



**Department of Computer Science and Engineering**  
**Islamic University of Technology (IUT)**  
A subsidiary organ of OIC

**Laboratory Report**

CSE 4412 : Data Communication and Networking Lab

<b>Name</b>	<b>:Nazia Karim Khan Oishee</b>
<b>Student ID</b>	<b>:200042137</b>
<b>Section</b>	<b>:1A</b>
<b>Semester</b>	<b>:Summer</b>
<b>Academic Year</b>	<b>:2021-2022</b>
<b>Date of Submission</b>	<b>:11.04.2023</b>
<b>Lab No</b>	<b>:10</b>

**Title:** Understanding the concept of NAT and configuration of NAT.

**Objective:**

1. Understand NAT
2. Configuration of NAT

**Devices Used In the Experiment:**

1. CISCO Packet Tracer

**Theory:**

**NAT Definition**

NAT stands for Network Address Translation. NAT translates a local IP address into a Global IP address in order to provide Internet access to the local hosts.

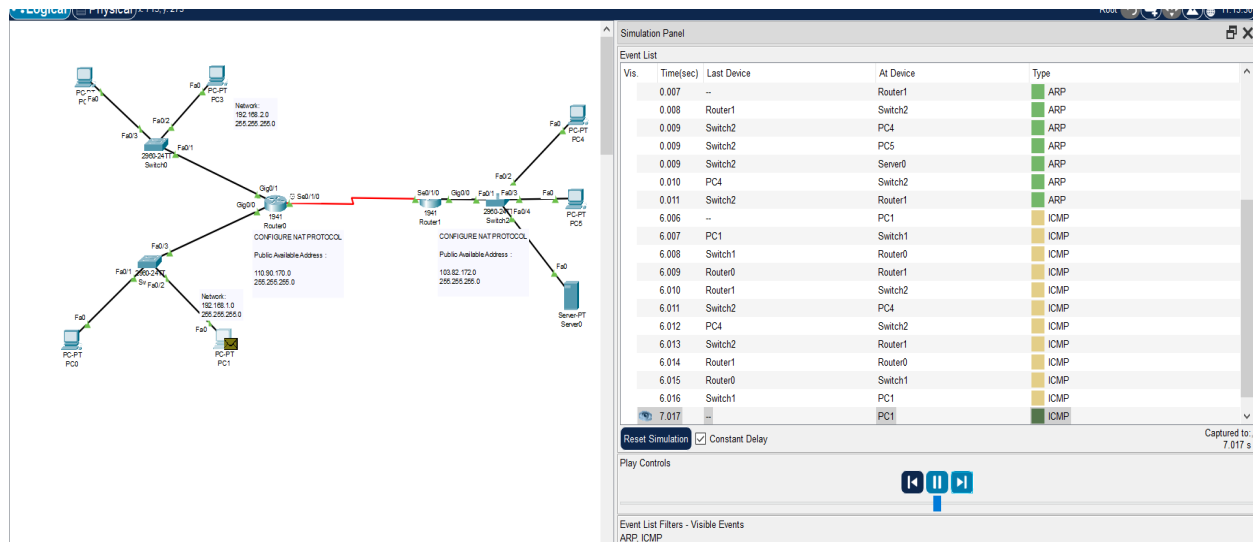
**Usage of NAT:**

Explain the usage of NAT with an example.

Suppose, our laptop is connected to our home network. This network is connected to a router that connects with the internet. When we search for something on the internet using Google or any other search engine, our laptop uses NAT. Basically, the laptop or the end system sends a request in an IP packet to the router, which passes the request to the internet. But before the request leaves our home network, the router first changes the private local IP address to a public IP address.

This is because if the packet keeps a private address, the receiving server won't know where to send the information back to. That's why routers effectively translate the private address to one public IP address that can be used on the internet. The router has an automated translator inside of it.

## Diagram of the experiment:



## Configuration of NAT in Router:

### Commands for configuring VLAN

```
Router0
Physical Config CLI Attributes
IOS Command Line Interface
Router(config)#
Router(config)#
Router(config)#
Router(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)#access-list 1 permit 192.168.2.0 0.0.0.255
Router(config)#ip nat pool pool1 110.90.170.1 110.90.170.50 netmask
255.255.255.0
Router(config)#ip nat inside source list 1 pool pool1
Router(config)#int g0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int g0/1
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int se0/1/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
```

```
Router1
Physical Config CLI Attributes
IOS Command Line Interface
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)
Press RETURN to get started!
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed
state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to
up
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip nat inside source static 192.168.1.2 103.82.172.2
Router(config)#ip nat inside source static 192.168.1.3 103.82.172.3
Router(config)#ip nat inside source static 192.168.1.4 103.82.172.4
Router(config)#int g0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int se0/1/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
Router(config)#ip route 110.90.170.0 255.255.255.0 11.11.11.1
Router(config)#
```

For Router0 I entered the following commands:

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

```
Router(config)#access-list 1 permit 192.168.2.0 0.0.0.255
Router(config)#ip nat pool pool1 110.90.170.1 110.90.170.50 netmask
255.255.255.0
Router(config)#ip nat inside source list 1 pool pool1
Router(config)#int g0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int g0/1
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int se0/1/0
Router(config-if)#ip nat outside
Router(config-if)#exit
```

For Router1 I entered the following commands:

```
Router(config)#ip nat inside source static 192.168.1.2 103.82.172.2
Router(config)#ip nat inside source static 192.168.1.3 103.82.172.3
Router(config)#ip nat inside source static 192.168.1.4 103.82.172.4
Router(config)#int g0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int se0/1/0
Router(config-if)#ip nat outside
Router(config-if)#exit
```

After that I set route in both the routers using these following commands:

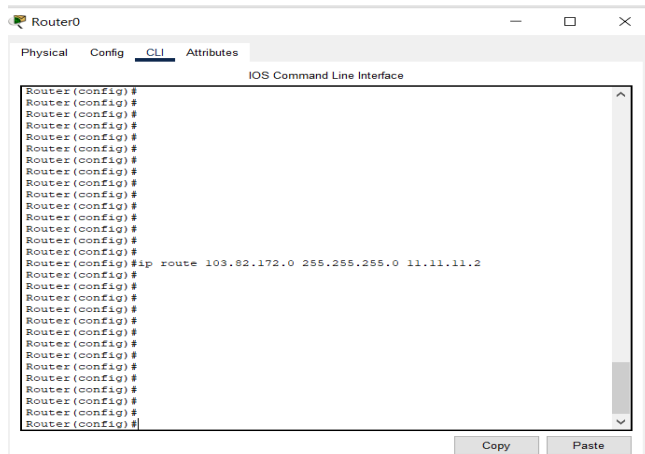
For Router0:

```
Router(config)#ip route 103.82.172.0 255.255.255.0 11.11.11.2
```

Here 103.82.172.0 is the Public available address of the other network and 11.11.11.2 is the IP address of the serial port of the other router through which the routers are connected.

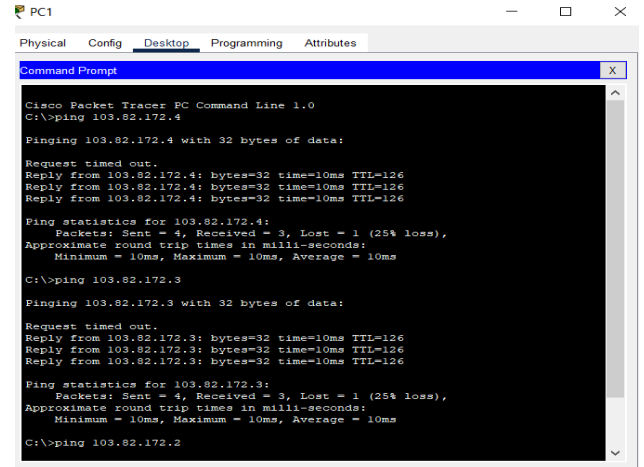
Similarly for Router1:

```
Router(config)#ip route 110.90.70.0 255.255.255.0 11.11.11.1
```



```
Router0
Physical Config CLI Attributes
IOS Command Line Interface

Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#ip route 103.82.172.0 255.255.255.0 11.11.11.2
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
```



```
PC1
Physical Config Desktop Programming Attributes
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 103.82.172.4

Pinging 103.82.172.4 with 32 bytes of data:

Request timed out.
Reply from 103.82.172.4: bytes=32 time=10ms TTL=126
Reply from 103.82.172.4: bytes=32 time=10ms TTL=126
Reply from 103.82.172.4: bytes=32 time=10ms TTL=126

Ping statistics for 103.82.172.4:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 10ms, Average = 10ms

C:\>ping 103.82.172.3

Pinging 103.82.172.3 with 32 bytes of data:

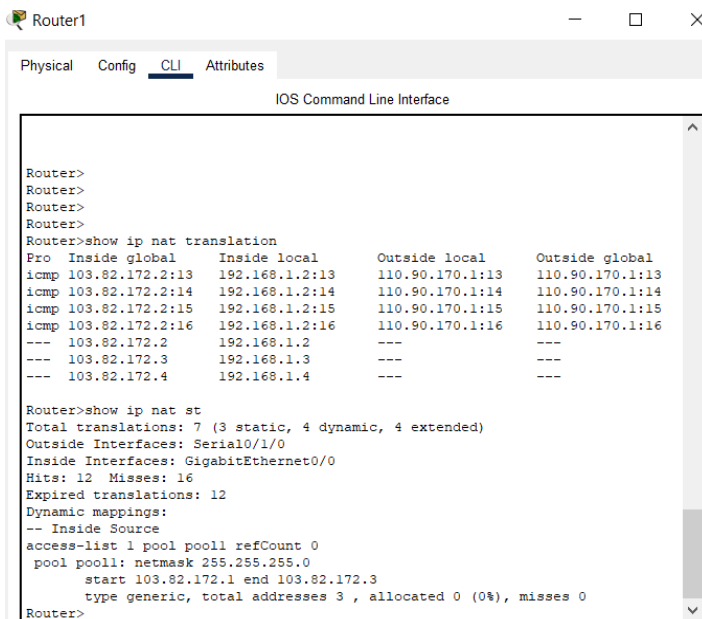
Request timed out.
Reply from 103.82.172.3: bytes=32 time=10ms TTL=126
Reply from 103.82.172.3: bytes=32 time=10ms TTL=126
Reply from 103.82.172.3: bytes=32 time=10ms TTL=126

Ping statistics for 103.82.172.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 10ms, Average = 10ms

C:\>ping 103.82.172.2
```

## Observation:

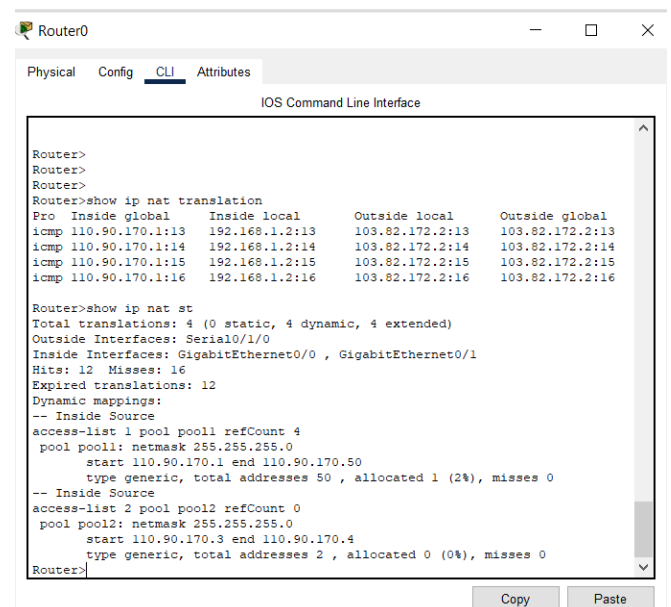
The screenshots of *show nat* command in two switches are shown below:



```
Router1
Physical Config CLI Attributes
IOS Command Line Interface

Router>
Router>
Router>
Router>
Router>show ip nat translation
Pro Inside global      Inside local      Outside local      Outside global
icmp 103.82.172.2:13    192.168.1.2:13    110.90.170.1:13    110.90.170.1:13
icmp 103.82.172.2:14    192.168.1.2:14    110.90.170.1:14    110.90.170.1:14
icmp 103.82.172.2:15    192.168.1.2:15    110.90.170.1:15    110.90.170.1:15
icmp 103.82.172.2:16    192.168.1.2:16    110.90.170.1:16    110.90.170.1:16
--- 103.82.172.2        192.168.1.2      ---                ---
--- 103.82.172.3        192.168.1.3      ---                ---
--- 103.82.172.4        192.168.1.4      ---                ---

Router>show ip nat st
Total translations: 7 (3 static, 4 dynamic, 4 extended)
Outside Interfaces: Serial0/1/0
Inside Interfaces: GigabitEthernet0/0
Hits: 12 Misses: 16
Expired translations: 12
Dynamic mappings:
-- Inside Source
access-list 1 pool pool1 refCount 4
pool pool1: netmask 255.255.255.0
start 103.82.172.1 end 103.82.172.3
type generic, total addresses 3, allocated 0 (0%), misses 0
Router>
```



```
Router0
Physical Config CLI Attributes
IOS Command Line Interface

Router>
Router>
Router>
Router>show ip nat translation
Pro Inside global      Inside local      Outside local      Outside global
icmp 110.90.170.1:13    192.168.1.2:13    103.82.172.2:13    103.82.172.2:13
icmp 110.90.170.1:14    192.168.1.2:14    103.82.172.2:14    103.82.172.2:14
icmp 110.90.170.1:15    192.168.1.2:15    103.82.172.2:15    103.82.172.2:15
icmp 110.90.170.1:16    192.168.1.2:16    103.82.172.2:16    103.82.172.2:16

Router>show ip nat st
Total translations: 4 (0 static, 4 dynamic, 4 extended)
Outside Interfaces: Serial0/1/0
Inside Interfaces: GigabitEthernet0/0 , GigabitEthernet0/1
Hits: 12 Misses: 16
Expired translations: 12
Dynamic mappings:
-- Inside Source
access-list 1 pool pool1 refCount 4
pool pool1: netmask 255.255.255.0
start 110.90.170.1 end 110.90.170.50
type generic, total addresses 50, allocated 1 (2%), misses 0
-- Inside Source
access-list 2 pool pool2 refCount 0
pool pool2: netmask 255.255.255.0
start 110.90.170.3 end 110.90.170.4
type generic, total addresses 2, allocated 0 (0%), misses 0
Router>
```

## Challenges:

In this task, I faced challenges to configure the NAT and while setting the route.