**# GuardianPass RFID - Project Documentation**

**1. Major Moving Parts**

The GuardianPass RFID system consists of the following major components:

* **RFID Authentication Subsystem:** Uses an RFID reader (RC522) to scan unique RFID tags assigned to parents and children.
* **BLE Location Tracking Subsystem:** Employs a BLE module (HM-10 or HM-19) to track the child's position within a predefined area via a mobile application.
* **Visual and Audio Feedback System:** Includes an display (TBD, LEDs (Green for success, Red for failure), and a buzzer to provide real-time status updates.
* **Processing Unit:** The ESP 32 acts as the microcontroller, managing RFID authentication, BLE communication, and feedback mechanisms.
* **Power Supply:** DC power source to keep the system running efficiently.
* **Mobile App :** Provides BLE-based location updates and user alerts for parents or guardians.

**2. Block Diagram**

* Block diagram attached as PDF

**3. Priorities**

**Primary Priorities:**

* Ensure secure and accurate RFID authentication for child-parent matching.
* Provide reliable BLE tracking to monitor the child's location within a designated area.
* Implement clear visual and audio indicators for real-time status updates.

**Secondary Priorities:**

* Develop a mobile app for improved user experience and location updates.
* Optimize power consumption to enhance battery life.
* Improve RFID read accuracy and BLE signal processing for better performance.

**4. Dependencies**

The project relies on:

* **Hardware Components:** RFID reader, BLE module, OLED display, LEDs, Buzzer, Arduino Nano.
* **Software Libraries:**
  + MFRC522 library (for RFID communication)
  + Display Integration (TBD)
  + BLE Communication (TBD)
* **Power Source:** Stable battery or DC power supply.

**5. Architecture: Implementation Options**

**5.1 RFID Authentication Implementation**

* **Option 1:** Store pre-registered parent-child RFID pairs in the ESP 32.
* **Option 2:** Use an external database for storing and managing RFID credentials remotely.

**5.2 BLE Tracking Implementation**

* **Option 1:** Estimate proximity using BLE RSSI (Signal Strength Indicator).
* **Option 2:** Use a dedicated BLE beacon-based indoor positioning system for greater accuracy.

**5.3 Feedback & Notification System**

* **Option 1:** Use only onboard Display and LEDs for real-time notifications.
* **Option 2:** Integrate mobile app notifications via BLE for remote alerts.

**6. Modules for Prototype Development**

To develop an initial working prototype, the following modules will be used:

| **Component** | **Model/Type** | **Function** |
| --- | --- | --- |
| Microcontroller | ESP 32 | Main processing unit, manages RFID and BLE modules. |
| RFID Reader | RC522 | Reads RFID tags assigned to parents and children. |
| BLE Module | HM-10 / HM-19 | Communicates location status with mobile app. |
| Display | TBD | Shows system messages and authentication status. |
| Buzzer | Passive Buzzer | Provides audible alerts for authentication errors. |
| LEDs | Red & Green | Indicates successful or failed authentication. |
| Power Supply | DC Source | Provides portable power for the system. |

**7. Next Steps**

* **Build and test individual modules separately.**
* **Integrate all components onto a PCB for compactness and reliability.**
* **Develop a prototype mobile application for extended functionality.**
* **Optimize power consumption to extend operational lifespan.**

This documentation provides a structured roadmap for developing **GuardianPass RFID**, ensuring a secure, reliable, and efficient child pick-up and tracking system.