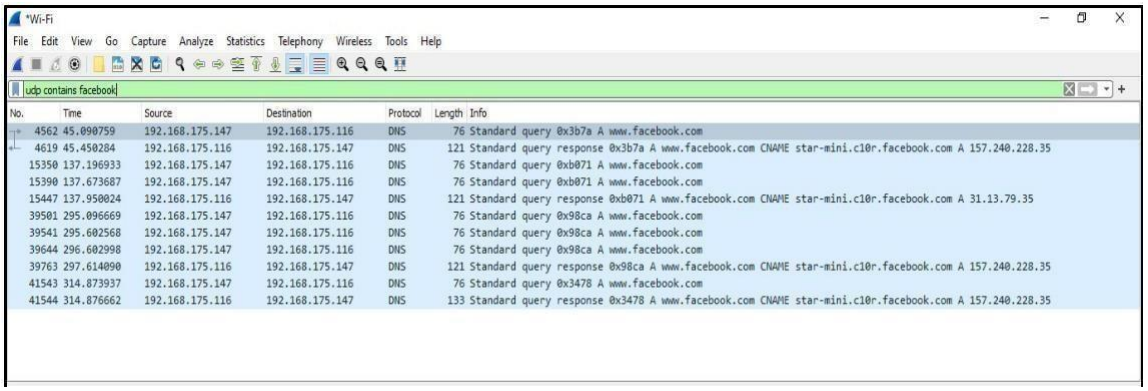


This filter displays only packets exchanged with a web server with DNS orHTTP only.



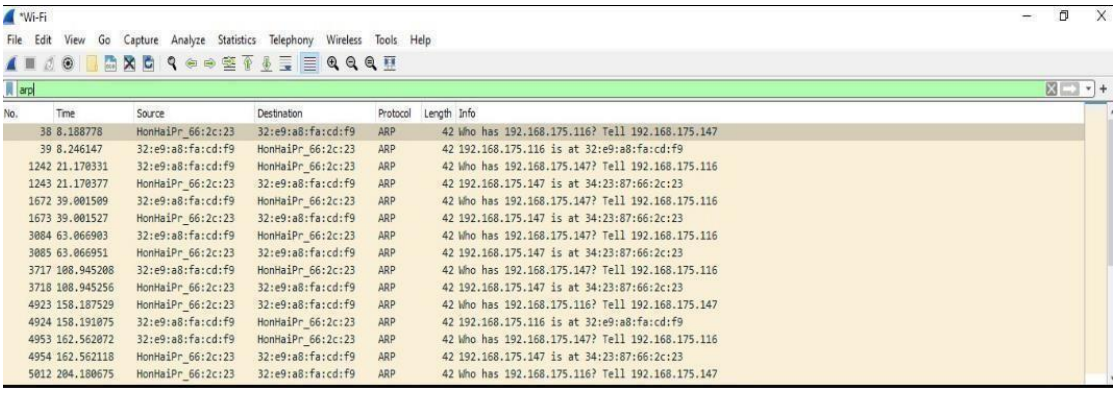
UDP:

This primitive allows you to filter on UDP port number. You can optionally precede this primitive with the keywords src|dst and udp which allow you to specify that you are only interested in source or destination ports and UDP packets respectively.



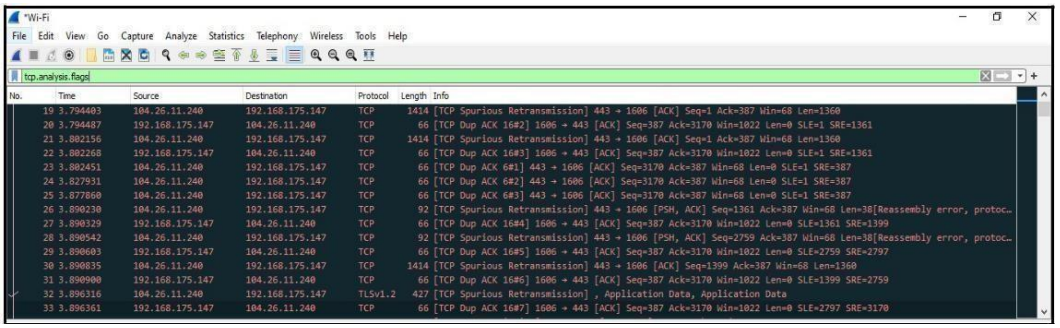
ARP:

Address Resolution Protocol (ARP) is a protocol or procedure that connects an ever-changing Internet Protocol (IP) address to a fixed physical machine address, also known as a media access control (MAC) address, in a local-area network (LAN).



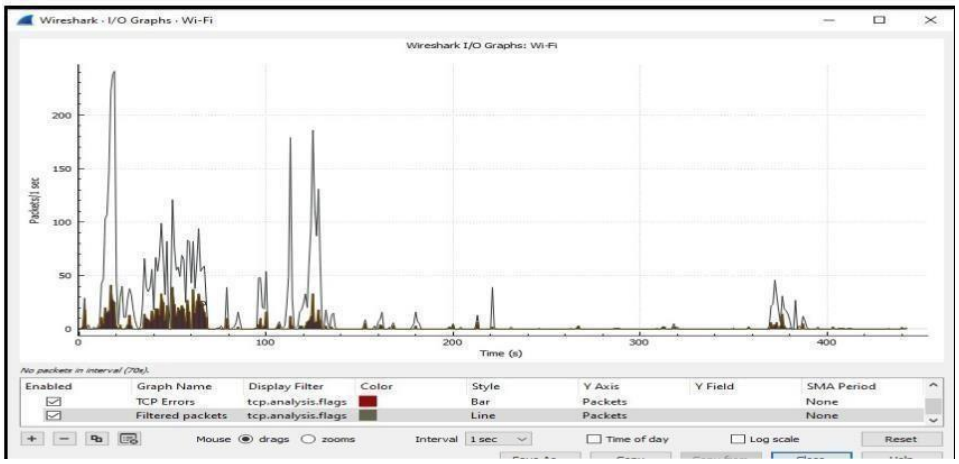
Tcp analysis flag:

Analysis is done once for each TCP packet when a capture file is first opened.Packets are processed in the order in which they appear in the packet list. Youcan enable or disable this feature via the “Analyze TCP sequence numbers” TCP dissector preference.



Wireshark I/O Graph

This window contains a chart drawing area along with a customizable list ofgraphs. Graphs are saved in your current profile.



PRACTICAL – 10

AIM:- Implement socket programming with UDP & TCP.

Code for ServerSide :

```
importjava.io.*;
importjava.net.*;
public class
MyServer
{
public static void main(String[] args)
{
Try
{
ServerSocket ss=new ServerSocket(6666); Socket  s=ss.accept();//establishes connection
DataInputStream dis=new
DataInputStream(s.getInputStream());
String str=(String)dis.readUTF();
System.out.println("message= "+str); ss.close();
}
catch(Exception e)
{
System.out.println(e);
}
}
}
```

Code For ClientSide :

```
importjava.io.*;
importjava.net.*;
public class
MyServer
{
public static void main(String[] args)
{
try
{ServerSocket ss=new ServerSocket(6666);  Socket s=ss.accept();//establishes
connection
DataInputStream dis=new
DataInputStream(s.getInputStream());  String str=(String)dis.readUTF();
System.out.println("message= "+str); ss.close();
}
catch(Exception e)
```

```
{
System.out.println(e);
}
}
}
```

OUTPUT: