

# **Fingerprint Sensor Lock**

**Team 12**  
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## What does it do?

- The user first registers their fingerprint on the device. To access the box, they place their finger on the fingerprint sensor, which sends the input to the processor (Arduino/ESP32). If authorized, the system unlocks the door and displays the message "Authorized". If unauthorized, a message will appear saying, "You are not authorized."
- The product can be used in many different contexts. Homeowners can secure items without keys, preventing unauthorized access. Businesses can use it for office doors, server rooms, or restricted areas, ensuring only authorized staff can enter. Factories and warehouses can secure equipment rooms or sensitive areas, reducing theft and unauthorized entry. Universities, hospitals, and labs can limit access to sensitive information or materials.

## Market Analysis

- People who want to not carry around keys all the time can use this to unlock or enable doors, garages, hatches, etc.
- Competition includes other similar devices such as "Ring" which are electronic types of keys to unlock items. We differ from Ring as we have physical feedback for unauthorized entry attempts.
- Potential selling point is \$25. Price is cheap enough to be widely available to everyday users and materials would be around cost once in mass production. The custom pcb, materials, and labor are the driving factors of why it's priced the way it is.
- Optionally if the customer prefers not to change batteries they can purchase a wall adapter kit for an additional cost, but it will be a battery design from the box.
- Our primary consumers are home and business owners who wish to physically protect their buildings.

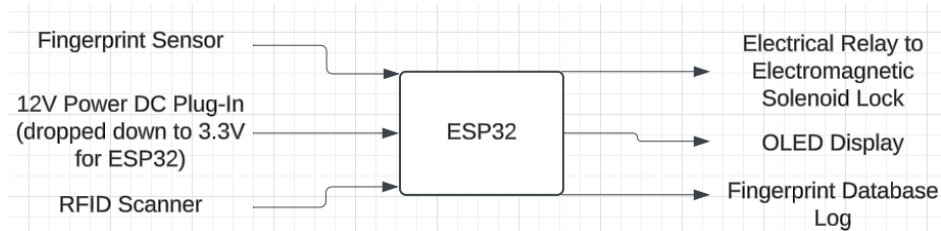
## Requirements

- **Must**
  - Be plugged into the wall for power.
  - Take in fingerprints as input.
  - Accurately read fingerprints and verify if the user is authorized.
  - Display a message upon reading fingerprint
  - Open lock for the user upon activation.
  - Store fingerprint information.
  - Relock itself after 5 Seconds..
  - Have an RFID scanner for 2-factor authentication
- **May**
  - Have an optional battery for power to function without the wall plug
  - 
  - Generate a log whenever the box is accessed or denies entry as a .txt file
  - Have a sleek and visually appealing design.
  - Re-lock the box and return to waiting for fingerprint input after being closed
  - Have cutouts in the housing for the screen and rfid
  - Have mounting points or brackets for stability purposes
- **Should**
  - Include user instructions emphasizing proper use and handling to avoid tampering.
  - Have user interface options for lock box settings on the display
  - Have customizable status updates and alerts for the box owner
  - Have a manual lock in case of technical failure
  - Stand up to repeated attempts of unauthorized forced entry.

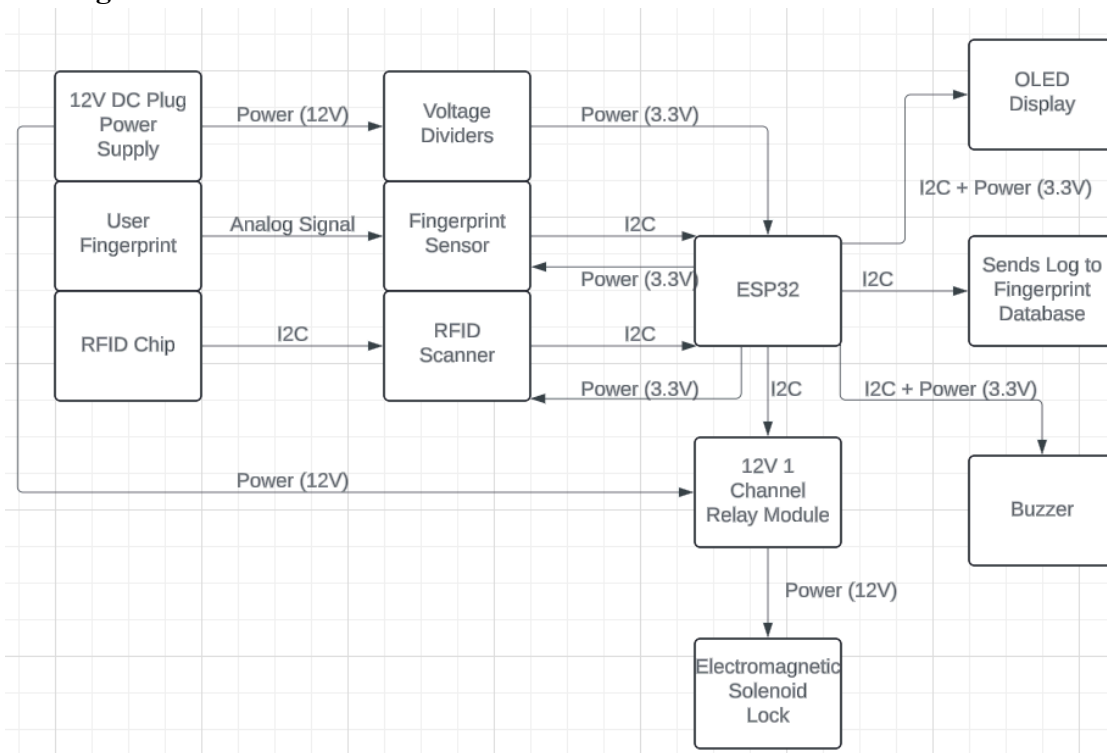
- Have everything be flush with the housing for aesthetic purposes.

## System Architecture

### - Level 0 Diagram



### - Level 1 Diagram



## Design Specifications

- **Processor**
  - ESP32/Huzzah32 Feather
- **Firmware**
  - C/C++ in Arduino
- **Sensor**
  - Optical Fingerprint Reader Sensor Module (R305 O40)
- **Actuator**
  - Display (SPI ST7735S)
  - Locking mechanism (DC 12V Mini Solenoid Lock)
- **Power Supply**
  - DC 12V AC adapter wall plug
  - Onboard 12V battery supply

- Secondary battery supply (Higher Voltage)