PROJECT REPORT — Hybrid Smart Building Security & Safety System

1. Introduction

Modern institutional buildings require an integrated approach to physical security, access control, environmental monitoring, and safety management. This project simulates a hybrid smart building security system using Cisco Packet Tracer. The goal is to create a controlled environment where only authorized personnel can access sensitive rooms, building conditions can be monitored, and safety mechanisms such as alarms and detectors are implemented.

This project demonstrates the foundational design and partial implementation of such a system.

2. Problem Statement

Educational facilities and research buildings often face challenges such as:

- Unauthorized access to restricted rooms (server room, laboratory, storage).

- Inadequate monitoring of safety conditions (fire, gas leaks, air quality).

- Lack of centralized logging and real-time incident notification.

- Difficulty managing and monitoring the system remotely.

3. Project Objectives

The primary objectives of this project are:

1. Implement multi-level access control using RFID cards and smart door locks.

2. Integrate IoT sensors for environmental safety (fire, smoke, CO, CO■).

3. Design a hybrid building network using a Layer-3 router and switches.

4. Simulate a centralized security office that receives real-time notifications and unauthorized access alerts.

4. System Design Overview

- Layer-3 Router (Cisco 2911)

- VLAN segmentation

- IoT Home Gateway

- RFID-based access control

- Environmental sensors

5. Implementation Approach

Router configured with hostname, VLAN routing, admin credentials, and partial SSH setup. IoT access control logic designed but limited by Packet Tracer's constraints.

6. Challenges

IoT devices rejecting server IP input, incomplete authentication features, Home Gateway limitations, unsupported router commands, and time constraints.

7. Conclusion

The prototype successfully demonstrates the building blocks of an integrated smart security system.

8. Future Enhancements

- Full automation of access control

- Logging and syslog integration

- Real-time security office interface

- Advanced AAA security

- Cloud or physical hardware integration