NAT (Network Address Translations)

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To apply NAT, Prerequisite:

1) LAN Routing
    a) Dynamic Routing (eg. RIP)
    b) Default Routing to ISP
    c) Default Routing using Dynamic Routing
2) WAN Routing
    a) Static Routing to LAN Network using Public IP

Then, NAT:

1) Static NAT
2) Dynamic NAT
    a) Create a user List to access the internet
    b) Create a public IP address pool
    c) List→ pool IP address → To internet

Let's do NAT for our designed network.

1) LAN Routing (RIP)

(RIP→ Introducing all the connected networks)

RIP in R1 Router

```
R1(config)# router rip
R1(config-router)# network 192.168.12.0
R1(config-router)# network 192.168.221.0
R1(config-router)# network 192.168.222.0
R1(config-router)# exit
```

Apply RIP in R2, R3 Router by yourself.

2) Default Routing (Static Default)

We will use static default to forward any unknown packet to ISP

```
R1(config)# ip route 0.0.0.0 0.0.0.0 200.165.200.193
```

200.165.200.193 is the DEFAULT GATEWAY for R1 to ISP

3) Dynamic Default Routing

What is Dynamic Default Routing?

- It's more like telling every router that "I am default router, forward any unknown packet to me"

Dynamic Default Routing in R1

```
R1(config)# router rip
R1(config)# default-information originate
```

To check Route in Route:

```
Router# show ip route
```

4) WAN Routing

→ for this we need public IP
→ Static routing to LAN NETWORK using public IP
→ as there is 1 LAN connected to the border router, so we will use routing only 1 time. Multiple LANs required multiple routing.

Static Routing in ISP

```
ISP(config)# ip route 209.165.200.240   255.255.255.248   200.165.200.194
```

Here,
209.165.200.240 → Given public network address
255.255.255.248 → subnet mask of given network address (29 Network Bit)
200.165.200.194 → Default gateway for ISP to Broader router.

NAT

There are 2 types of NAT.

1) Static NAT: predefined public IP for private IP in NAT Table.
2) Dynamic NAT: No predefined public IP for private IP. Rather, it uses a certain number of IPs (Stored in IP POOL) and sets up a free IP instant for a private IP when it travels to the internet and writes it in the NAT Table.

NAT Commands:

To check the NAT TABLE in the router:

```
Router# show ip nat translations
```

1) Static NAT

Let's consider the UCAM server (192.168.12.12) and game server (192.168.11.11) to use 209.165.200.241, and 209.165.200.242

```
R1(config)# ip nat inside source static 192.168.12.12   209.165.200.241
R1(config)# ip nat inside source static 192.168.11.11   209.165.200.242
```

That means this IP of UCAM server (192.168.12.12) will always use this public IP (209.165.200.241) while travelling to the internet.

But the problem is, we have to tell the router which side of the router is private and which side is public. Sad right?
→ In our case, se0/1/1 is outside and the rest are inside for Router 1.
Let's do it using the command:

Telling se0/1/1 is outside:

```
R1(config)# interface serial0/1/1
R1(config)# ip nat outside
R1(config)# exit
```

Telling G0/0 is inside:

```
R1(config)# interface G0/0
R1(config)# ip nat inside
R1(config)# exit
```

Telling serial 0/0/0 is outside:

```
R1(config)# interface serial0/1/1
R1(config)# ip nat inside
R1(config)# exit
```

2) Dynamic NAT

a) Create Pool

```
R1(config)# ip nat pool pool1 209.165.200.243 209.165.200.245 netmask 255.255.255.248
```

Here,
209.165.200.243→209.165.200.245: range of Public IP to include them in the POOL.
255.255.255.248: Netmask for the given public IP

b) Create ACL

```
R1(config)# access-list 1 permit 192.168.10.0   0.0.0.255
R1(config)# access-list 1 permit 192.168.11.0   0.0.0.255
R1(config)# access-list 1 permit 192.168.12.0   0.0.0.255
```

if there are more LANs connected to Router 1 are auto-denied

Why are we doing this?
→ because we have only 3 public IPs, so if any more LANs want to go outside (internet) how can we handle it?

Combining NAT-ACL

```
R1(config)# ip nat inside source list 1 pool pool1
```

We are all set to PING the internet.