



Department of Information Science and Engineering

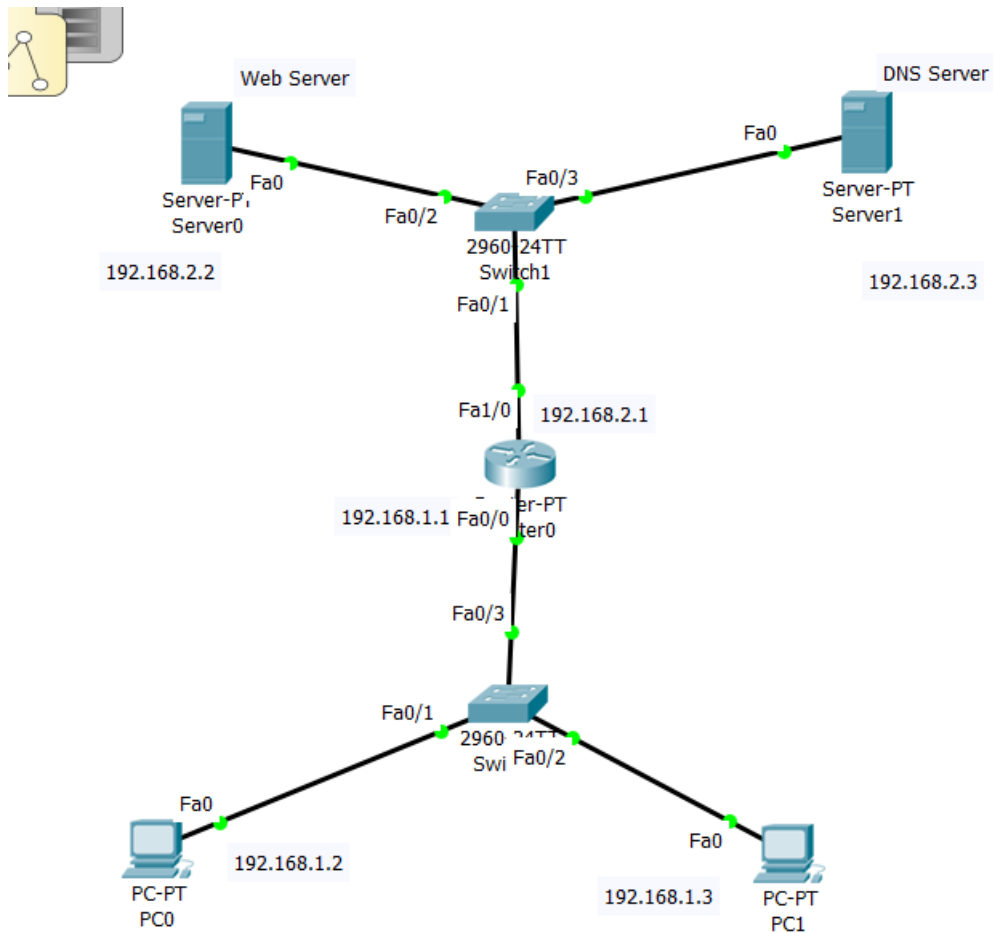
LAB PROGRAMS FOR COMPUTER NETWORKS-1

DNS server configuration in Packet Tracer

A Domain Name Service(**DNS**) server resolves host names into IP addresses. Although we can access a network host using its IP address, DNS makes it easier by allowing us use domain names which are easier to remember. For example its much easier to access google website by typing <http://www.google.com> as compared to typing <http://208.117.229.214>. In either case, you'll access google website, but using domain name is obviously easier.

Now, before any host can use a DNS service, we must configure a DNS server first. For example, when you type the URL <http://www.google.com> in your browser, the host will query the DNS server for the IP address of <http://www.google.com>. The DNS server will resolve <http://www.google.com> into an IP address then answer back the host with the IP address.

An HTTP server is a web server. It stores web resources that can be accessed by a web client. Your PC's browser(a web client) requests for web resources from a web server over the internet. Web resources are files such as text and images that the server will give to the client on request.



Configuration of PC

The screenshot shows the configuration window for PC1. The 'Config' tab is active, and the 'IP Configuration' section is expanded. The 'Static' radio button is selected under 'IP Configuration'. The fields are filled with the following values:

- IP Address: 192.168.1.3
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.1.1
- DNS Server: 192.168.2.3

Under the 'IPv6 Configuration' section, the 'Static' radio button is also selected. The IPv6 Address field is empty, and the Link Local Address is set to FE80::20C:85FF:FE03:9B64.

Configuration of Web Server

Server0

Physical Config Services Desktop Programming Attributes

IP Configuration X

IP Configuration

DHCP Static

IP Address: 192.168.2.2

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.2.1

DNS Server: 192.168.2.3

IPv6 Configuration

DHCP Auto Config Static

IPv6 Address: /

Link Local Address: FE80::230:F2FF:FE5A:367B

IPv6 Gateway:

IPv6 DNS Server:

Server0

Physical Config Services Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management

HTTP

HTTP: On Off

HTTPS: On Off

File Manager

	File Name	Edit	Delete
1	copyrights.html	(edit)	(delete)
2	cscoptlogo177x111.jpg		(delete)
3	helloworld.html	(edit)	(delete)
4	image.html	(edit)	(delete)
5	index.html	(edit)	(delete)

Server0

Physical Config Services Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

FastEthernet0

Port Status On

Bandwidth 100 Mbps 10 Mbps Auto

Duplex Half Duplex Full Duplex Auto

MAC Address 0030.F25A.367B

IP Configuration

DHCP

Static

IP Address 192.168.2.2

Subnet Mask 255.255.255.0

IPv6 Configuration

DHCP

Auto Config

Static

IPv6 Address

Link Local Address: FE80::230:F2FF:FE5A:367B

Configuration of DNS Server

The screenshot shows the 'IP Configuration' window for 'Server1'. The 'Desktop' tab is selected. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with: IP Address: 192.168.2.3, Subnet Mask: 255.255.255.0, Default Gateway: 192.168.2.1, and DNS Server: 0.0.0.0. Under 'IPv6 Configuration', the 'Static' radio button is selected. The fields are: IPv6 Address: (empty), Link Local Address: FE80::201:C7FF:FECE:4205, IPv6 Gateway: (empty), and IPv6 DNS Server: (empty).

The screenshot shows the 'Services' configuration window for 'Server1'. The 'Services' tab is selected. The 'DNS' service is listed in the left sidebar and is currently selected. The 'DNS Service' is set to 'On'. Under 'Resource Records', there is a table with one entry:

No.	Name	Type	Detail
0	bmsce.in	A Record	192.168.2.2

Buttons for 'Add', 'Save', and 'Remove' are visible above the table. The 'Name' field is empty and the 'Type' dropdown is set to 'A Record'.

Demo of TCP and HTTP using Cisco packet tracer

1. Use Simulation Mode Select the PC with IP Address 192.168.1.3 . Click on the web browser and type 192.168.2.2 . Show the Demo of TCP by right clicking on the Envelop. Note down the values at every Layer.

PDU Information at Device: PC1

OSI Model Outbound PDU Details

At Device: PC1
Source: PC1
Destination: 192.168.2.2

In Layers	Out Layers
Layer7	Layer 7:
Layer6	Layer6
Layer5	Layer5
Layer4	Layer 4: TCP Src Port: 1027, Dst Port: 80
Layer3	Layer 3: IP Header Src. IP: 192.168.1.3, Dest. IP: 192.168.2.2
Layer2	Layer 2: Ethernet II Header 000C.8503.9B64 >> 00D0.FFB6.234D
Layer1	Layer 1: Port(s): FastEthernet0

1. The HTTP client makes a connection to the server.

PDU information at Web server

PDU Information at Device: Server0

OSI Model Inbound PDU Details Outbound PDU Details

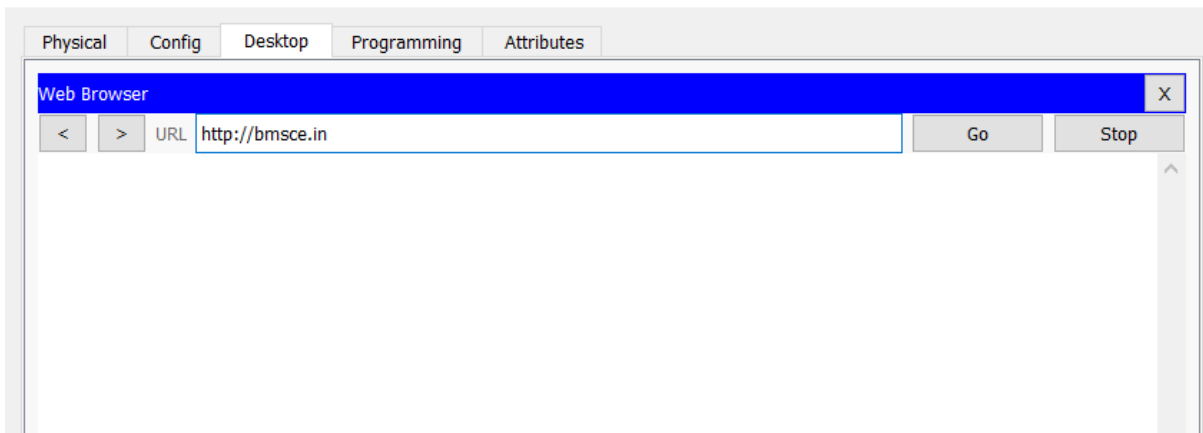
At Device: Server0
Source: PC1
Destination: 192.168.2.2

In Layers	Out Layers
Layer7	Layer7
Layer6	Layer6
Layer5	Layer5
Layer 4: TCP Src Port: 1027, Dst Port: 80	Layer 4: TCP Src Port: 80, Dst Port: 1027
Layer 3: IP Header Src. IP: 192.168.1.3, Dest. IP: 192.168.2.2	Layer 3: IP Header Src. IP: 192.168.2.2, Dest. IP: 192.168.1.3
Layer 2: Ethernet II Header 00E0.F97B.607B >> 0030.F25A.367B	Layer 2: Ethernet II Header 0030.F25A.367B >> 00E0.F97B.607B
Layer 1: Port FastEthernet0	Layer 1: Port(s): FastEthernet0

1. FastEthernet0 receives the frame.

Demo of UDP with DNS

1. At the same PC in Simulation mode select web browser and type bmsce.in



2. Show the demo of UDP with DNS

PDU Information at Device: PC1

OSI Model Outbound PDU Details

At Device: PC1
Source: PC1
Destination: 192.168.2.3

In Layers	Out Layers
Layer7	Layer 7: DNS
Layer6	Layer6
Layer5	Layer5
Layer4	Layer 4: UDP Src Port: 1026, Dst Port: 53
Layer3	Layer 3: IP Header Src. IP: 192.168.1.3, Dst. IP: 192.168.2.3
Layer2	Layer 2: Ethernet II Header 000C.8503.9B64 >> 00D0.FFB6.234D
Layer1	Layer 1: Port(s): FastEthernet0

1. The DNS client sends a DNS query to the DNS server.

3. At the DNS Server

PDU Information at Device: Server1

OSI Model Inbound PDU Details Outbound PDU Details

At Device: Server1
Source: PC1
Destination: 192.168.2.3

In Layers	Out Layers
Layer 7: DNS	Layer 7: DNS
Layer6	Layer6
Layer5	Layer5
Layer 4: UDP Src Port: 1026, Dst Port: 53	Layer 4: UDP Src Port: 53, Dst Port: 1026
Layer 3: IP Header Src. IP: 192.168.1.3, Dst. IP: 192.168.2.3	Layer 3: IP Header Src. IP: 192.168.2.3, Dst. IP: 192.168.1.3
Layer 2: Ethernet II Header 00E0.F97B.607B >> 0001.C7CE.4205	Layer 2: Ethernet II Header 0001.C7CE.4205 >> 00E0.F97B.607B
Layer 1: Port FastEthernet0	Layer 1: Port(s): FastEthernet0

1. FastEthernet0 receives the frame.

Note down the output at each level with neat explanation.

Network Address Translation

Design a network that provides a pool of private IP addresses at each LANs. The LAN s in turn connected to a WAN Gate way Router with a pubic IP address provided by ISP.

For a computer to communicate with the Internet as a whole, it must have an IP address. Using the IPv4 system, these are unique, 32-bit numbers that are broken up into four different binary octets. It doesn't matter whether it's a server, or a computer, or an Xbox. If it doesn't have an IP address, it's not getting online.

But, there simply isn't enough IP addresses to go around to give each host their own address. So, in order to make better use of the extremely limited address space available, we use Network Address Translation.

Network Address Translation allows a single device to sit between a local area network and the Internet, and forward traffic to the appropriate host. You probably know this as your router. The advantage of this is multiple computers can share the same IP public address.

This single device (usually **a router**, switch, or hardware firewall) modifies IP packet headers on the fly, ensuring that the contents of the packet get to the intended destination. However, it comes with a downside, as it becomes exponentially harder for hosts outside the local network to communicate with servers that are located behind the router.

There are multiple ways in which Network Address Translation can work, with the three of the most common being Dynamic NAT, Static NAT, and Overloading.

1) Dynamic NAT

With Dynamic NAT, a router will maintain a list of public IP addresses. When a host behind the network needs to transmit or receive, the router will select one of the public IP addresses that is not currently in use, and forward any packets accordingly. As a result, this means a host's IP address can change at any given moment.

But crucially, it means a large pool of hosts can share a significantly smaller pool of IP addresses. This was vital, given the impending exhaustion of the available pool of IPv4 addresses.

2) Overloading (PAT)

A common way of performing network address translation is through something called ‘Overloading’, where multiple internal IP addresses are mapped to a single public IP address. This is done by giving each internal host a corresponding port. For instance, suppose you’ve got three computers on an internal network, and a public IP address of 212.18.123.123. Each of those internal computers could theoretically be accessible via 212.18.123.123:2001, 212.18.123.123:2002 and 212.18.123.123:2003.

This is commonly known as Port Address Translation (PAT), Single-Address NAT, and port-level multiplexed NAT.

3) Static NAT

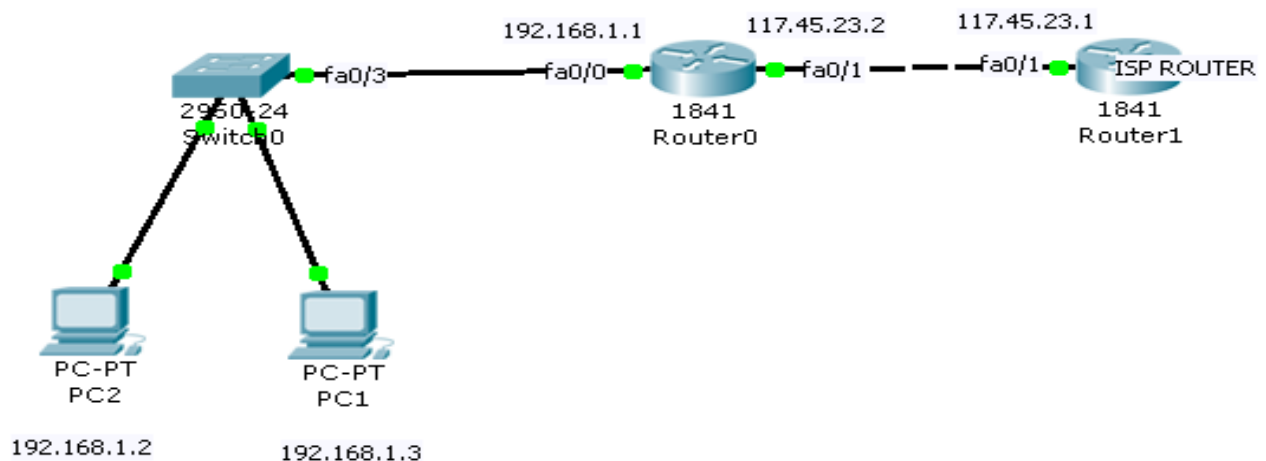
Finally, let’s talk about Static NAT.

Internal networks, like your home or office network, do not use the same IP addressing system that’s used on the public Internet. Any networked device effectively has two IP addresses. The first is a private one, and that’s only reachable from within that network. The second is the one that’s externally accessible.

Static NAT makes it possible to create a direct, one-to-one link between a private IP address and a **static, public IP address**.

Dynamic Network Address Translation

Step 1: Draw the topology as shown below



Configure the devices with the IP address as shown in above figure.

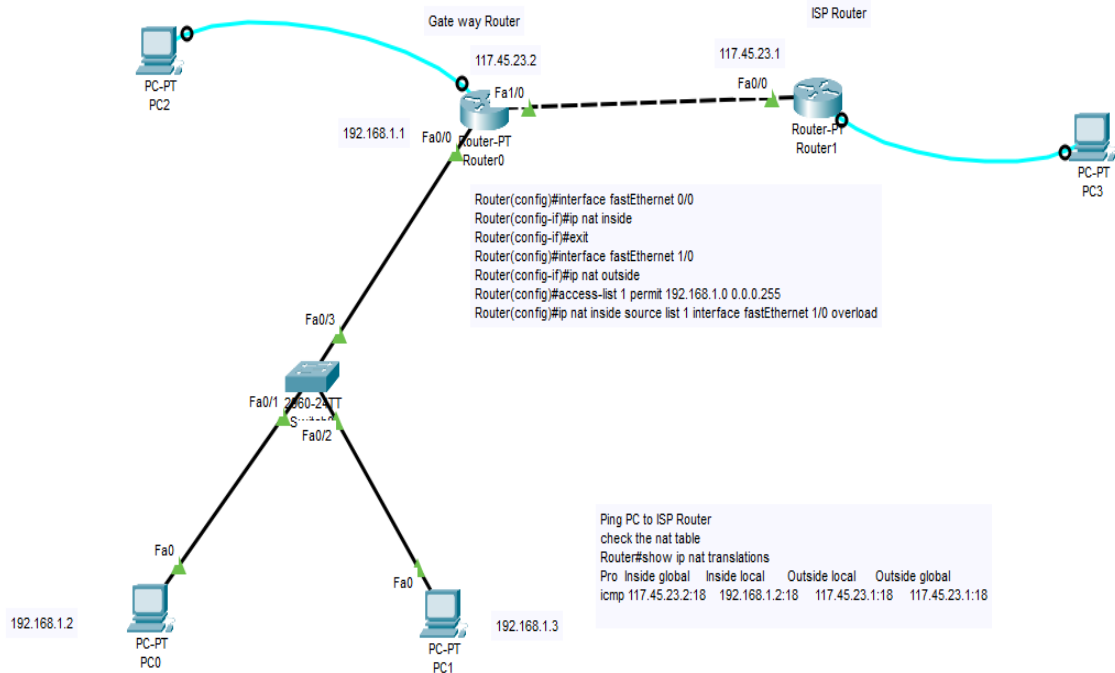
Step 2: Configure the router 0 as below

- Click on the router 0
- Select CLI
- Execute the following commands

```
Router>enable
Router#configure terminal
Router(config)#interface fastethernet 0/0
Router(config)#ip nat inside
Router(config)#interface fastethernet 0/1
Router(config)#ip nat outside
Router(config)# access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)#ip nat pool public-ips 117.45.23.2 117.45.23.5 netmask 255.255.255.0
Router(config)#ip nat inside source list 1 pool public-ips overload
```

Step 3: Ping from PC2 to Router 1 and check the NAT table

To see NAT table select inspect tool at right side and click on router 0 then select NAT table.

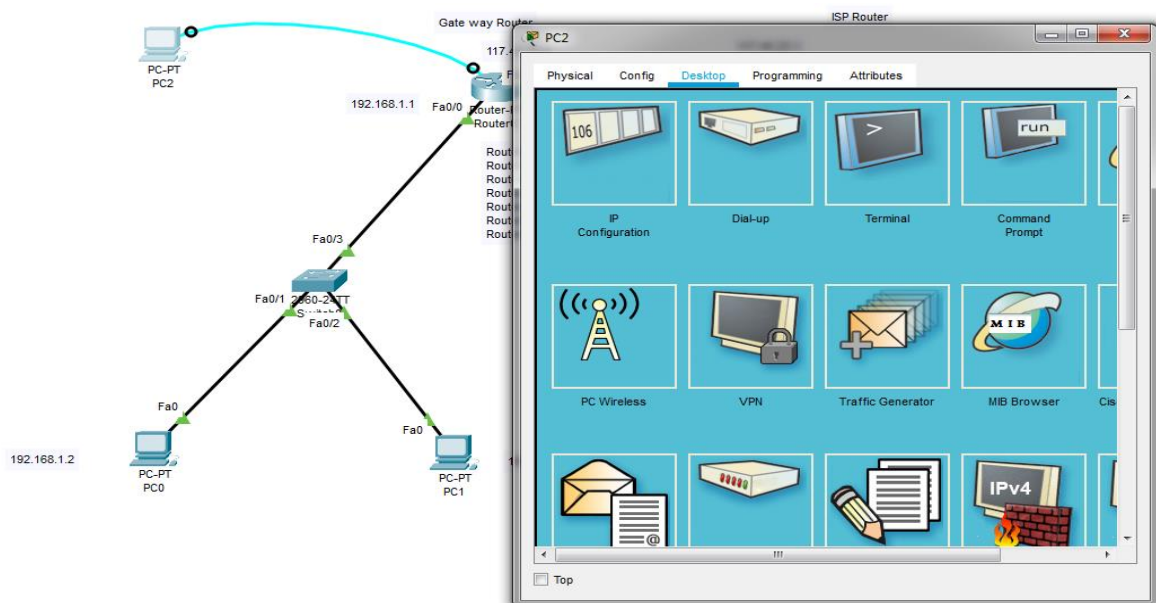


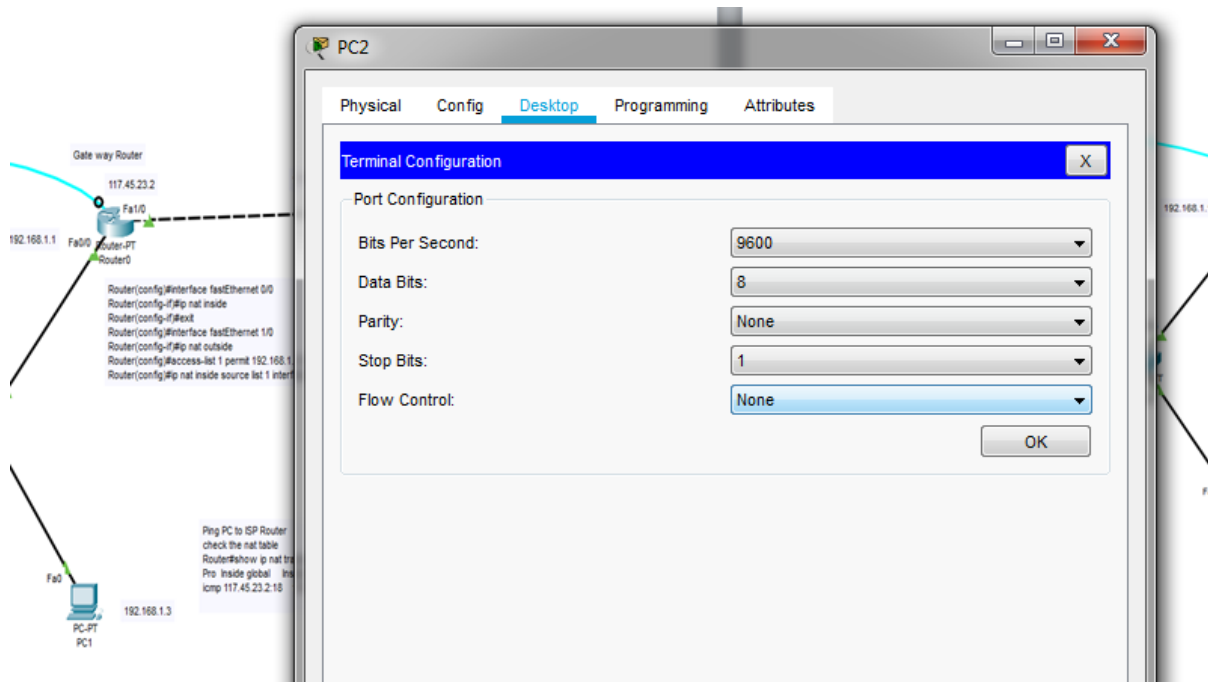
Step 1: Design the network as shown in the figure.

Step 2: To configure the routers use the Console.

Procedure to Configure the Router Using Console

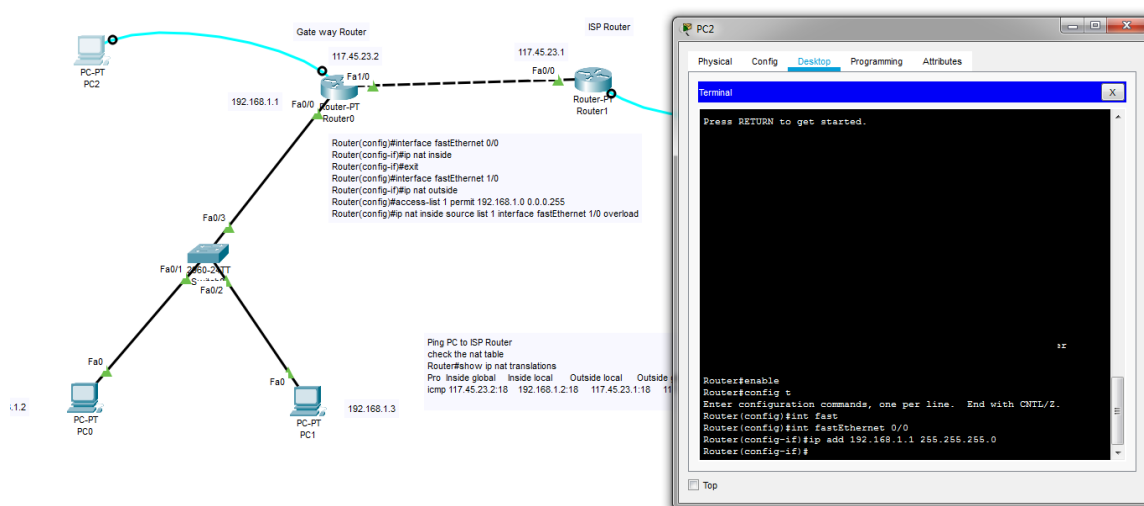
1. Connect PC and Router using Console Cable.
2. PC using RS232C and Router to Console Port.
3. Click on PC
4. Select Terminal. Click OK. Now the PC will be used to configure the Router.





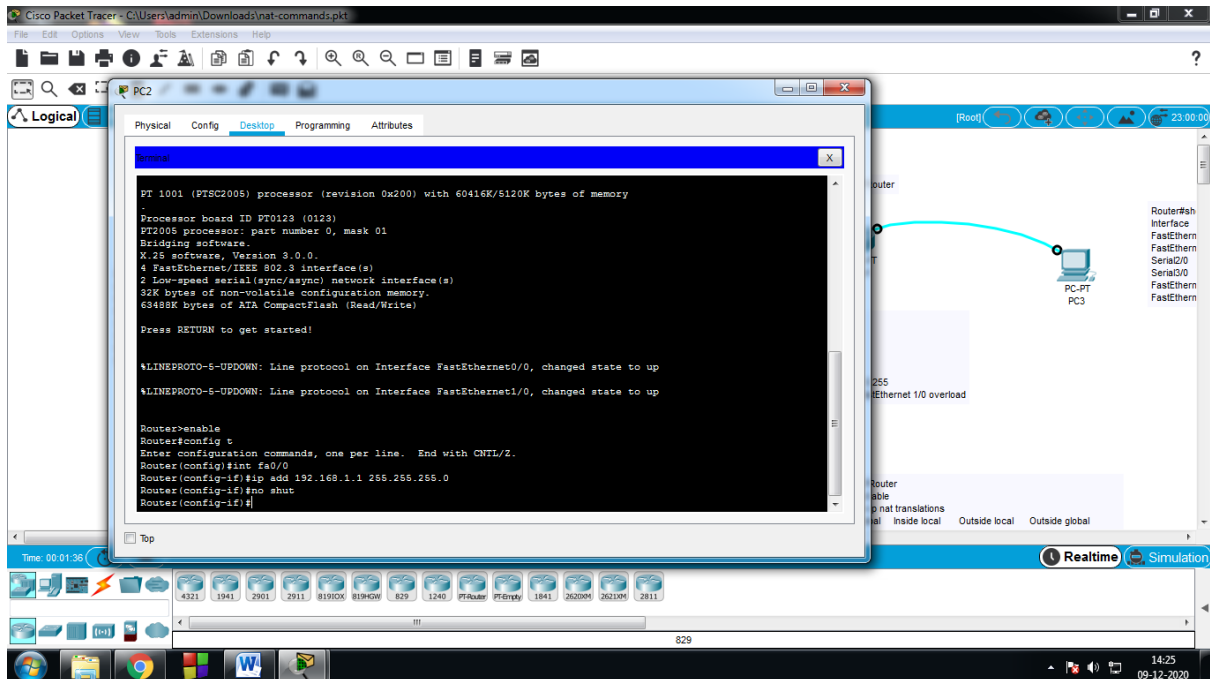
Step 3: configure two ports fast0/0 and fast1/0

Step 4: Configure Default Gateway of Router – Gateway Router

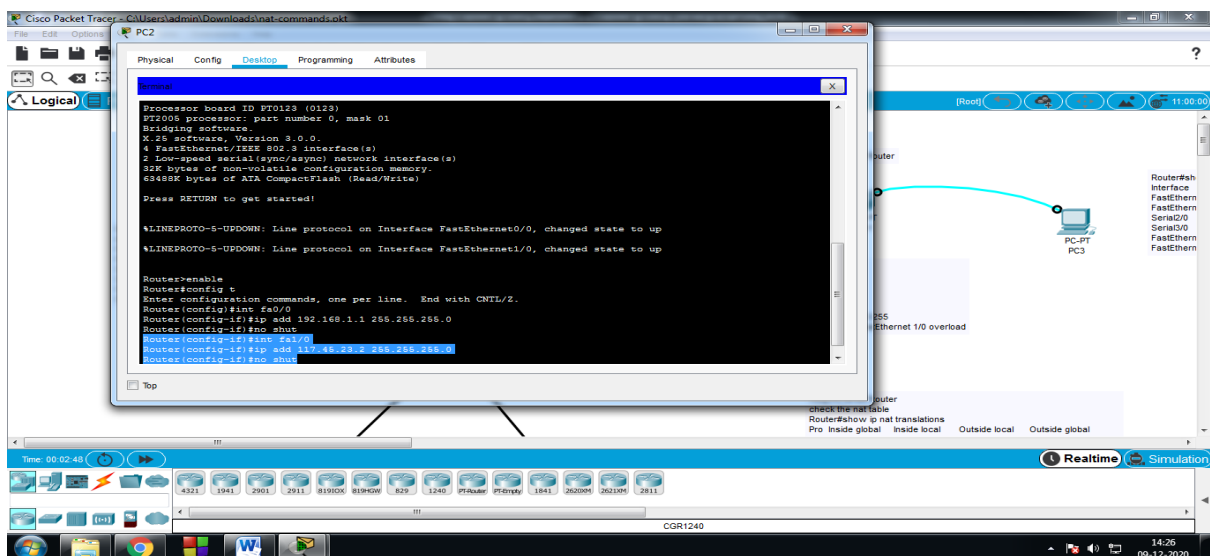


Router>enable
 Router#config t
 Enter configuration commands, one per line. End with CNTL/Z.

```
Router(config)#int fa0/0
Router(config-if)#ip add 192.168.1.1 255.255.255.0
Router(config-if)#no shut
```



```
Router#enable
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa1/0
Router(config-if)#ip add 117.45.23.2 255.255.255.0
Router(config-if)#no shut
```

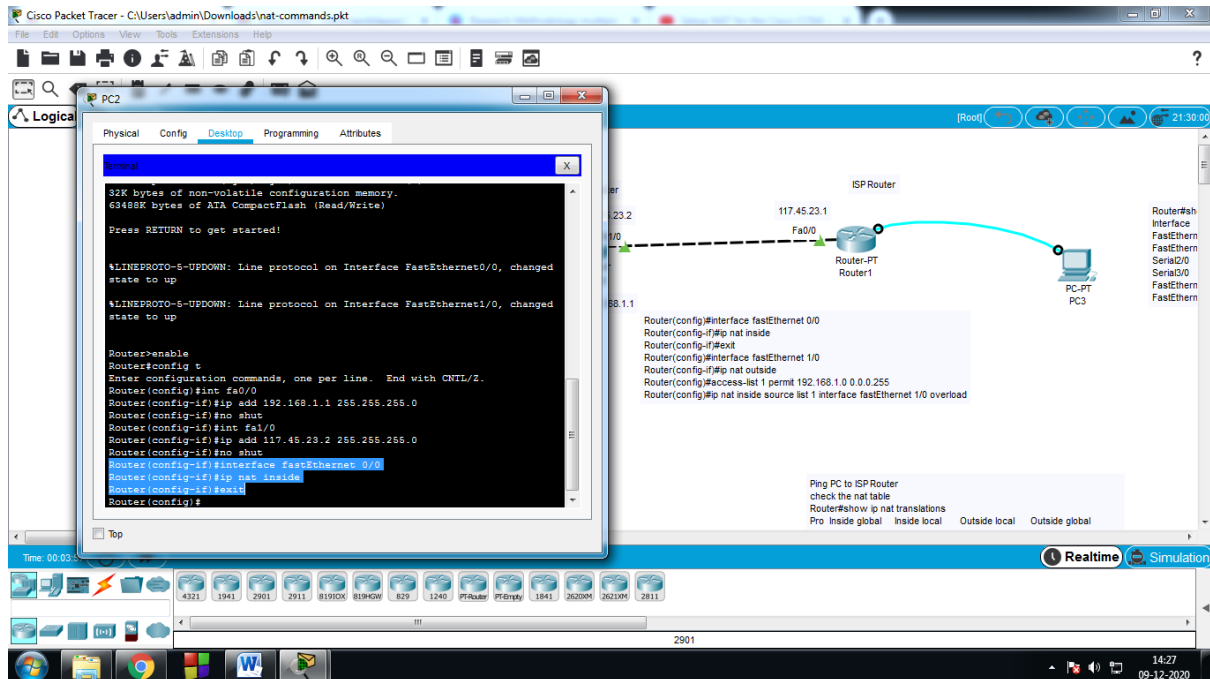


Step 5: configure NATing at Gate way Router

```
Router(config-if)#interface fastEthernet 0/0
```

```
Router(config-if)#ip nat inside
```

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



```
Router(config-if)#interface fastEthernet 0/0
```

```
Router(config-if)#ip nat inside
```

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

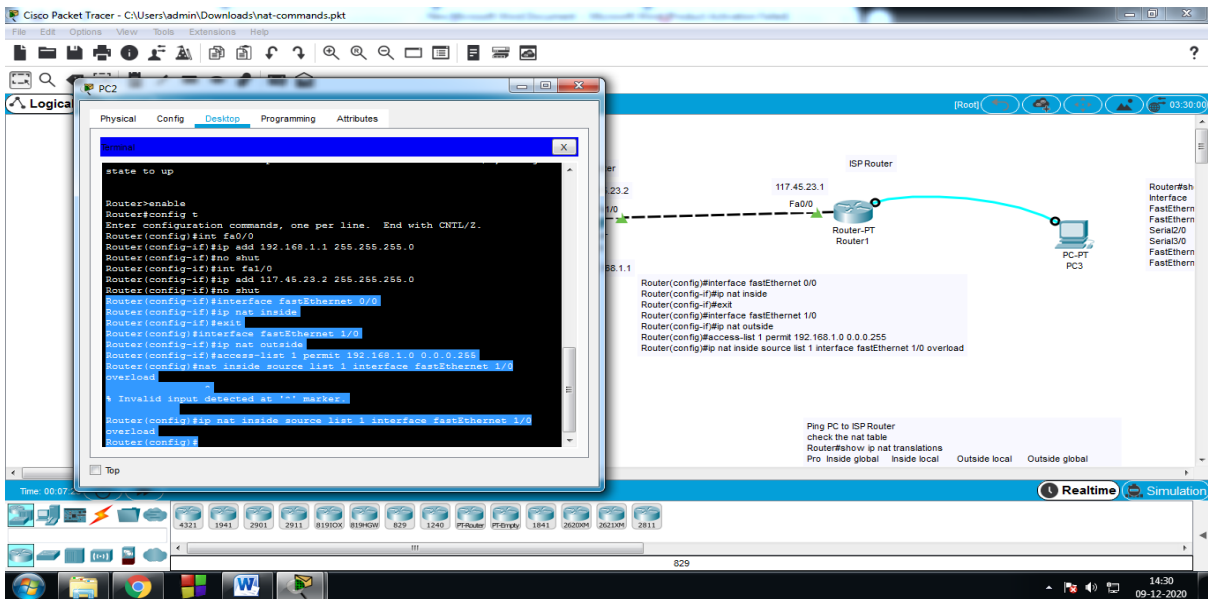
```
Router(config)#interface fastEthernet 1/0
```

```
Router(config-if)#ip nat outside
```

```
Router(config-if)#access-list 1 permit 192.168.1.0 0.0.0.255
```

```
Router(config)#ip nat inside source list 1 interface fastEthernet 1/0 overload
```

```
Router(config)#
```



Step 7: Click on PC3 and configure the ports fast0/0

Router>enable

Router#config t

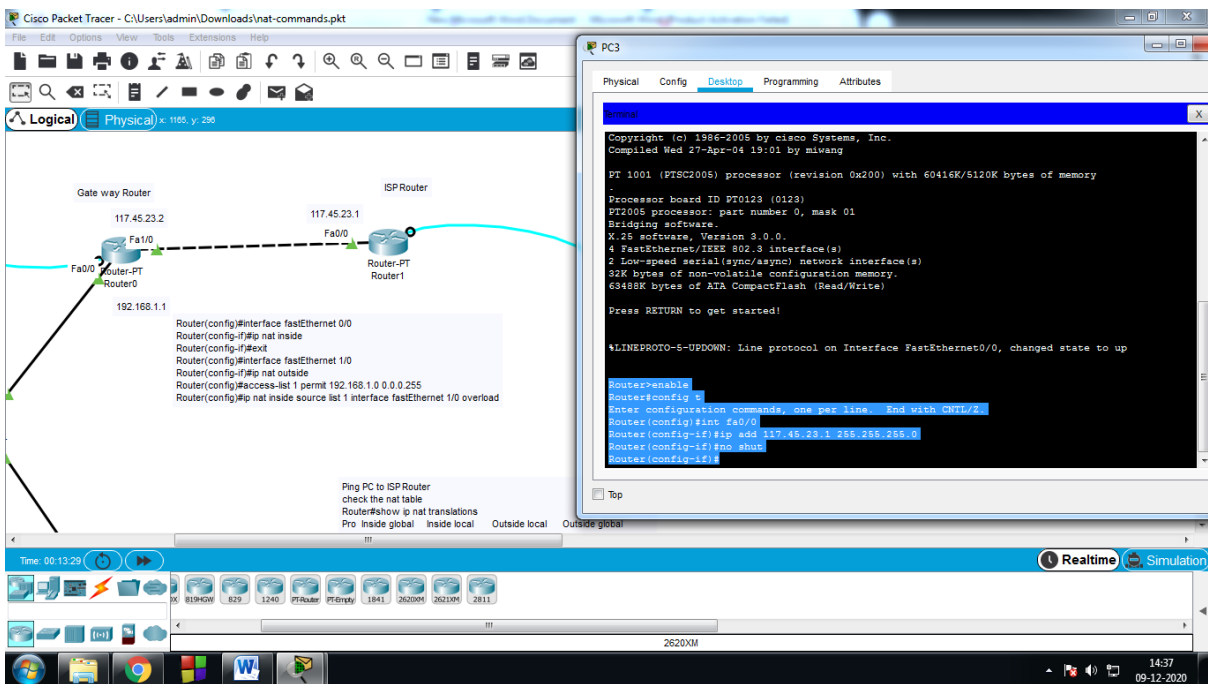
Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa0/0

Router(config-if)#ip add 117.45.23.1 255.255.255.0

Router(config-if)#no shut

Router(config-if)#



Step 8: Ping PC to ISP Router and check the nat table

Router#enable

Router#show ip nat translations

The screenshot displays the Cisco Packet Tracer interface. A terminal window for a router is open, showing the following configuration and verification steps:

```
Router(config-if)#ip add 192.168.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#int fa1/0
Router(config-if)#ip add 117.45.23.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#interface fastEthernet 0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#interface fastEthernet 1/0
Router(config)#ip nat outside
Router(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)#nat inside source list 1 interface fastEthernet 1/0 overload
Router(config)#exit
Router#
$SYS-6-CONFIG_I: Configured from console by console

Router#enable
Router#show ip nat translations
Pro inside global      Inside local      Outside local      Outside global
icmp 117.45.23.2:3      192.168.1.3:3      117.45.23.1:3      117.45.23.1:3
```

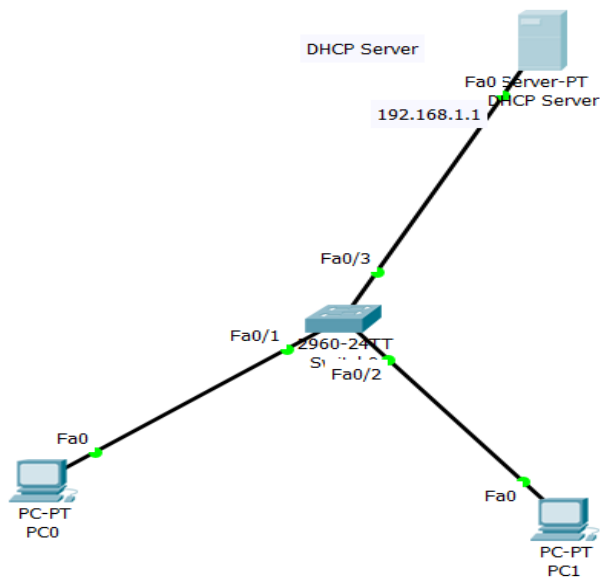
The background shows a network diagram with a router (Router-PT-Empty) and a PC (PC-PT). The router's configuration is visible in the left pane, and the simulation status is shown at the bottom right.

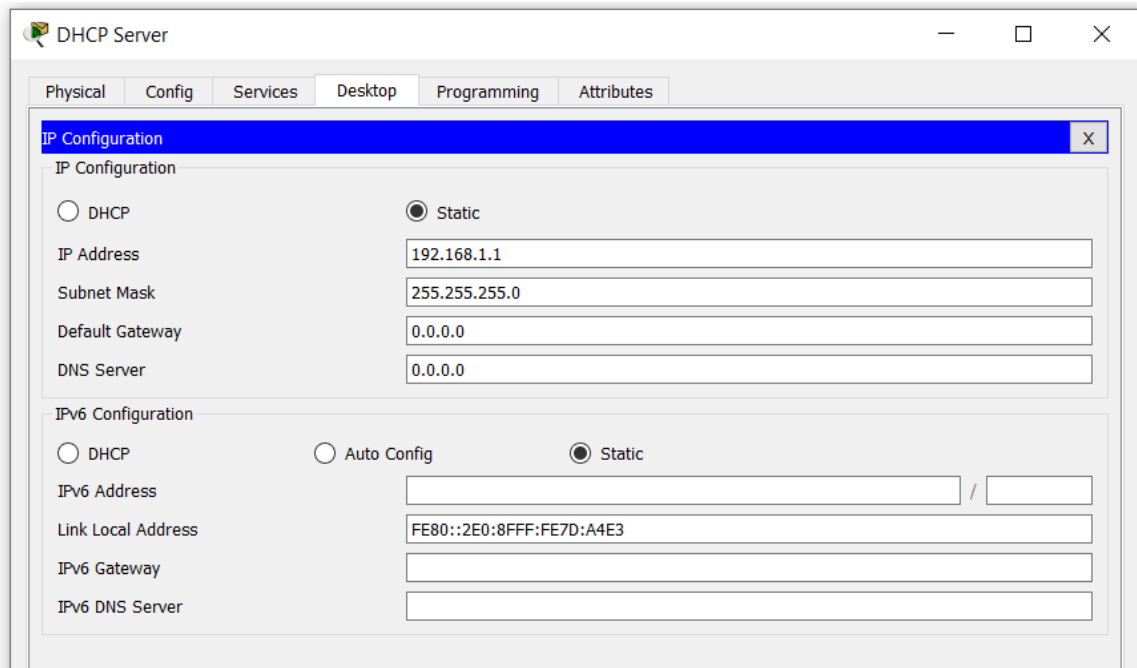


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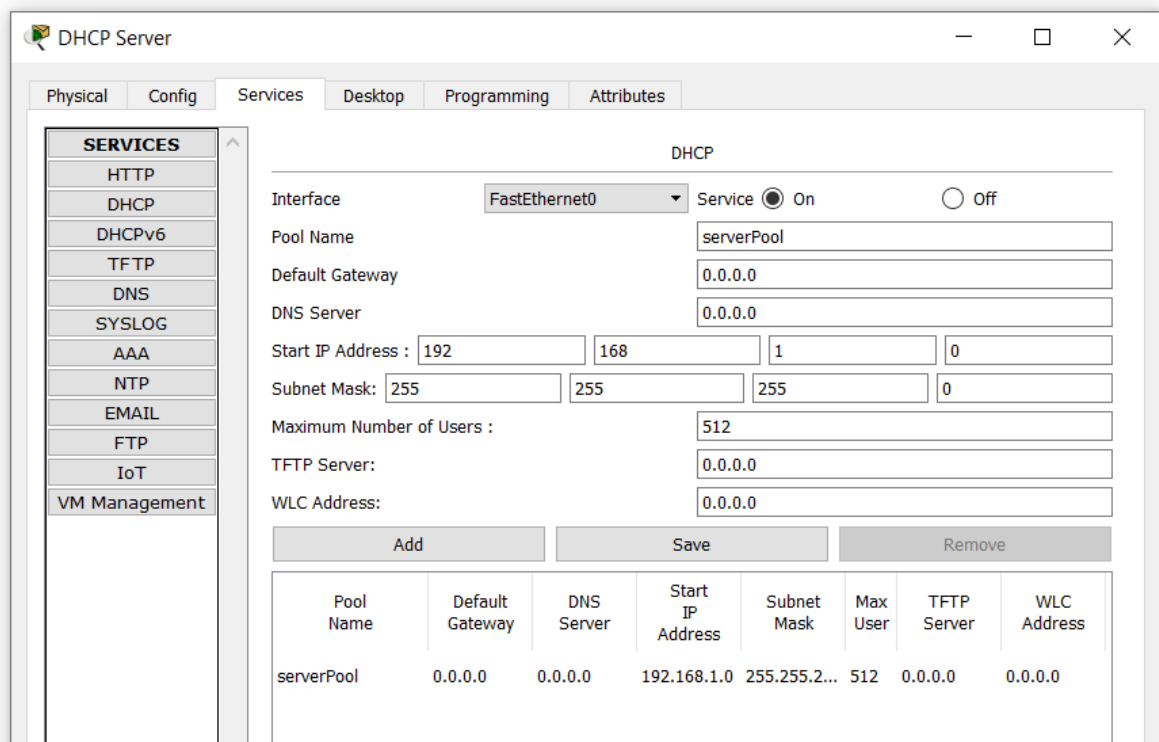
LAB PROGRAMS FOR COMPUTER NETWORKS-1

DHCP Server:- The DHCP (Dynamic Host Configuration Protocol) is a network protocol used to assign IP automatically to the systems with the help of a machine called DHCP server. A DHCP Server allows computers to request an IP address and networking parameters automatically. If you do not have a DHCP Server to configure IP addresses automatically to the PCs then you need to assign a static or manual IP address on the Computers. So in simple words, we can say that DHCP Server is only used for assigning the IP addresses to the Systems automatically.





Configuration of DHCP Server



Assign IP address to the PC

IP Configuration X

IP Configuration

DHCP Static DHCP request successful.

IP Address: 192.168.1.2

Subnet Mask: 255.255.255.0

Default Gateway: 0.0.0.0

DNS Server: 0.0.0.0

IPv6 Configuration

DHCP Auto Config Static

IPv6 Address: [] / []

Link Local Address: FE80::201:63FF:FE95:4059

IPv6 Gateway: []

IPv6 DNS Server: []