

Cisco Packet Tracer Network Implementation for Smart Software House

Final Project – Computer Networks (4th Semester)

1. Introduction

This project demonstrates the design and implementation of a Smart Software House Network using Cisco Packet Tracer. The objective was to integrate traditional enterprise networking concepts (VLANs, RIP routing, DHCP, NAT, Servers) with modern technologies such as IoT integration and wireless connectivity. The network was designed for scalability, security, and real-world functionality.

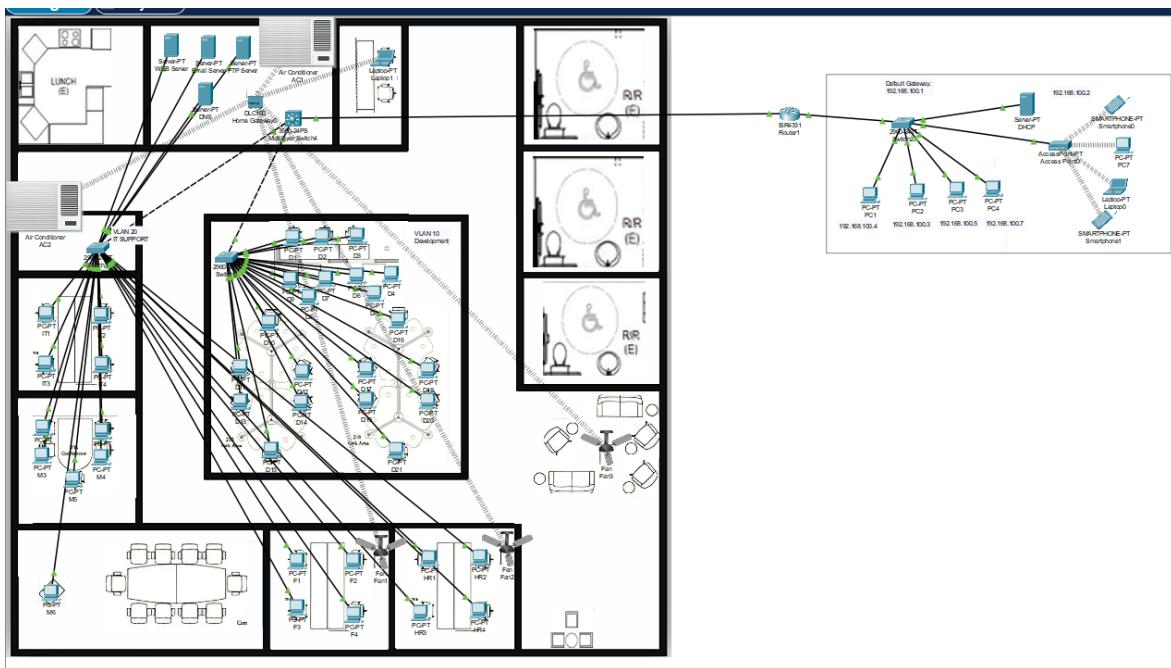
2. Tools Used

- **Cisco Packet Tracer 8.x** – for network design and simulation
- **Routers & Multilayer Switches** – for routing and inter-VLAN communication
- **Servers** – DNS, FTP, Email, HTTP, DHCP
- **IoT Gateway & Devices** – Smart appliances like fans, ACs, controlled wirelessly
- **Wireless Access Point (WAP)** – for mobile and laptop connectivity
- **CLI Tools** – ping, traceroute, show commands

3. Network Topology Overview

The Smart Software House consists of:

- **Enterprise Core:** Router, Multilayer Switch, DHCP, DNS, Email, HTTP, FTP Servers
- **Departmental VLANs:** Segmented LANs for structured communication
- **Routing:** Implemented via RIP (dynamic routing protocol)
- **Dynamic NAT:** Provides internet-style access for internal hosts
- **IoT Integration:** Smart appliances connected via IoT Gateway
- **Wireless Devices:** Laptops and mobiles connected via WAP



4. Key Features & Configurations

4.1. VLANs & Inter-VLAN Routing

- Created VLANs for each department in the software house.
- Configured **inter-VLAN routing** on the multilayer switch.

Multilayer Switch4

Physical Config **CLI** Attributes

IOS Command Line Interface

```
*SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet0/2 on VLAN0001. Inconsistent port type.
*SPANTREE-2-RECV_PVID_ERR: Received 802.1Q BPDU on non trunk FastEthernet0/1 VLAN1.
*SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet0/1 on VLAN0001. Inconsistent port type.

*LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down
*LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up
*LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up
*LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan20, changed state to up
*LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
*LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

00:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.100.1 on FastEthernet0/3 from LOADING to FULL,
Loading Done

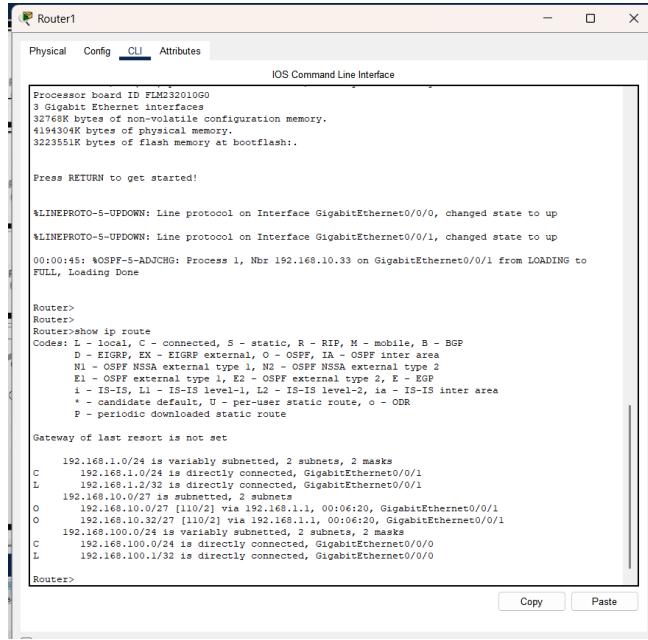
Switch>
Switch>show vlan brief
```

VLAN Name	Status	Ports
1 default	active	Fa0/4, Fa0/5, Fa0/6, Fa0/7 Fa0/8, Fa0/9, Fa0/10, Fa0/11 Fa0/12, Fa0/13, Fa0/14, Fa0/15 Fa0/16, Fa0/17, Fa0/18, Fa0/19 Fa0/20, Fa0/21, Fa0/22, Fa0/23 Fa0/24, Gig0/1, Gig0/2
10 VLAN0010	active	
20 VLAN0020	active	
1002 fddi-default	active	
1003 token-ring-default	active	
1004 fddinet-default	active	
1005 trnet-default	active	

Switch>

4.2. RIP Routing

- Configured **RIPv2** on routers for dynamic route exchange.
- Verified learned routes using show ip route.



```
Router1
Physical Config CLI Attributes
IOS Command Line Interface

Processor board ID FTM031001050
0 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
3223551K bytes of flash memory at bootflash:.

Press RETURN to get started!

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
00:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.33 on GigabitEthernet0/0/1 from LOADING to FULL, Loading Done

Router>
Router>
Router>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

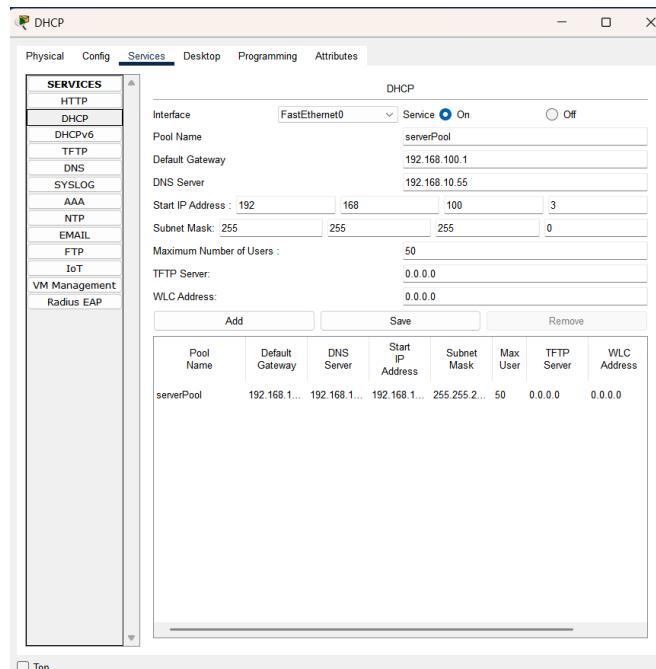
Gateway of last resort is not set

      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, GigabitEthernet0/0/1
L          192.168.1.2/32 is directly connected, GigabitEthernet0/0/1
      192.168.10.0/27 [110/2] via 192.168.1.1, 00:06:20, GigabitEthernet0/0/1
O        192.168.10.0/27 [110/2] via 192.168.1.1, 00:06:20, GigabitEthernet0/0/1
      192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.100.0/24 is directly connected, GigabitEthernet0/0/0
L          192.168.100.1/32 is directly connected, GigabitEthernet0/0/0

Router>
```

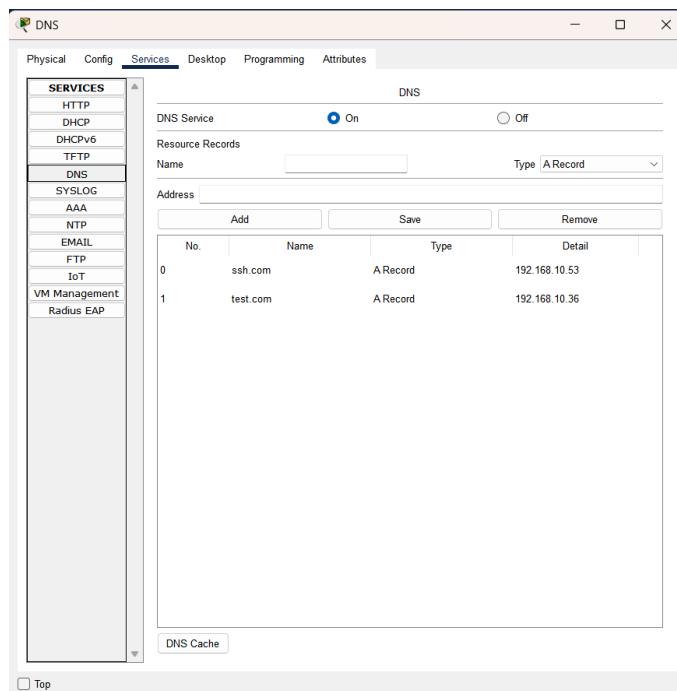
4.3. DHCP Server

- Configured **DHCP** to assign IPs dynamically to hosts.
- Verified PC obtained IP from correct scope.

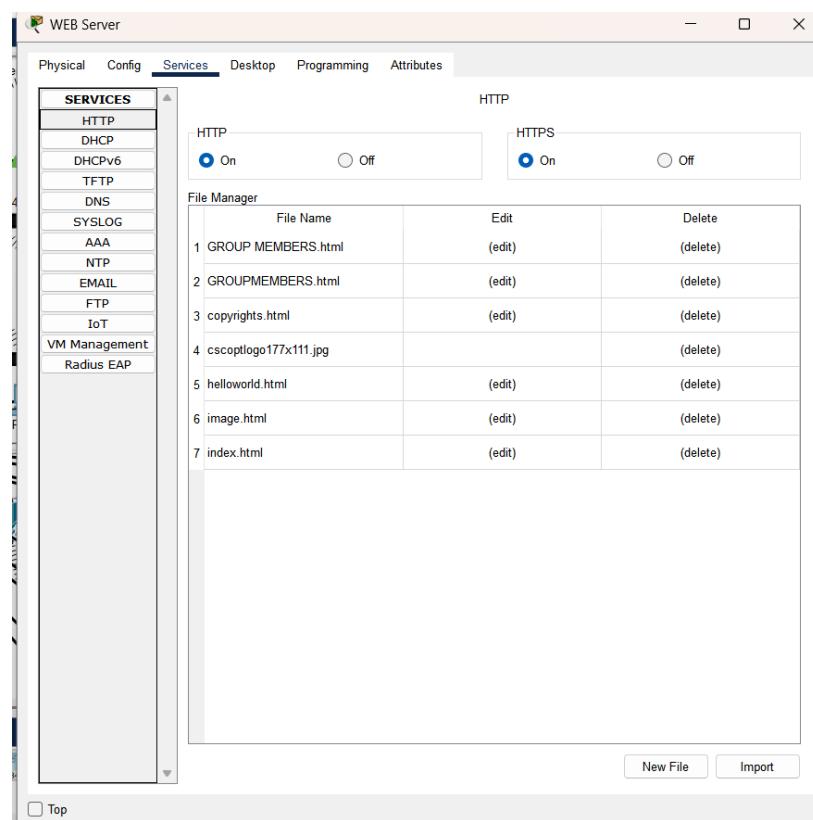


4.4. Core Servers

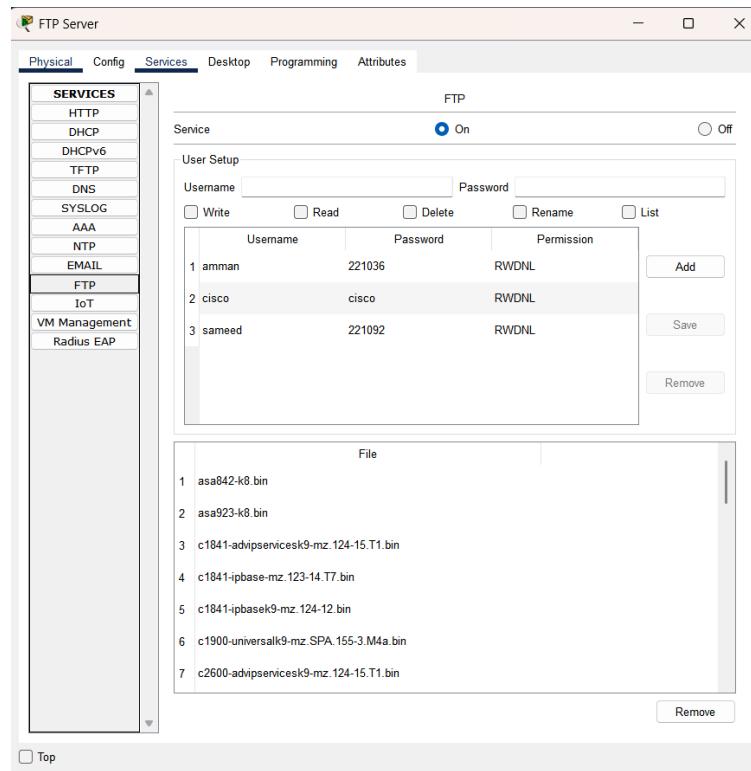
- **DNS Server:** Configured domain name resolution.



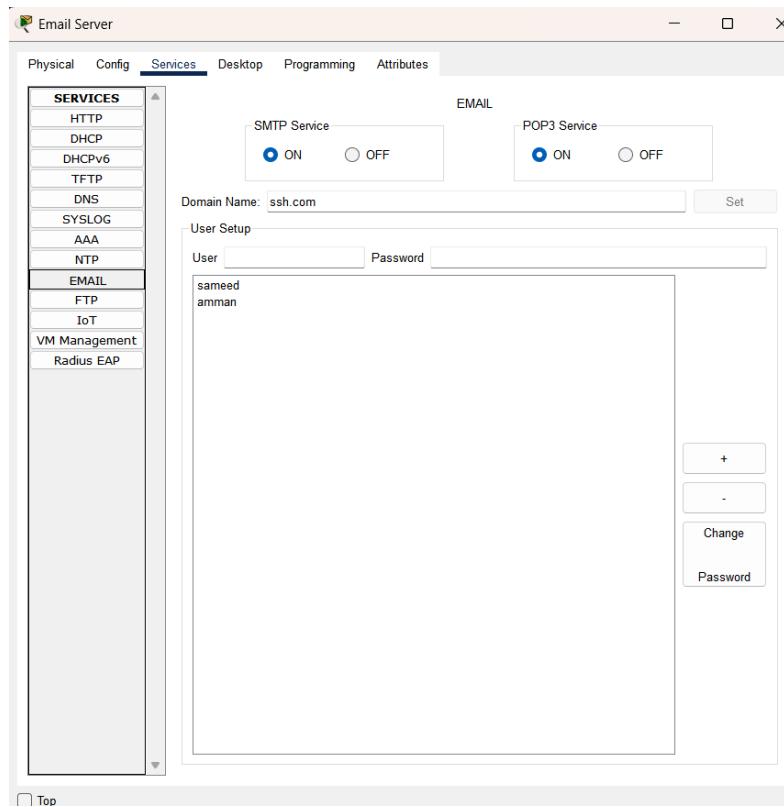
- **HTTP Server:** Hosted a sample webpage accessible from client PCs.



- **FTP Server:** Enabled file upload/download with authentication.

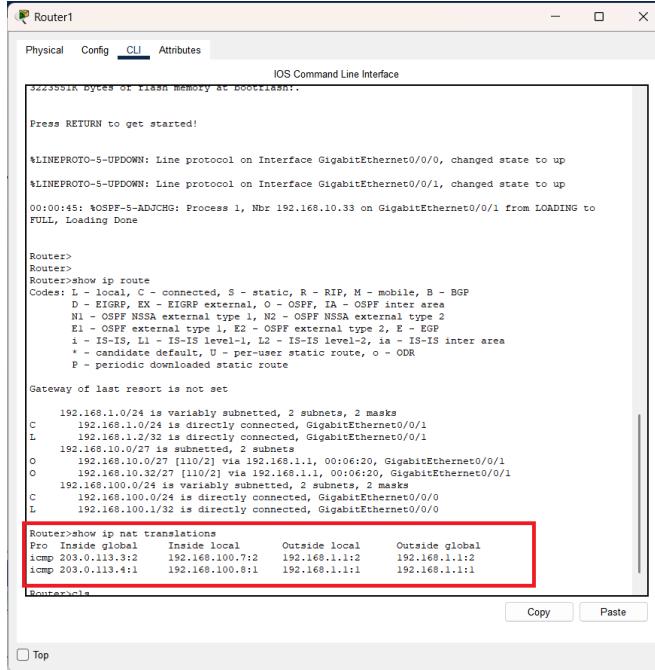


- **Email Server:** Configured SMTP/POP; email sent from one client to another.



4.5. Dynamic NAT

- Configured NAT on the router to translate private IPs to public addresses.
- Verified active translations using show ip nat translations.



Router1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
%20000000 bytes of flash memory at bootflash:.

Press RETURN to get started!

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up
00:00:45: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.33 on GigabitEthernet0/0/1 from LOADING to
FULL, Loading Done

Router>
Router>
Router>show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF IA - OSPF inter area
      N1 - OSPF external type 1, N2 - OSPF external type 2, E - EGP
      I1 - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-3, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C   192.168.1.0/24 is directly connected, GigabitEthernet0/0/1
L   192.168.1.0/27 is subnetted, 2 subnets
      192.168.10.0/27 [110/2] via 192.168.1.1, 00:06:20, GigabitEthernet0/0/1
O   192.168.10.0/27 [110/2] via 192.168.1.1, 00:06:20, GigabitEthernet0/0/1
      192.168.10.0/27 is variably subnetted, 2 subnets, 2 masks
C   192.168.10.0/24 is directly connected, GigabitEthernet0/0/0
L   192.168.10.0/32 is directly connected, GigabitEthernet0/0/0

Router>show ip nat translations
Pro Inside global     Inside local     Outside local     Outside global
icmp 203.0.113.3:2    192.168.100.7:2   192.168.1.1:2
icmp 203.0.113.4:1    192.168.100.8:1   192.168.1.1:1
```

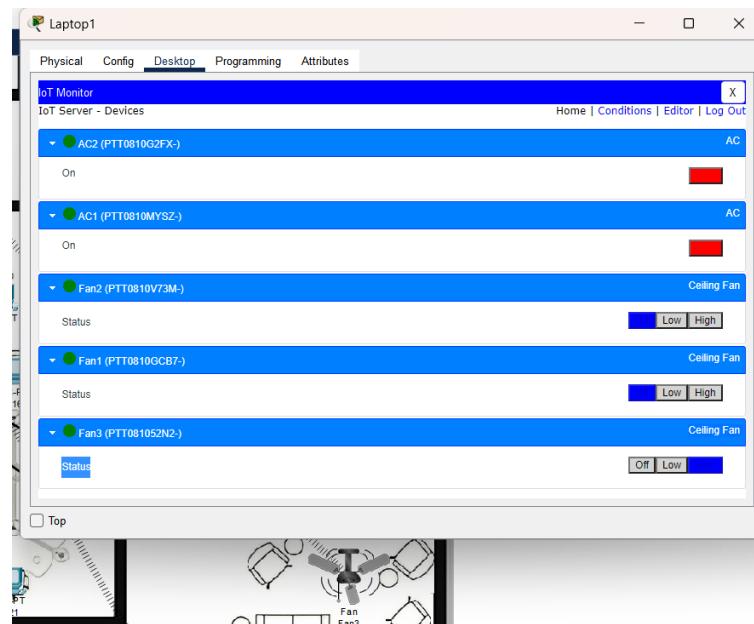
Router>

Copy Paste

Top

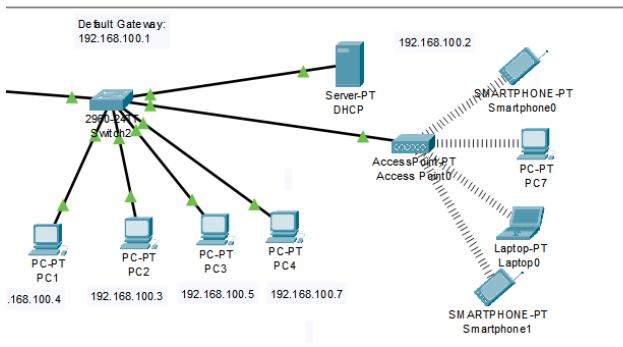
4.6. IoT Integration

- Configured an **IoT Gateway** connecting smart devices (fans, ACs).
- Controlled devices wirelessly from a laptop.



4.7. Wireless Connectivity

- Configured a **Wireless Access Point (WAP)**.
- Laptops and mobiles connected successfully.
- Verified reachability with ping to servers.



5. Learning Outcomes

Through this project, I learned how to:

- Design and configure a complete enterprise + IoT-enabled network
- Implement VLAN segmentation with inter-VLAN routing on multilayer switches
- Use RIPv2 for dynamic routing across subnets
- Deploy and test DHCP, DNS, HTTP, FTP, and Email servers in a lab environment
- Configure and verify Dynamic NAT for external communication
- Integrate IoT devices into enterprise networks with centralized control
- Provide wireless access for mobile clients

6. Conclusion

This project successfully demonstrates how an enterprise-level network can integrate both traditional networking services and modern IoT features. Using Cisco Packet Tracer, a **Smart Software House Network** was built with VLAN segmentation, routing, NAT, and core servers, alongside IoT device management and wireless access. The design highlights scalability, practicality, and readiness for real-world adaptation.

7. Attachments

- **Packet Tracer File:** Smart-Software-House.pkt
- **Screenshots:** Located in /assets/screenshots/
- **Report (this document):** Smart-Software-House-Report.pdf