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Static NAT

1. Int-S1 is your company's web server. It must be reachable from external customers browsing the Internet. Configure NAT on R1 so that external customers can reach the server using the public IP address 203.0.113.3. Do not change any IP addressing or routing information.

```
R1(config)#interface FastEthernet 0/0
R1(config-if)#ip nat outside
R1(config-if)#exit

R1(config)#interface FastEthernet 0/1
R1(config-if)#ip nat inside
R1(config-if)#exit

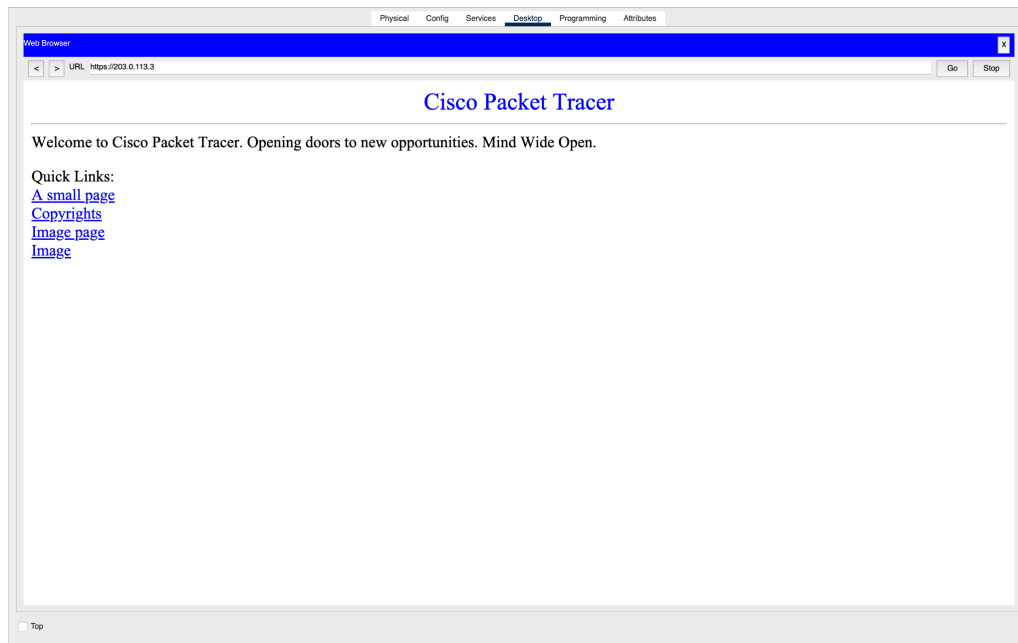
R1(config)#ip nat inside source static 10.0.1.10 203.0.113.3
```

2. Ping Ext-S1 from Int-S1 to check the NAT rule is working and you have connectivity.

```
C:\>ping 203.0.113.20
Pinging 203.0.113.20 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Reply from 203.0.113.20: bytes=32 time<1ms TTL=126
Ping statistics for 203.0.113.20:
    Packets: Sent = 4, Received = 1, Lost = 3 (75% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 203.0.113.20
Pinging 203.0.113.20 with 32 bytes of data:
Reply from 203.0.113.20: bytes=32 time<1ms TTL=126
Reply from 203.0.113.20: bytes=32 time=2ms TTL=126
Reply from 203.0.113.20: bytes=32 time<1ms TTL=126
Reply from 203.0.113.20: bytes=32 time<1ms TTL=126
Ping statistics for 203.0.113.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

Approximate round trip times **in** milli-seconds:
Minimum = 0ms, Maximum = 2ms, Average = 0ms

3. On Ext-S1, click on 'Desktop' then open 'Web Browser'. Open the NAT'd public IP address of Int-S1 at https://203.0.113.3 in the browser to verify that external customers on the Internet can reach your web server.



4. Verify the connection appears in the NAT translation table. Note that entries age out quickly so generate the traffic again if you did not check the table quickly enough.

```
R1#show ip nat translations
Pro  Inside global      Inside local      Outside local      Outside global
---  203.0.113.3          10.0.1.10         ---                ---
tcp  203.0.113.3:443      10.0.1.10:443     203.0.113.20:1025 203.0.113.20:1025
```

Dynamic NAT

5. Configure NAT on R1 so that PCs in the 10.0.2.0/24 subnet have connectivity to external networks on a first come first served basis. Assign global addresses from the range 203.0.113.4 to 203.0.113.12. Do not enable Port Address Translation

```
R1(config)#interface FastEthernet 1/0
R1(config-if)#ip nat inside
```

```
# Configure the pool of global addresses
R1(config)#ip nat pool Flackbox 203.0.113.4 203.0.113.12 netmask
255.255.255.240

# Create an access list that references the internal IP addresses we want
to translate
R1(config)#access-list 1 permit 10.0.2.0 0.0.0.255

# Associate the access list with the NAT pool to complete the configuration
R1(config)#ip nat inside source list 1 pool Flackbox
```

6. Turn on NAT debugging on R1. Ping Ext-S1 from PC1. View the debug output on R1. You should see NAT entries for the 5 pings. Which global address was PC1 translated to?

PC1 local address of 10.0.2.10 global address was translated to 203.0.113.4

```
R1#debug ip nat
IP NAT debugging is on
R1#
*Feb 28, 10:19:00.1919: NAT: s=10.0.2.10->203.0.113.4, d=203.0.113.20 [1]
R1#
*Feb 28, 10:19:06.1919: NAT: s=10.0.2.10->203.0.113.4, d=203.0.113.20 [2]
*Feb 28, 10:19:06.1919: NAT*: s=203.0.113.20, d=203.0.113.4->10.0.2.10
[125]
R1#
*Feb 28, 10:19:07.1919: NAT: s=10.0.2.10->203.0.113.4, d=203.0.113.20 [3]
*Feb 28, 10:19:07.1919: NAT*: s=203.0.113.20, d=203.0.113.4->10.0.2.10
[126]
R1#
*Feb 28, 10:19:08.1919: NAT: s=10.0.2.10->203.0.113.4, d=203.0.113.20 [4]
*Feb 28, 10:19:08.1919: NAT*: s=203.0.113.20, d=203.0.113.4->10.0.2.10
[127]
R1#
```

7. Verify the ping connection appears in the NAT translation table.

Note: The entry disappears fast so make sure to check right after the ping

```
R1#show ip nat translations
Pro  Inside global      Inside local      Outside local      Outside global
icmp 203.0.113.4:5      10.0.2.10:5      203.0.113.20:5    203.0.113.20:5
icmp 203.0.113.4:6      10.0.2.10:6      203.0.113.20:6    203.0.113.20:6
---  203.0.113.3        10.0.1.10        ---               ---
tcp  203.0.113.3:443    10.0.1.10:443    203.0.113.20:1025
203.0.113.20:1025
```

8. When all the addresses in the pool 203.0.113.4 to 203.0.113.12 have been allocated, what will happen when the next PC tries to send traffic to an external host?

Since dynamic NAT is first-come first-serve basis, the PC will receive an error until another allocated public IP lease end and it's added back into the IP pool. For example, if PC1 has 203.0.113.12 and its associated public IP lease ends then the next PC will be able to use that same IP.

9. Enable Port Address Translation so that the last IP address in the range can be reused when all IP addresses have been allocated to clients.

```
R1#clear ip nat translation
R1#config terminal
R1(config)#ip nat inside source list 1 pool Flackbox overload
```

10. Cleanup: Completely remove the access list and all NAT configuration from R1. Use the commands “show run | section nat” and “show access-list” to verify all configuration is removed

```
R1(config)#int f0/0
R1(config-if)#no ip nat outside
R1(config-if)#int f0/1
R1(config-if)#no ip nat inside
R1(config-if)#int f1/0
R1(config-if)#no ip nat inside
R1(config-if)#no ip nat inside source static 10.0.1.10 203.0.113.3
R1(config-if)#end
R1#clear ip nat translation *
R1# configuration terminal
R1(config)#no ip nat inside source list 1 pool Flackbox overload
```

```

R1(config)#no ip nat pool Flackbox 203.0.113.4 203.0.113.12 netmask
255.255.255.240
R1(config)#no access-list 1

R1#show run | section nat
R1#

R1#show access-list
R1#

```

Port Address Translation

11. Your company no longer has a range of public IP addresses. Instead you will receive a single public IP address via DHCP from your service provider. Shutdown interface F0/0 on R1 and remove its IP address. Reconfigure it to receive its IP address via DHCP from the service provider router SP1.

```

R1(config)#interface FastEthernet 0/0
R1(config-if)# shutdown
R1(config-if)# no ip address
R1(config-if)# ip address dhcp

```

12. Bring the interface back up and wait for DHCP. What IP address is it assigned?

```

R1(config-if)# no shutdown
R1(config-if)#
*Feb 28, 10:38:14.3838: %DHCP-6-ADDRESS_ASSIGN: Interface FastEthernet0/0
assigned DHCP address 203.0.113.13, mask 255.255.255.240, hostname R1

```

```

R1#show ip int brief

```

Interface	IP-Address	OK?	Method	Status
FastEthernet0/0	203.0.113.13	YES	DHCP	up
FastEthernet0/1	10.0.1.1	YES	manual	up
FastEthernet1/0	10.0.2.1	YES	manual	up
FastEthernet1/1	unassigned	YES	manual	administratively down

Vlan1	unassigned	YES	unset	administratively	down
down					

13. Configure NAT on R1 so that PCs in the 10.0.2.0/24 subnet have connectivity to external networks on a first come first served basis. Allow multiple PCs to reuse the IP address on interface F0/0 on R1. Ensure that NAT continues to work if the DHCP address assigned by the provider changes.

```
# Configure f0/0 interface as the outside interface
R1(config)#int f0/0
R1(config-if)#ip nat outside

# Configure f1/0 interface as the inside interface
R1(config)#int f1/0
R1(config-if)#ip nat inside

# Create an access-list which references the internal IP addresses
R1(config)#access-list 1 permit 10.0.2.0 0.0.0.255

# Associate the access list with the outside interface and enable
overload(PAT)
R1(config)#ip nat inside source list 1 interface f0/0 overload
```

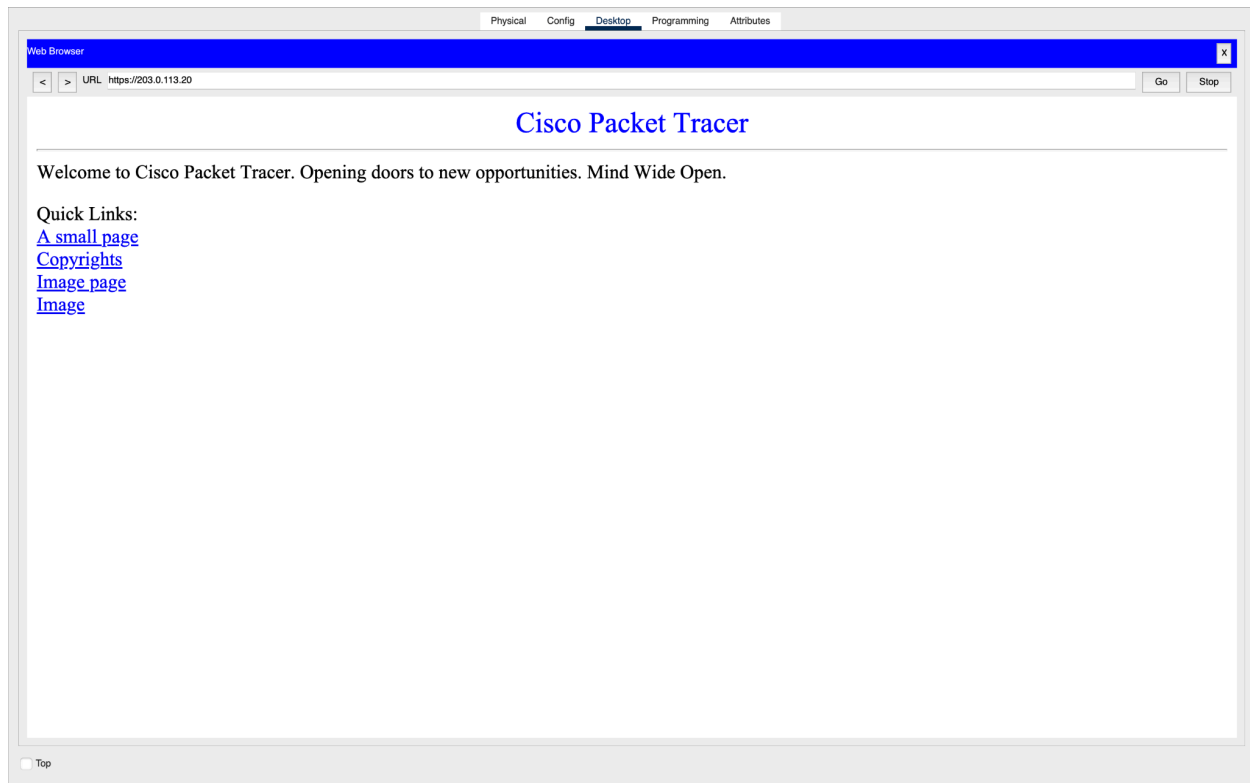
14. Ensure NAT debugging on R1 is still enabled. On PC1, click on 'Desktop' then open 'Web Browser'. Open the public IP address of Ext-S1 at https://203.0.113.20 in the browser to verify that PAT is working and you can reach external servers.

You will see a 'Request Timeout' error message if your configuration is not working (you need to fix it).

PC1 to EXT-S1

```
C:\>ping 203.0.113.20
Pinging 203.0.113.20 with 32 bytes of data:
Request timed out.
Reply from 203.0.113.20: bytes=32 time<1ms TTL=126
Reply from 203.0.113.20: bytes=32 time<1ms TTL=126
Reply from 203.0.113.20: bytes=32 time<1ms TTL=126
Ping statistics for 203.0.113.20:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
```

Minimum = 0ms, Maximum = 0ms, Average = 0ms



15. View the debug output on R1. Which global IP address was PC1 translated to?

PC1 with a local address 10.0.2.10 is translated to global ip address 203.0.113.20

```
R1#
*Feb 28, 09:07:49.077: NAT: s=10.0.2.10->203.0.113.13, d=203.0.113.20 [2]
*Feb 28, 09:07:49.077: NAT*: s=203.0.113.20, d=203.0.113.13->10.0.2.10 [10]
*Feb 28, 09:07:49.077: NAT*: s=10.0.2.10->203.0.113.13, d=203.0.113.20 [3]
*Feb 28, 09:07:49.077: NAT*: s=10.0.2.10->203.0.113.13, d=203.0.113.20 [4]
*Feb 28, 09:07:49.077: NAT*: s=203.0.113.20, d=203.0.113.13->10.0.2.10 [11]
*Feb 28, 09:07:49.077: NAT*: s=10.0.2.10->203.0.113.13, d=203.0.113.20 [5]
*Feb 28, 09:07:49.077: NAT*: s=203.0.113.20, d=203.0.113.13->10.0.2.10 [12]
*Feb 28, 09:07:49.077: NAT*: s=10.0.2.10->203.0.113.13, d=203.0.113.20 [6]
```

16. On PC2, click on 'Desktop' then open 'Web Browser'. Open the public IP address of Ext-S1 at http://203.0.113.20 in the browser. Which global IP address is PC2 translated to?

PC2 with a local address of 10.0.2.11 is translated to global IP address 203.0.113.20

```
R1#debug ip nat
IP NAT debugging is on
R1#
*Feb 28, 09:05:31.055: NAT: s=10.0.2.11->203.0.113.13, d=203.0.113.20 [13]
*Feb 28, 09:05:31.055: NAT*: s=203.0.113.20, d=203.0.113.13->10.0.2.11 [7]
*Feb 28, 09:05:31.055: NAT*: s=10.0.2.11->203.0.113.13, d=203.0.113.20 [14]
*Feb 28, 09:05:31.055: NAT*: s=10.0.2.11->203.0.113.13, d=203.0.113.20 [15]
*Feb 28, 09:05:31.055: NAT*: s=203.0.113.20, d=203.0.113.13->10.0.2.11 [8]
*Feb 28, 09:05:31.055: NAT*: s=10.0.2.11->203.0.113.13, d=203.0.113.20 [16]
*Feb 28, 09:05:31.055: NAT*: s=203.0.113.20, d=203.0.113.13->10.0.2.11 [9]
*Feb 28, 09:05:31.055: NAT*: s=10.0.2.11->203.0.113.13, d=203.0.113.20 [17]
```

17. Verify the connections in the NAT translation table.

Note: I did PC2 first instead of PC1 hence why the port is less by 1

```
R1#show ip nat translations
Pro  Inside global      Inside local      Outside local      Outside global
tcp  203.0.113.13:1024   10.0.2.10:1026    203.0.113.20:443
203.0.113.20:443
tcp  203.0.113.13:1025   10.0.2.11:1025    203.0.113.20:443
203.0.113.20:443
```

18. Show the NAT statistics on R1.

```
Total translations: 4 (0 static, 4 dynamic, 4 extended)
Outside Interfaces: FastEthernet0/0
Inside Interfaces: FastEthernet1/0
Hits: 30 Misses: 6
Expired translations: 0
Dynamic mappings:
R1#
```