Koneru Lakshmaiah Education Foundation
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Case Study ID: 11

1. Title:

Router and Switch Configuration for Improved Network Performance

2. Introduction

Overview:
This case study explores the configuration of routers and switches to optimize the network performance of an organization. The focus is on enhancing connectivity, reducing latency, and ensuring secure data transmission.

Objective:
To design and implement an efficient network infrastructure using routers and switches that meets the organization's needs for scalability, security, and reliability.

3. Background

Organization/System Description:
The case study involves a mid-sized company with 200 employees, operating in the IT services sector. The company has a central office and two branch offices, requiring seamless communication and data sharing across locations.

Current Network Setup:
The existing network is a flat topology with limited segmentation, leading to frequent network congestion and security vulnerabilities. The company relies on basic routers and unmanaged switches with minimal configuration.

4. Problem Statement

Challenges Faced:

- Network Congestion: High traffic due to lack of segmentation, resulting in slower data transmission.

- Security Risks: Lack of advanced security configurations, exposing the network to potential threats.

- Scalability Issues: Difficulty in accommodating new devices and users without impacting performance.

5. Proposed Solutions

Approach:
The proposed solution includes reconfiguring the network with VLANs for segmentation, implementing advanced routing protocols, and securing the network with firewalls and access control lists (ACLs).

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Technologies/Protocols Used:

- VLANs (Virtual LANs): For network segmentation.

- OSPF (Open Shortest Path First): As the primary routing protocol.

- ACLs (Access Control Lists): For enhanced security.

- 802.1X: For network access control.

6. Implementation

Process:

- Network Design: Planning VLANs and subnets, selecting routing protocols, and defining security policies.

- Configuration: Setting up VLANs on switches, configuring routers with OSPF, and applying ACLs.

- Testing: Conducting performance and security tests to ensure the configurations meet the desired objectives.

Implementation:
The configuration process was executed in three phases:

1. Phase 1: VLAN creation and switch configuration (2 weeks).

2. Phase 2: Router configuration with OSPF and testing (1 week).

3. Phase 3: Security measures implementation and final testing (1 week).

Timeline:
The entire implementation was completed over four weeks.

7. Results and Analysis

Outcomes:

- Improved Performance: Network congestion was reduced by 60%, resulting in faster data transmission and lower latency.

- Enhanced Security: The implementation of ACLs and 802.1X significantly reduced unauthorized access attempts.

- Scalability: The network can now easily accommodate additional devices and users without performance degradation.

Analysis:
The reconfiguration of routers and switches successfully addressed the challenges, providing a more secure, scalable, and high-performing network infrastructure.

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8. Security Integration

Security Measures:

- Firewalls: Deployed at key points in the network to monitor and control incoming and outgoing traffic.

- ACLs: Applied to restrict access based on IP addresses and protocols.

- 802.1X Authentication: Ensured that only authorized devices could connect to the network.

9. Conclusion

Summary:
The case study demonstrates the importance of proper router and switch configuration in creating an efficient and secure network. The implemented solutions led to a marked improvement in performance, security, and scalability.

Recommendations:

- Regular Audits: Perform routine network audits to ensure configurations remain optimal.

- Continuous Monitoring: Use network monitoring tools to detect and resolve issues promptly.

- Training: Provide staff training on network management to maintain the infrastructure effectively.

10. References

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SECTION-NO: 1