**University Dual-Stack IPv4/IPv6 Network**

**Introduction**

**Overview**

**The National Polytechnic School (NPS) is a renowned institution of higher learning that offers a wide range of academic programs to students from diverse backgrounds. With the increasing demand for online resources and services, the university's network infrastructure needs to be upgraded to accommodate the growing number of users and devices.**

**Objective**

**The objective of this case study is to design and implement a dual-stack IPv4/IPv6 network infrastructure at NPS, ensuring a seamless transition from the existing IPv4 network to a more scalable and future-proof IPv6 network.**

**Background**

**Organization/System Description**

**NPS is a large university with multiple campuses, comprising of various faculties, departments, and administrative offices. The university has a diverse range of users, including students, faculty members, and staff.**

**Current Network Setup**

**The current network infrastructure at NPS is based on IPv4, which is facing scalability issues due to the rapid growth of users and devices. The network is divided into multiple subnets, each serving a specific faculty or department. The current network setup is as follows:**

* **IPv4 address space: 10.0.0.0/8**
* **Network devices: Routers, switches, and firewalls from various vendors**
* **Network protocols: TCP/IP, DNS, DHCP, and HTTP**

**Problem Statement**

**Challenges Faced**

**The current IPv4 network infrastructure at NPS is facing several challenges, including:**

* **IPv4 address exhaustion: The university is running out of IPv4 addresses, making it difficult to accommodate new users and devices.**
* **Limited scalability: The current network infrastructure is not scalable to meet the growing demands of the university.**
* **Security concerns: The IPv4 network is vulnerable to security threats, such as IP spoofing and fragmentation attacks.**

**Proposed Solutions**

**Approach**

**The proposed solution is to design and implement a dual-stack IPv4/IPv6 network infrastructure at NPS, which will allow the university to transition from the existing IPv4 network to a more scalable and future-proof IPv6 network.**

**Technologies/Protocols Used**

**The proposed solution will utilize the following technologies and protocols:**

* **IPv6: The next-generation Internet protocol that provides a much larger address space than IPv4.**
* **Dual-stack network: A network infrastructure that supports both IPv4 and IPv6 protocols.**
* **DNS64: A DNS server that provides IPv6 addresses to clients and translates them to IPv4 addresses for communication with IPv4-only servers.**
* **Tunneling protocols: Such as 6in4 and Teredo, which enable communication between IPv6 devices over an IPv4 network.**

**Implementation**

**Process**

**The implementation process will involve the following steps:**

1. **Network design and planning: Designing the dual-stack network infrastructure, including the IPv6 address plan and subnetting.**
2. **Network device configuration: Configuring network devices, such as routers and switches, to support IPv6.**
3. **DNS64 configuration: Configuring DNS64 servers to provide IPv6 addresses to clients and translate them to IPv4 addresses.**
4. **Tunneling protocol configuration: Configuring tunneling protocols, such as 6in4 and Teredo, to enable communication between IPv6 devices over an IPv4 network.**
5. **Network testing and validation: Testing the dual-stack network infrastructure to ensure that it is functioning as expected.**

**Implementation Timeline**

**The implementation timeline is expected to be 6 months, with the following milestones:**

* **Month 1-2: Network design and planning**
* **Month 3-4: Network device configuration and DNS64 configuration**
* **Month 5-6: Tunneling protocol configuration and network testing and validation**

**Results and Analysis**

**Outcomes**

**The proposed solution is expected to provide the following outcomes:**

* **A scalable and future-proof network infrastructure that can accommodate the growing number of users and devices.**
* **Improved network security through the use of IPv6, which provides built-in security features, such as IPsec.**
* **Enhanced user experience through faster and more reliable network connectivity.**

**Analysis**

**The proposed solution will be analyzed based on the following metrics:**

* **Network performance: Measured in terms of throughput, latency, and packet loss.**
* **Network security: Measured in terms of the number of security incidents and vulnerabilities.**
* **User satisfaction: Measured through surveys and feedback forms.**

**Security Integration**

**Security Measures**

**The proposed solution will incorporate the following security measures:**

* **Firewalls: Configured to allow only authorized traffic to flow between the IPv4 and IPv6 networks.**
* **Intrusion detection and prevention systems: Deployed to detect and prevent security threats.**
* **Encryption: Used to protect data transmitted over the network.**

**Conclusion**

**Summary**

**The proposed solution provides a comprehensive approach to designing and implementing a dual-stack IPv4/IPv6 network infrastructure at NPS. The solution addresses**

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