

**USMAN INSTITUTE OF TECHNOLOGY**

Affiliated with NED University of Engineering & Technology, Karachi

**BACHELOR OF SCIENCE (COMPUTER SCIENCE/SOFTWARE ENGINEERING)**

**CS222 DATA COMMUNICATION & COMPUTER NETWORKS**

**PROJECT REPORT**

**TITLE: DESIGN AND IMPLEMENTATION OF SECURE HEALTH CARE INFORMATION NETWORK SYSTEM**

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# **1.** **INTRODUCTION:**

* 1. Background

The following report provides an overview of the Secure Healthcare Information Network System implemented using Cisco Packet Tracer. The Laboratory is a healthcare service provider which specializes in diagnostic and related healthcare tests on blood, urine and various human bodily tissues. The company’s offices are located on three floors of a single-story building. On first floor, there is a Pharmacy and Medical Labs, along with Reception and Guest Area. On second floor, is a Doctors and Consultancy department and which also manages Procurement, HR, and Finance operations. The last floor (i.e. the third floor) is divided between Internal Auditors and Corporate Functions and an entire IT team. The IT department is further structured into various teams, Including Brand and Digital Marketing Team, IT Support; System/Network Admin, Network Security Engineers, Cyber Security Analysts, Software Engineers, Cloud Engineers, And IT Management Team.

* 1. Objectives
     1. Hierarchical Network Design: Implement a structured network design to optimize performance, scalability, and security.
     2. VLANs and Inter-VLAN Routing: Configure Virtual LANs to segregate network traffic and implement Inter-VLAN routing for seamless communication between different departments.
     3. DHCP Server: Set up a Dynamic Host Configuration Protocol (DHCP) server to automate IP address assignment.
     4. SSH (Secure Shell): Implement SSH for secure remote management of network devices.
     5. OSPF (Open Shortest Path First): Configure OSPF to ensure efficient routing and redundancy in the network.
     6. HSRP (Hot Standby Router Protocol): Implement HSRP to ensure high availability and failover for critical network components.
     7. Firewall Configuration: Configure firewall rules and zones to control traffic and protect the network from threats.
     8. NAT (Network Address Translation): Set up Network Address Translation for efficient use of IP addresses and improved security.
     9. Default Route Configuration: Establish default routes to ensure proper traffic flow.
     10. Inspection Policy Configurations: Define traffic inspection policies to monitor and secure network traffic.
     11. Access Control Lists (ACLs): Implement standard and extended ACLs to control traffic based on rules and policies.
     12. VoIP Configurations: Set up Voice over IP (VoIP) configurations for seamless communication within the healthcare network.
     13. Wireless Network Implementation: Deploy Wireless LAN Controllers (WLCs) and Lightweight Access Points to provide wireless access while maintaining security.
     14. EtherChannel and LACP: Configure EtherChannel using the Link Aggregation Control Protocol (LACP) to aggregate multiple links for increased bandwidth and redundancy.
     15. STP PortFast and BPDUguard: Implement Spanning Tree Protocol enhancements to ensure rapid network convergence and protect against unauthorized devices.
     16. Static IPv4 Addressing: Assign static IP addresses to network devices for better management.
     17. Host Configurations and Subnetting: Configure individual host devices and perform subnetting to efficiently manage IP address allocation.

# **FEATURES:**

* 1. Security: The network will prioritize security at every level, ensuring that patient data is protected from unauthorized access or breaches.
  2. Scalability: The network design will be scalable to accommodate the growing needs of healthcare organizations.
  3. Reliability: Redundancy and failover mechanisms will be in place to ensure network availability at all times.
  4. Efficiency: Efficient data transmission and routing protocols will be used to optimize network performance.
  5. Wireless Connectivity: Patients, staff, and devices will have access to secure wireless connectivity for convenience.

# **NETWORK DESIGN:**

# **IMPLEMENTATION:**

# **SIMULATION & TESTING:**

# **CONCLUSION:**

The output of this project is a highly secure, scalable, and efficient healthcare information network system that enables healthcare providers to access and share patient data seamlessly. The network will meet regulatory compliance standards, protect patient confidentiality, and enhance the overall quality of care. Additionally, the project will equip the team with advanced networking skills, making them valuable assets in the healthcare IT industry and beyond.