Hybrid Smart Building Security & Safety System

PROJECT REPORT

Prepared by: _____
Course: _____
Date: _____

1. Introduction

This project focuses on designing a hybrid smart building system integrating network infrastructure, IoT-based access control, and safety mechanisms. The simulation was developed using Cisco Packet Tracer to demonstrate controlled access, environmental monitoring, and centralized security auditing.

2. Problem Statement

Modern educational and research facilities face challenges including:
1. Unauthorized access to restricted areas
2. Inadequate environmental safety monitoring
3. Lack of real-time notifications during incidents
4. Limited centralized administrative visibility These challenges demand an integrated smart security and safety system.

3. Project Objectives

1. Implement multi-level RFID access control.
2. Integrate IoT sensors (fire, smoke, CO, CO■).
3. Establish a network backbone with VLAN segmentation.
4. Provide event logging and real-time alerting functionality.
5. Support future expansion including automation and remote management.

4. System Design Overview

The design consists of four main layers:
NETWORK LAYER Router (Cisco 2911), Switch (2960-24TT), VLANs
ACCESS CONTROL LAYER Five RFID clearance levels, four controlled doors (Main, Server, Lab, Storage)
IoT CONTROL LAYER One Home Gateway acting as IoT controller
SAFETY LAYER Smoke detectors, CO/CO■ detectors, sprinkler systems, fans

[Insert Screenshot 1 – Network Topology Here]

5. Implementation Approach

• Router configured with hostname, subinterfaces, VLANs, and partial SSH setup • RFID clearance table designed (Security, Lab Tech, Lecturer, Student, Visitor) • IoT devices positioned and configured • Safety sensors distributed across building levels

[Insert Screenshot 2 – Access Control Layout Here]

6. Challenges Encountered

Key challenges included: • IoT devices refusing IP and IoT Server configuration • Authentication options unavailable or malfunctioning • Home Gateway limited in complexity (no scripting, no database) • Unsupported Layer-3 commands in Packet Tracer • Time constraints preventing full automation implementation

7. Conclusion

The project successfully established a functional prototype of a hybrid smart security environment. Even though automatic door logic and real-time notifications were not fully implemented due to software limitations, the structural foundations for an integrated system were completed.

8. Future Enhancements

Planned improvements include: • Complete automation of all door access logic • Integration of centralized logging and monitoring • Real-time dashboard for the security office • Implementation of AAA, RADIUS, and encrypted remote access • Migration to real hardware or cloud-based IoT platforms

[Insert Screenshot 3 – Future Design Diagram Here]