

NAT (STATIC): PART 1

PRIVATE IPv4 ADDRESSES (RFC 1918)

- IPv4 doesn't provide enough ADDRESSES for all DEVICES that need an IP ADDRESS in the modern world
- The long-term solution is to switch to IPv6
- There are THREE MAIN short-term solutions:
 - CIDR
 - PRIVATE IPv4 ADDRESS
 - NAT
- RFC 1918 specifies the following IPv4 ADDRESS RANGES as PRIVATE:

10.0.0.0 /8	(10.0.0.0 to 10.255.255.255)	CLASS A
172.16.0.0 /12	(172.16.0.0 to 172.31.255.255)	CLASS B
192.168.0.0 /16	(192.168.0.0 to 192.168.255.255)	CLASS C
- You are free to use these ADDRESSES in your NETWORKS. They don't have to be GLOBALLY UNIQUE

```
C:\Users\user>ipconfig  
Windows IP Configuration  
Ethernet adapter Ethernet0:  
  
Connection-specific DNS Suffix . . . . .  
IPv4 Address . . . . . : 192.168.0.167  
Subnet Mask . . . . . : 255.255.255.0  
Default Gateway . . . . . : 192.168.0.1
```

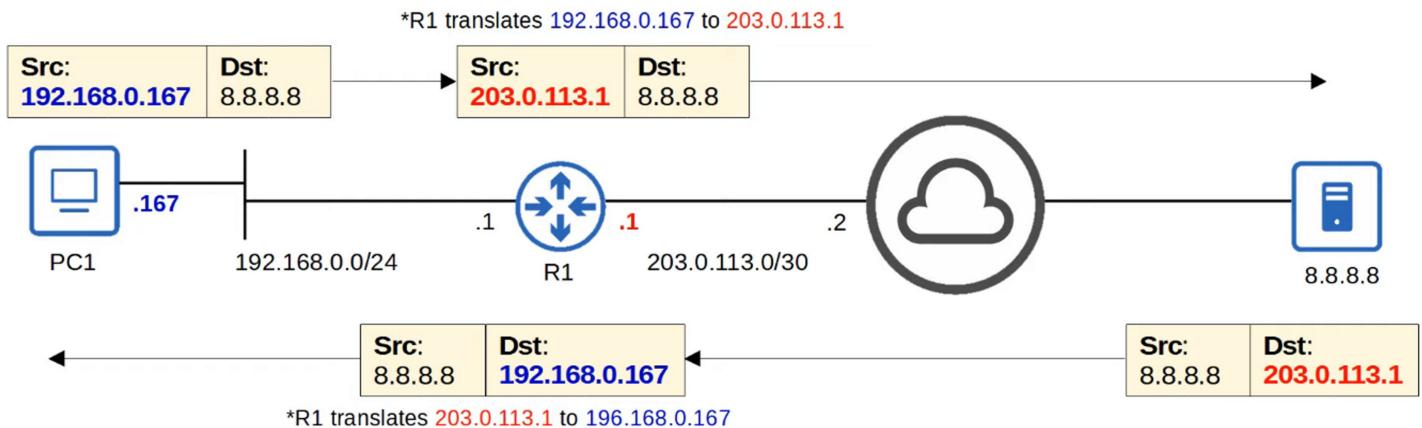
*Private IP addresses cannot be used over the Internet!

- Two problems:
 - 1) Duplicate addresses
 - 2) Private IP addresses can't be used over the Internet, so the PCs can't access the Internet.



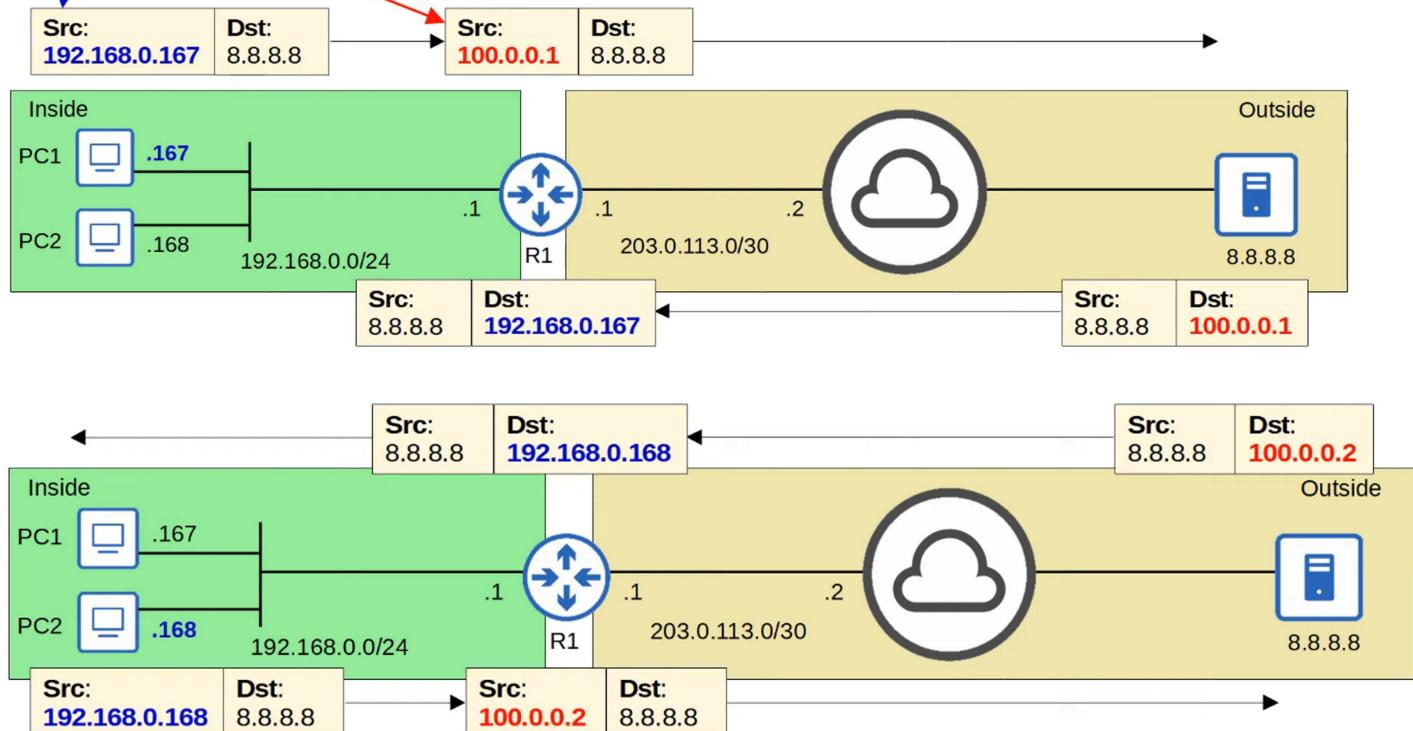
INTRO TO NAT

- NETWORK ADDRESS TRANSLATION (NAT) is used to modify the SOURCE and / or DESTINATION IP ADDRESSES of packets
- There are various reasons to use NAT, but the MOST common reason is to ALLOW HOSTS with PRIVATE IP ADDRESSES to communicate with other HOSTS over the INTERNET
- For the CCNA you have to understand SOURCE NAT and how to configure it on CISCO ROUTERS



STATIC NAT

- STATIC NAT involves statically configuring ONE-TO-ONE MAPPINGS of PRIVATE IP ADDRESSES to PUBLIC ADDRESSES
- An *inside local* IP address is mapped to an *inside global* IP address.
 - **Inside Local** = The IP address of the *inside* host, from the perspective of the local network
*the IP address actually configured on the inside host, usually a private address
 - **Inside Global** = The IP address of the *inside* host, from the perspective of *outside* hosts
*the IP address of the inside host after NAT, usually a public address



Static NAT allows devices with private IP addresses to communicate over the Internet.

However, because it requires a one-to-one IP address mapping, it doesn't help preserve IP addresses.

PRIVATE IP CANNOT BE MAPPED TO THE SAME GLOBAL IP

THE SECOND MAPPING WILL BE REJECTED

```
R1(config)#ip nat inside source static 10.0.0.1 20.0.0.1
R1(config)#ip nat inside source static 10.0.0.2 20.0.0.1
% similar static entry (10.0.0.1 -> 20.0.0.1) already exists
```

STATIC NAT CONFIGURATIONS

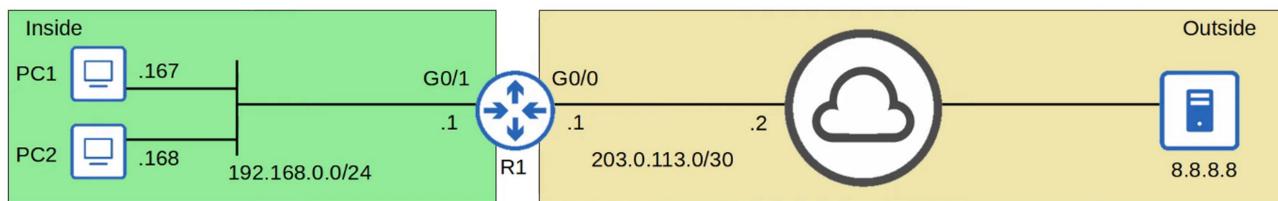
Static NAT Configuration

```
R1(config)#int g0/1
R1(config-if)#ip nat inside
R1(config-if)#int g0/0
R1(config-if)#ip nat outside
R1(config-if)#exit
R1(config)#ip nat inside source static 192.168.0.167 100.0.0.1
R1(config)#ip nat inside source static 192.168.0.168 100.0.0.2
R1(config)#exit
R1#show ip nat translations
Pro Inside global      Inside local      Outside local      Outside global
udp 100.0.0.1:56310   192.168.0.167:56310 8.8.8.8:53
--- 100.0.0.1          192.168.0.167        ---           ---
udp 100.0.0.2:62321   192.168.0.168:62321 8.8.8.8:53
--- 100.0.0.2          192.168.0.168        ---           ---
```

Define the 'inside' interface(s) connected to the internal network.

Define the 'outside' interface(s) connected to the external network.

Configure the one-to-one IP address mappings.
`ip nat inside source static inside-local-ip inside-global-ip`

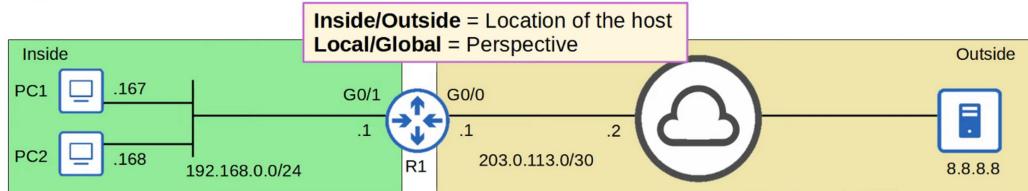


show ip nat translations

```
R1#show ip nat translations
Pro Inside global      Inside local      Outside local      Outside global
udp 100.0.0.1:56310   192.168.0.167:56310 8.8.8.8:53
--- 100.0.0.1          192.168.0.167        ---           ---
udp 100.0.0.2:62321   192.168.0.168:62321 8.8.8.8:53
--- 100.0.0.2          192.168.0.168        ---           ---
```

Unless **destination NAT** is used, these two addresses will be the same.

- **Inside Local** = The IP address of the *inside* host, from the perspective of the local network
*the IP address actually configured on the inside host, usually a private address
- **Inside Global** = The IP address of the *inside* host, from the perspective of *outside* hosts
*the IP address of the inside host *after NAT*, usually a public address
- **Outside Local** = The IP address of the *outside* host, from the perspective of the local network
- **Outside Global** = The IP address of the *outside* host, from the perspective of the outside network



ip

Command clear ip nat translation

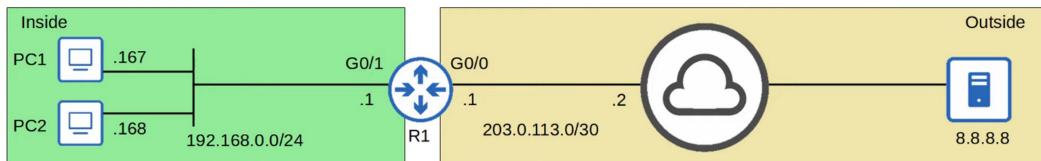


clear ip nat translation *

```
R1#show ip nat translations
Pro Inside global      Inside local      Outside local      Outside global
udp 100.0.0.1:56310    192.168.0.167:56310 8.8.8.8:53      8.8.8.8:53
--- 100.0.0.1          192.168.0.167       ---           ---
udp 100.0.0.2:62321    192.168.0.168:62321 8.8.8.8:53      8.8.8.8:53
--- 100.0.0.2          192.168.0.168       ---           ---
```

```
R1#clear ip nat translation *
```

```
R1#show ip nat translations
Pro Inside global      Inside local      Outside local      Outside global
--- 100.0.0.1          192.168.0.167       ---           ---
--- 100.0.0.2          192.168.0.168       ---           ---
```



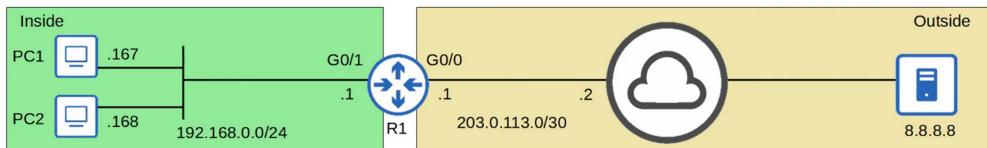
Command show ip nat statistics



show ip nat statistics

```
R1#show ip nat statistics
Total active translations: 2 (2 static, 0 dynamic; 0 extended)
Peak translations: 4, occurred 02:29:00 ago
Outside interfaces:
  GigabitEthernet0/0
Inside interfaces:
  GigabitEthernet0/1
Hits: 34  Misses: 0
CEF Translated packets: 30, CEF Punted packets: 4
Expired translations: 4
Dynamic mappings:

Total doors: 0
Appl doors: 0
Normal doors: 0
Queued Packets: 0
```



COMMAND REVIEW



Command Review

```
R1(config-if)# ip nat inside
R1(config-if)# ip nat outside
R1(config)# ip nat inside source static inside-local-ip inside-global-ip
R1# show ip nat translations
R1# show ip nat statistics
R1# clear ip nat translation *
```