

LAB PROJECT II: SWITCH, ROUTER, VLAN, AND DHCP CONFIGURATION

1. Introduction

This lab project is designed to give students hands-on experience in configuring switches, routers, VLANs, and DHCP services. The project is based on a LAN design of a specific building, and all VLANs must be created according to the building selected by the student or group.

2. Project Description

Students are required to implement a LAN for one building (e.g., Administration Block, Academic Block, or Laboratory Block). The network must use VLANs that correspond to departments or sections within the chosen building. The project focuses on basic configuration and testing using physical lab equipment.

3. Project Objectives

- Configure a switch for VLANs and access ports
- Configure a router for inter-VLAN communication
- Configure DHCP for automatic IP address assignment
- Assign VLANs based on building structure
- Test and verify network connectivity

4. Network Requirements

4.1 Devices

- Router
- Layer 2 Switch
- End devices (PCs)
- DHCP service (Router or Server)

4.2 Network Rules

- VLANs must match the building used in the LAN design
- Use private IPv4 addressing
- Each VLAN must have: Network address, Default gateway, DHCP address range

5. VLAN Design (Building-Based Example)

Example: Academic Block

VLAN ID | VLAN Name | Department

10 | FACULTY | Lecturers' Offices

20 | CLASSROOMS | Lecture Rooms

30 | LABS | Computer Labs

Students must rename VLANs according to their chosen building.

6. IP Addressing (Example)
 - VLAN 10 → 192.168.10.0 /24
 - VLAN 20 → 192.168.20.0 /24
 - VLAN 30 → 192.168.30.0 /24

Router interface or sub-interfaces act as default gateways.

7. Switch Configuration Requirements
 - Assign a hostname to the switch
 - Create VLANs according to the building design
 - Assign switch ports to the correct VLANs
 - Verify VLAN configuration using commands
8. Router Configuration Requirements
 - Assign IP addresses to router interfaces or sub-interfaces
 - Configure inter-VLAN routing
 - Configure the router as DHCP Server
9. DHCP Configuration Requirements
 - Create a DHCP pool from window server for each VLAN
 - Define network address and default gateway
 - Exclude router IP addresses
 - Verify PCs obtain IP addresses automatically
10. Testing and Verification
 - Successful DHCP IP allocation
 - Connectivity using ping (ICMP)
 - Communication between devices in different VLANs
11. Tools Requirements

Physical lab equipment only: Router, Layer 2 Switch, PCs / Workstations, DHCP Server or Windows Server machine
12. Group Deliverable
 - Network topology diagram
 - Router and switch configuration files
 - Screenshots showing VLAN configuration, DHCP IP assignment, and successful ping tests

Important Note: VLAN configuration must strictly follow the building used in your LAN design. Any mismatch between the LAN design and VLAN implementation will not be accepted.

Note: *The project shall be presented by all group members on or before 31 December 2025. Presentations submitted after the stated deadline will not be accepted under any circumstances. The required equipment, including routers, switches, Windows Server systems, and servers, is available at the Office of the Head of the Computer Science Department. Group leaders are required to formally obtain the equipment from the office prior to the presentation*