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Course: Computer Networks I

Topic: Simple Office Network – NAT and Diagnostics

Introduction

This laboratory focused on understanding Network Address Translation (NAT), packet flow, and network diagnostics using Cisco Packet Tracer. The objective was to configure a simple office network, implement Dynamic PAT, and analyze network traffic using sniffers.

Network Design

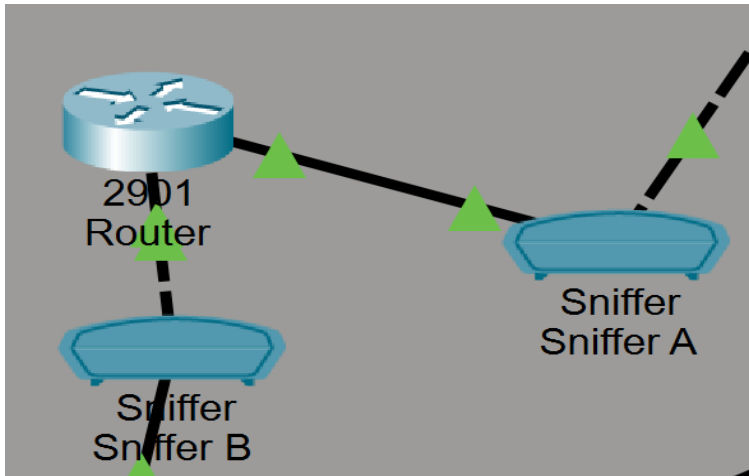
The network consists of multiple PCs connected to a switch, a router acting as the main gateway, and external connectivity through a cloud representing the internet. Additional components include servers and sniffers for packet analysis.

Main Devices

- 1 Router
- 2 Sniffers
- 1 Switches
- 6 PCs (instead of 4, upgraded)
- 1 Wireless Access Point (AP)
- 1 Server

Sniffer Usage

Sniffer devices were placed on both sides of the router to capture packets before and after NAT translation. This allowed observation of how IP addresses change when packets move between internal and external networks.



Room of configuration in sniffer

Physical Contig GUI Attributes

GLOBAL
Settings

Global Settings

Display Name: Sniffer A

Device Clock: 18:08:41 Mon Mar 1 1993 UTC

Packet Analysis

Different types of packets were analyzed:

- ICMP (Ping): Used to test connectivity between devices.
- DNS: Used for domain name resolution.
- HTTP: Used to access web services.

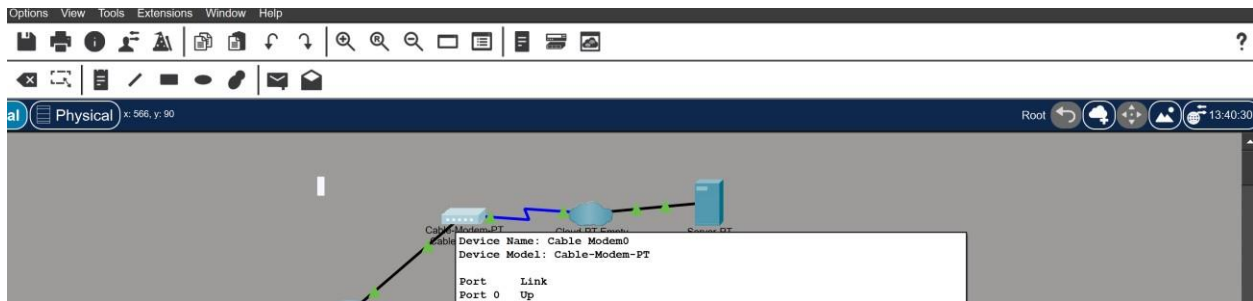
Before NAT, packets contained private IP addresses. After NAT, these addresses were translated into public IP addresses, demonstrating how NAT enables internet access.

DHCP Process

The DHCP process was observed, including Discover, Offer, Request, and Acknowledgment. This process allows devices to automatically obtain IP configuration from the server

Server Room Devices

- 1 Server
- 1 Cloud (PT-CLOUD)
- 1 Modem



. Network Design Description

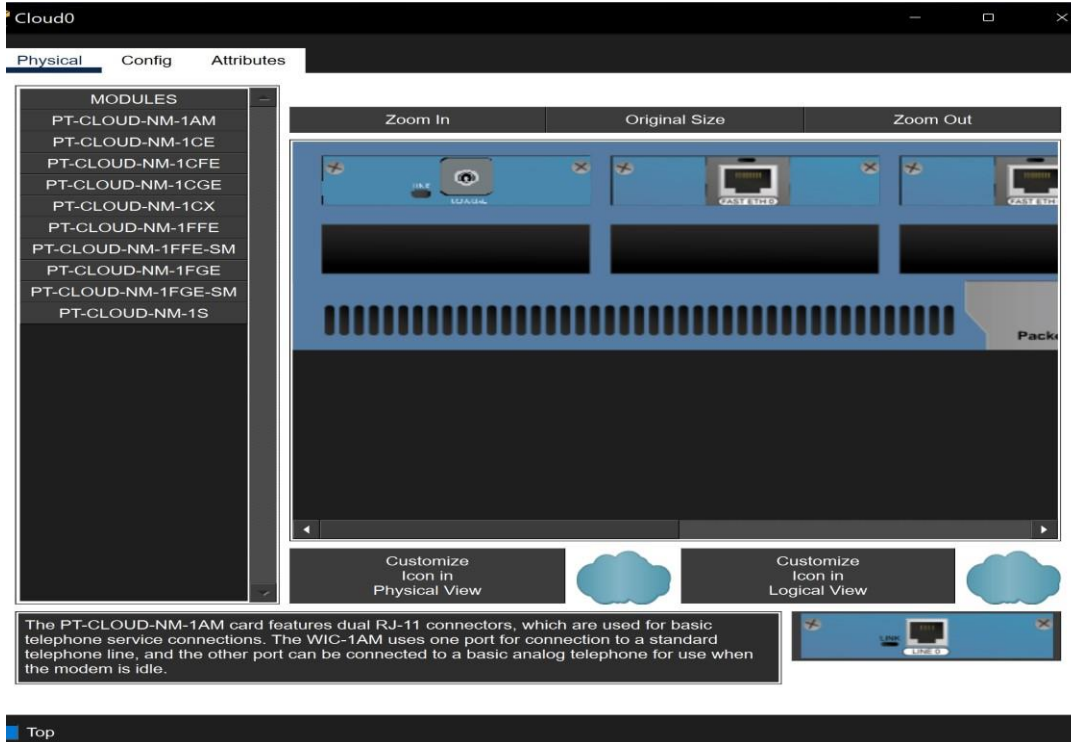
- Each switch connects to **3 PCs**, making a total of 6 PCs.
- The router connects both switches and manages communication between networks.
- A **Wireless Access Point (AP)** provides wireless connectivity. □ The **server room** simulates internet and network services.

. Initial Connections

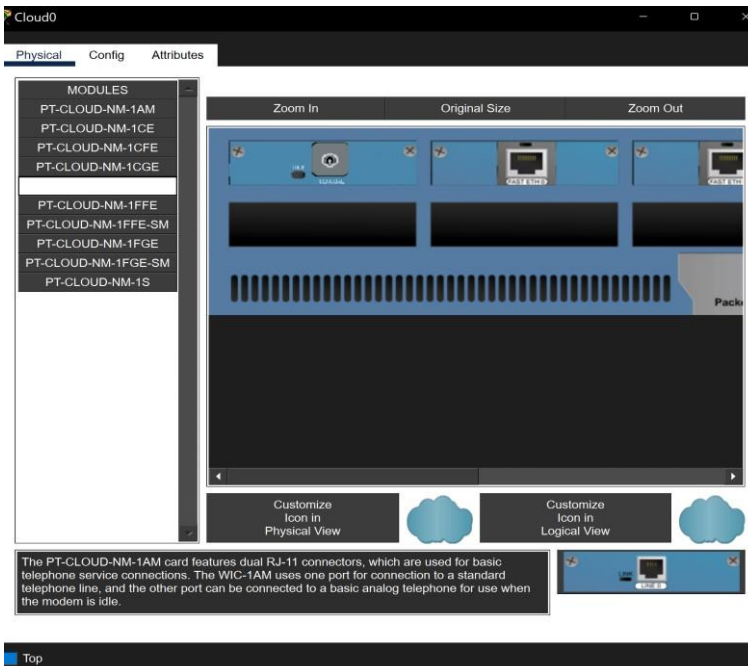
Cabling

- Router → Switches: Copper straight-through

- Switches → PCs: Copper straight-through
- Router → AP: Copper straight-through
- Server → Cloud: using **PT-CLOUD-NM-1CGE**



- Cloud → Modem: using **PT-CLOUD-NM-1CX (coaxial)**

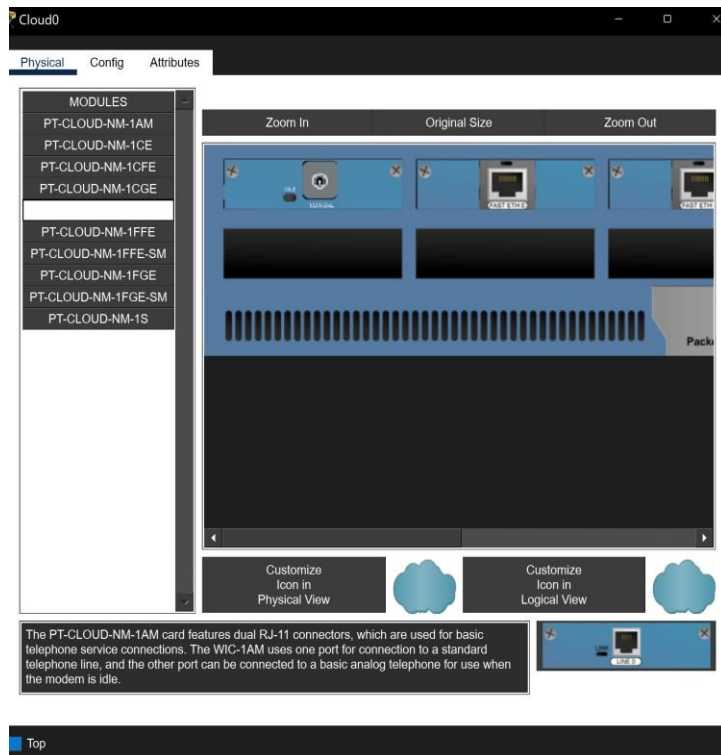


. Server Room Setup

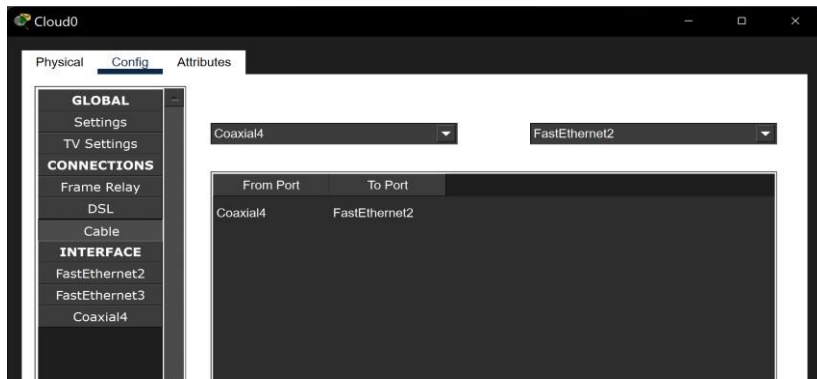
Components and Connections

1. Cloud (PT-CLOUD)

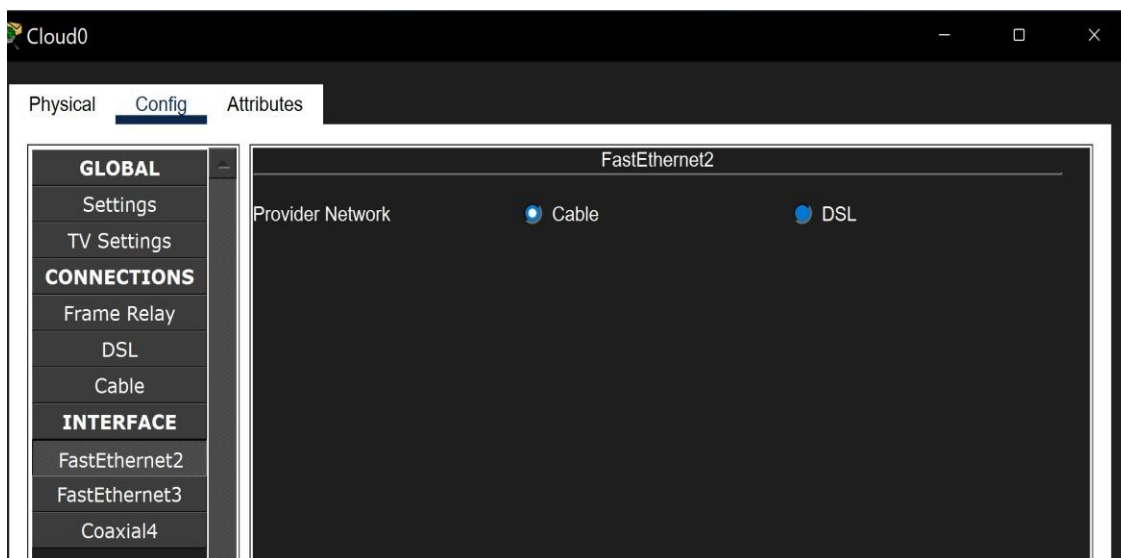
- Acts as an internet service provider (ISP) ○ Uses:
 - **PT-CLOUD-NM-1CX** → connected to modem (coaxial cable)
 - **PT-CLOUD-NM-1CGE** → connected to server



COAXIAL4 AND FASTETHERNET 2

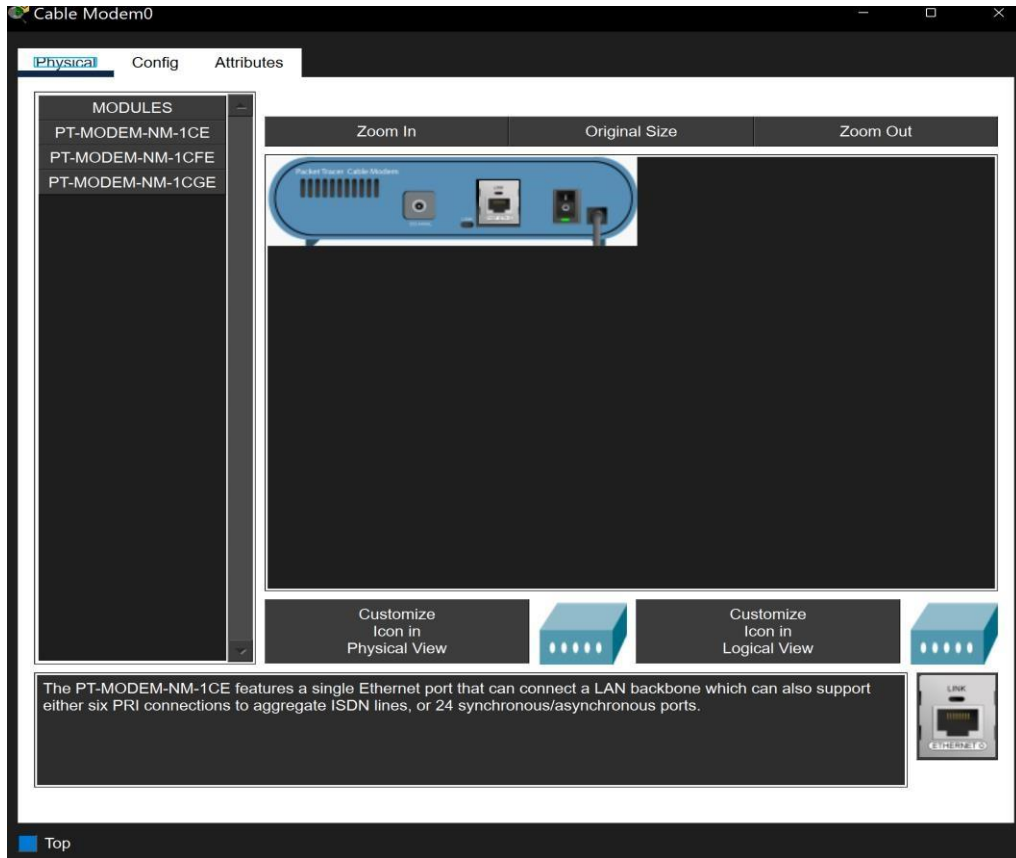


AND CABLE SHOULD BE ON

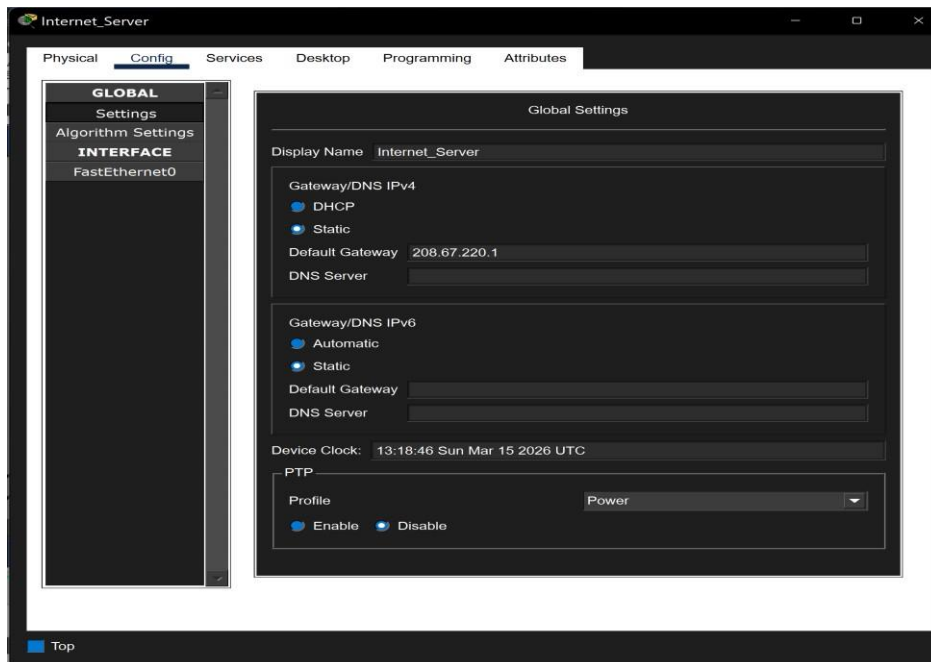
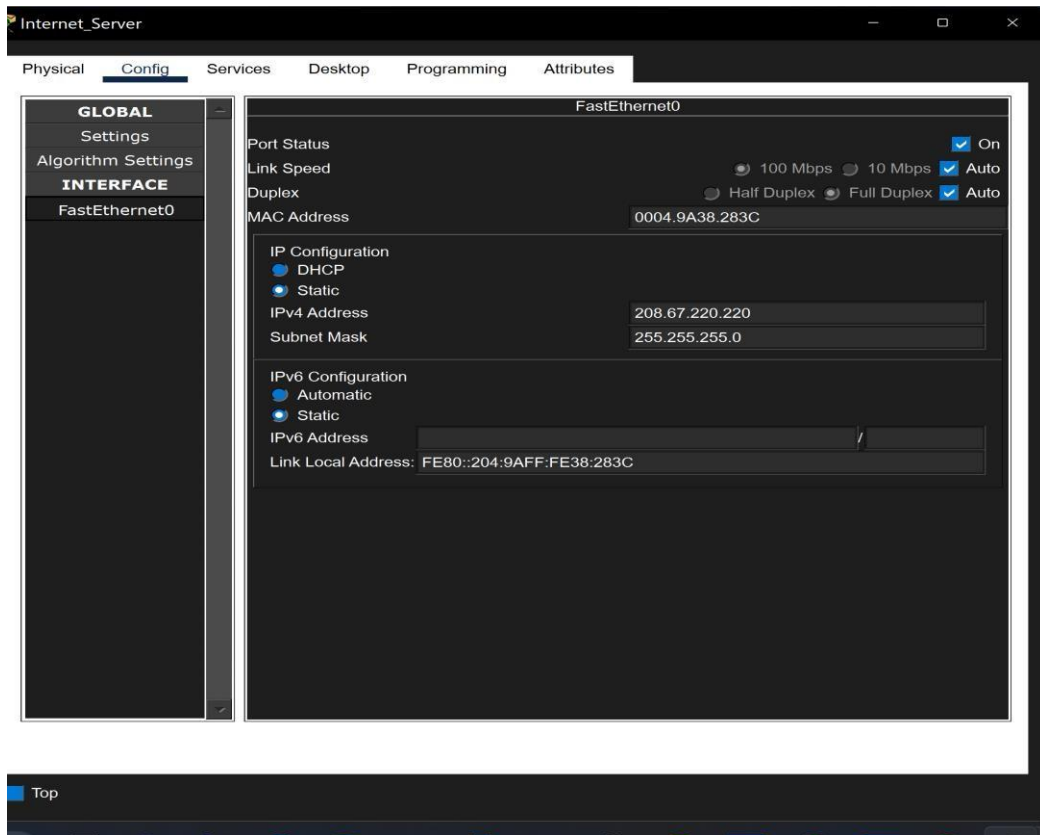


2. Modem

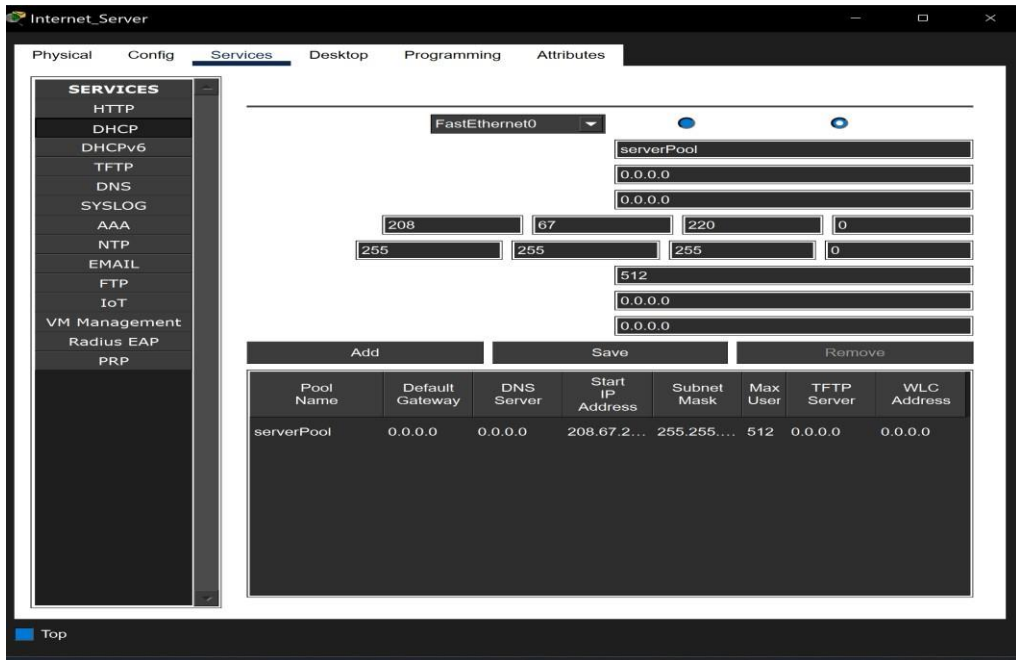
- Connects the internal network to the cloud (internet simulation)



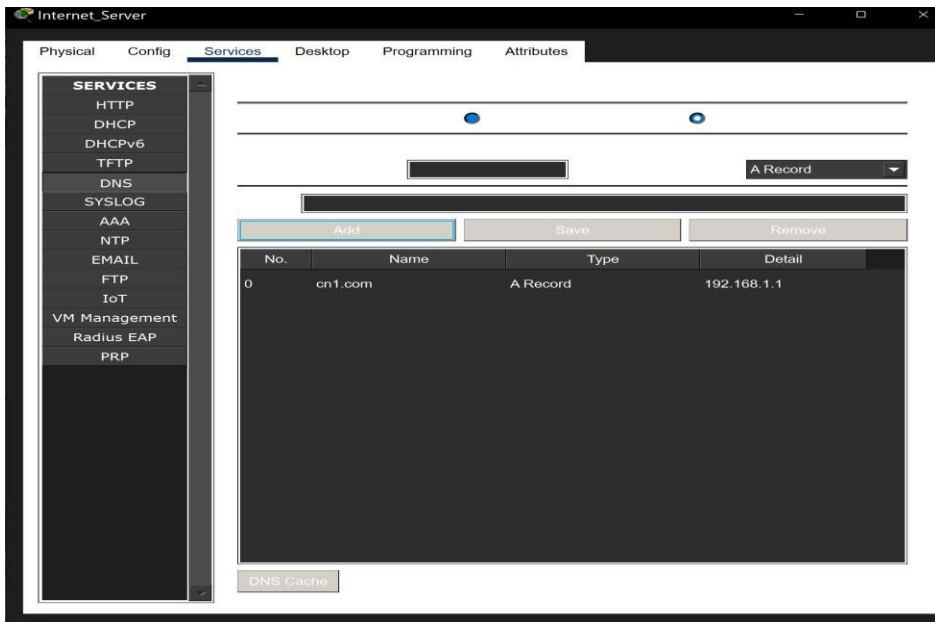
3. Server



- Provides:
 - DHCP (automatic IP assignment)



- DNS (domain name resolution)



. Router Configuration (Same as Previous + RIP)

Step 1: Access CLI



```
Router0
Physical Config CLI Attributes
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface g0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
^
% Invalid input detected at '^' marker.
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
Router(config-if)#exist
^
% Invalid input detected at '^' marker.
Router(config-if)#exit
Router(config)#configure terminal
^
% Invalid input detected at '^' marker.
Router(config)#configure terminal
^
% Invalid input detected at '^' marker.
Router(config)#interface g 0/1
Router(config-if)#ip address 192.168.2.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
```

```
enable      configure
```

```
terminal   Step 2:
```

Configure Interfaces

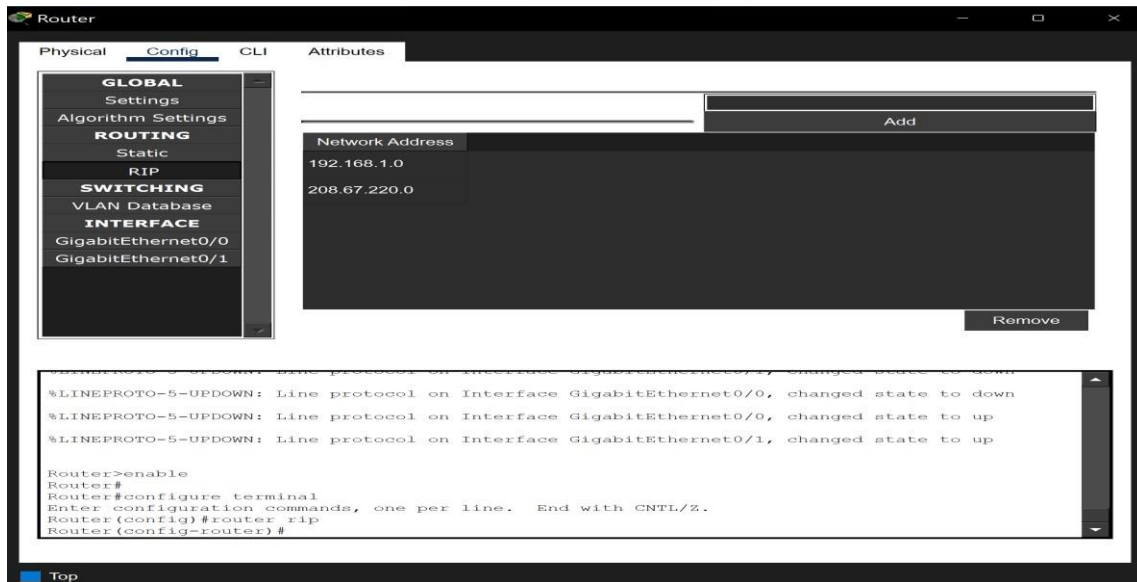
```
interface gig0/0
ip address 192.168.1.1
255.255.255.0 no shutdown
```

```
interface gig0/1
ip address 192.168.2.1
255.255.255.0 no shutdown
```

Step 3: Enable RIP Routing

RIP (Routing Information Protocol) allows networks to communicate dynamically.

```
router rip
version 2
network
192.168.1.0
network
192.168.2.0
no auto-
summary
```



. Switch Configuration (6 PCs / 6 Desks)

Each switch connects to 3 PCs (desks).

Basic configuration:

```
enable
configure
terminal
hostname
Switch1
```

(Repeat for Switch2)

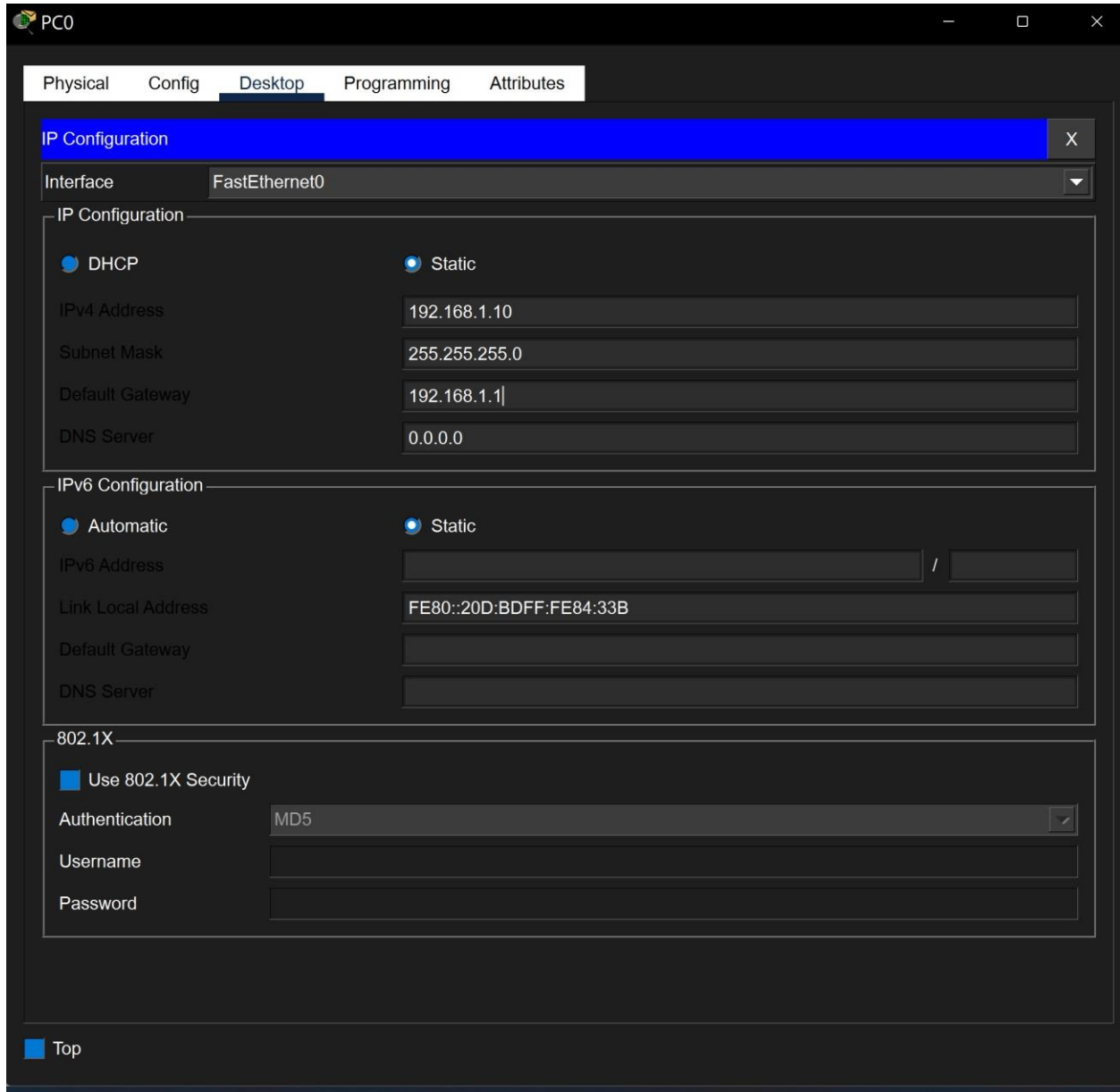
Switches operate at Layer 2, so no complex configuration is required.

. PC Configuration (6 PCs)

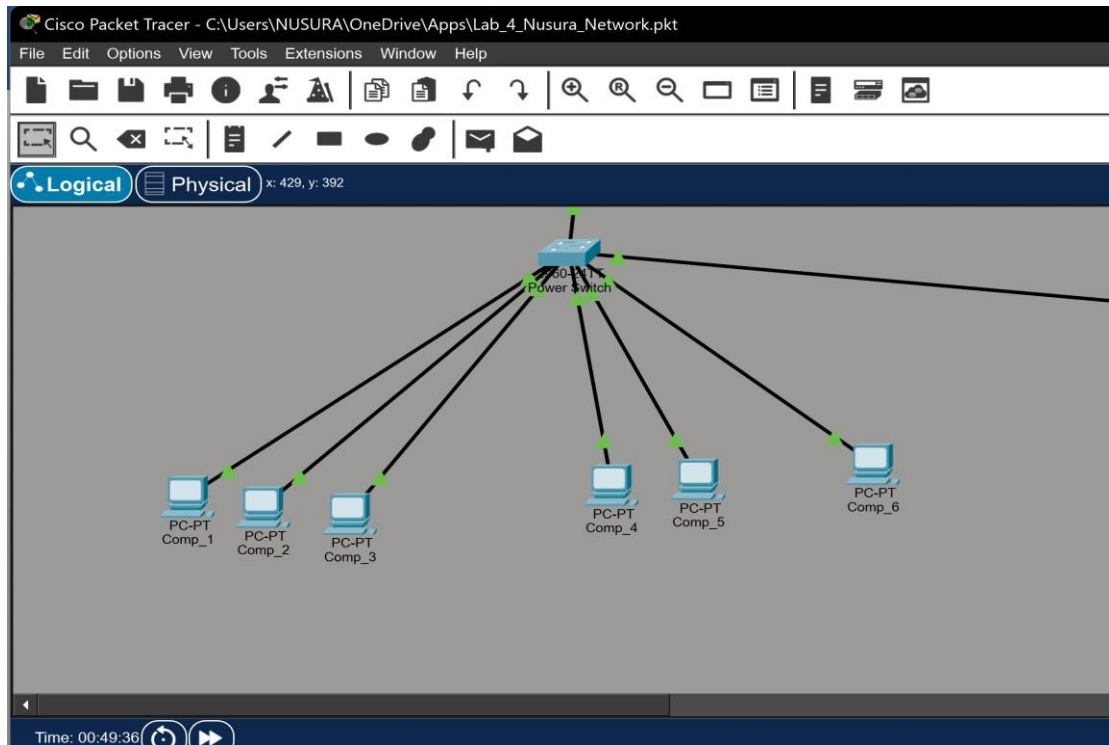
Initially, PCs can be set to **DHCP mode** so they receive IP automatically from the server.

Steps:

- Open PC → Desktop → IP Configuration



- Select **DHCP**



. Server Configuration (IMPORTANT SECTION)

Step 1: Assign Static IP to

Server Go to:

- Desktop → IP Configuration Example:
- IP Address: 192.168.1.10
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.1.1
- DNS Server: 192.168.1.10

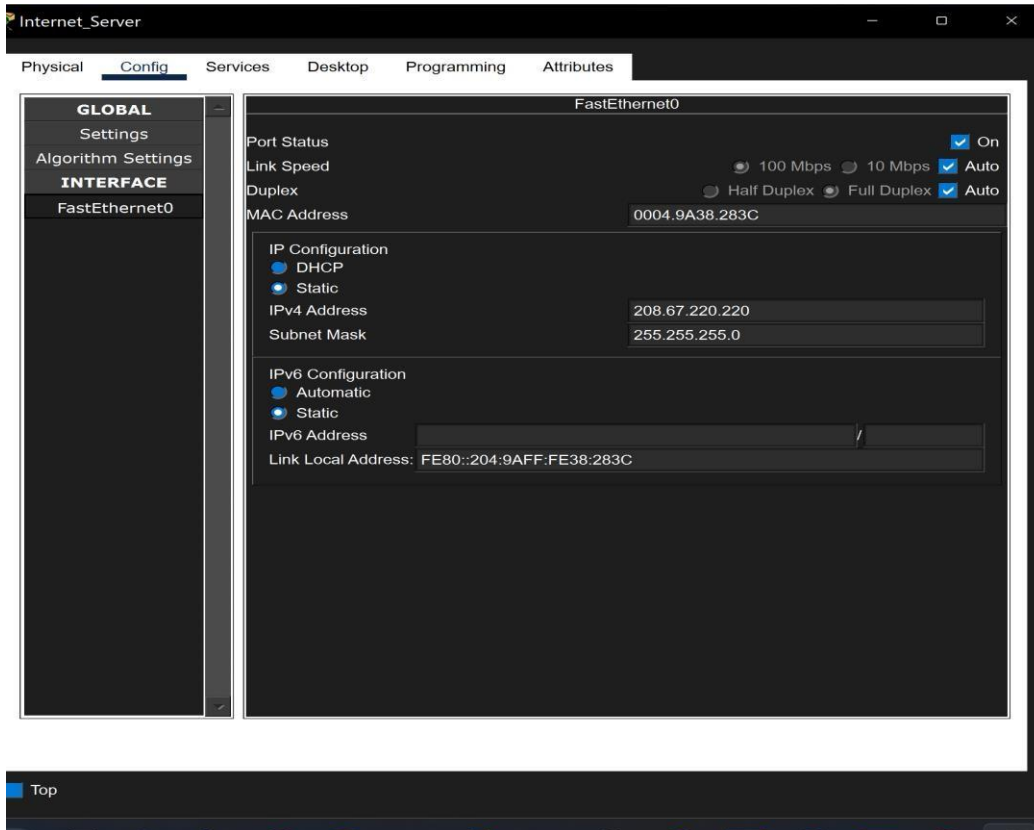
Step 2: Configure DHCP Service

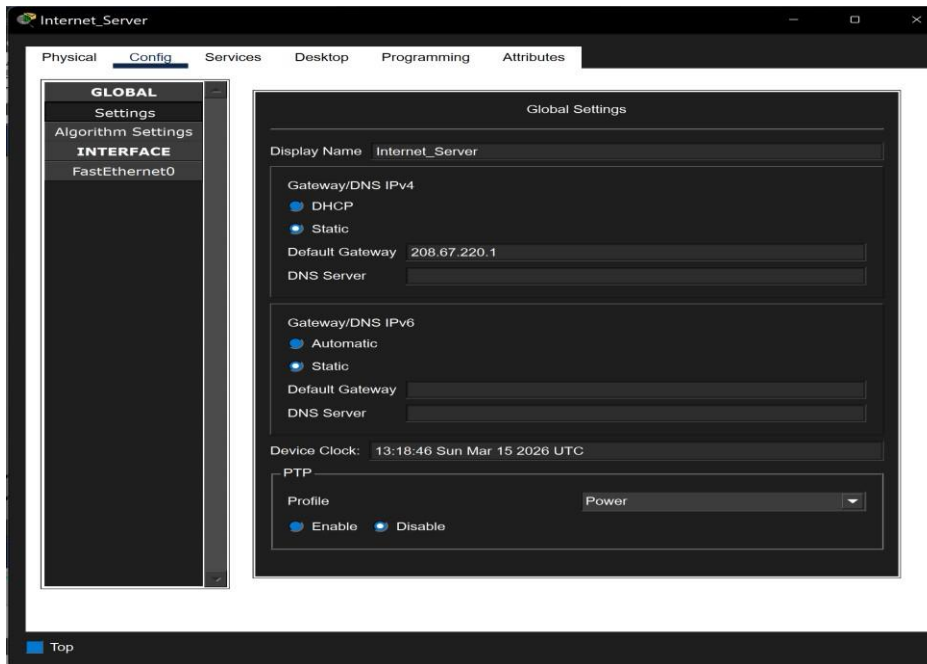
Go to:

- Services → DHCP → Turn ON

Create a pool:

- Pool Name: LAN1
- Default Gateway: 192.168.1.1
- DNS Server: 192.168.1.10
- Start IP Address: 192.168.1.100
- Subnet Mask: 255.255.255.0
- Maximum Users: 50





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Purpose of DHCP:

- Automatically assigns IP addresses to PCs
- Reduces manual configuration errors
- Makes network management easier

Step 3: Configure DNS Service

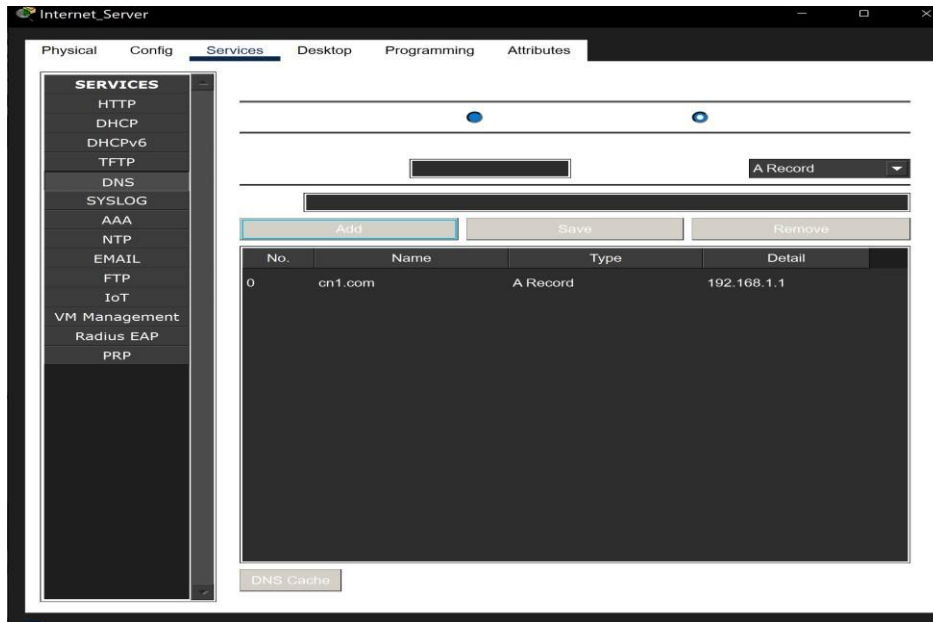
Go to:

- Services → DNS → Turn ON Add records:

Name	IP Address
google.com	8.8.8.8
myserver.com	192.168.1.10

Purpose of DNS:

- Converts domain names into IP addresses
- Example: typing "google.com" connects to its IP



. Wireless Access Point Configuration

Steps:

1. Click AP
2. Go to Config → Wireless Set:

- SSID: MyWiFi
- Security: WPA2-PSK
- Password: 12345678

Connect Wireless Devices

- Select WiFi on PC or laptop
- Enter password

. Testing Connectivity

1. Test DHCP

- PCs should automatically receive IP addresses

2. Test Ping

```
ping
192.168.1.1
ping
192.168.2.1
```

3. Test DNS

- Open Web Browser
- Type: myserver.com

Conclusion

The laboratory successfully demonstrated how NAT works in a simple office network. The use of sniffers provided clear insights into packet transformation and network behavior. This exercise improved understanding of real-world networking concepts such as IP translation, packet flow, and diagnostics.

Network Topology Screenshot

