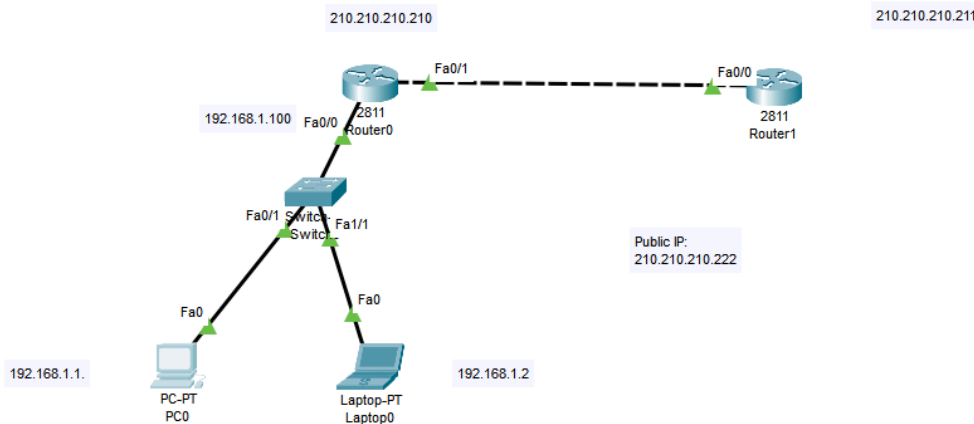# NAT:

➤ **Definition:**

NAT is a process that **translates private IP addresses into public IP addresses** (and vice versa) so devices in a private network can communicate with the internet.

NAT = allows private IP devices to access the internet using fewer public IPs, adds security, and saves cost.

Think of it as a **middleman** between your home/office network and the internet.

Why Do We Need NAT?

1. **IPv4 Address Shortage**

   - There aren't enough public IPv4 addresses for every device.
   - NAT lets many devices share **one public IP**.

2. **Security**

   - NAT hides internal private IPs from the outside world → attackers see only the public IP.

3. **Flexibility**

- Allows private networks to use **non-routable IP ranges** (like 192.168.x.x, 10.x.x.x, 172.16.x.x).

4. **Cost Saving**

- ISP gives you **1 public IP,** but you can connect dozens of devices.

Static NAT:

Interface should know which one is public and private.

DO these configurations on the router0.

To check NAT Translation:

show ip nat translations

Public-facing (internet) side

int fast0/0

ip nat outside

Private side:

int fast0/1

ip nat inside

Static NAT:

- One **private IP ↔ one public IP** (fixed mapping).

- Example: A web server inside your LAN that always needs the same public IP.

ip nat inside source static 192.168.1.2 200.1.1.200

ip address ko static way mai translate karo 192.168.1.2 sai 200.1.1.200 par.

```
Router(config)#int fast0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int fast0/1
Router(config-if)#ip nat outside
Router(config-if)#
Router(config-if)#exit
Router(config)#ip nat inside source static 192.168.1.1 210.210.210.222
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#show ip nat translations
Pro  Inside global    Inside local    Outside local    Outside global
---  210.210.210.222  192.168.1.1     ---              ---
```

Dynamic NAT:

- Private IPs are mapped to a **pool of public IPs**.

- Mapping changes dynamically.

Commands:

interface fast0/0

ip nat inside

int fast0/1

ip nat outside

exit

no ip nat inside source static 192.168.1.2 200.1.1.200

Access list to match:

access-list 1 permit 192.168.1.0 0.0.0.255

Public IP pool:

ip nat pool RR 200.1.1.200 200.1.1.200 netmask 255.255.255.0

from where the public IP starts to where it ends

Dynamic NAT translation:

ip nat inside source list 1 pool RR overload

```
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#no ip nat inside source static 192.168.1.1 210.210.210.222
Router(config)#access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)#ip nat pool RR 210.210.210.222 210.210.210.222 netmask 255.255.255.0
Router(config)#ip nat inside source list 1 pool RR overload
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Port Address Translation:

- Most common type (used at home).

- Many devices share **one public IP**, but NAT uses **different ports** to track connections.

- Example: Your laptop, phone, and TV all go online using the same public IP.

Do no to Dynamic NAT Configurations.

access-list 5 permit 192.168.1.0 0.0.0.255

IP nat inside source list 5 fasteth0/0 overload

Now PC can ping the router.

```
C:\>ping 210.210.210.211

Pinging 210.210.210.211 with 32 bytes of data:

Reply from 210.210.210.211: bytes=32 time<1ms TTL=254
Reply from 210.210.210.211: bytes=32 time=1ms TTL=254
Reply from 210.210.210.211: bytes=32 time<1ms TTL=254

Ping statistics for 210.210.210.211:
    Packets: Sent = 3, Received = 3, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

Control-C
^C
C:\>
```