7b. Configure and examine Network Address Translation (NAT).

Network Address Translation (NAT)

NAT is a method used to remap IP addresses by modifying network address information in the IP header of packets while they are in transit. NAT is commonly used to enable multiple devices on a local network to share a single public IP address for Internet access.

- **Types of NAT:**

1. **Static NAT**: Maps one private IP address to one public IP address. It's useful for hosting services that must be accessible from outside the network.

2. **Dynamic NAT**: Maps multiple private IP addresses to a pool of public IP addresses.

3. **PAT (Port Address Translation)**: Also known as **NAT overload**, it maps multiple private IP addresses to a single public IP address by differentiating sessions with unique port numbers.
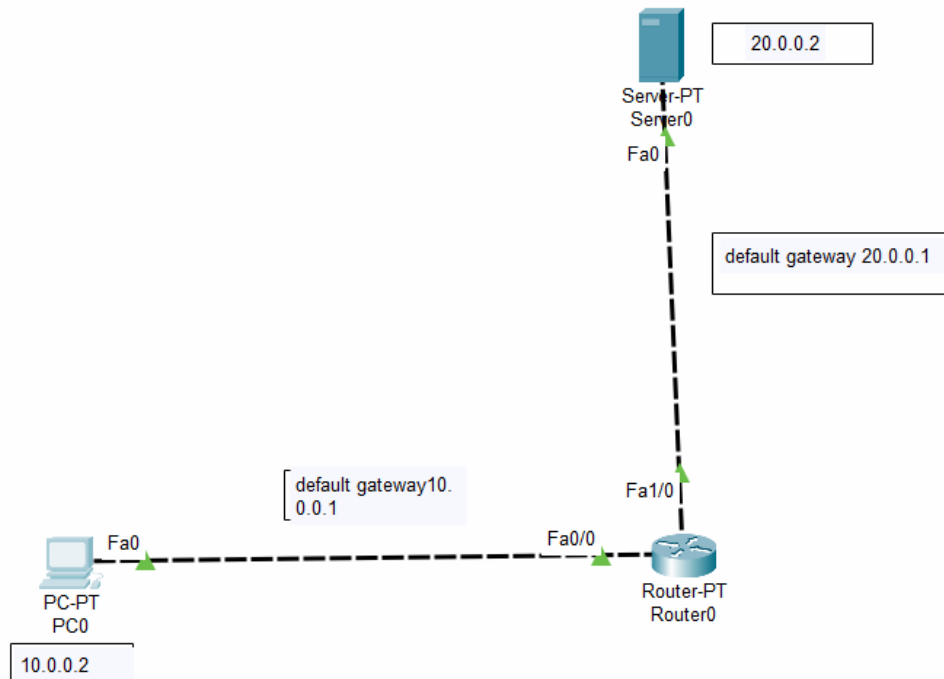
- `ip nat inside source static`:

    - This specifies that you are configuring a **static NAT** translation. Static NAT creates a permanent, one-to-one mapping between an inside local address (private IP) and an inside global address (public IP).
    - **inside_local_ip**: The private IP address of the internal device.
    - **outside_global_ip**: The public IP address accessible from the internet.

Example Use Case

Suppose you have a web server inside your private network with the IP address `10.0.0.2`, and you want external users to be able to access it using the public IP address `200.100.50.25`. The static NAT configuration ensures that when users connect to `200.100.50.25`, the router translates the request to `10.0.0.2` and forwards the traffic to the web server.

i). Static routing

Step 1:

IP configurations:

Step 2:

Router configuration:

Route>
Router>en
Router#conf t
  Enter configuration commands, one per line. End with CNTL/Z.
  Router(config)#int fa0/0
  Router(config-if)#ip add 10.0.0.1
  255.0.0.0 Router(config-if)#no shut

  Router(config-if)#
  %LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

  %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
  state to up

  Router(config-if)#ip
  nat inside
  Router(config-if)#int
  fa1/0
  Router(config-if)#ip add 20.0.0.1
  255.0.0.0 Router(config-if)#no shut

  Router(config-if)#
  %LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

  %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed
  state to up

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

  Router(config)#ip nat inside source static 10.0.0.2 200.100.50.25

Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
Router#sh ip nat translations
Pro Inside global Inside local Outside local Outside global
--- 200.100.50.25 10.0.0.2 --- ---

Router#

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shut
Router(config-if)#ip nat inside
Router(config-if)#int fal/0
Router(config-if)#ip address 20.0.0.1 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#ip nat inside source static 10.0.0.2 200.100.50.25
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#sh ip nat transulation
                   ^
% Invalid input detected at '^' marker.

Router#sh ip nat translations
Pro  Inside global    Inside local       Outside local      Outside global
---  200.100.50.25    10.0.0.2           ---                ---

Router#
```
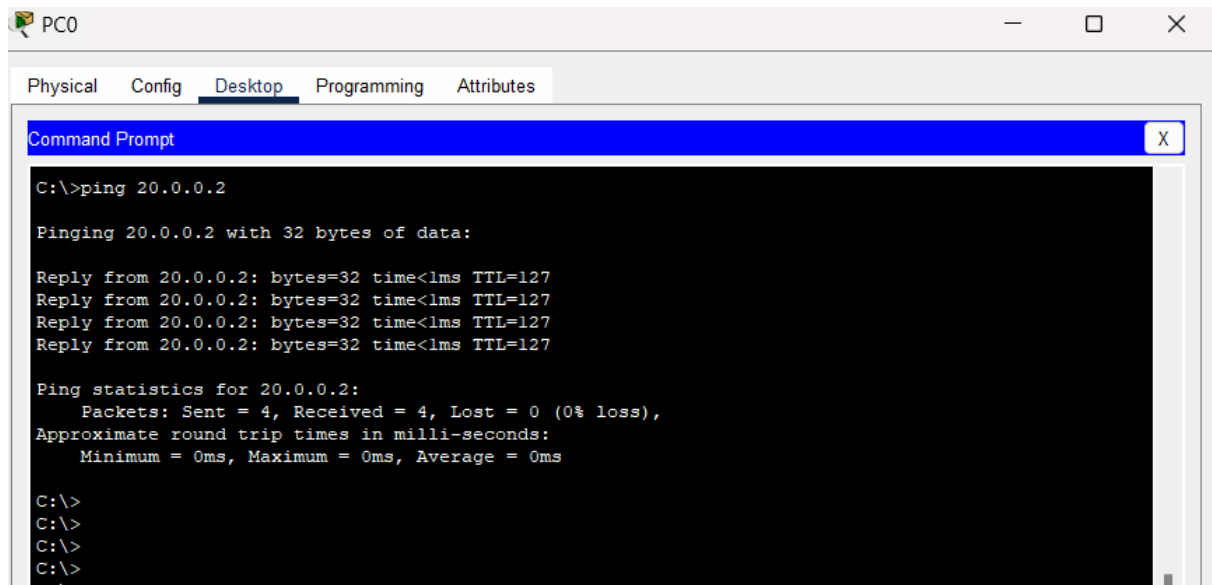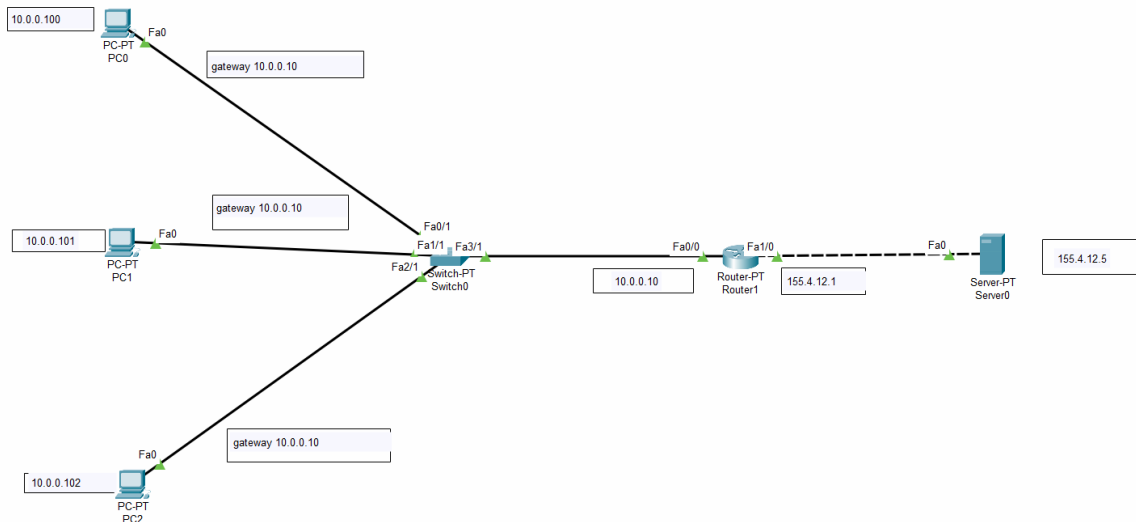
Step 3: Test Connectivity

To test the connection ping from the terminal

PC0   —   □   ✕

Physical   Config   Desktop   Programming   Attributes

Command Prompt   X

```
C:\>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes=32 time<1ms TTL=127
Reply from 20.0.0.2: bytes=32 time<1ms TTL=127
Reply from 20.0.0.2: bytes=32 time<1ms TTL=127
Reply from 20.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 20.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
C:\>
C:\>
C:\>
```

ii). Dynamic routing


```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
up

Router(config-if)#ip nat inside
Router(config-if)#ex
Router(config)#int fa1/0
Router(config-if)#ip address 155.4.12.1 255.255.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to
up

Router(config-if)#ip nat outside
Router(config-if)#ex
Router(config)#access-list 1 permit 10.0.0.0 0.0.0.255
Router(config)#ip nat pool newpool 155.4.12.1 155.4.12.3 netmask 255.255.255.0
Router(config)#ip nat inside source list 1 pool newpool
Router(config)#ip route 0.0.0.0 0.0.0.0 155.4.12.5
Router(config)#ex
Router#
```
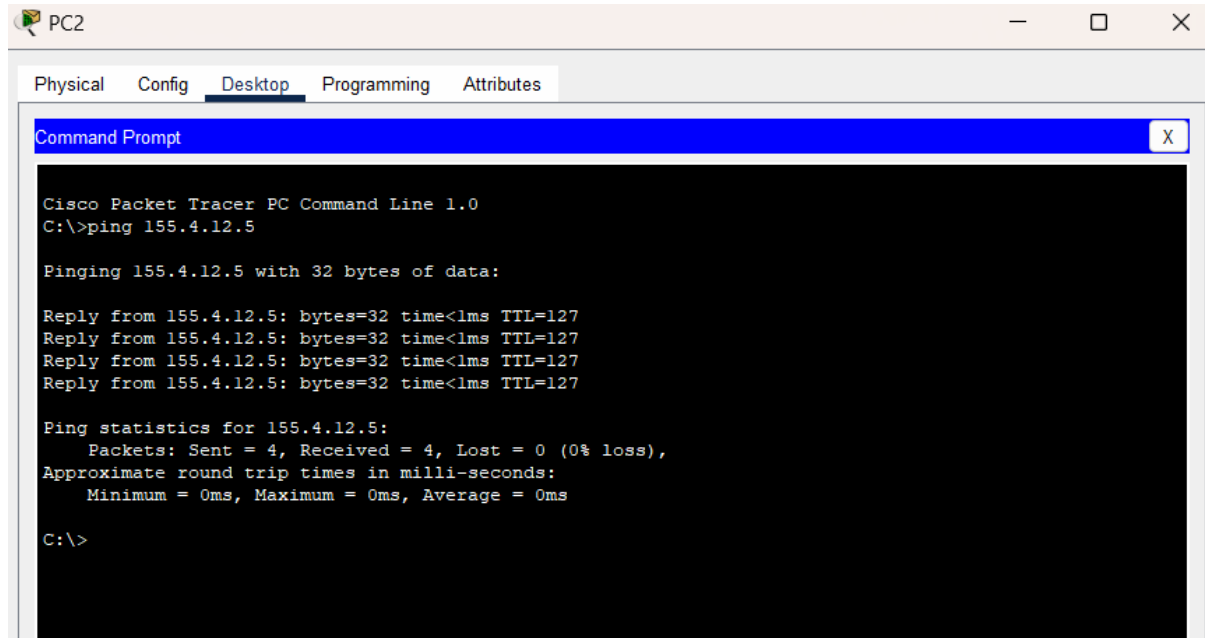
%SYS-5-CONFIG_I: Configured from console by console

Note:
- To test the nat translations, need ping from source system to destination system. (Exp:from PC2 **c:\>ping 155.4.12.5**)
- After ping, go to Router configuration and check for nat translations (**Router#sh ip nat translations**)

Router#sh ip nat translations
Router#sh ip nat translations
Router#sh ip nat translations
Pro Inside global Inside local Outside local Outside global
icmp 155.4.12.1:1 10.0.0.102:1 155.4.12.5:1 155.4.12.5:1
icmp 155.4.12.1:2 10.0.0.102:2 155.4.12.5:2 155.4.12.5:2
icmp 155.4.12.1:3 10.0.0.102:3 155.4.12.5:3 155.4.12.5:3
icmp 155.4.12.1:4 10.0.0.102:4 155.4.12.5:4 155.4.12.5:4

Physical   Config   CLI   Attributes

IOS Command Line Interface

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip address 10.0.0.10 255.0.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#ip nat inside
Router(config-if)#ex
Router(config)#int fa1/0
Router(config-if)#ip address 155.4.12.1 255.255.0.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

Router(config-if)#ip nat outside
Router(config-if)#ex
Router(config)#access-list 1 permit 10.0.0.0 0.0.0.255
Router(config)#ip nat pool newpool 155.4.12.1 155.4.12.3 netmask 255.255.255.0
Router(config)#ip nat inside source list 1 pool newpool
Router(config)#ip route 0.0.0.0 0.0.0.0 155.4.12.5
Router(config)#ex
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#sh ip nat translations
Router#sh ip nat translations
Router#sh ip nat translations
Pro  Inside global     Inside local      Outside local      Outside global
icmp 155.4.12.1:1      10.0.0.102:1      155.4.12.5:1       155.4.12.5:1
icmp 155.4.12.1:2      10.0.0.102:2      155.4.12.5:2       155.4.12.5:2
icmp 155.4.12.1:3      10.0.0.102:3      155.4.12.5:3       155.4.12.5:3
icmp 155.4.12.1:4      10.0.0.102:4      155.4.12.5:4       155.4.12.5:4

Router#
```

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