RFID BASED INVENTORY MANAGEMENT SYSTEM

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ABOUT THE PROJECT

Our project is an RFID-based Inventory managment system.
This system is devised for warehouse employees in warehouses, especially catering in ecommerce that have various sections. RFID is used here for authentication and since this is for general employees, the access to valuable sections like Electronics, Workshop items is granted or denied access as per the RFID.

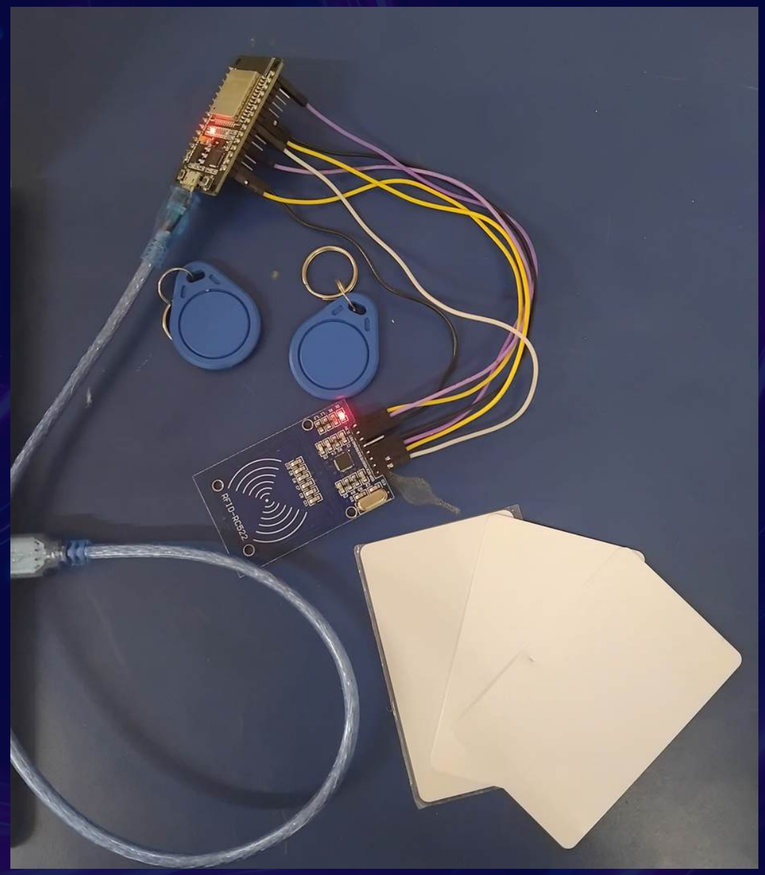
TECHNICAL OVERVIEW

This project is a Level-2 IoT project. We can further integrate the authentication with the internal ecommerce database to validate and identify the amount of goods taken or added to that particular section.

PROJECT SETUP

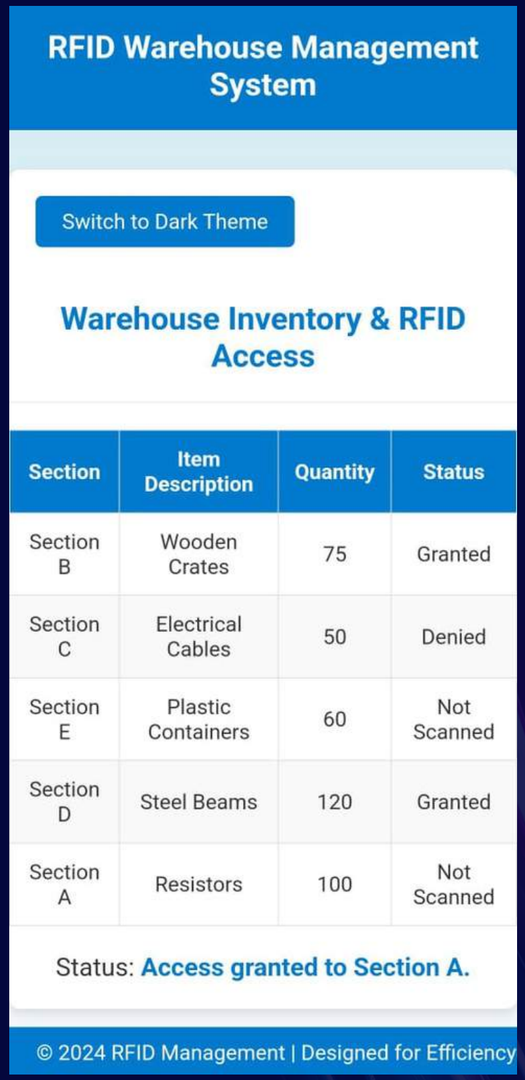
HARDWARE REQUIREMENTS:

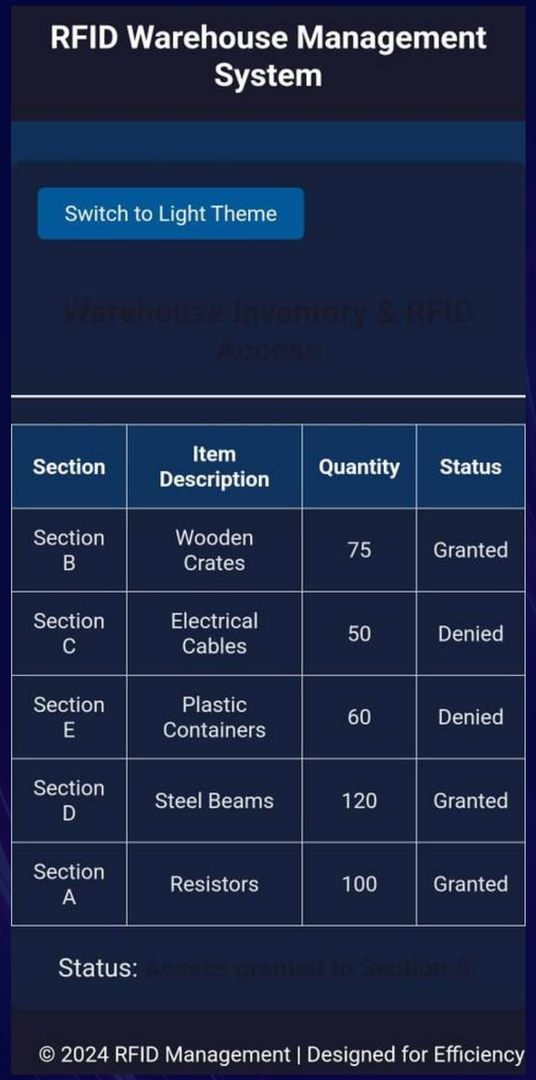
- ESP32: A microcontroller with built-in Wi-Fi capabilities, acting as the brain of the system.
- MFRC522 RFID Reader: To scan RFID tags that control access to specific warehouse sections.
- Relay Module: To simulate the control of devices (such as unlocking doors) based on RFID authorization.
- RFID Tags: Represent the items or users, each with a unique ID.
- Power Supply: Powering the ESP32 and connected components.



SOFTWARE AND LIBRARIES:

1. ***MicroPython***: The programming environment used for the ESP32 in this project.
2. ***MFRC522 Library:*** To interface with the RFID reader module. This library handles communication via the SPI protocol and reads RFID tag information.
3. ***Pin and SPI Libraries:*** From the ESP32 MicroPython package for handling GPIO (General-Purpose Input/Output) operations and SPI communication.
4. ***Network Library:*** Used to configure the ESP32 as a Wi-Fi Access Point (AP), allowing other devices to connect and interact with the ESP32 via a web interface.
5. ***uSocket***: Provides socket programming to set up the web server on the ESP32.





PROPOSED SOLUTION

The solution uses ESP-32 as an access point and when a device connects to its Wifi, they get a data table, ready to be scanned real time. Upon scanning, the section gets added and the system wilil determine whether the access to that section will be granted or not.

PROJECT SCOPE

This project can be scaled to operate on multiple levels of IoT, right from level 2 to level 6. As a level 2 project, it simply determines whether the user is allowed to entire the warehouse section or not. This can be scaled up from both sensors as well as cybersecurity perspective. We can add more sensors, especially those for environment monitoring, especially required for cold chain stores. If this project is used from a wholesaler to a retailer, it can serve as a smart card for shopping by incorporating a payment gateway. We can integrate multiple setups of this prototype with cloud for larger warehouses. From cybersecurity perspective, we can assign different employee and adminstrator roles to card holders, permitting them access to selected sections. It can be integrated with ERP Software for business purposes.

CONCLUSION

This project showcases a robust implementation of an RFID-based access control and monitoring system using the ESP32. It demonstrates the use of IoT technologies for real-time monitoring, secure access, and inventory control. With its modular design and easy integration with web interfaces, this project provides a strong foundation for future development and scaling in warehouse management, industrial automation, or even smart homes.


THANK YOU!