

ENTERPRISE NETWORK DESIGN

Implementation Using Huawei Datacom
Technologies

Project Final Edition

Presentation Agenda

- ✓ Project Scope & Objectives
- ✓ Design Timeline
- ✓ Network Topology Overview
- ✓ VLAN & IP Addressing
- ✓ Switching & Routing Protocols
- ✓ Security & Remote Access
- ✓ Validation & Testing



Project Overview

Objective

To design, implement, and validate a scalable enterprise-grade network infrastructure using **Huawei Datacom Technologies**.

Key Deliverables

- ✓ Robust Hierarchical Topology
- ✓ Segregated VLANs for departments
- ✓ Secure Remote Access (PPPoE)
- ✓ High Availability (STP, OSPF)
- ✓ Future-proof IPv6 Integration



4-Week Execution Plan



Week 1

Requirements Gathering,
Initial Topology Design, VLAN
Planning



Week 2

IP Addressing Scheme, DHCP
Pools Configuration, STP
Implementation



Week 3

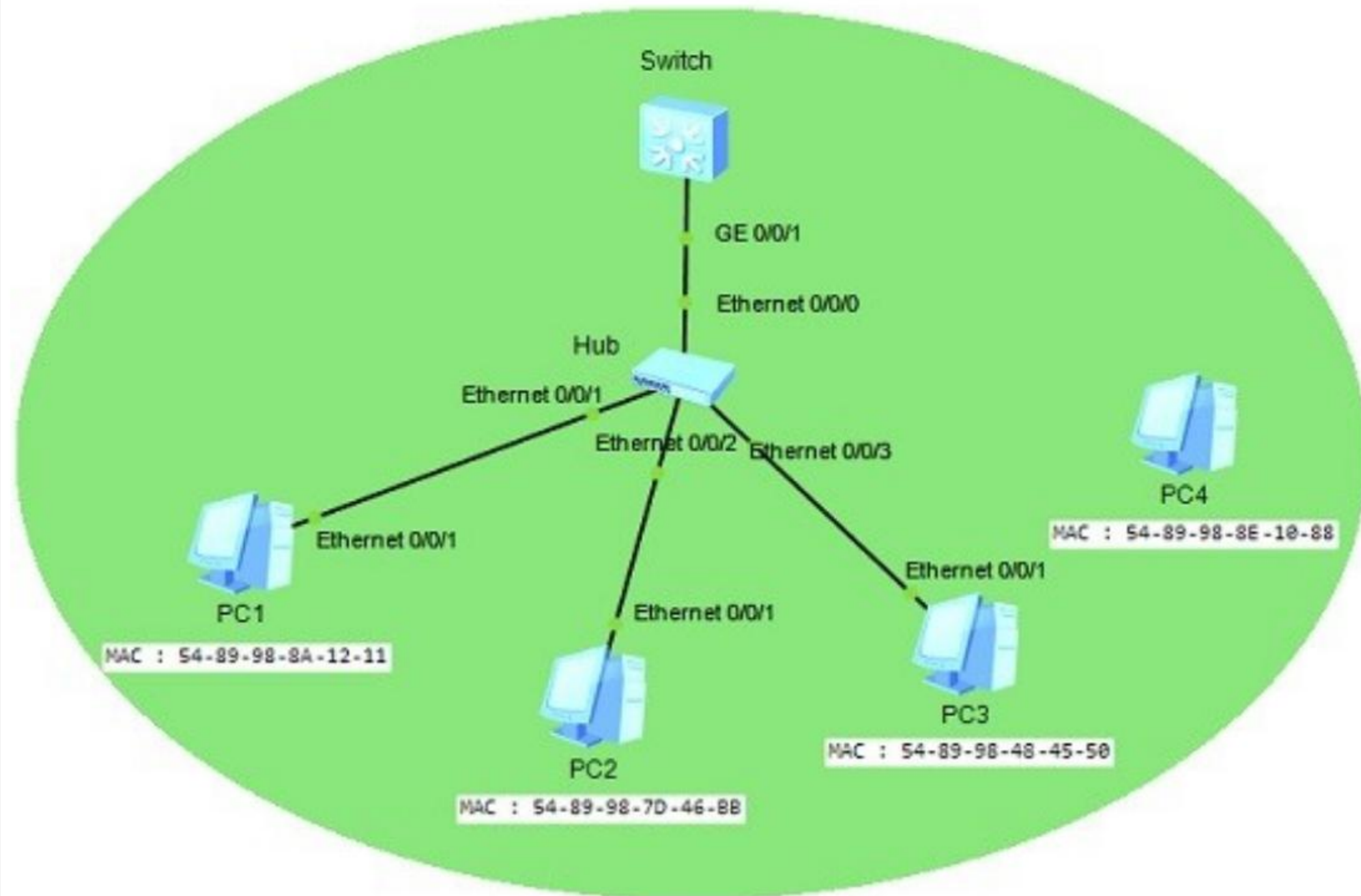
Inter-VLAN Routing, OSPF
Protocol Setup, Access Port
Configuration



Week 4

NAT, PPPoE for Remote
Users, IPv6 Integration, Final
Validation

Network Topology Design



Hierarchical Design

The network follows a standard three-layer model for scalability and ease of management:

Core Layer: High-speed switching and routing (Huawei AR Routers).

Aggregation Layer: Distribution of policies and inter-VLAN routing.

Access Layer: Connecting end devices (Sales, IT, Management PCs) via Layer 2 switches.

VLAN Segmentation Strategy

VLAN ID	DEPARTMENT NAME	NETWORK ADDRESS	GATEWAY
10	Sales Department	192.168.10.0/24	192.168.10.100
20	IT Support	192.168.20.0/24	192.168.20.100
30	Management	192.168.30.0/24	192.168.30.100
100	Guest WiFi	192.168.100.0/24	192.168.100.100
200	PPPoE Users	200.0.0.0/24	200.0.0.1

IP Addressing & Subnetting



Internal LANs

Standard Class C private addresses (192.168.x.x/24) used for all internal departments to ensure sufficient address space.



Infrastructure Links

Strict /30 subnet masking for Router-to-Router links (e.g., 10.0.0.1/30) to conserve public IP space and enhance security.



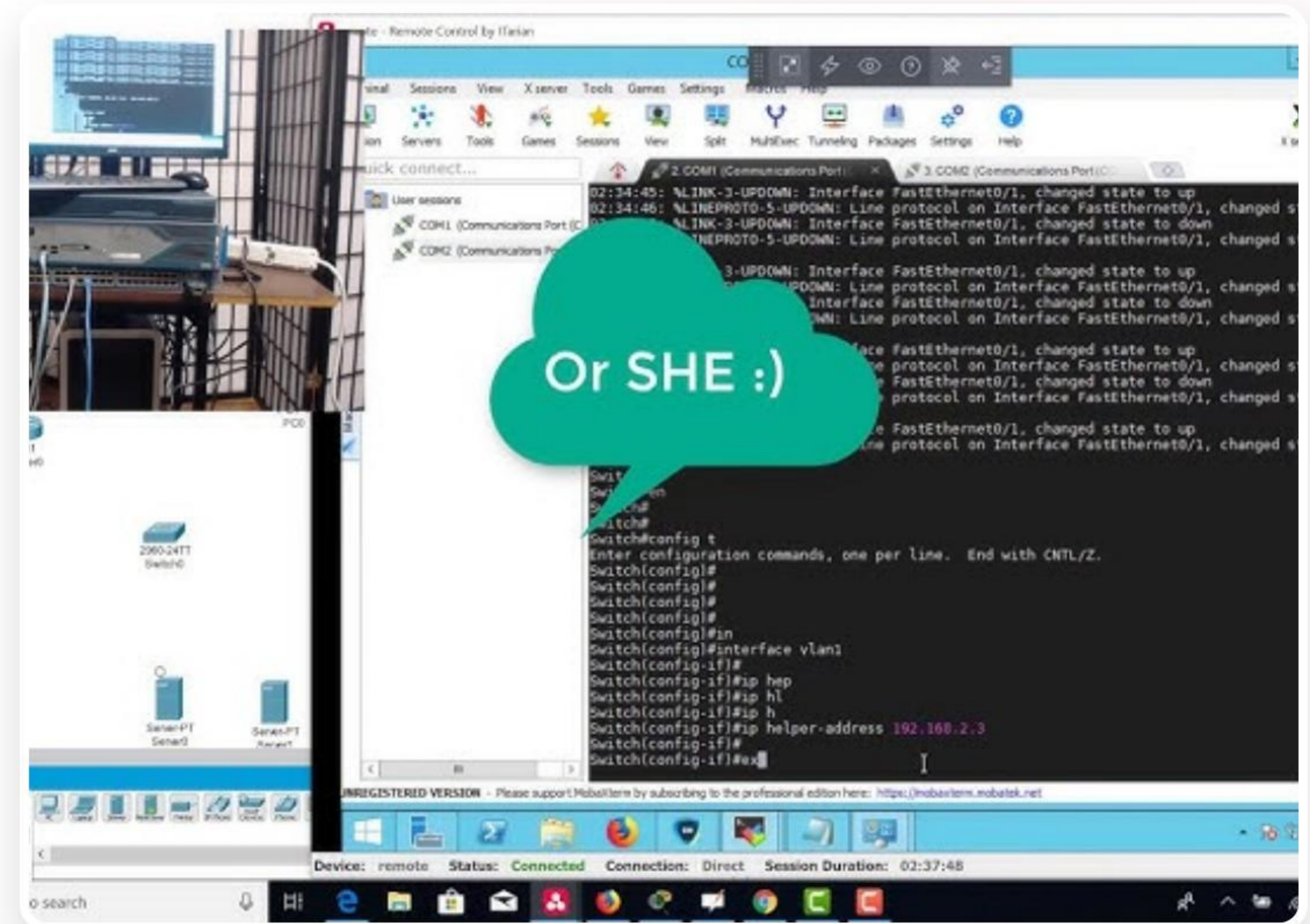
Server Farm

Dedicated static IP allocation (192.168.100.254) for critical servers to ensure consistent reachability.

Switching Technologies

Layer 2 Configuration

- ✓ **Access Ports:** Configured for end devices (PCs, Printers) based on VLAN tags.
- ✓ **Trunk Ports:** 802.1Q encapsulation enabled on uplinks between switches and routers to carry multiple VLANs.
- ✓ **STP (Spanning Tree Protocol):** Enabled to prevent Layer 2 loops and ensure path redundancy.



Routing Strategy: OSPF

OSPF Area 0

All routers (R1, R2, R3, R4) are configured in the OSPF backbone area (Area 0) for rapid convergence and efficient routing table updates.

Inter-VLAN Routing

- ✓ **Router-on-a-Stick:** Sub-interfaces configured on the gateway routers to allow communication between isolated VLANs (e.g., Sales to Management).
- ✓ **Dynamic Updates:** OSPF automatically advertises new subnets, reducing manual configuration overhead.

Network Services: DHCP

Dynamic Host Configuration Protocol

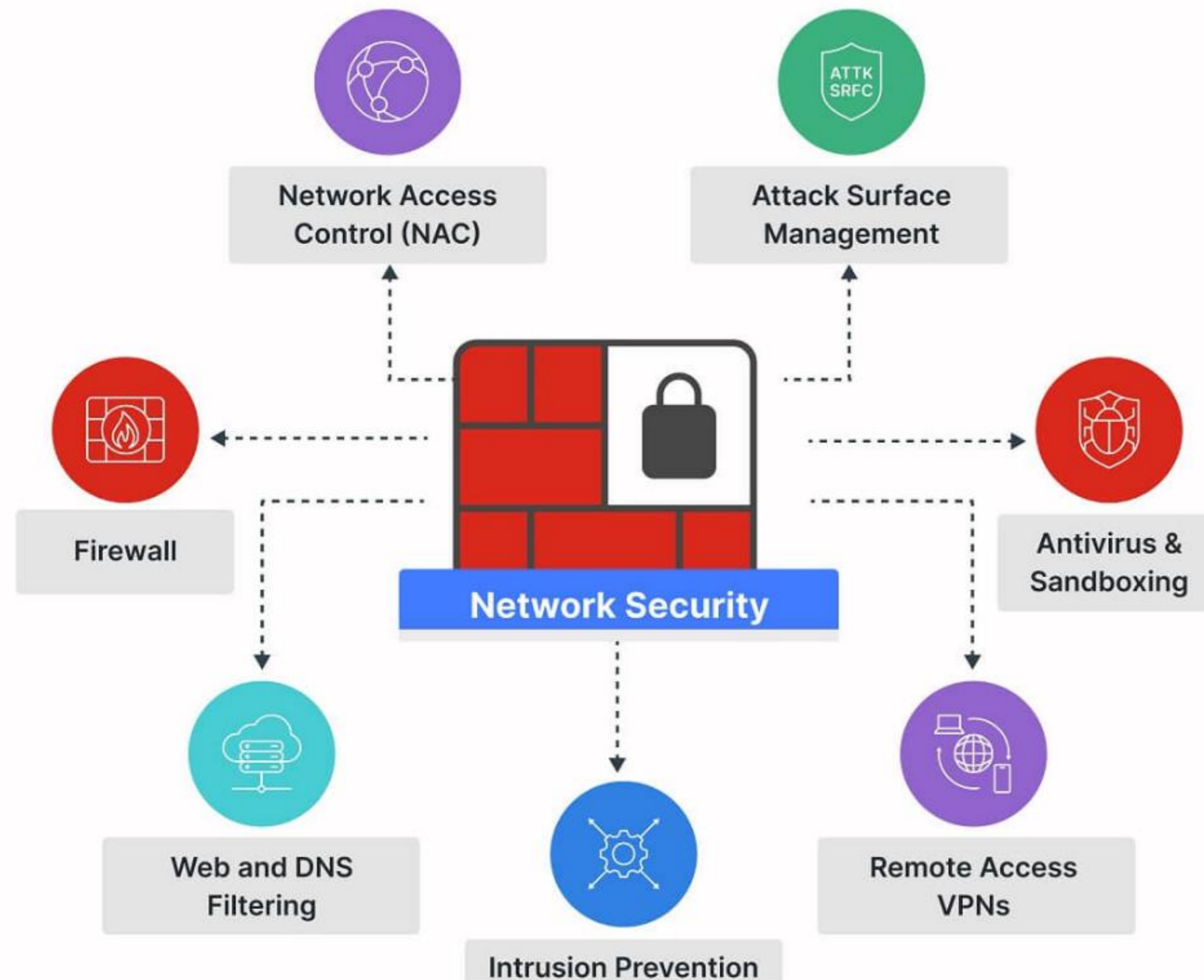
Configured dedicated DHCP pools on the Core Switch/Router to automatically assign:

- ✓ IP Addresses
- ✓ Subnet Masks
- ✓ Default Gateways
- ✓ DNS Server IPs

Exclusions: First 10 IPs in each subnet reserved for static assignment (Printers, APs).

```
ip pool vlan10
gateway-list 192.168.10.100
network 192.168.10.0 mask 255.255.255.0
dns-list 8.8.8.8
excluded-ip-address 192.168.10.254
```

Edge Security & NAT



Network Address Translation

Static NAT: Configured on the edge router (R4) to map the internal Server IP (192.168.100.254) to a global public IP (30.0.0.10).

AAA Security

Authentication, Authorization, and Accounting (AAA) framework implemented for secure access control to network devices.

Remote Access: PPPoE

Connecting Remote Users

Point-to-Point Protocol over Ethernet (PPPoE) is deployed to manage remote client connections securely.

Virtual Template: Handles IP address assignment from the 200.0.0.0/24 pool.

Authentication: CHAP/PAP used to verify remote user credentials before granting access.



Future-Proofing: IPv6



Dual Stack

Running IPv4 and IPv6 simultaneously on core interfaces to ensure backward compatibility while preparing for the future.



OSPFv3

Implemented OSPF version 3 to support IPv6 routing and neighbor discovery across the topology.



Testing

Validated connectivity using `ping ipv6` commands between end-points (2001::1 to 2001::2).

Validation Results

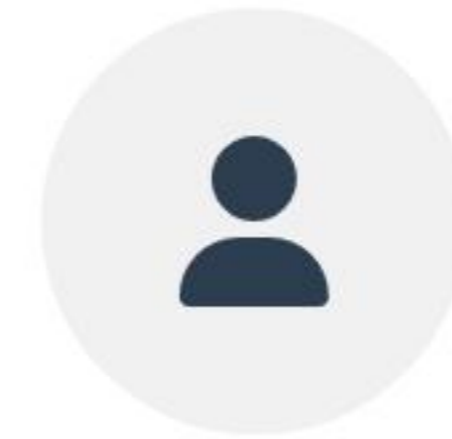
TEST CASE	METHODOLOGY	RESULT
DHCP Lease	Connect Client to VLAN 10 Port	✓ Success (IP Assigned)
Inter-VLAN	Ping Sales PC to IT PC	✓ Success (Reply Received)
OSPF Routing	Check Routing Table (display ip routing-table)	✓ Full Convergence
NAT Access	Ping Public IP 30.0.0.10	✓ Server Reachable

Project Team



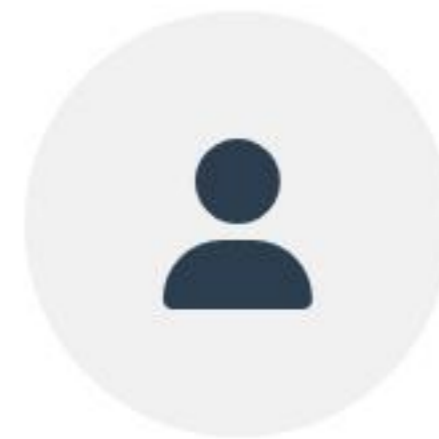
Ali Ragab

Ali Mohamed



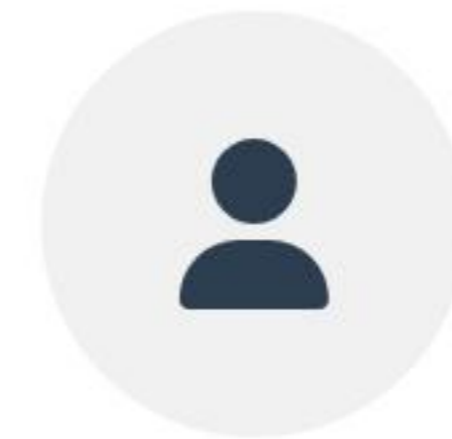
Nooran Maged

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Thank You!



Image Sources



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