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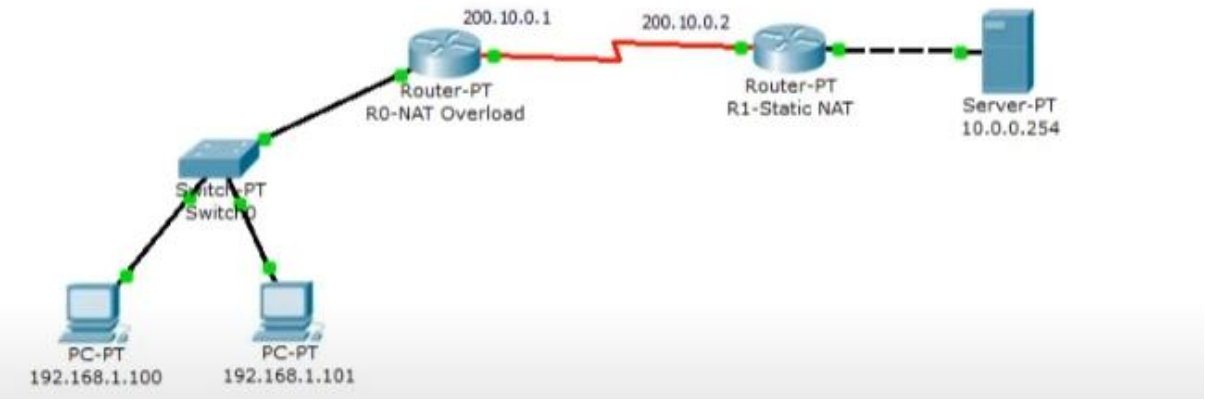
NAT



To assign IP address in Laptop click Laptop and click Desktop and IP configuration and Select Static and set IP address.

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

By default interfaces on router are remain administratively down during the start up. We need to configure IP address and other parameters on interfaces before we could actually use them for routing. 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.

We can use 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.

We will use same commands to assign IP addresses on interfaces of Router2. We need to provided clock rate and bandwidth only on DCE side of serial interface. 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)#
```

That's all initial IP configuration we need. Now this topology is ready for the practice of static nat.

Configure Static NAT

Static NAT configuration requires three steps: -

Define IP address mapping

Define inside local interface

Define inside global interface

Since static NAT use manual translation, we have to map each inside local IP address (which needs a translation) with inside global IP address. Following command is used to map the inside local IP address with inside global IP address.

```
Router(config)#ip nat inside source static [inside local ip address] [inside global IP address]
```

For example in our lab Laptop1 is configured with IP address 10.0.0.10. To map it with 50.0.0.10 IP address we will use following command

```
Router(config)#ip nat inside source static 10.0.0.10 50.0.0.10
```

In second step we have to define which interface is connected with local the network. On both routers interface Fa0/0 is connected with the local network which need IP translation.

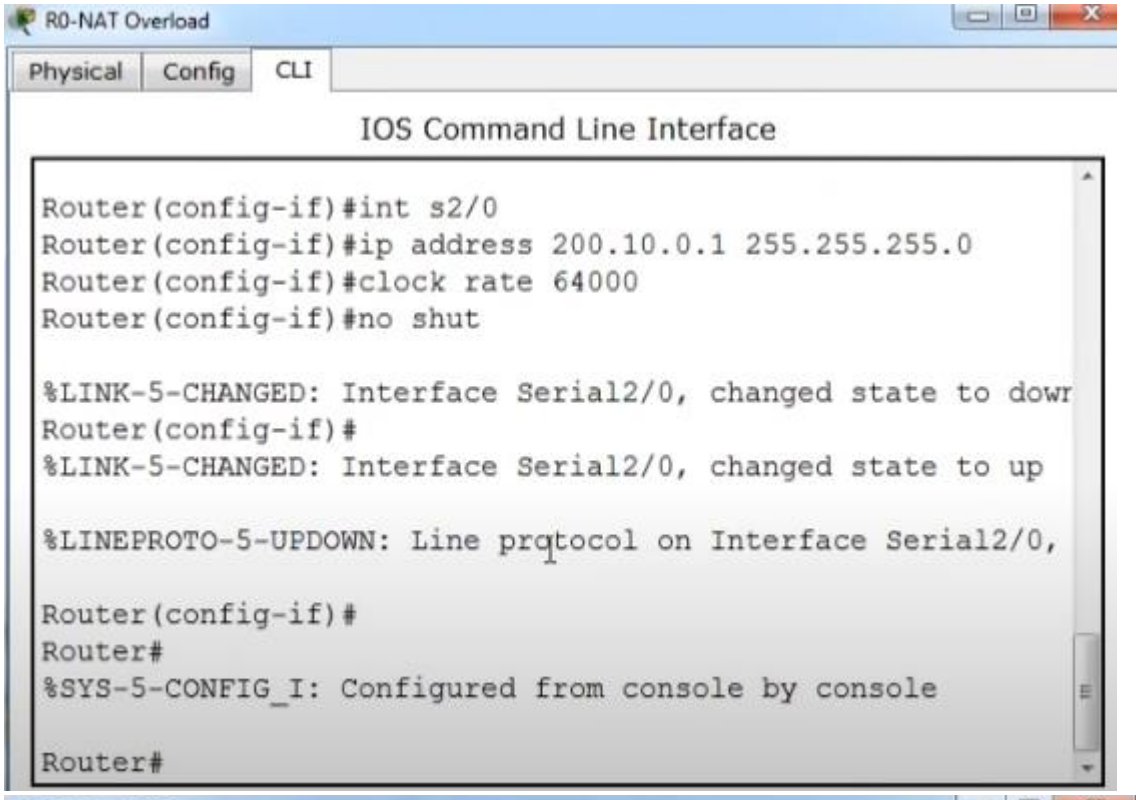
Following command will define interface Fa0/0 as inside local.

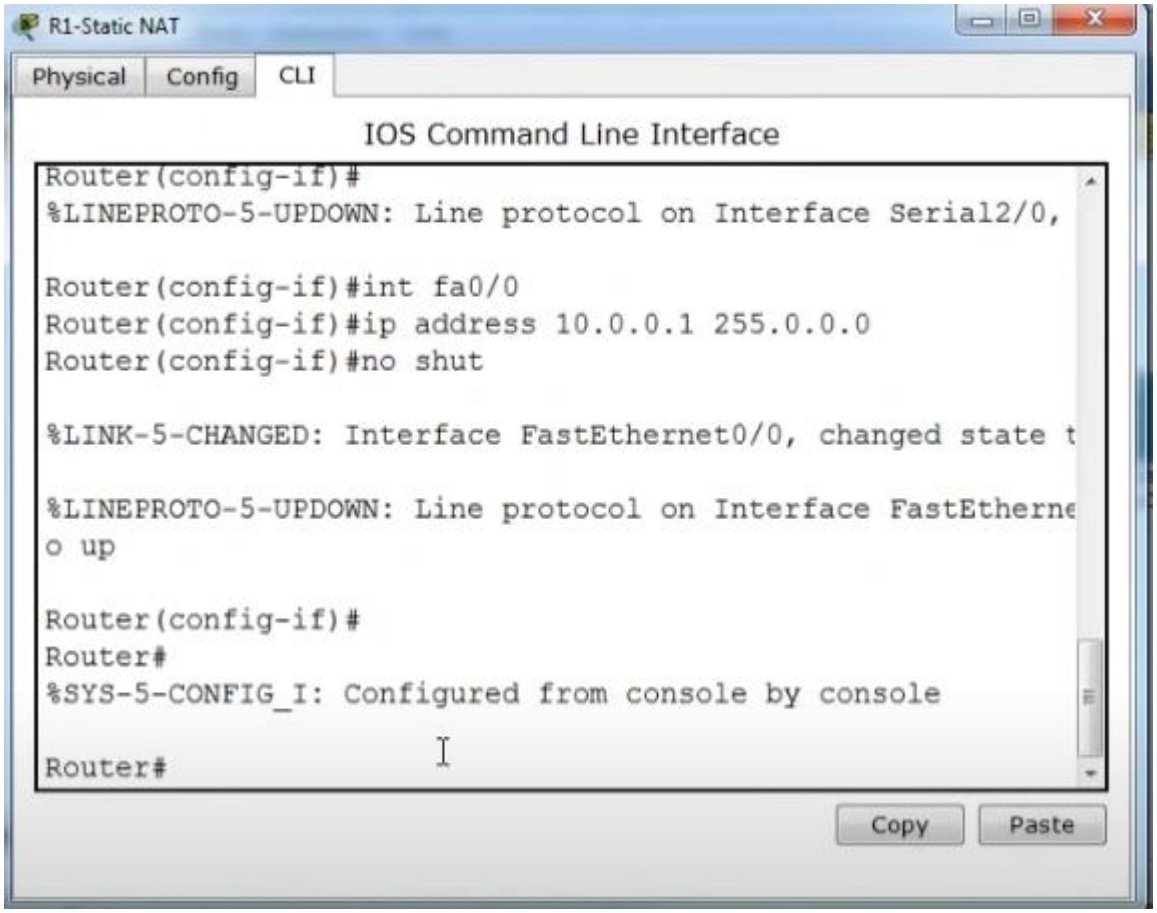
```
Router(config-if)#ip nat inside
```

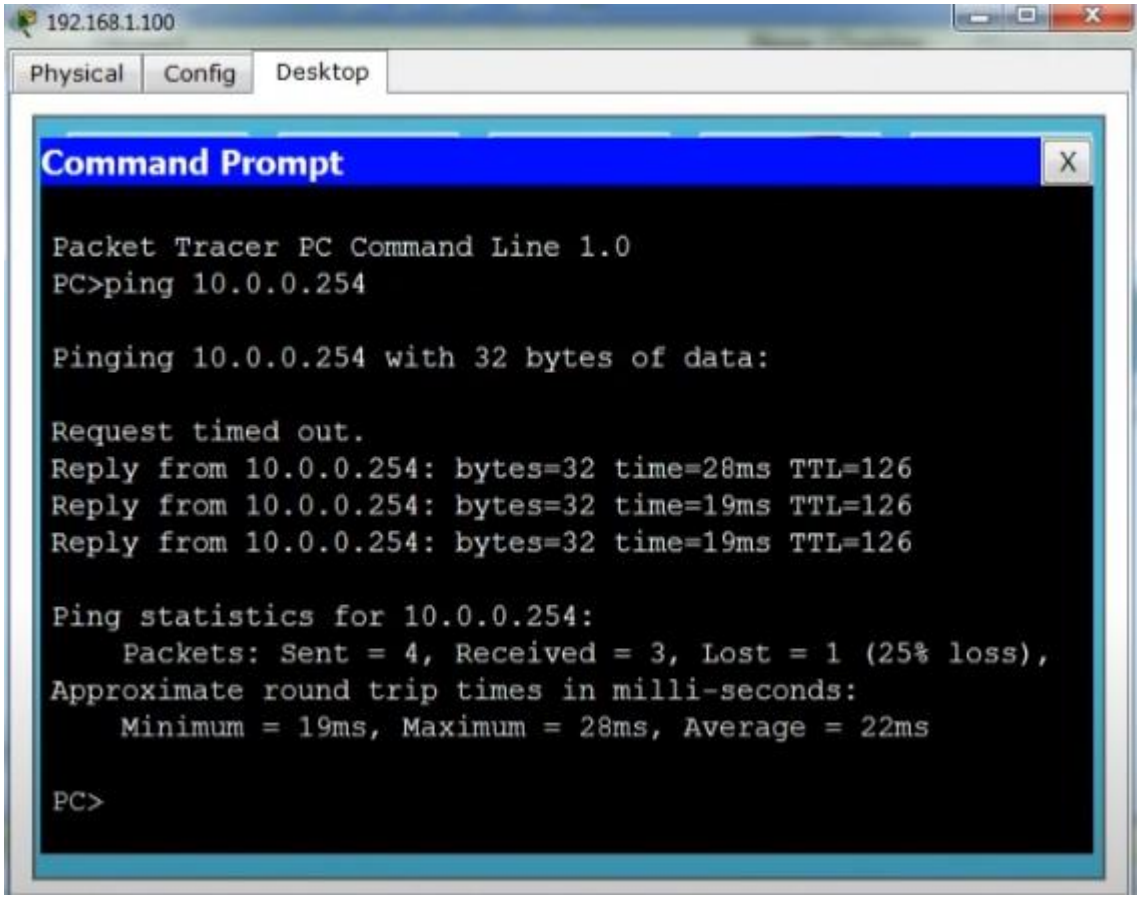
In third step we have to define which interface is connected with the global network. On both routers serial 0/0/0 interface is connected with the global network.
Following command will define interface Serial0/0/0 as inside global.

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

Following figure illustrates these terms.


R0-NAT Overload
Physical
Config
CLI
IOS Command Line Interface
Router(config-if)#int s2/0
Router(config-if)#ip address 200.10.0.1 255.255.255.0
Router(config-if)#clock rate 64000
Router(config-if)#no shut
%LINK-5-CHANGED: Interface Serial2/0, changed state to dowr
Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0,
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#


R1-Static NAT
Physical
Config
CLI
IOS Command Line Interface
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0,
Router(config-if)#int fa0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shut
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state t
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEtherne
o up
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#
Copy
Paste



Let's implement all these commands together and configure the static NAT.

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
```

Before we test this lab we need to configure the IP routing. IP routing is the process which allows router to route the packet between different networks. Following tutorial explain routing in detail with examples

Routing concepts Explained with Examples

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
```

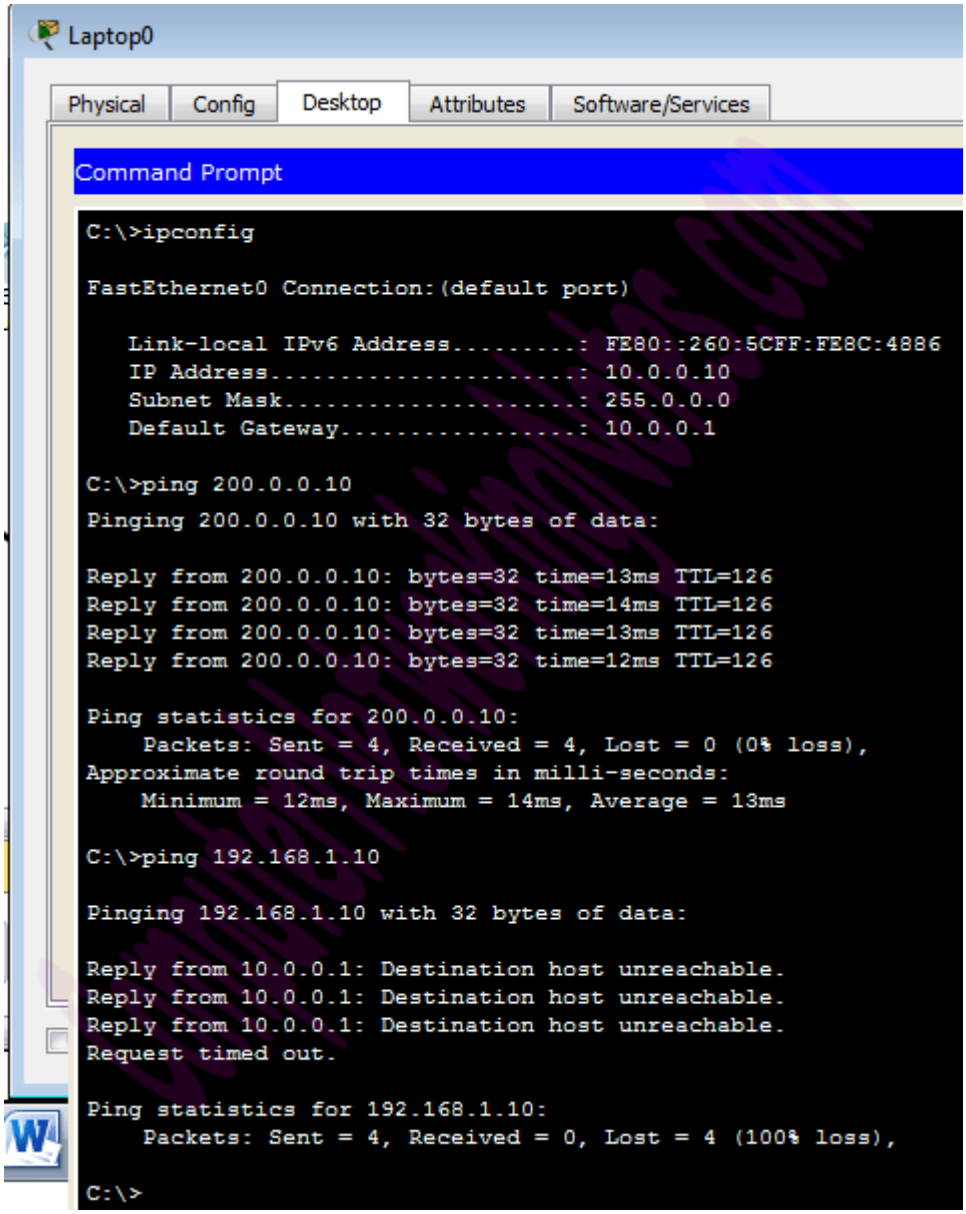
Testing Static NAT Configuration

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 I
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.

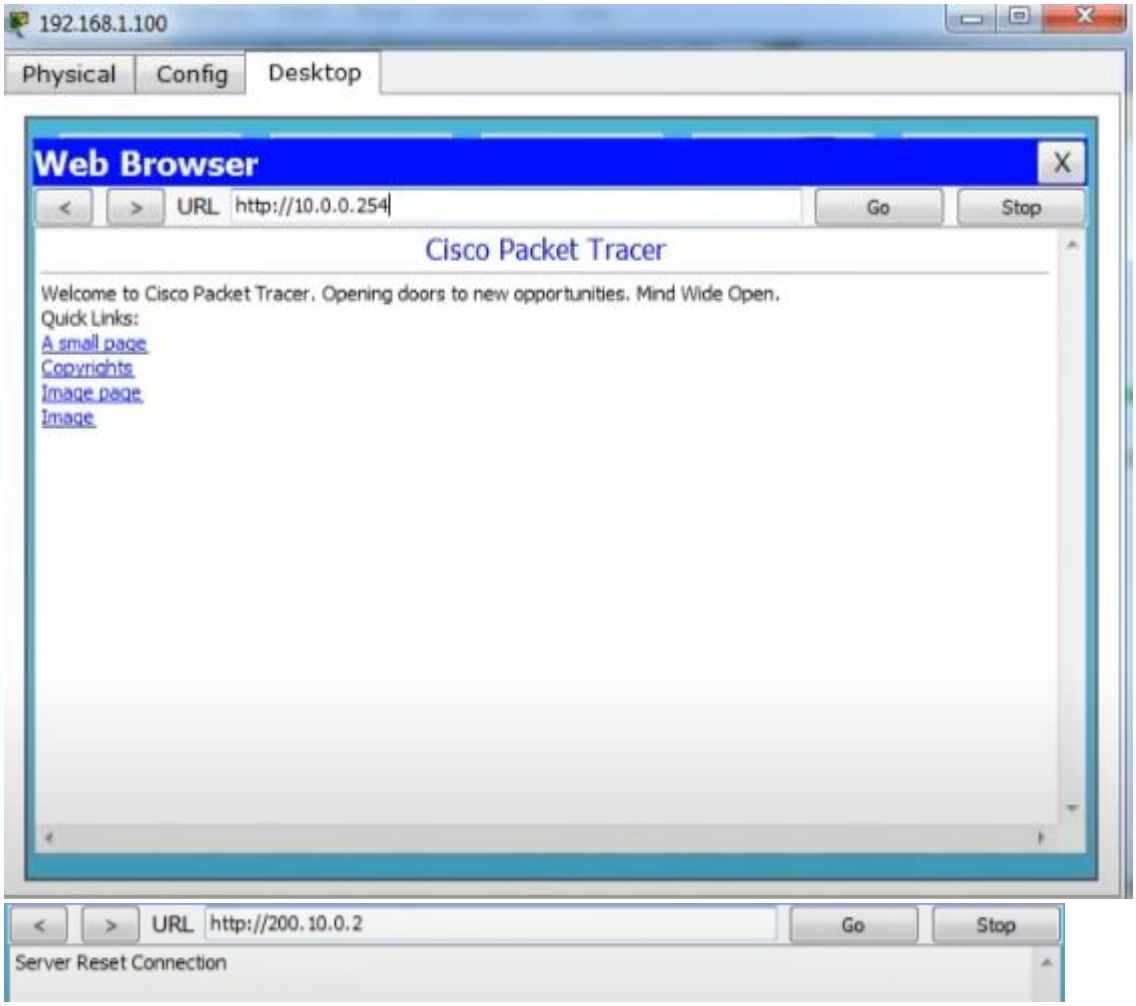


First command verifies that we are testing from correct NAT device.

Second command checks whether we are able to access the remote device or not. A ping reply confirms that we are able to connect with remote device on this IP address.

Third command checks whether we are able to access the remote device on its actual IP address or not. A ping error confirms that we are not able to connect with remote device on this IP address.

Let's do one more testing. Click **Laptop0** and click **Desktop** and click **Web Browser** and access 200.0.0.10.



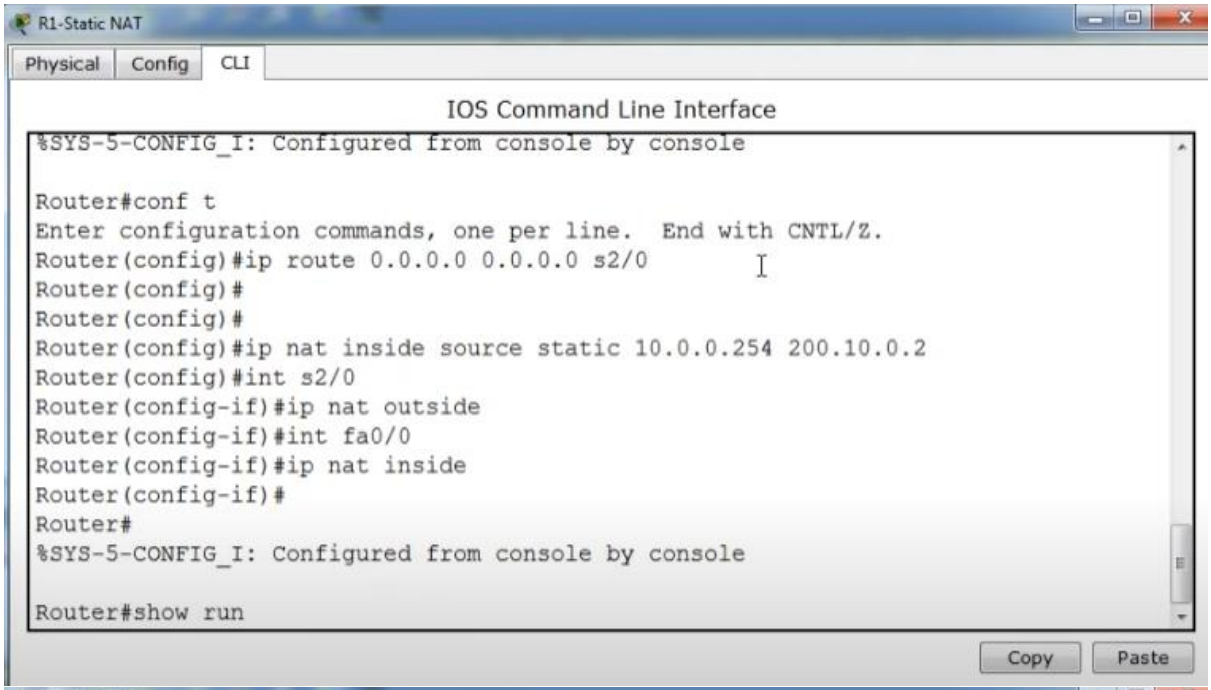
We can also verify this translation on router with ***show ip nat translation*** command.

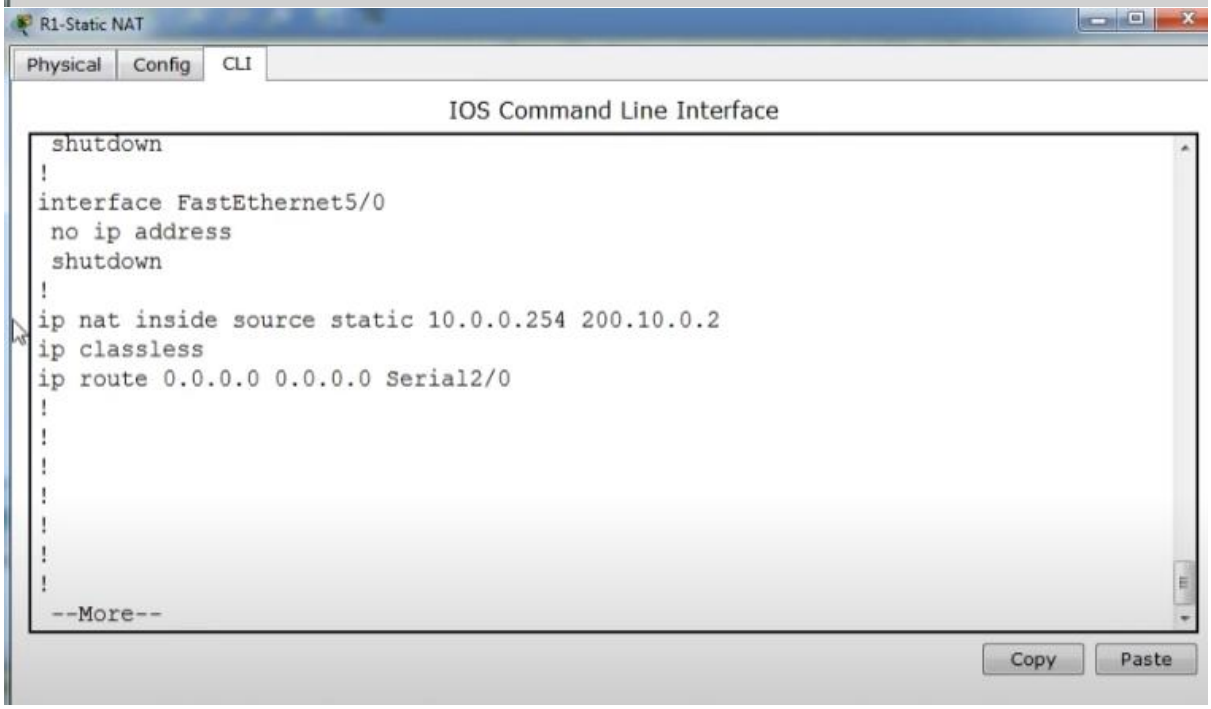
Following figure illustrate this translation on router R1.

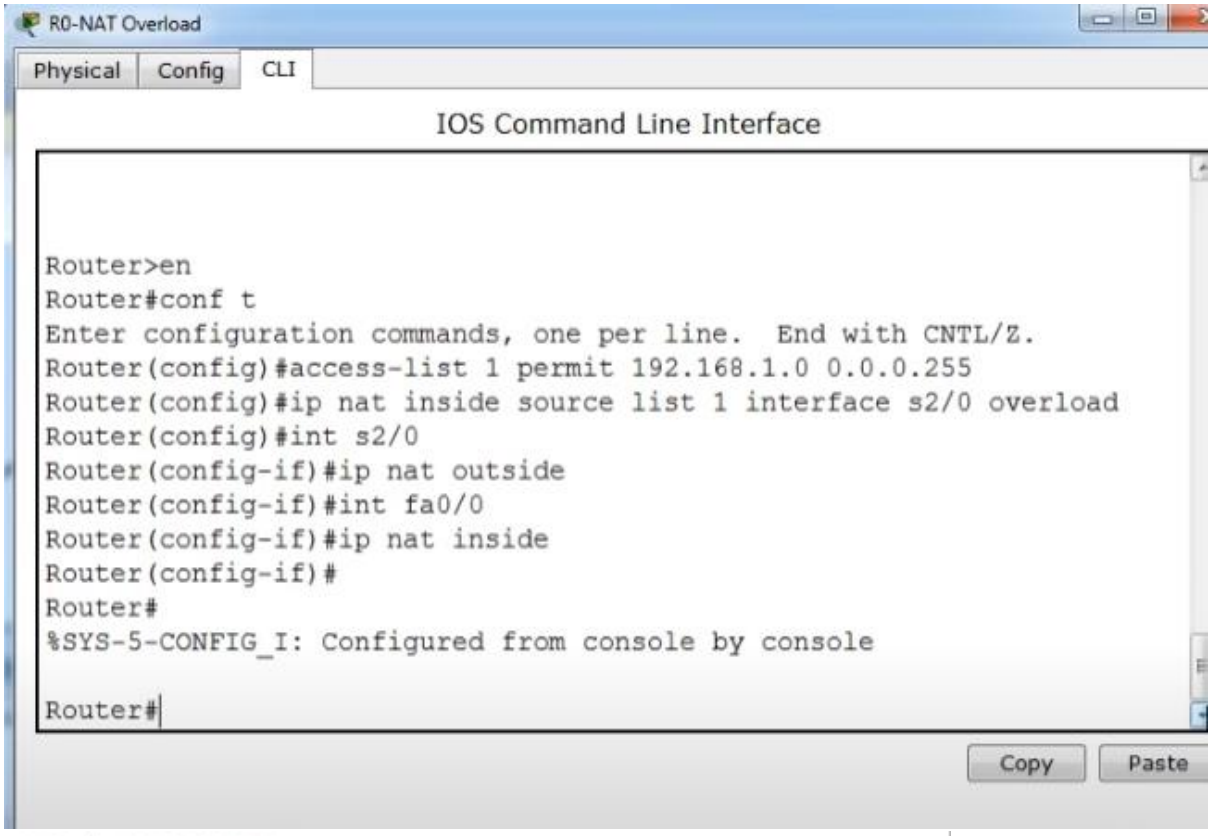
```
R1#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 50.0.0.10:13      10.0.0.10:13       200.0.0.10:13      200.0.0.10:13
icmp 50.0.0.10:14      10.0.0.10:14       200.0.0.10:14      200.0.0.10:14
icmp 50.0.0.10:15      10.0.0.10:15       200.0.0.10:15      200.0.0.10:15
icmp 50.0.0.10:16      10.0.0.10:16       200.0.0.10:16      200.0.0.10:16
tcp 50.0.0.10:1030     10.0.0.10:1030     200.0.0.10:80      200.0.0.10:80
tcp 50.0.0.10:1031     10.0.0.10:1031     200.0.0.10:80      200.0.0.10:80

R1#
```

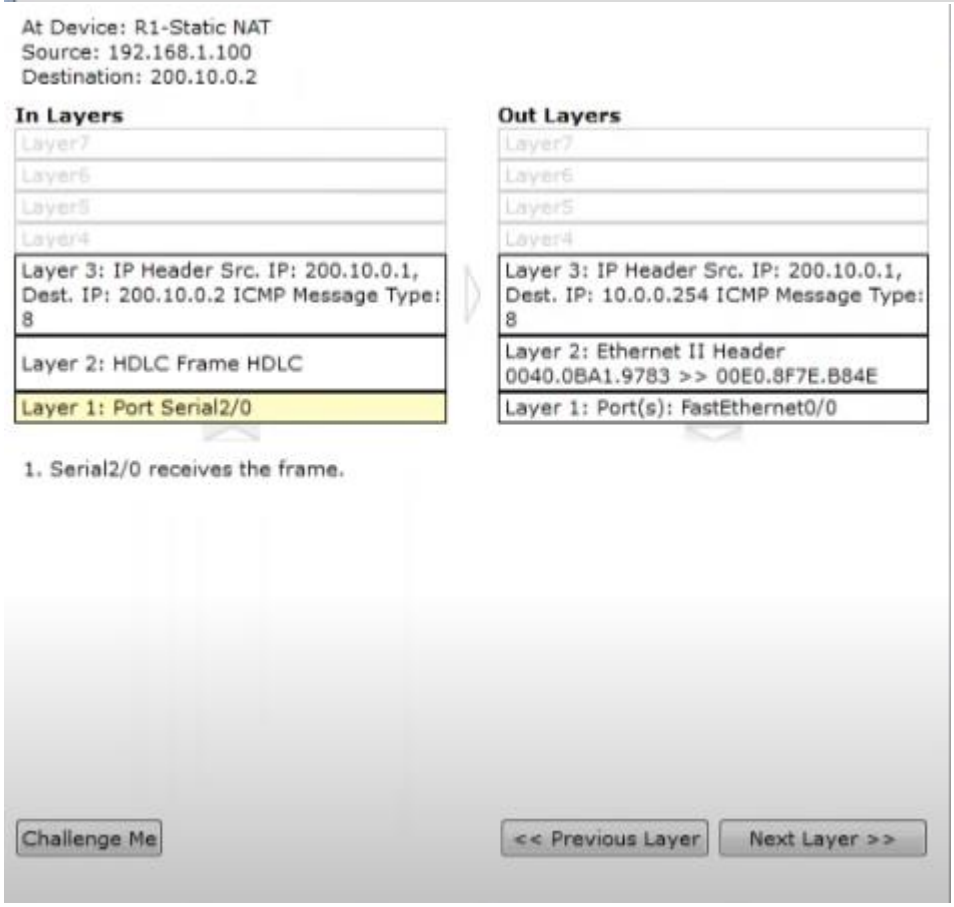
Following figure illustrate this translation on router R2

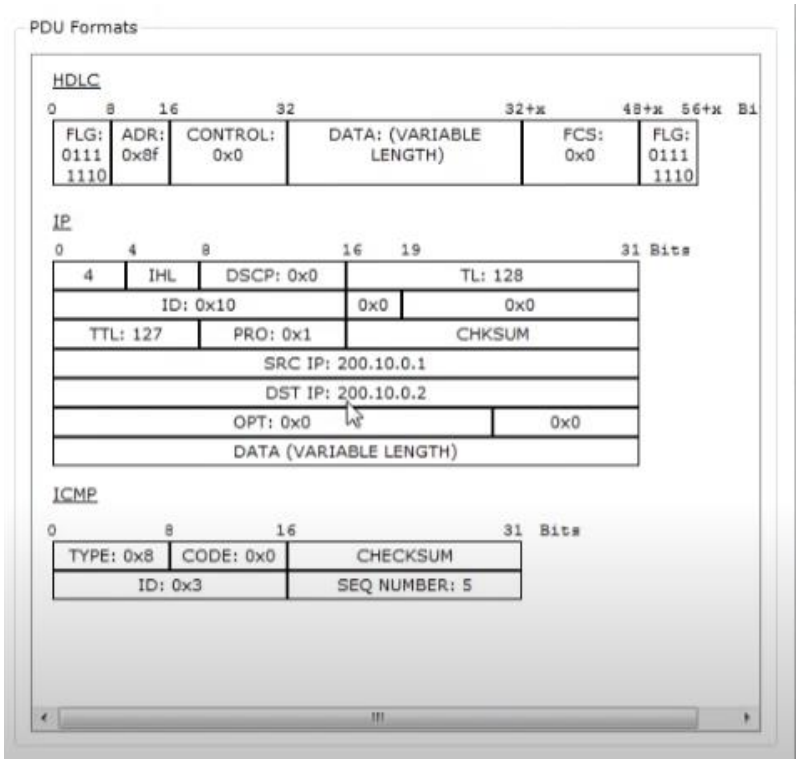
```
R2#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 200.0.0.10:13     192.168.1.10:13    50.0.0.10:13       50.0.0.10:13
icmp 200.0.0.10:14     192.168.1.10:14    50.0.0.10:14       50.0.0.10:14
icmp 200.0.0.10:15     192.168.1.10:15    50.0.0.10:15       50.0.0.10:15
icmp 200.0.0.10:16     192.168.1.10:16    50.0.0.10:16       50.0.0.10:16
tcp 200.0.0.10:80      192.168.1.10:80    50.0.0.10:1030     50.0.0.10:1030
tcp 200.0.0.10:80      192.168.1.10:80    50.0.0.10:1031     50.0.0.10:1031

R2#
```

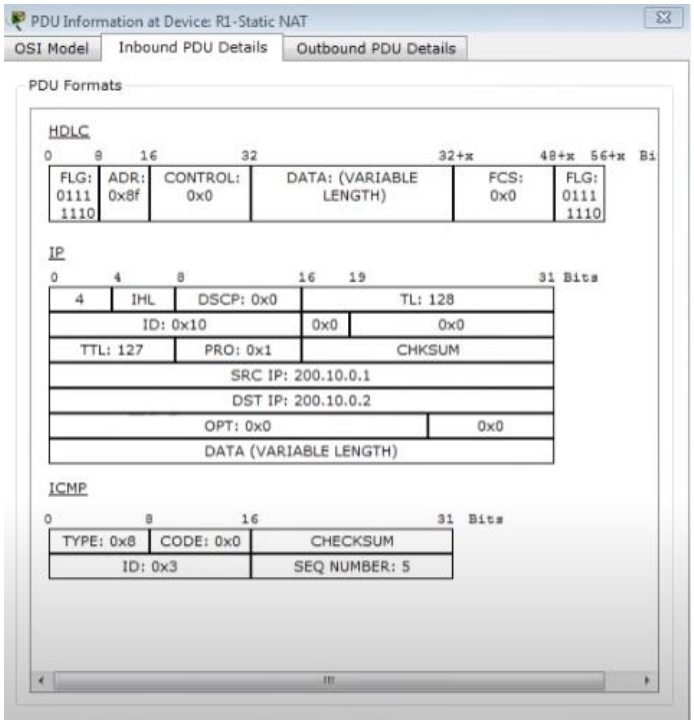






R0-NAT Overload
Physical
Config
CLI
IOS Command Line Interface
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)#ip nat inside source list 1 interface s2/0 overload
Router(config)#int s2/0
Router(config-if)#ip nat outside
Router(config-if)#int fa0/0
Router(config-if)#ip nat inside
Router(config-if)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#
Copy
Paste


At Device: R1-Static NAT
Source: 192.168.1.100
Destination: 200.10.0.2
In Layers
Out Layers
Layer7
Layer6
Layer5
Layer4
Layer 3: IP Header Src. IP: 200.10.0.1, Dest. IP: 200.10.0.2 ICMP Message Type: 8
Layer 3: IP Header Src. IP: 200.10.0.1, Dest. IP: 10.0.0.254 ICMP Message Type: 8
Layer 2: HDLC Frame HDLC
Layer 2: Ethernet II Header 0040.0BA1.9783 >> 00E0.8F7E.B84E
Layer 1: Port Serial2/0
Layer 1: Port(s): FastEthernet0/0
1. Serial2/0 receives the frame.
Challenge Me
<< Previous Layer
Next Layer >>





The actual IP address is not listed here because router is receiving packets after the translation. From R1's point of view remote device's IP address is 200.0.0.10 while from R2's point of view end device's IP address is 50.0.0.10.

This way if NAT is enabled we would not be able to trace the actual end device.