



TELECOMMUNICATION NETWORKS (TCN) TC-421

Youail John (EL-19038)

SECTION : A

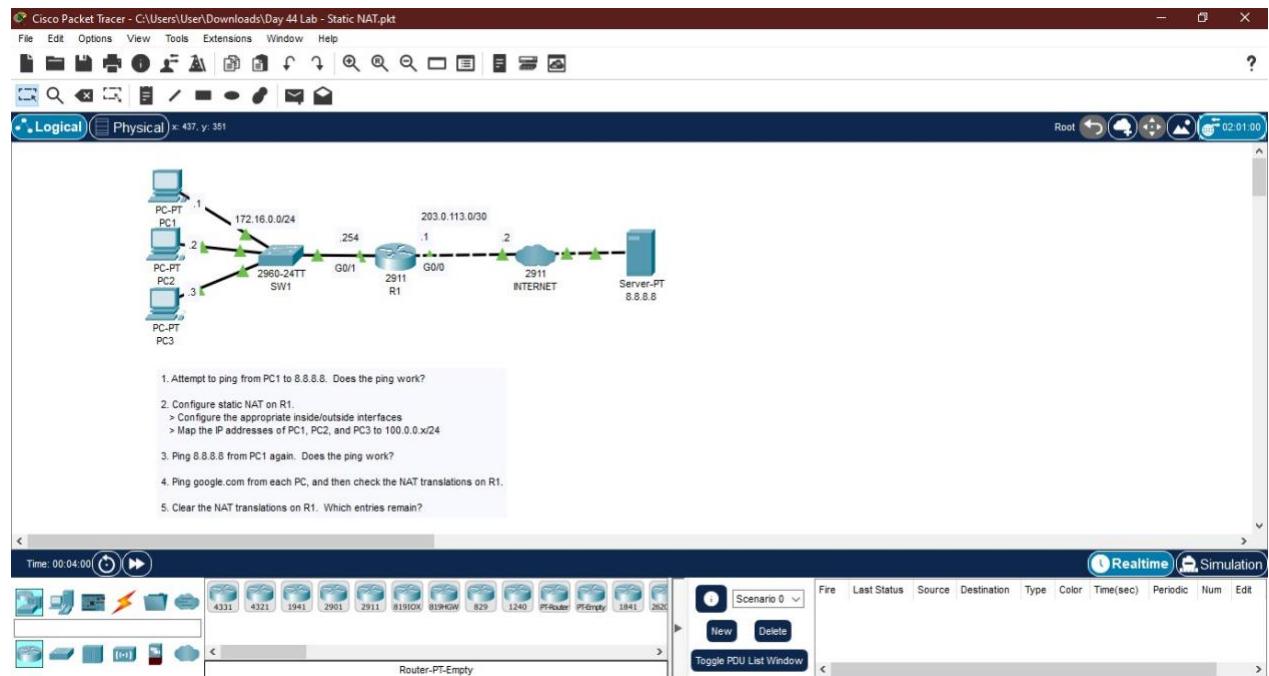
ELECTRONICS DEPARTMENT

SUBMITTED TO: SIR MUHAMMAD ABBAS

## NAT: NETWORK ADDRESS TRANSLATION

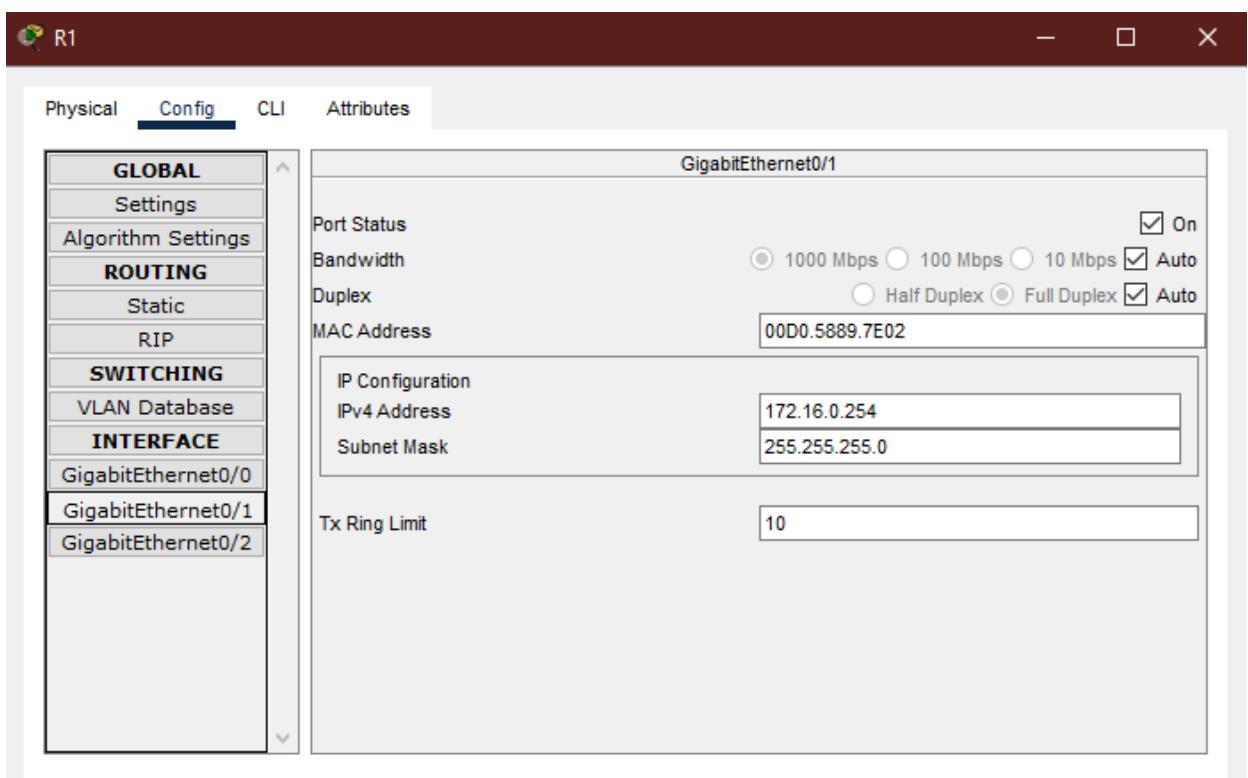
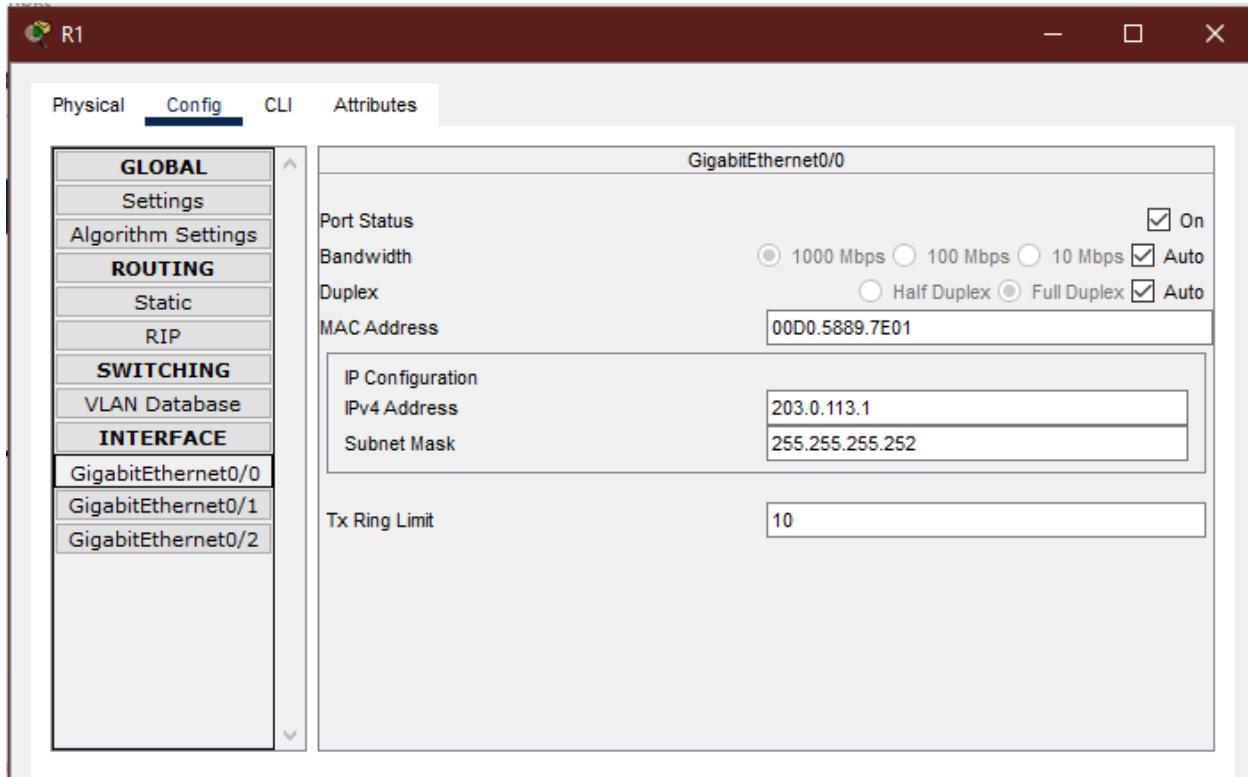
Network Address Translation (NAT) is a service that enables private IP networks to use the internet and cloud. NAT translates private IP addresses in an internal network to a public IP address before packets are sent to an external network

The following network is being created in Packet Tracer. It consists of a router R1, which is connected to 3 PCs by means of a switch.



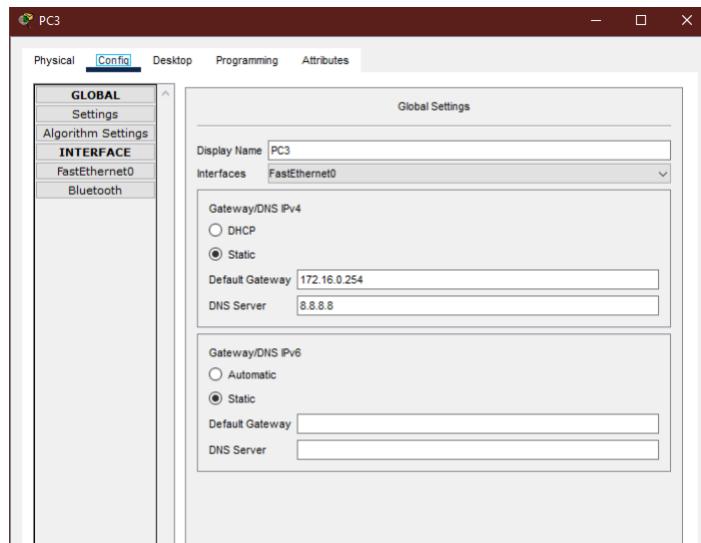
The router is configured to have an inside local address of 172.16.0.254 which is an example of a private IP address. The inside global address is 203.0.113.1 which is a public IP address for the router to connect it to the internet.

## Router Configuration:

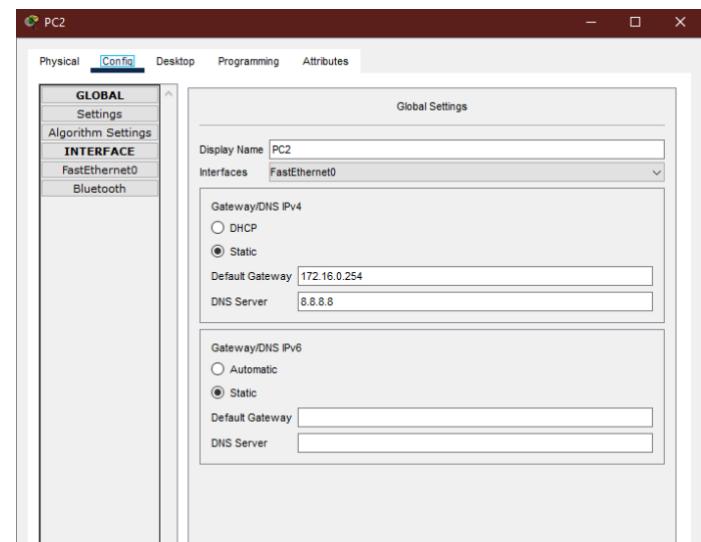


## PCs Configuration:

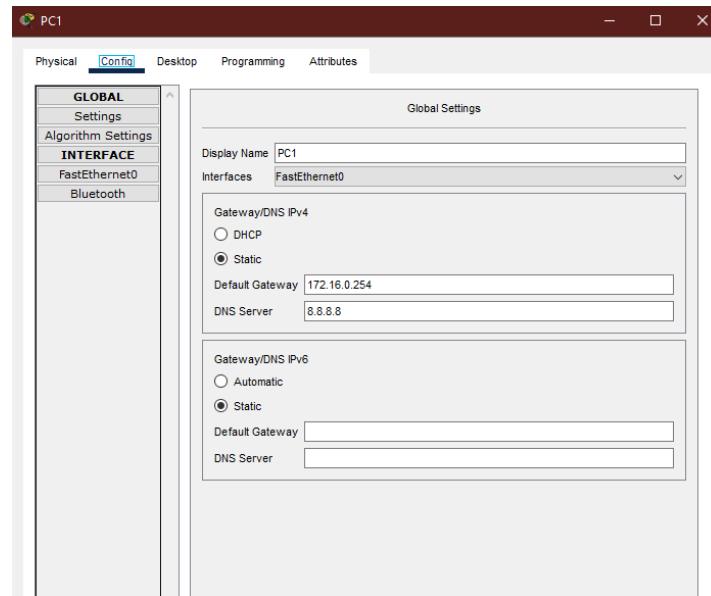
### PC1:



### PC 2:



## PC 3:



Ping the ip address 8.8.8.8 by PC 1. Since it doesnot have a public ip address of its own, it will not be able to communicate with the internet.

The screenshot shows the Cisco Packet Tracer Command Prompt window for PC1. The 'Desktop' tab is selected. A blue header bar reads 'Command Prompt'. The terminal window displays the following output:

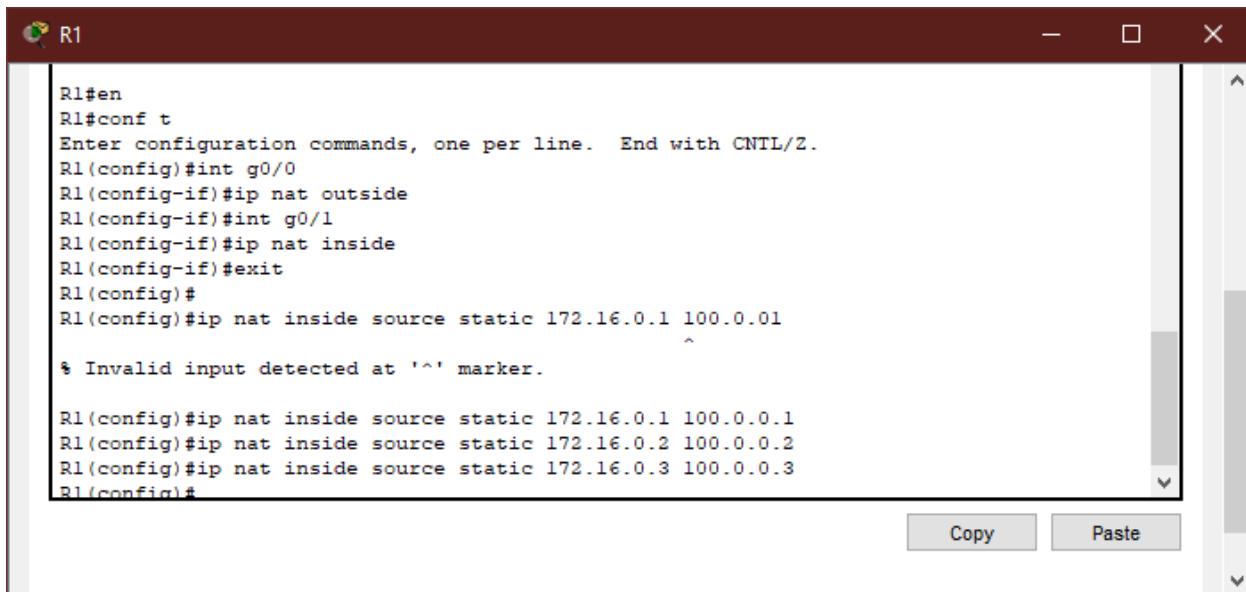
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 8.8.8.8:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

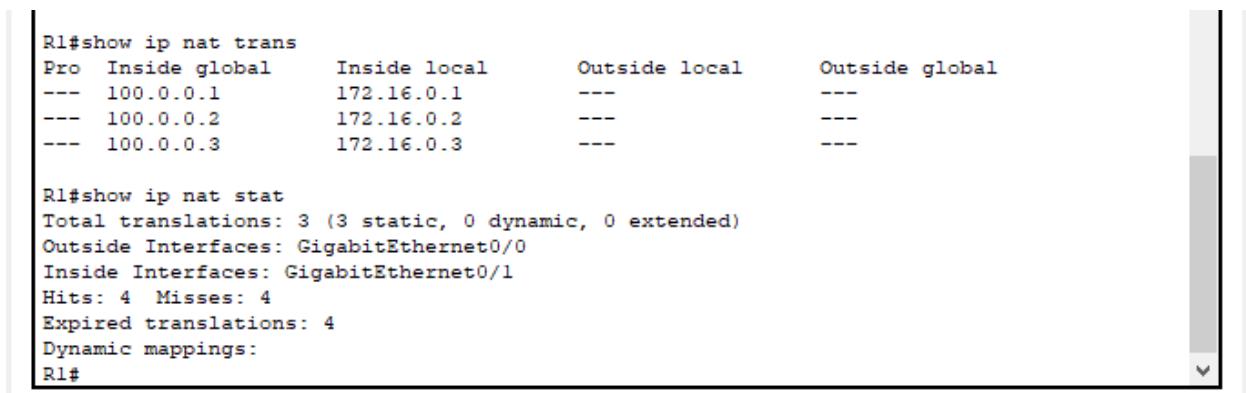
Configure the router to create NATS for the PCs using the IOS commands on the CLI.



```
R1#en
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#int g0/0
R1(config-if)#ip nat outside
R1(config-if)#int g0/1
R1(config-if)#ip nat inside
R1(config-if)#exit
R1(config)#
R1(config)#ip nat inside source static 172.16.0.1 100.0.0.1
^
% Invalid input detected at '^' marker.

R1(config)#ip nat inside source static 172.16.0.1 100.0.0.1
R1(config)#ip nat inside source static 172.16.0.2 100.0.0.2
R1(config)#ip nat inside source static 172.16.0.3 100.0.0.3
R1(config)#
R1#
```

To demonstrate the successful translations, following commands are used to check the static NATs.

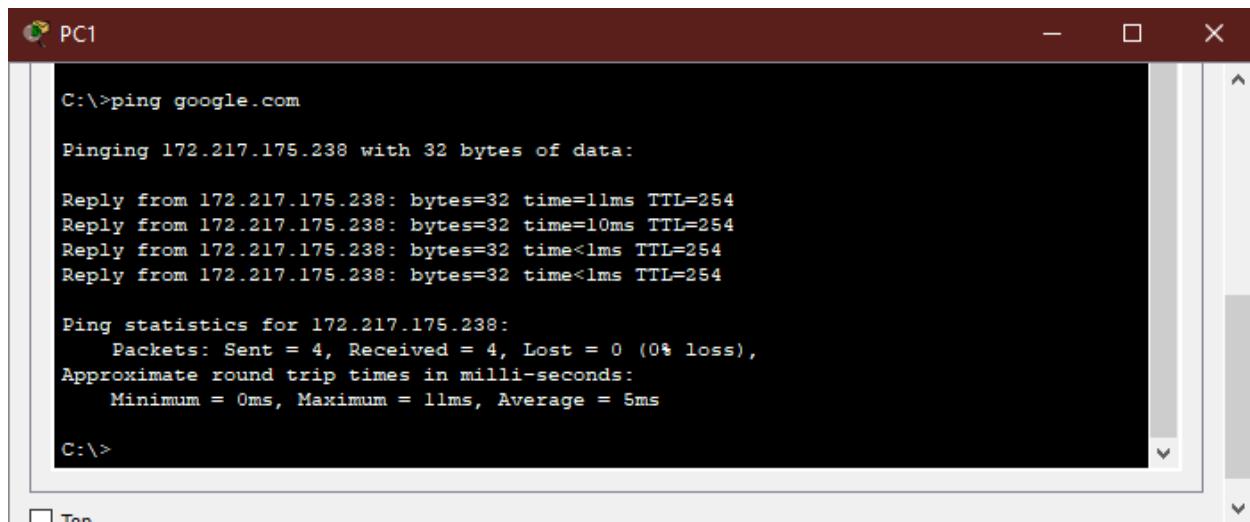


```
R1#show ip nat trans
Pro Inside global      Inside local      Outside local      Outside global
--- 100.0.0.1          172.16.0.1        ---              ---
--- 100.0.0.2          172.16.0.2        ---              ---
--- 100.0.0.3          172.16.0.3        ---              ---

R1#show ip nat stat
Total translations: 3 (3 static, 0 dynamic, 0 extended)
Outside Interfaces: GigabitEthernet0/0
Inside Interfaces: GigabitEthernet0/1
Hits: 4 Misses: 4
Expired translations: 4
Dynamic mappings:
R1#
```

Since the PCs have inside global addresses now, each PC is used to send a ping request to google.com. The successful ping acknowledgment shows that the PCs are now connected to the Internet.

### PC 1:



```
C:\>ping google.com

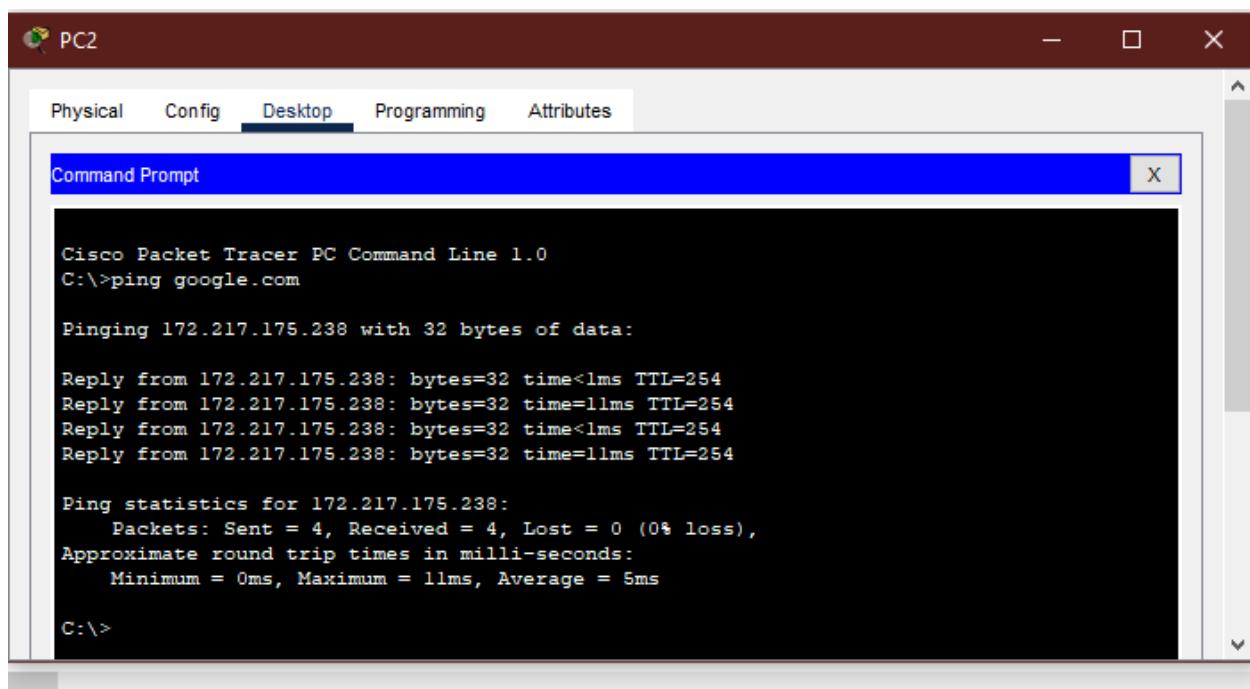
Pinging 172.217.175.238 with 32 bytes of data:

Reply from 172.217.175.238: bytes=32 time=11ms TTL=254
Reply from 172.217.175.238: bytes=32 time=10ms TTL=254
Reply from 172.217.175.238: bytes=32 time<1ms TTL=254
Reply from 172.217.175.238: bytes=32 time<1ms TTL=254

Ping statistics for 172.217.175.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 5ms

C:\>
```

### PC 2:



Physical    Config    **Desktop**    Programming    Attributes

```
Command Prompt X

Cisco Packet Tracer PC Command Line 1.0
C:\>ping google.com

Pinging 172.217.175.238 with 32 bytes of data:

Reply from 172.217.175.238: bytes=32 time<1ms TTL=254
Reply from 172.217.175.238: bytes=32 time=11ms TTL=254
Reply from 172.217.175.238: bytes=32 time<1ms TTL=254
Reply from 172.217.175.238: bytes=32 time=11ms TTL=254

Ping statistics for 172.217.175.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 5ms

C:\>
```

### PC 3:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping google.com

Pinging 172.217.175.238 with 32 bytes of data:

Reply from 172.217.175.238: bytes=32 time<1ms TTL=254
Reply from 172.217.175.238: bytes=32 time=11ms TTL=254
Reply from 172.217.175.238: bytes=32 time=11ms TTL=254
Reply from 172.217.175.238: bytes=32 time=1ms TTL=254

Ping statistics for 172.217.175.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 5ms

C:\>
```

Finally, the “*show ip nat translation*” command is used to display the translations. Notice that the last two translations are udp, because they are using dns to search for the ip of google.com with port number 53.

Lastly, “*clear ip nat translation \**” is used to clear all the dynamic translations.

```
R1#show ip nat trans
Pro Inside global      Inside local       Outside local       Outside global
--- 100.0.0.1          172.16.0.1        ---              ---
--- 100.0.0.2          172.16.0.2        ---              ---
--- 100.0.0.3          172.16.0.3        ---              ---
udp 100.0.0.2:1025     172.16.0.2:1025   8.8.8.8:53       8.8.8.8:53
udp 100.0.0.3:1025     172.16.0.3:1025   8.8.8.8:53       8.8.8.8:53

R1#clear ip nat translations *
^
% Invalid input detected at '^' marker.

R1#clear ip nat translation *
R1#show ip nat translation
Pro Inside global      Inside local       Outside local       Outside global
--- 100.0.0.1          172.16.0.1        ---              ---
--- 100.0.0.2          172.16.0.2        ---              ---
--- 100.0.0.3          172.16.0.3        ---              ---

R1#
```