Experiment No. 9
To design and Simulate NAT on the router using Cisco packet tracer
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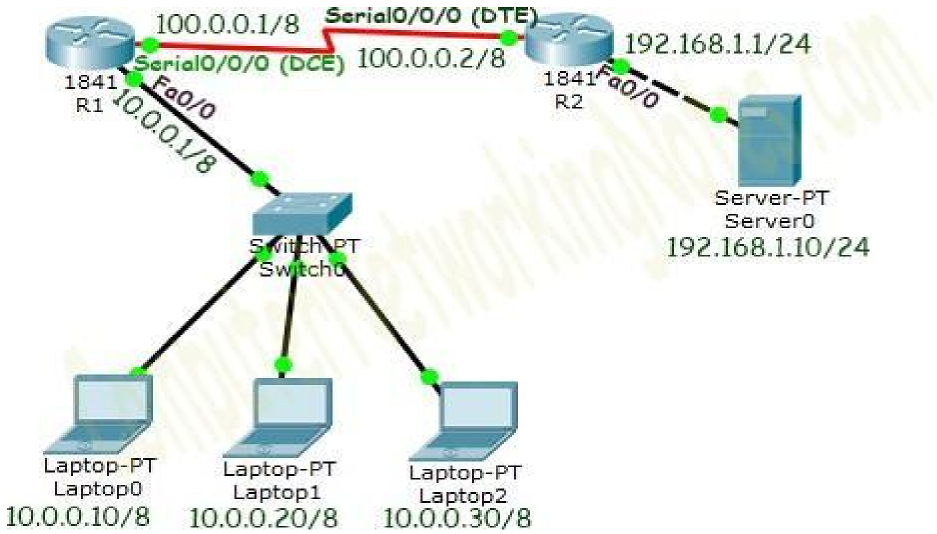
Aim - To configure and verify Static NAT translation

Objective -
1. To create a network topology to understand static NAT configuration
2. To configure static NAT by defining IP addressing, local interface and global interface

Theory:

Network address translation (NAT) is a method of mapping an IP address space into another by modifying network address information in the IP header of packets while they are in transit across a traffic routing device. The technique was originally used to bypass the need to assign a new address to every host when a network was moved, or when the upstream Internet service provider was replaced, but could not route the network's address space.

Creart a network topology as shown below in Cisco packet tracer



Initial IP Configuration

Device / Interface	IP Address	Connected With
Laotop0	10.0.0.10/8	Fa0/0 of R0
Laptop1	10.0.0.20/8	Fa0/0 of R0
Laptop2	10.0.0.30/8	Fa0/0 of R0
Server0	192.168.1.10/24	Fa0/0 of R1
Serial 0/0/0 of R1	100.0.0.1/8	Serial 0/0/0 of R2
Serial 0/0/0 of R2	100.0.0.2/8	Serial 0/0/0 of R2

Two interfaces of Router1 are used in topology; FastEthernet0/0 and Serial 0/0/0.

Interface mode is used to assign the IP address and other parameters. Interface mode can be accessed from global configuration mode. Following commands are used to access the global configuration mode.

Router>enable
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#

Before we configure IP address in interfaces let's assign a unique descriptive name to router.

Router(config)#hostname
R1 R1#

Now execute the following commands to set IP address in FastEthernet 0/0 interface.

R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 10.0.0.1
255.0.0.0 R1(config-if)#no shutdown
R1(config-if)#exit

interface FastEthernet 0/0 command is used to enter in interface mode.

ip address 10.0.0.1 255.0.0.0 command assigns IP address to interface.

no shutdown command is used to bring the interface up.

exit command is used to return in global configuration mode.

Serial interface needs two additional parameters clock rate and bandwidth. Every serial cable has two ends DTE and DCE. These parameters are always configured at DCE end.

show controllers interface command from privilege mode to check the cable's end.

R1(config)#exit
R1#show controllers serial 0/0/0
Interface Serial0/0/0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 2000000
[Output omitted]

Fourth line of output confirms that DCE end of serial cable is attached. If you see DTE here instead of DCE skip these parameters.

Now we have necessary information let's assign IP address to serial interface.

R1#configure terminal
R1(config)#interface Serial0/0/0
R1(config-if)#ip address 100.0.0.1 255.0.0.0
R1(config-if)#clock rate 64000
R1(config-if)#bandwidth
64 R1(config-if)#no
shutdown
R1(config-if)#exit
R1(config)#

Router#configure terminal Command is used to enter in global configuration mode.

Router(config)#interface serial 0/0/0 Command is used to enter in interface mode.

Router(config-if)#ip address 100.0.0.1 255.0.0.0 Command assigns IP address to interface.

Router(config-if)#clock rate 64000

In real life environment this parameter controls the data flow between serial links and need to be set at service provider's end. In lab environment we need not to worry about this value. We can use any valid rate here.

Router(config-if)#bandwidth 64

Bandwidth works as an influencer. It is used to influence the metric calculation of EIGRP or any other routing protocol which uses bandwidth parameter in route selection process.

Router(config-if)#no shutdown Command brings interface up.

Router(config-if)#exit Command is used to return in global configuration mode.

Use commands to assign IP addresses on interfaces of Router2. Clock rate and bandwidth only on DCE side of serial interface need to be provided. Following command will assign IP addresses on interface of Router2.

Initial IP configuration in R2
Router>enable
Router#configure terminal
Router(config)#hostname R2
R2(config)#interface FastEthernet0/0
R2(config-if)#ip address 192.168.1.1
255.255.255.0 R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface Serial0/0/0
R2(config-if)#ip address 100.0.0.2
255.0.0.0 R2(config-if)#no shutdown
R2(config-if)#exit

R2(config)#\

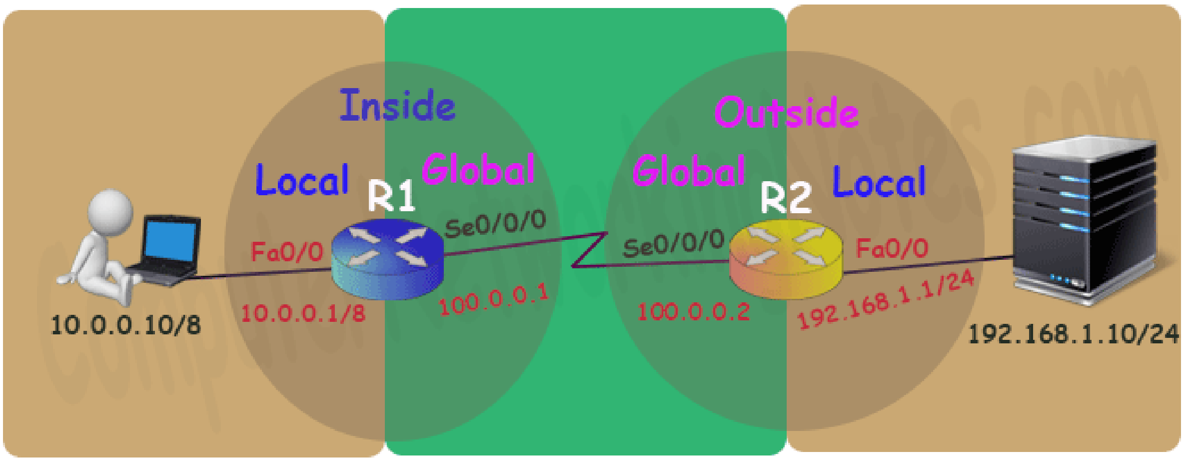
Configure Static NAT

Static NAT configuration requires three steps: -

1. Define IP address mapping
2. Define inside local interface
3. Define inside global

interface Following figure illustrates

these terms.



R1 Static NAT Configuration

R1(config)#ip nat inside source static 10.0.0.10 50.0.0.10
R1(config)#interface FastEthernet 0/0
R1(config-if)#ip nat inside
R1(config-if)#exit
R1(config)#
R1(config)#interface Serial 0/0/0
R1(config-if)#ip nat outside
R1(config-if)#exit

For testing purpose I configured only one static translation. You may use following commands to configure the translation for remaining address.

R1(config)#ip nat inside source static 10.0.0.20 50.0.0.20
R1(config)#ip nat inside source static 10.0.0.30 50.0.0.30

R2 Static NAT Configuration

R2(config)#ip nat inside source static 192.168.1.10 200.0.0.10

R2(config)#interface FastEthernet 0/0
R2(config-if)#ip nat inside
R2(config-if)#exit
R2(config)#
R2(config)#interface Serial 0/0/0
R2(config-if)#ip nat outside
R2(config-if)#exit

Configure static routing in R1

R1(config)#ip route 200.0.0.0 255.255.255.0 100.0.0.2

Configure static routing in R2

R2(config)#ip route 50.0.0.0 255.0.0.0 100.0.0.1

Testing Static NAT Configuration

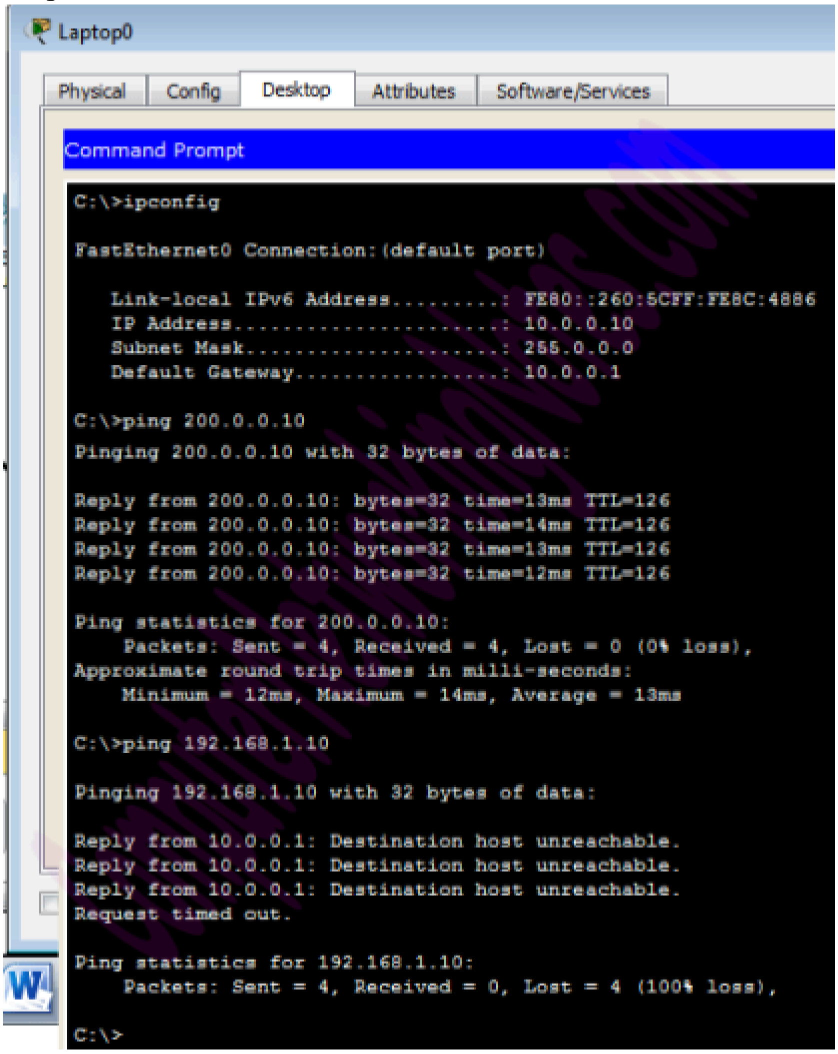
In this lab we configured static NAT on R1 and R2. On R1 we mapped inside local IP address 10.0.0.10 with inside global address 50.0.0.10 while on R2 we mapped inside local IP address 192.168.1.10 with inside global IP address 200.0.0.10.

Device	Inside Local IP Address	Inside Global IP Address
Laptop0	10.0.0.10	50.0.0.10
Server	192.168.1.10	200.0.0.10

To test this setup click Laptop0 and Desktop and click Command Prompt.

- Run **ipconfig** command.
- Run **ping 200.0.0.10** command.
- Run **ping 192.168.1.10** command.

Output:



Conclusion -

Network Address Translation (NAT) is configured on routers to allow private IP addresses within a local network to communicate with external public networks, such as the Internet. When NAT is enabled, the router translates private IP addresses into a single or limited number of public IP addresses, effectively masking the actual identity of end devices. This not only conserves the limited pool of public IP addresses but also enhances network security by preventing direct access to internal devices from external networks. Through this experiment, the successful implementation of NAT demonstrates how data packets are translated and forwarded, ensuring secure and efficient communication between private and public networks.