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|  | Secure and Scalable LAN Design for MetroHealth Hospital Headquarters |  |

**Description:**

MetroHealth Hospital, a leading healthcare provider, is expanding its headquarters to manage multiple clinics and departments. A high-performance Local Area Network (LAN) is required to support critical operations such as patient care, administrative functions, and medical services. Your task is to design and prototype a network for the hospital’s new headquarters that meets their need for segmented traffic, communication and redundancy. This network will be presented to the hospital’s IT management team for review and approval.

**Project Requirements:**

**Requirement 1: Departmental Segmentation Using VLANs**  
The LAN must support multiple departments, each segmented into its own VLAN for traffic isolation, security, and management efficiency. The VLANs should be set up to optimise network performance while keeping communication secure. The user groups that need to be separated are:

* Executive Management
* Administrative Staff
* Finance Department
* IT Services Department
* Medical Staff

**Requirement 2: Inter-VLAN Communication and External Connectivity**  
The different VLANs must be able to communicate with one another where necessary, and all users should have access to devices and services outside of the hospital’s network, such as cloud-based medical applications or internet resources.

**Requirement 3: IPv4 Addressing with Dynamic Allocation**  
Each VLAN should be assigned a unique /24 IPv4 address range. IP addresses should be allocated dynamically through a DHCP server for efficient network management and ease of use.

**Requirement 4: Network Redundancy for High Availability**  
The network must be designed with redundancy to ensure minimal downtime. Implement redundancy at Layer 2 levels to prevent failures and ensure continuous operation of critical hospital services.

**Requirement 5: Network Device Security and Hardening**  
Network devices (such as switches and routers) must be hardened to enhance the security of the network and prevent unauthorised access. Securing the network devices will help ensure the availability of services and reduce the risk of attacks.

**Tasks:**

1. **Create a Prototype Network Using Cisco Packet Tracer**
   * Build a network prototype that includes all the specified features, including VLAN segmentation, inter-VLAN communication, IP addressing, redundancy, and security hardening.
2. **Report on LAN Design:**
   * Provide a detailed report explaining how the network meets the hospital’s requirements. The report should describe:
     + How the VLANs are set up to separate traffic between departments.
     + How inter-VLAN communication is achieved and how external connectivity is ensured.
     + The IP addressing scheme, with details on dynamic allocation using DHCP.
     + How network redundancy is implemented to ensure high availability.
     + Security measures taken to harden network devices and improve the security posture.
   * Include screenshots from Cisco Packet Tracer and configuration details to support your explanations.

**Submission Guidelines:**

* **Due Date:** Friday, 29th Nov 2024 @ 9pm
* **Deliverables:**
  + **Prototype**: Cisco Packet Tracer file (.pkt)
  + **Report**: PDF document explaining the design (.pdf)
* **Submission:** Email both ***files*** to *keara.barrett@setu.ie*

**Project Interviews/Defence:**

* Project defence will take place during the week starting **2nd December 2024**. You will be required to demonstrate and explain your prototype to show how it fulfils the hospital’s network needs. Be ready to discuss your design choices.

**Weighting:**

* This project accounts for 40% of the ‘Networking: Switching and VLAN Concepts’ module.