CAPSTONE PROJECT

TITLE: IPV6 MIGRATION LAN

CSA0747: COMPUTER NETWORKS FOR IOT APPLICATIONS

SUBMITTED BY :

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1. Introduction

In the era of expanding internet connectivity and increasing device proliferation, the IPv4 address space is rapidly depleting. IPv6, the successor to IPv4, offers a vastly larger address space and improved network functionalities. This capstone project aims to develop a comprehensive migration plan from IPv4 to IPv6, addressing key elements such as address allocation, protocol configuration, and security measures. The project will ensure a smooth transition while minimizing network disruptions and optimizing performance.

2. Objectives

1. **Develop a Comprehensive Migration Plan**: Outline a detailed migration strategy, including time lines, milestones, and resource allocation.
2. **Determine Address Allocation and Sub netting**: Establish effective methodologies for IPv6 address allocation and sub netting.
3. **Configure IPv6 Routing Protocols**: Implement and configure routing protocols (OSPFv3 and BGP) and enable IPv6 forwarding.
4. **Implement IPv6-Aware Security Measures**: Incorporate security measures such as IP sec for encryption and authentication.
5. **Conduct a Pilot Deployment**: Validate the migration plan through a controlled pilot deployment and address any issues.

3. Literature Review

3.1 IPv6 Basics

- **Overview of IPv6**: IPv6 is designed to address the limitations of IPv4, providing a 128-bit address space, improved routing efficiency, and enhanced security features. The transition from IPv4 to IPv6 is crucial for future-proofing network infrastructure (Hidden & Daring, 2017).

3.2 Address Allocation and Sub-netting

- **Address Allocation Methodologies**: Effective strategies include hierarchical allocation and use of global unicast addresses (GUA) and unique local addresses (ULA) (Carpenter & Nichols, 2018).
- **Sub-netting Strategies**: Sub-netting with IPv6 typically uses a /48 prefix for site-level allocation and /64 for individual subnets, allowing efficient and scalable network design (RFC 4291).

3.3 IPv6 Routing Protocols

- **OSPFv3**: Designed for IPv6, OSPFv3 supports multiple address families and enhances routing capabilities (RFC 5340).
- **BGP**: Border Gateway Protocol (BGP) for IPv6 facilitates inter-domain routing and ensures scalability (RFC 4760).

3.4 IPv6 Security

- **IP sec**: Provides end-to-end encryption and authentication, enhancing IPv6 security (RFC 4301).
- **Firewall and IDS/IPS**: Updates are required to accommodate IPv6 traffic and ensure network protection (RFC 5115).

4. Methodology

4.1 Planning Phase

- **Project Planning**: Define project scope, allocate resources, and create a detailed time line.
- **Resource Allocation**: Assign roles for project management, network engineering, security, and training.

4.2 Address Allocation and Sub-netting

- **Address Allocation**: Allocate a /32 prefix to the organization and /48 prefixes for individual sites.
- **Sub-netting**: Implement /64 subnets within each site.

4.3 Protocol Configuration

- **OSPFv3 Configuration**: Enable OSPFv3 on routers, configure areas, and establish router IDs.
- **BGP Configuration**: Set up BGP for IPv6, configure peers, and advertise networks.

4.4 Security Implementation

- **IP sec Configuration**: Define and apply IP sec policies for end-to-end encryption.
- **Firewall and IDS/IPS Updates**: Adjust rules and policies to handle IPv6 traffic.

4.5 Pilot Deployment

- **Controlled Environment**: Deploy IPv6 in a test segment, validate addressing, routing, and security.
- **Monitor and Analyse**: Track performance, gather feedback, and resolve issues.

4.6 Full Deployment

- **Phased Roll out**: Expand IPv6 deployment based on pilot results.
- **Training and Documentation**: Provide training and update documentation.

5. IP Address Allocation

5.1 Addressing Methodologies

- **Global Unicast Addresses (GUA)**: Allocate a /32 prefix.
- **Unique Local Addresses (ULA)**: Use fd00::/8 for internal addressing.

5.2 Sub-netting Strategies

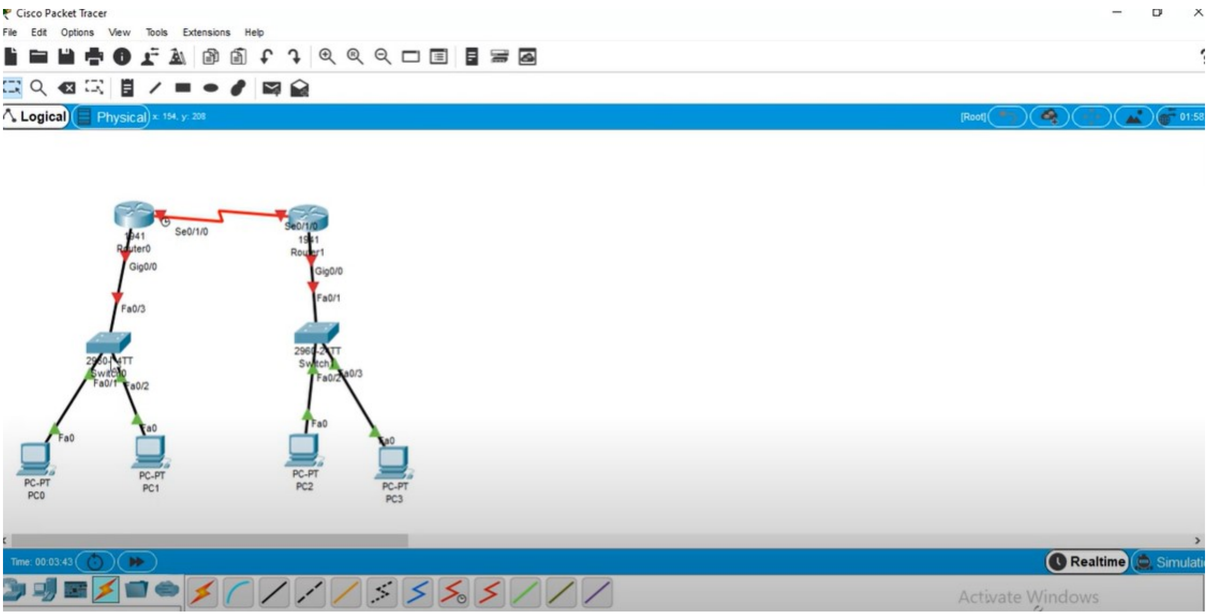
- **Site-Level**: Assign a /48 prefix for each site.
- **Subnet Level**: Use /64 for individual subnets.

5.3 Address Assignment Mechanisms

- **Static**: For critical infrastructure.
- **DHCPv6**: For dynamic client devices.
- **SLAAC**: For automatic address configuration.

6.RESULT:

Network design:



7. Conclusion

The migration to IPv6 is a critical step in ensuring the scalability and future-readiness of network infrastructure. This comprehensive migration plan outlines the necessary steps for a successful transition, from detailed planning and address allocation to protocol configuration and security implementation. By conducting a controlled pilot deployment, the plan allows for validation and adjustment before full roll out, minimizing disruptions and ensuring a smooth transition. Effective implementation will result in a robust, secure, and scalable network capable of supporting future growth and technological advancements.