Network Address Translation Cisco Router

NAT on Cisco Router:

o NAT is a cisco term which is stand for Network Address Translation.

o NAT is a process that involves translating Private IP into Public IP addresses.

o The process of translating one IP address to another is known as a NAT.

o Router and Firewall is a device, which is used for network Address Translation.

o There are many forms and kinds of Network Address Translation (NAT).

o Network Address Translation used to reduce requirement of the Public IP address.

o Network Address Translation increase security of Internal Computer Networks.

o NAT Translate Private IP into Public IP address & Public IP into Private IP address.

o NAT used to connect a device with Private IP address to the Internet or WAN.

o Network Address Translation hide an organization internal network from external.

o Network Address Translation (NAT) modifies only the Layer 3 header of IP address.

o PAT, translation of an IP address and Port to another IP address and Port number.

o Port Address Translation (PAT) modifies both the Layer 3 and Layer 4 header of IP.

NAT:
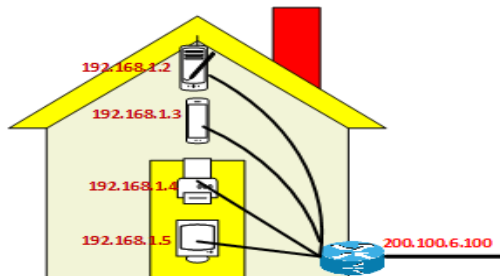
Network Address Translation, or NAT, implies a translation of an IP address to another IP address. Network Address Translation (NAT) modifies only the Layer 3 header of IP.

PAT:

Port Address Translation, or PAT, implies a translation of an IP address and Port to another IP address and Port. PAT modifies both the Layer 3 and Layer 4 header. PAT as a subset of NAT.

Static vs Dynamic:

Both a NAT and a PAT can exist in two forms: Static NAT or Dynamic NAT.
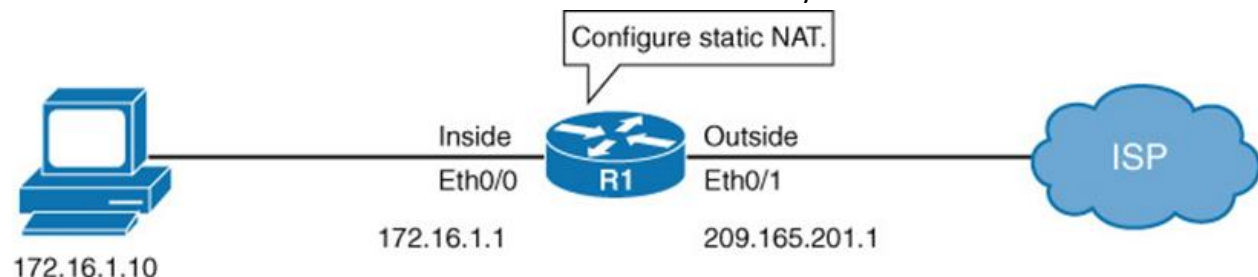
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Static NAT:

A Static mapping is sometimes referred to as a One-to-One translation. Static NAT translation is bidirectional. Whether the internal host or the external host sent the first packet, it would "pass through" the Static NAT. Static NAT is used to do a one-to-one mapping between an inside address and an outside address. Static NAT also allows connections from an outside host to an inside host.

Dynamic NAT:

A Dynamic mapping is sometimes referred to as a One-to-Many– implying that in a Dynamic translation, many addresses can appear as one. Dynamic NAT is used when you have a "pool" of public IP addresses that you want to assign to your internal hosts dynamically.

Static NAT:

Static NAT implies a translation of single IP address to another single IP address. Static NAT modifies only the L3 header. Static NAT is useful when a network device inside a private network needs to be accessible from internet.
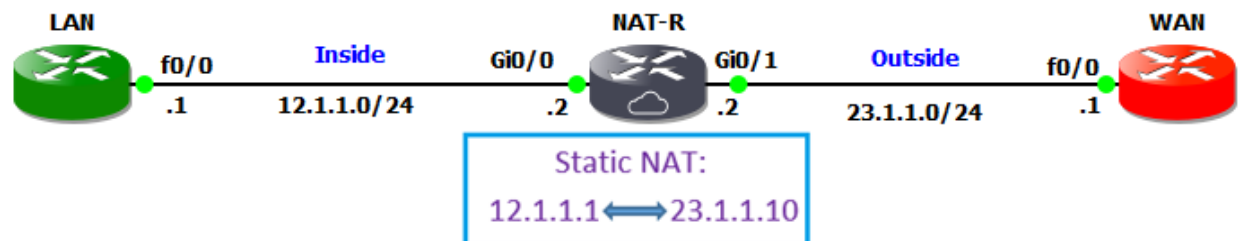

Dynamic NAT:

Translation of just the IP address, where the device determines the new IP address after translation. Dynamic NAT can be defined as mapping of a private IP address to a public IP address from a group of public IP addresses called as NAT Pool.
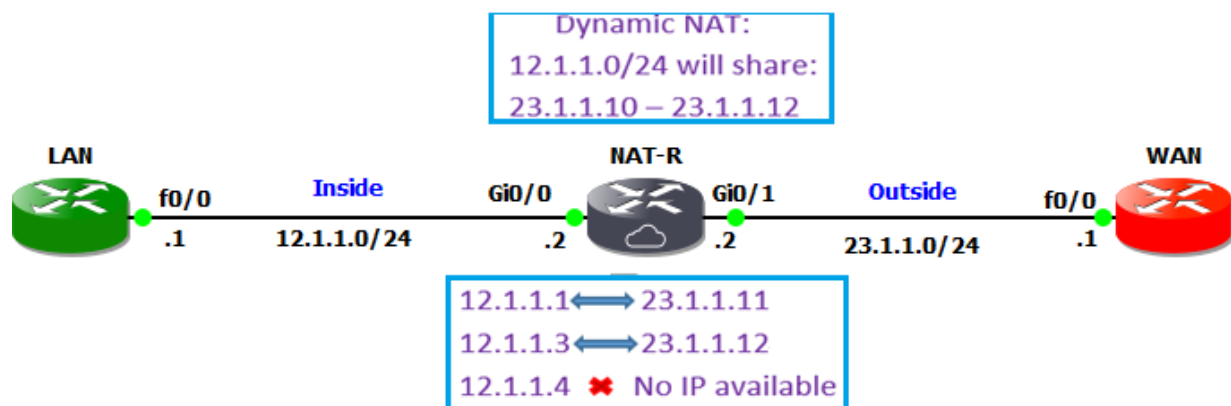
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PAT (Port Address Translation):

PAT is another type of dynamic NAT, which can map multiple private IP addresses to a single public IP address by using a technology known as Port Address Translation. When a client from inside network communicate to a host in the internet, the router changes the source port number with another port number. These port mappings are kept in a table. When the router receives data packet from internet, it will refer the table, which keep the port mappings and forward the data packet to the original sender.
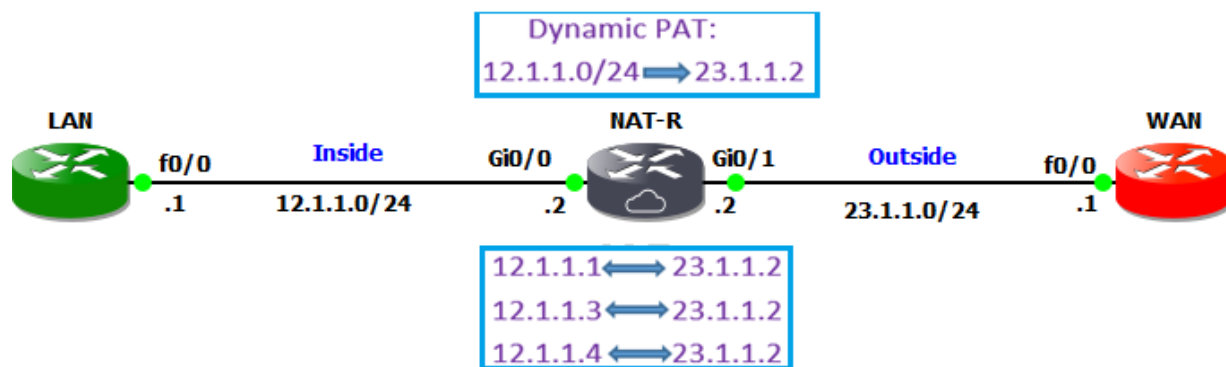
Inside Local Address:

Inside local address is an IP address assigned to a workstation inside our network. Inside Local addresses are typically private IP addresses, which stay inside our network.

Inside Global Address:

Inside Global address are typically public IP addresses which are assigned to our end internet facing router to be used as the IP address for communicating with other devices in the internet. The Inside Local IP addresses are removed at the NAT router and translated with Inside Global address.

Outside Global Address:

Outside Global address is the public IP address assigned to the end device on the other network to communicate other devices in the internet. Outside Global addresses are public IP addresses which are routable.

Outside Local Address:

Outside local address is the real IP address of the end device at other network. Outside local addresses are typically private IP addresses assigned to the computers in the other private network. We cannot know the Outside local addresses because in a NAT enabled network we use the destination IP address as Outside Global address.

Network Address Translation Cisco Router
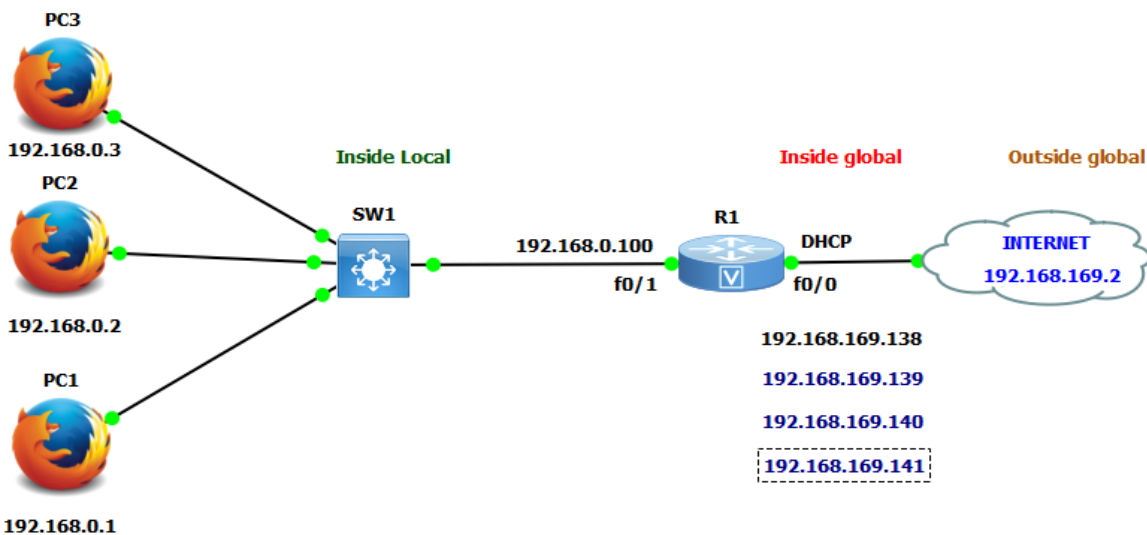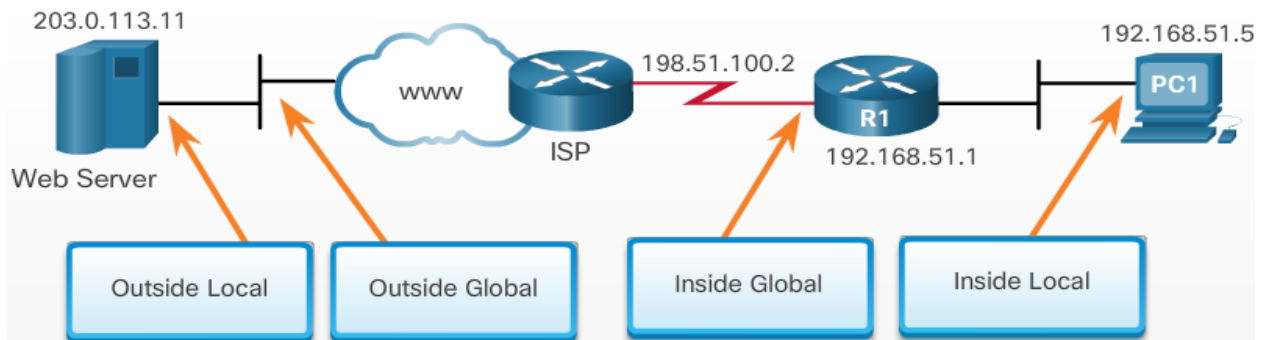
R1 Basic Configuration	
R1(config)#interface f0/0 R1(config-if)#ip address dhcp R1(config-if)#no shutdown	R1(config)#interface f0/1 R1(config-if)#ip add 192.168.0.100 255.255.255.0 R1(config-if)#no shutdown
R1(config)#ip name-server 8.8.8.8	R1(config)#ip domain-lookup

Static NAT Configuration on R1
R1(config)#ip nat inside source static 192.168.0.1 192.168.169.139
R1(config)#ip nat inside source static 192.168.0.3 192.168.169.141
R1(config)#ip nat inside source static 192.168.0.2 192.168.169.140
R1(config)#interface f0/0 R1(config-if)#ip nat outside
R1(config-if)#interface f0/1 R1(config-if)#ip nat inside

```
R1#show ip nat translations
Pro Inside global     Inside local      Outside local       Outside global
--- 192.168.169.139   192.168.0.1       ---                 ---
--- 192.168.169.140   192.168.0.2       ---                 ---
--- 192.168.169.141   192.168.0.3       ---                 ---
```

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After send the traffic from 192.168.01, it is translated and send the traffic outside.

```
R1#show ip nat translations
Pro Inside global      Inside local       Outside local       Outside global
tcp 192.168.169.139:46834 192.168.0.1:46834 94.97.232.152:80 94.97.232.152:80
--- 192.168.169.139     192.168.0.1        ---                 ---
tcp 192.168.169.140:41018 192.168.0.2:41018 94.97.232.152:80 94.97.232.152:80
```

Dynamic NAT Configuration on R1
R1(config)#access-list 1 permit 192.168.0.0 0.0.0.255
R1(config)#ip nat pool mypool 192.168.169.139 192.168.169.140 netmask 255.255.255.0
R1(config)#ip nat inside source list 1 pool mypool
R1(config)#interface f0/0 R1(config-if)#ip nat outside
R1(config-if)#interface f0/1 R1(config-if)#ip nat inside

```
R1#show ip nat translations
Pro Inside global      Inside local       Outside local       Outside global
tcp 192.168.169.140:39648 192.168.0.1:39648 93.184.220.29:80 93.184.220.29:80
tcp 192.168.169.140:46812 192.168.0.1:46812 13.249.11.44:443 13.249.11.44:443
tcp 192.168.169.140:54766 192.168.0.1:54766 50.112.78.76:443 50.112.78.76:443
tcp 192.168.169.140:59112 192.168.0.1:59112 13.249.11.17:443 13.249.11.17:443
--- 192.168.169.140     192.168.0.1        ---                 ---
tcp 192.168.169.139:36886 192.168.0.3:36886 13.249.11.44:443 13.249.11.44:443
tcp 192.168.169.139:49660 192.168.0.3:49660 157.240.1.35:443 157.240.1.35:443
```

PAT Configuration on R1
R1(config)#access-list 1 permit 192.168.0.0 0.0.0.255
R1(config)#ip nat pool mypool 192.168.169.139 192.168.169.139 netmask 255.255.255.0
R1(config)#ip nat inside source list 1 pool mypool overload
R1(config)#interface f0/0 R1(config-if)#ip nat outside
R1(config-if)#interface f0/1 R1(config-if)#ip nat inside

```
R1#show ip nat translations
Pro Inside global      Inside local       Outside local       Outside global
tcp 192.168.169.139 44240 192.168.0.1 44240 52.88.19.211:443 52.88.19.211:443
tcp 192.168.169.139 33424 192.168.0.2 33424 93.184.220.29:80 93.184.220.29:80
tcp 192.168.169.139 33426 192.168.0.2 33426 93.184.220.29:80 93.184.220.29:80
tcp 192.168.169.139 33516 192.168.0.2 33516 93.184.220.29:80 93.184.220.29:80
tcp 192.168.169.139 37276 192.168.0.2 37276 54.187.176.55:443 54.187.176.55:443
tcp 192.168.169.139 50932 192.168.0.2 50932 94.97.232.147:80 94.97.232.147:80
tcp 192.168.169.139 60004 192.168.0.2 60004 35.163.69.146:443 35.163.69.146:443
tcp 192.168.169.139 60006 192.168.0.2 60006 35.163.69.146:443 35.163.69.146:443
tcp 192.168.169.139 60008 192.168.0.2 60008 35.163.69.146:443 35.163.69.146:443
tcp 192.168.169.139 60010 192.168.0.2 60010 35.163.69.146:443 35.163.69.146:443
tcp 192.168.169.139 60012 192.168.0.2 60012 35.163.69.146:443 35.163.69.146:443
tcp 192.168.169.139 35792 192.168.0.3 35792 34.211.202.13:443 34.211.202.13:443
```