Project Type

Project Type

☒ Networking ☐ Database ☐ Infrastructure ☐ Programming

Introduction

Kalam Telecom is an Internet Service Provider. Kalam Telecom is intended to expand it network to cover all Bahrain cities and provide services to compete with other Internet services providers in Bahrain. Kalam Telecom wants to adopt and apply Multiprotocol Label Switching and quality of services to its infrastructure to improve the reliability and performance of the network. In addition to providing flexibility in routing services.

This project focuses on utilizing and integrating MPLS into the ISP infrastructure alongside with redundant links, security, and scalability to be capable of serving multiple users across Bahrain Plus to integrate Kalam Telecom MPLS network with other ISPs MPLS network in Bahrain.

The motivation behind this project is to design a robust ISP network connecting multiple customers in Bahrain to provides the end users with excellent and reliable internet connection. As the ISP expands their customer base and coverage in Bahrain, the need for inter-AS (Autonomous System) communication, reliability and fault tolerance is critical and mandatory.

Project Description

Summary (Project Definition & Background):

The project involves the design and implementation of MPLS into the network that connects two customers, each with multiple branches across Bahrain. Each customer will have a dedicated connection to their respective branches using a combination of advanced routing, peering, and tunneling technologies. The design will focus on core and edge structure to provide the MPLS services alongside with availability, scalability, and fault tolerance. Protocols such as BGP, MPLS, OSPF and EIGRP will ensure efficient routing and traffic engineering, while MPLS VPN and QoS mechanisms will enable service segmentation and customer traffic isolation.

Objectives:

The designed ISP backbone topology should aim to achieve the following:

- Design a hierarchical ISP backbone structure with a clear separation between core, edge routers.
- Basic Configuration such as device identification, NTP and management access.
- Configure multiple routing protocols, including BGP for inter-AS connectivity, and OSPF/EIGRP for internal routing.
- Implement MPLS and traffic engineering to optimize performance and support VPN services for customers.
- Apply redundancy techniques such as VRFs, and route reflectors to ensure high availability.
- Integrate security practices such as AAA to potect the infrastructure.
- Deploy ISP services such as PPP and NAT for edge connectivity.

Benefits:

- Provides hands-on experience in building and managing a large-scale ISP backbone.
- Enhance understanding of real-world ISP protocols such as BGP, MPLS, and traffic engineering.
- Simulate realistic service provider operations across different counties.
- Improve troubleshooting skills and optimization skills in a multi-AS environment.
- Address real-life challenges and their solutions.

Pre-Requisite Knowledge

Students should have knowledge of the following:

- Networking fundamentals (TCP/IP, Subnetting, IP addressing).
- Cisco routing and switching concepts.
- Knowledge of routing protocol (OSPF, EIGRP, BGP).
- VLANs, STP, VTP, EtherChannel and Inter-VLAN.
- Security concepts (ACLs, Port security, VRF).

Details

Supervisor:	
Client:	
Other main participants/stakeholders:	

Hardware/Software Requirements

Software:

Hardware:

Project Requirements

- Implementation of OSPF, EIGRP, BGP and Static Routes.
- VLANs, VTP, STP, EtherChannel, Inter-VLAN configuration.
- High availability via HSRP, redundant links and VRF.
- MPLS backbone simulation.
- Security implementation such as Port Security.
- PPP configuration for WAN simulation.
- Network testing for redundancy failover.

Elements of solution

Note: Details of Project Elements

IT7099 Project - Product - Elements_`