Network Address Translation

SDC, CNW (CSE 4541)

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Book(s)

Text Book(s)

Glen E. Clarke, Richard Dea

CCT/CCNA Routing and Switching

Complete Study Guide: Exam 100-490
Exam 200-301

McGraw-Hill Education

Talk Flow

Introduction

- The original intention for **NAT** was to slow the depletion of available IP address space by allowing multiple private IP addresses to be represented by a much smaller number of public IP addresses.
- NAT is a useful tool for network migrations and mergers, server load sharing, and creating "virtual servers". Because NAT really decreases the amount of public IP addresses required in a network.
- Typically NAT is used on a border router. For example, using NAT on the Corporate router connected to the Internet.

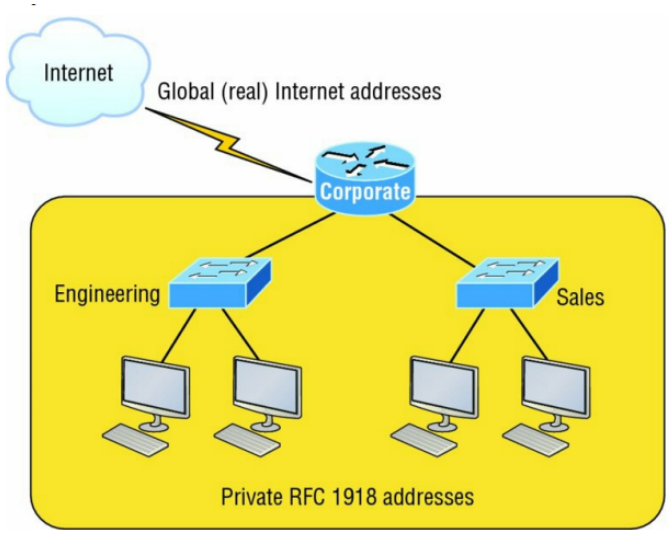

Figure 1: NAT example

Advantages and Disadvantages

Advantages

- Conserves legally registered addresses.
- Remedies address overlap events.
- Increases flexibility when connecting to the Internet.
- Eliminates address renumbering as a network evolves.

Disadvantages

- Translation results in switching path delays.
- Causes loss of end-to-end IP traceability.
- Certain applications will not function with NAT enabled.
- Complicates tunneling protocols such as IPsec because NAT modifies the values in the header.

Types

- **Static NAT (one-to-one)** : This type of NAT is designed to allow one-to-one mapping between local and global addresses. it requires to have one real Internet IP address for every host on network.
- **Dynamic NAT (many-to-many)** : This version gives the ability to map an unregistered IP address to a registered IP address from out of a pool of registered IP addresses.
- **Overloading (one-to-many)** : Understand that overloading is a form of dynamic NAT that maps multiple unregistered IP addresses to a single registered IP address (many-to-one) by using different source ports. it's also known as Port Address Translation (PAT), also referred as NAT Overload.

Names

4 different types of NAT address types :

- **INSIDE LOCAL**
  - Represents the Private address of the host
- **INSIDE GLOBAL**
  - Represents the Public address of the host
  - Translated address
- **OUTSIDE LOCAL**
  - Represents the Private address of the host
  - Not normally seen
- **OUTSIDE GLOBAL**
  - Represents the Public address of the host (address over the internet)

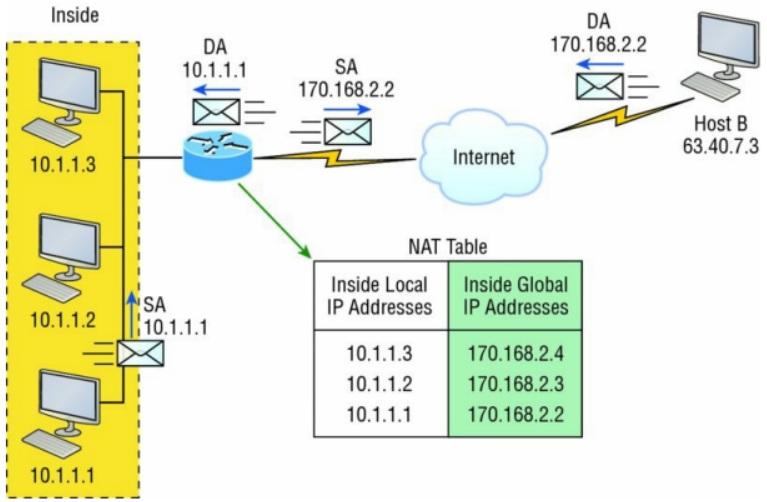

Figure 2: Names in NAT

Static NAT Workings

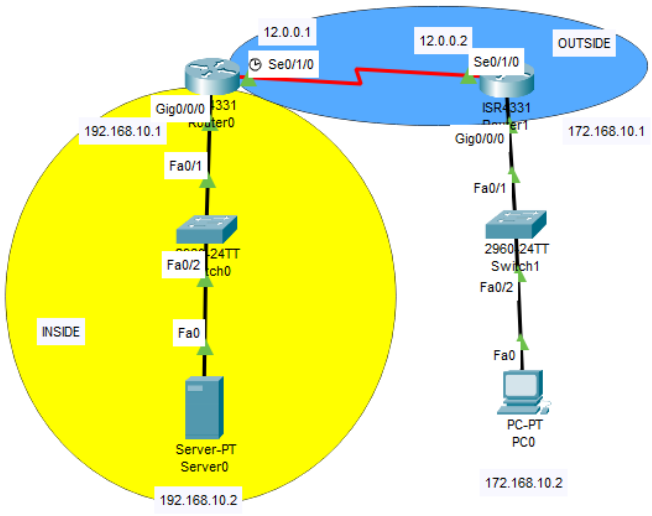

Figure 3: Static NAT

```
Configuration of Static NAT:

Router(config)# ip nat inside source
Static <private IP> <public IP>
```

```
Implementation of Static NAT:

Router(config)# Interface Gig0/0/0
Router(config)# ip nat inside
Router(config)# Interface Se0/1/0
Router(config)# ip nat outside
```

Private Address	Public Address
192.168.10.2	10.0.0.2
192.168.10.3	10.0.0.3

Table 1: Static NAT Mapping Table.

Dynamic NAT Workings

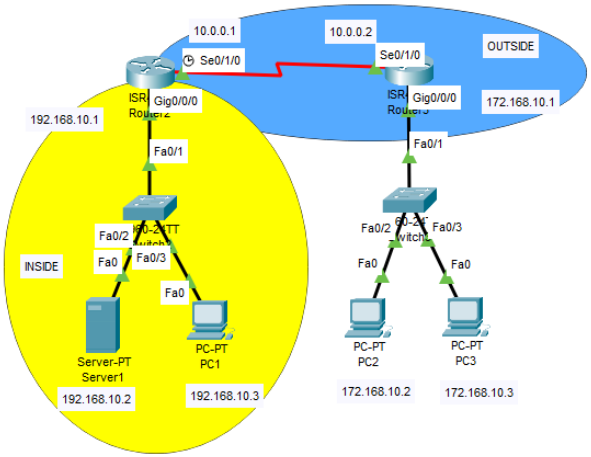

Figure 4: Dynamic NAT

```
Configuration of Dynamic NAT:

Router(config)# access-list <Unique
    Number> permit <Network Address> <
    Wildcard subnet>
Router(config)# ip nat pool <pool name
    > <Starting Address> <Ending
    Address> netmask <Subnet Mask>
Router(config)# ip nat inside source
    list <Unique Number> pool <Pool
    Name>
```

Private Address	Public Address
192.168.10.2	10.0.0.2
192.168.10.3	10.0.0.3

Table 2: Dynamic NAT Mapping Table.

```
Implementation of Dynamic NAT:

Router(config)# Interface Gig0/0/0
Router(config)# ip nat inside
Router(config)# Interface Se0/1/0
Router(config)# ip nat outside
```

PAT/NAT Overload Workings

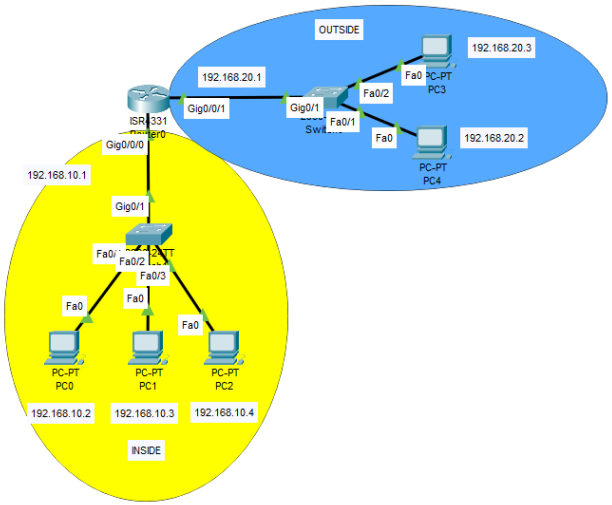

Figure 5: PAT / NAT Overload

```
Configuration of PAT / NAT Overload:

Router(config)# access-list permit <
    list number><Starting Address><
    Ending Address><Wildcard mask>
Router(config)# ip nat inside source
    list <list number> interface Gig0
    /0/1 overload
```

```
Implementation of PAT / NAT Overload:

Router(config)# Interface Gig0/0/0
Router(config)# ip nat inside
Router(config)# Interface Gig0/0/1
Router(config)# ip nat outside
```

Private Address(Port)	Public Address(Port)
192.168.10.2:10	10.0.0.2:10
192.168.10.3:11	10.0.0.2:11

Table 3: PAT/NAT Overload Mapping Table.

Commands for Verification

Simple Verification of NAT:

- To see basic IP address translation information, use the command:
  - ***Router show ip nat translations*** or
  - ***Router show running-config*** also can be used.
- You can also verify your NAT configuration via this command:
  - ***Router debug ip nat***
- To clear NAT entries from the translation table use the ***clear ip nat translation*** command
- To clear all entries from the NAT table use an asterisk (*) at the end of the command ***clear ip nat translation ****

Testing and Troubleshooting

List of potential causes:

- Check the dynamic pools, Are they composed of the right scope of addresses?
- Check to see if any dynamic pools overlap.
- Check to see if the addresses used for static mapping and those in the dynamic pools overlap.
- Ensure that your access lists specify the correct addresses for translation.
- Make sure there are not any addresses left out that need to be there, and ensure that none are included that should not be.
- Check to make sure you have got both the inside and outside interfaces delimited properly.