SAFETY HUB

TEAM 18
PDR PRESENTATION

University of *Massachusetts* Amherst **BE REVOLUTIONARY**™
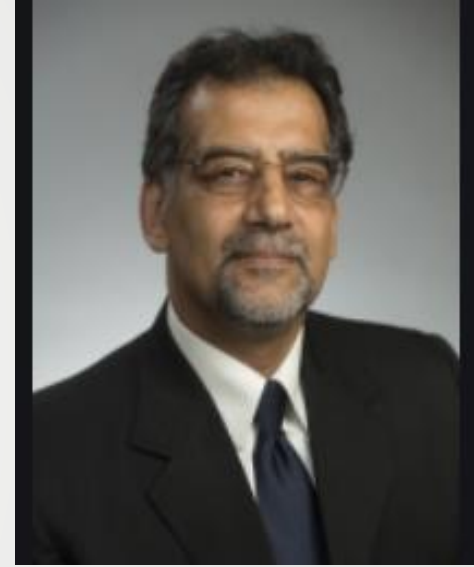
MEET THE TEAM

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PROBLEM STATEMENT

In a laboratory environment there are many sources of damage to sensitive equipment, a majority of which is caused by negligence and can be very expensive to rectify. Modern lab sensors are not programmable to recognize temperature thresholds, and if the temperatures in the lab were to change drastically, the lab owner would not be able to recognize the issue until it is too late, harming processes which require to be run at certain temperatures. Finally, safety of equipment in a lab setting is paramount. Sensors in labs are unable to give live updates of individuals entering and exiting a lab, which becomes a liability to the owner.

OUR PROPOSAL

To counter these issues we propose the 'SafetyHub'.

SafetyHub is a device which aims to be an intermediary between lab safety and the owner. With regular updates to the owner on the status of the lab, the owner can detect and monitor when a problem arises and can be better equipped to deal with the situation.

The SafetyHub will contain the following features:

● An RFID tag reader to keep track of people entering lab

● Heat monitors set at changeable temperature thresholds

Temperature above threshold: 26.5 °C

Temperature below threshold: 24.5 °C

OUR PROPOSAL

● Real-time updates via internet.

● App to keep user connected with the system.

● Ability to store readings from the sensors for a long term duration in case of loss of internet connection.

● Back up battery system to power the device in case of loss of electricity.

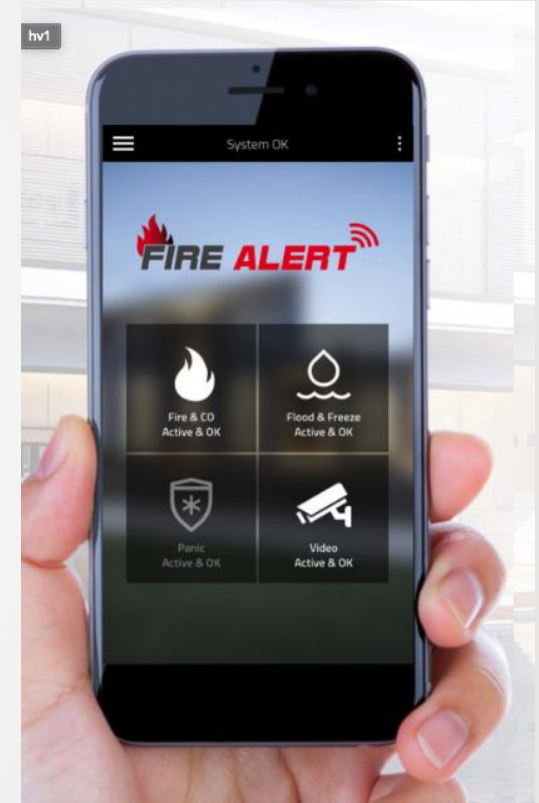# SURVEY OF COMPETING SOLUTIONS IN MARKETPLACE

#1)Fire Alert –

Aims at saving people and pets from

- house fires
- Carbon monoxide poisoning

Used to Minimize damage caused by

- Fire
- Smoke
- Water leaks
- Freezing temperatures.

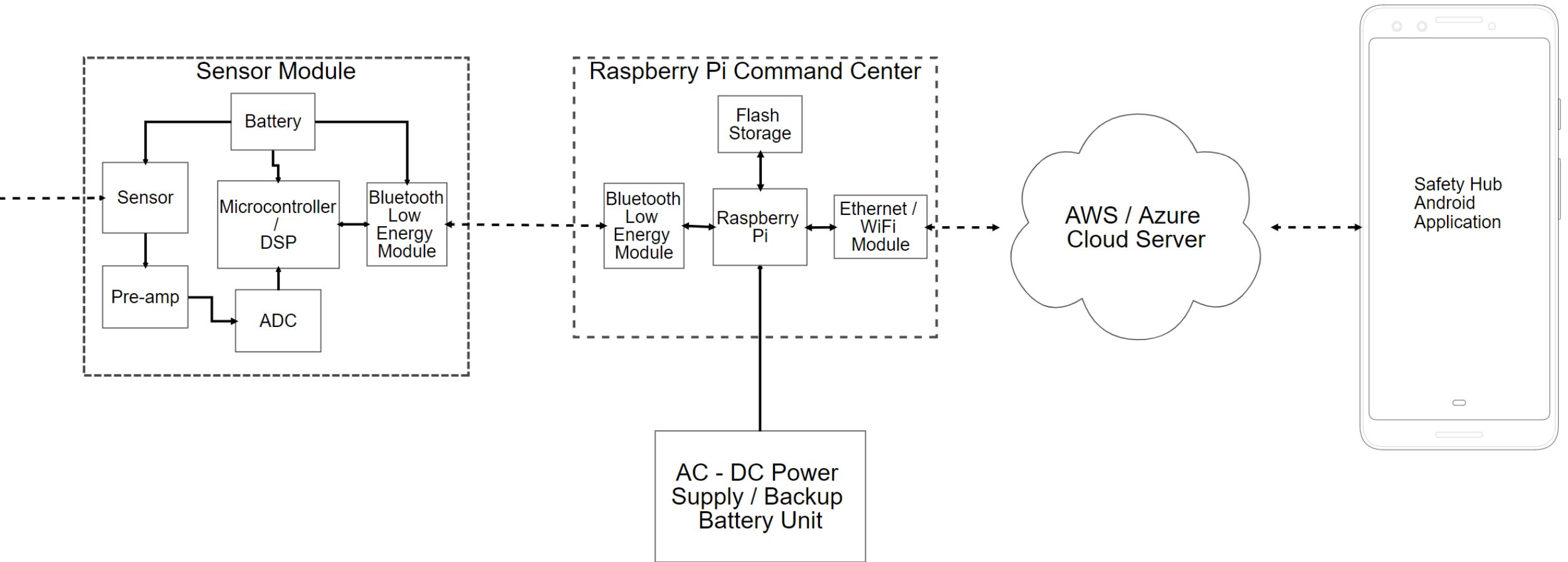# SURVEY OF COMPETING SOLUTIONS IN MARKETPLACE

#2)Temp Stick –

- Powered by Wi-Fi.
- App allows for setting temperature thresholds.
- Periodic updates via app.
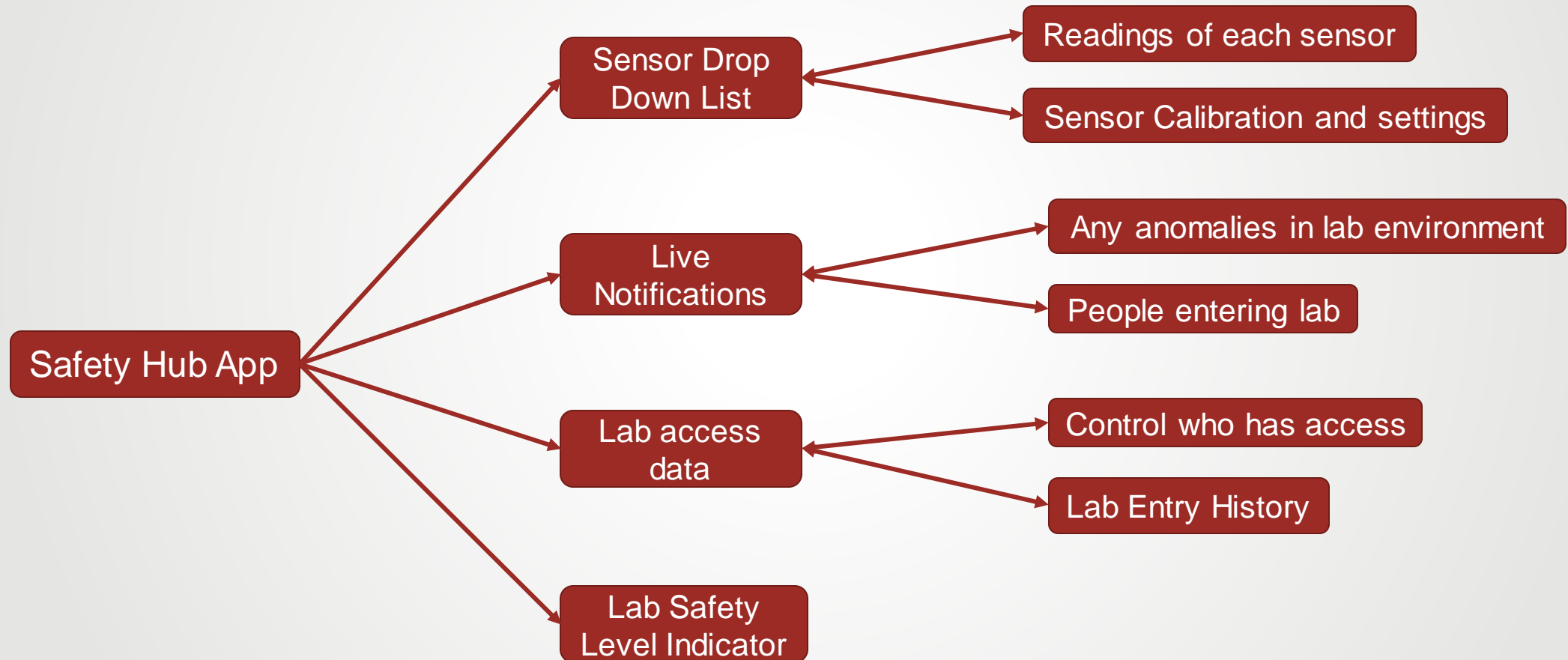- Re-chargeable battery.

PRELIMINARY SYSTEM SPECIFICATIONS

- The device should be portable enough such that it can be mounted to the ceiling or top of fume hood – about 180mm x 60mm and less than 2.5kg (imagine two decks of cards side by side at their longest side)
- The device should be powered from a wall outlet and have a battery backup with enough energy to last one week in case the power goes out
- The device should have user friendly interface to receive notifications and calibrate the connected sensors and devices (app with touch controls)
- The device design should be modular and customizable to customer requirements (each component can be connected through a Bluetooth connection).

SAFETY HUB UI FUNCTIONALITY

Safety Hub App

- Sensor Drop Down List
  - Readings of each sensor
  - Sensor Calibration and settings
- Live Notifications
  - Any anomalies in lab environment
  - People entering lab
- Lab access data
  - Control who has access
  - Lab Entry History
- Lab Safety Level Indicator

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SIGNIFICANT CUSTOM HARDWARE COMPONENTS

Sensors that are required:

- Humidity & Temperature Sensor
- Liquid Level Sensor
- Motion Sensor
- RFID Tag Reader

Micro Computer:

- Raspberry Pi

SENSORS

- Humidity Sensor: A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature.

- PIR Motion Sensor: Detects movement

- RFID Reader: Read information from an RFID tag

MICROCOMPUTER

Raspberry Pi 4

- Single board SOC

- Multicore processor with I/O peripherals

- Ethernet and Wi-Fi compatible, suitable for rapid prototyping

COST ESTIMATE

- **Raspberry Pi 4 Board - $35 x 2 = $70**
- **Temperature / Humidity Sensor - $10 x 5 = $50**
- **64GB SD Card - $20 x 2 = $40**
- **RFID Tag Reader - ($20 - $50) x 3 = ($60 - $150)**
- **Motion Sensor - $10 x 5 = $ 50**

- **Li-Ion Battery (6000mAh) - $20 x 3 = $60**

Total Estimate ~ $405 - $495

MDR DELIVERABLES

Software Component

- App -
  - Home Page UI
  - Sign in Page
  - Sensor Drop Down list with data
  - Lab Safety Indicator
- Raspberry Pi -
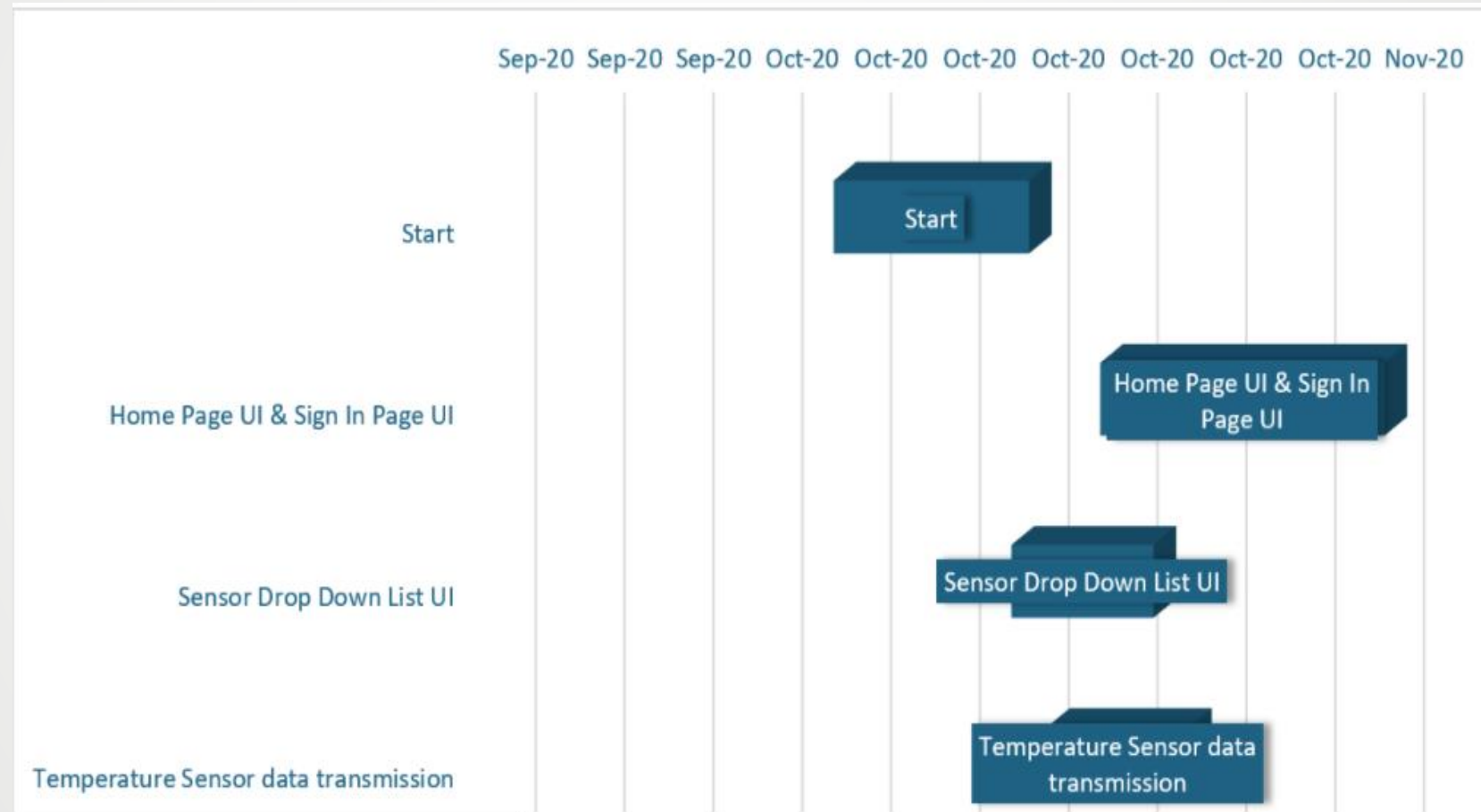 - Reading Data from Sensors
  - Relaying data to cloud

Hardware Component

- Transmit and Receive Temperature and Humidity Data through a Bluetooth Low Energy (BLE) Connection
- Receive PIR Sensor data in through a Bluetooth Low Energy (BLE) Connection
- Setup a Battery backup unit

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PROJECT MANAGEMENT

- **Rohit Draksha (Team Coordinator) – SafetyHub App and RFID Module**

- **Soumark Ray (Budget Management Lead) - SafetyHub App and AWS Cloud**

- **Anthony Panarelli (Altium Lead) – Sensor Signal Processing and PCB Layout**

- **Dhanush Chandra Palarapu - Battery Backup/Power Module and PIR sensor module**

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