Smart Stoves

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Objective

Smart Stoves is an IoT device built for home appliances. Equipped with natural gas detector, it alerts the user via phone application if it detects the presence of flammable gas. Using motion sensor, it can detect if a kitchen is unattended. Using Hall Effect sensor it can detect if an electric stove is on/off. Using the phone application, Smart Hub, it is possible to turn on/off electric stove. Extra functionality includes reading surrounding temperature and determining the air quality. The system is low cost, battery powered and portable.

Problem Statement

Many house fires are caused by natural gas leakage. Often, they are also caused by cooking related tasks. Kitchen equipment left unattended may lead to house fires. According to National Fire Protection Association, the leading case of house fires is cooking related. Majority of these cases, the fire is caused by unattended equipment in the kitchen. Almost 80% of fire deaths are caused by home fires. Smart solution such as Smart Stoves is required to mitigate this problem.

System Parts

Hardware

- MC105 Catalytic Flammable Gas Sensor.
- Panasonic PIR motion sensor.
- BME 280 : Temperature and Humidity Sensor.
- ESP-32 Wi-Fi Module with Built in MCU.

Software

- Embedded Programing: Arduino IDE, Atmel Studio.
- AWS Configuration.
- Android Studio : Mobile Application.
- Autodesk Fusion 360.
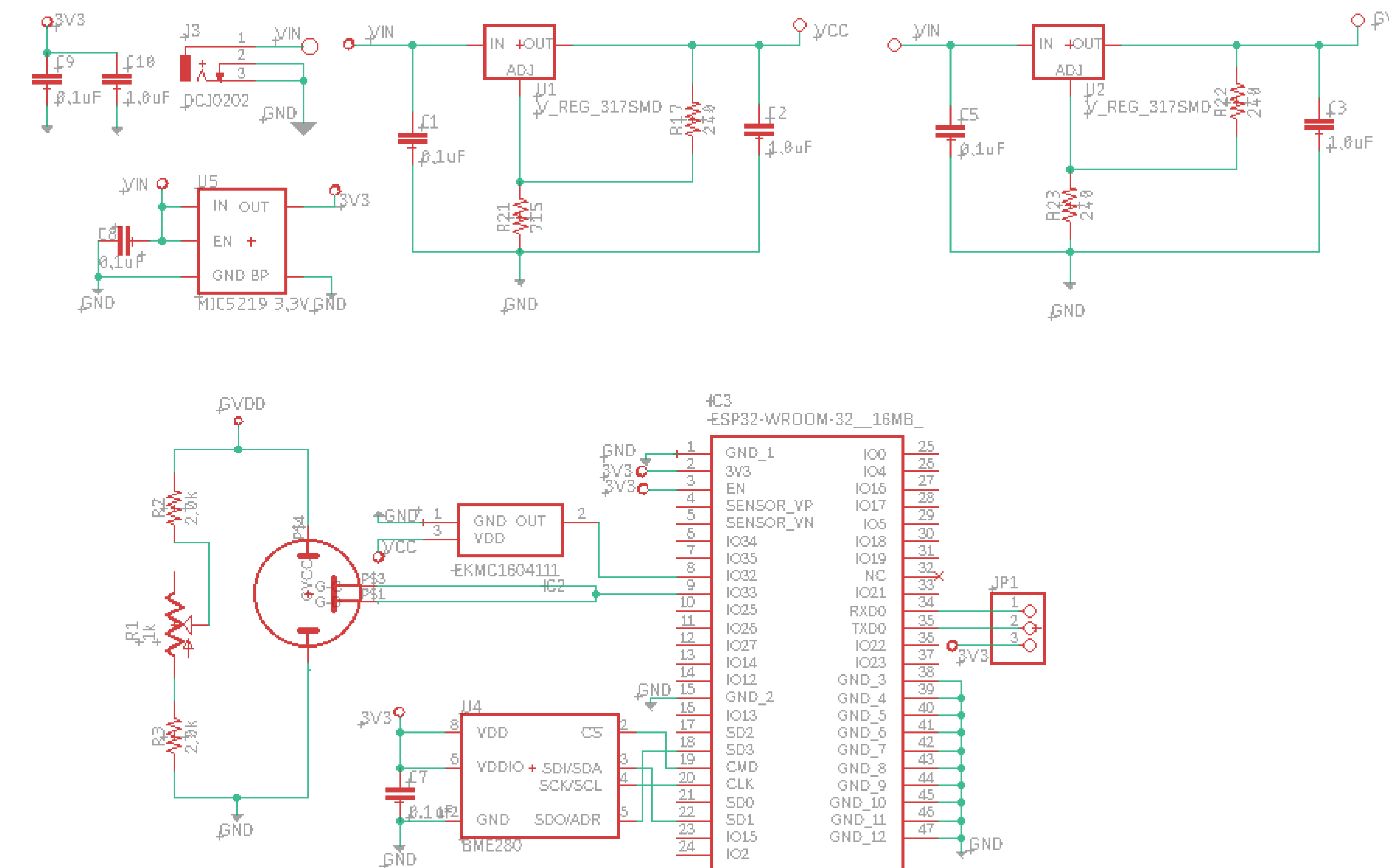- Eagle: PCB Design Software.

Hardware Solution

Fig 1. Top level Schematic

- → Multi-Sensor Nodes connected to ESP-32 Wi-Fi module.
- → LDO used to provide power to individual components.
- → FTDI chip is utilized in programing microprocessor.
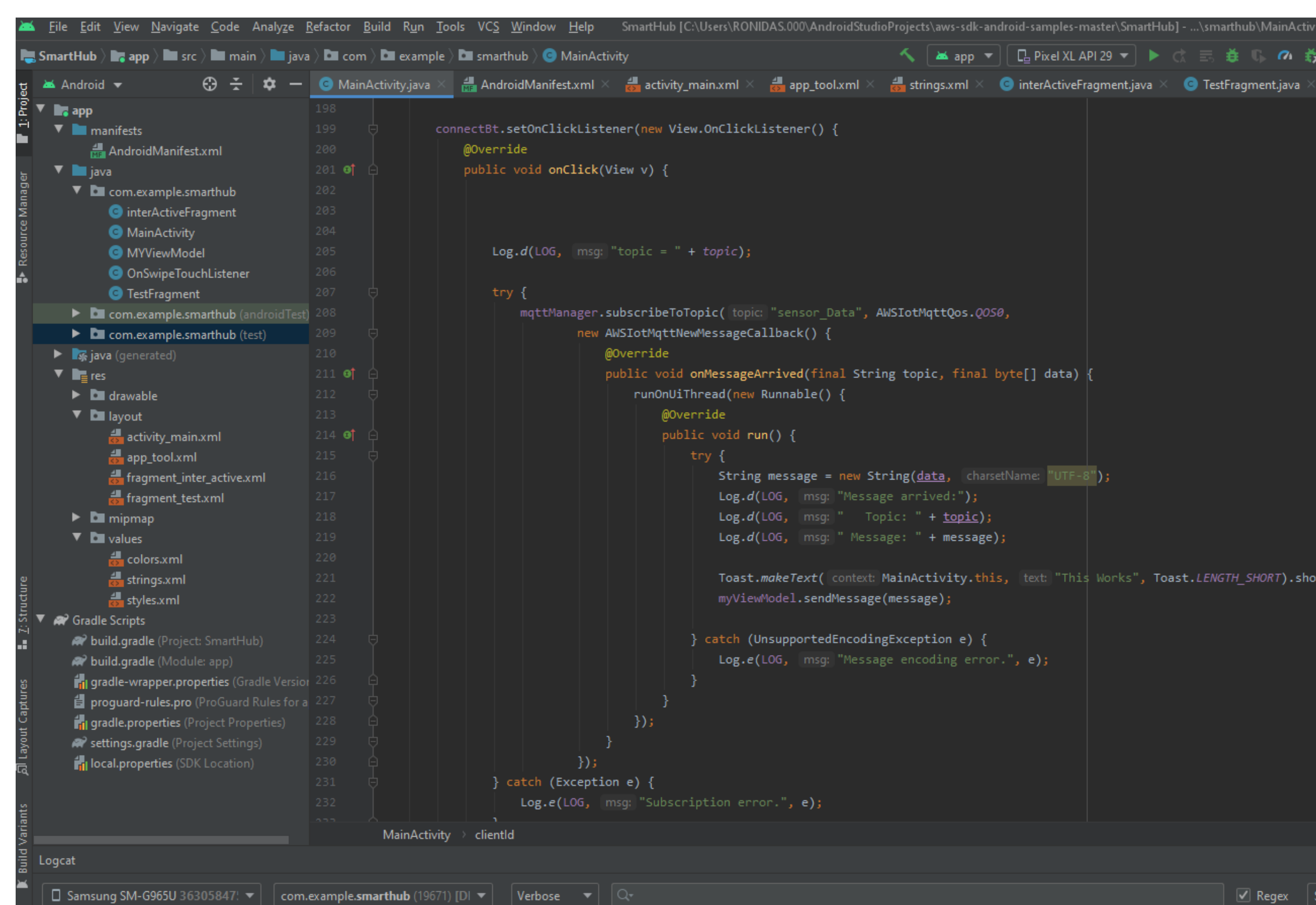
Software Solution

Fig 2.   Android Application Development

- → MQTT protocol is used to connect AWS services.
- → AWS IoT core, IAM Role , Cognito used to offer a serverless backend for application.
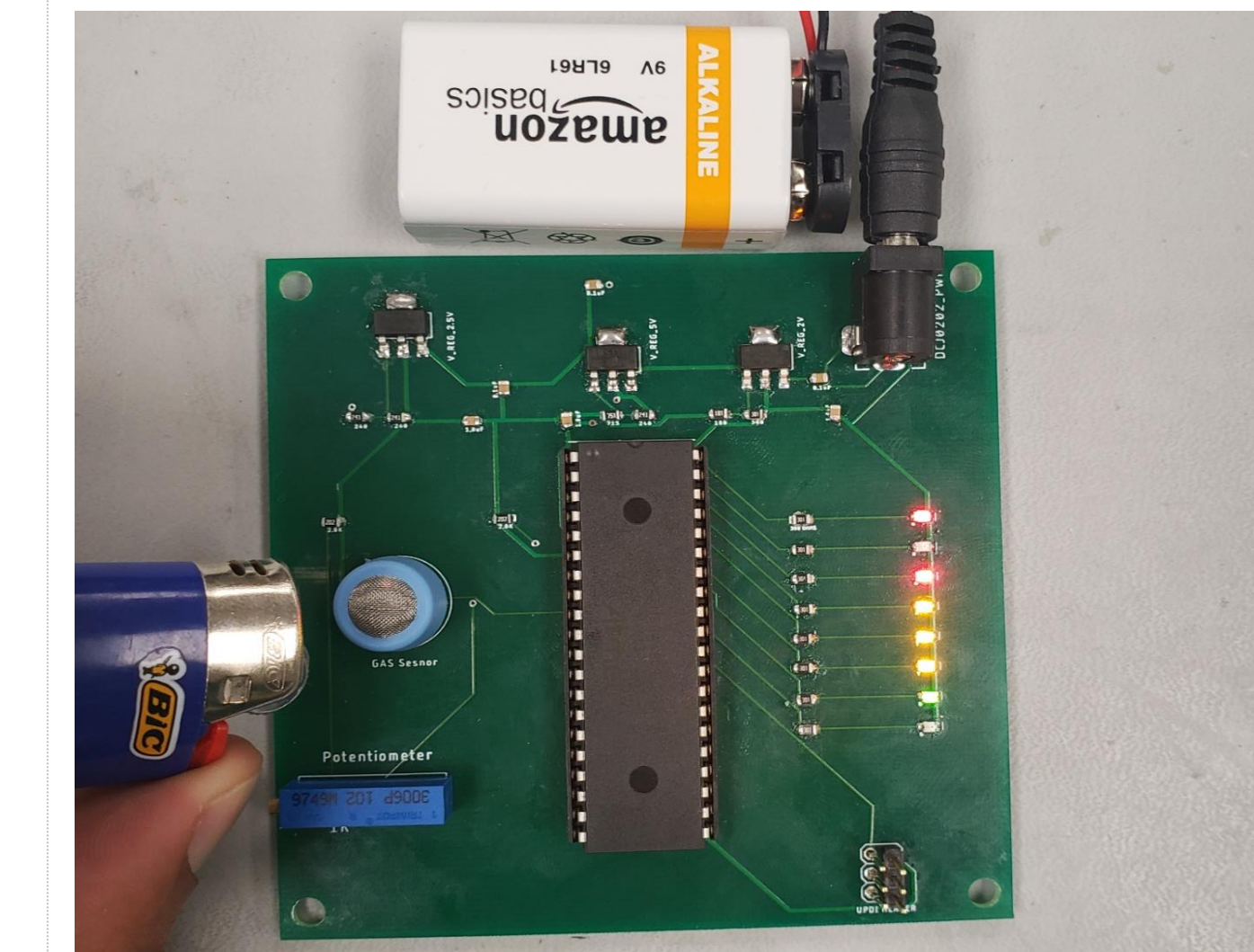
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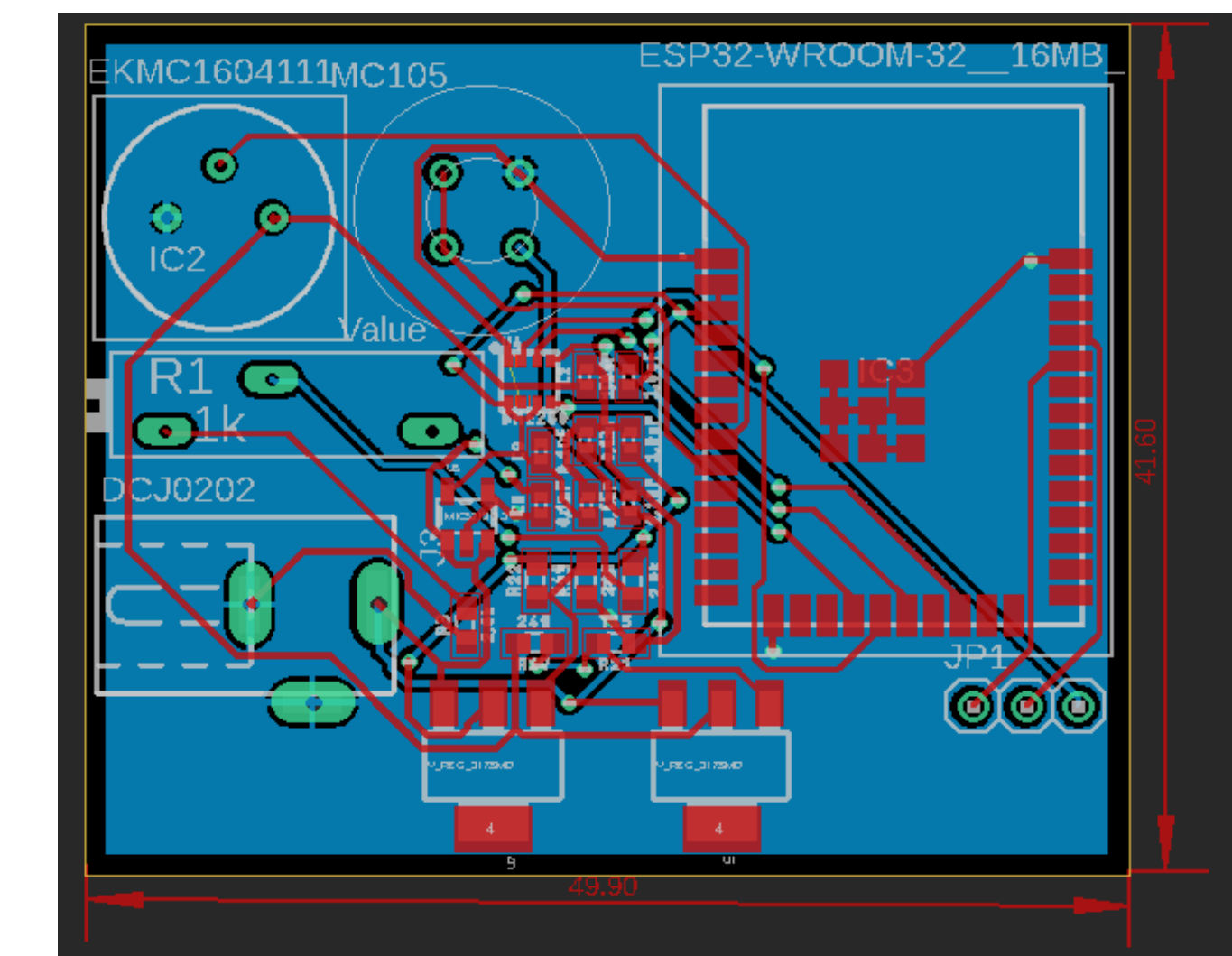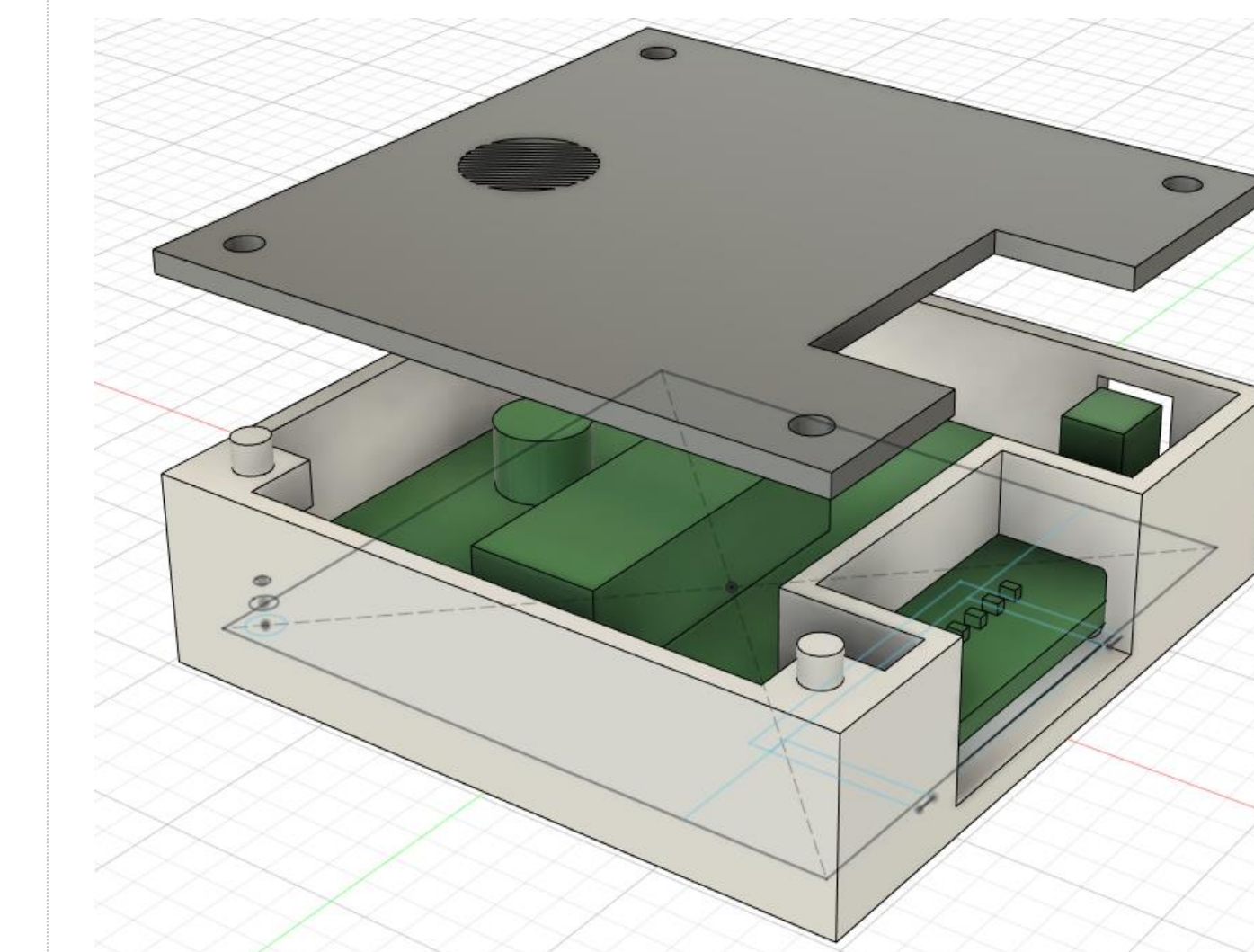

Fig 3. Monitoring System
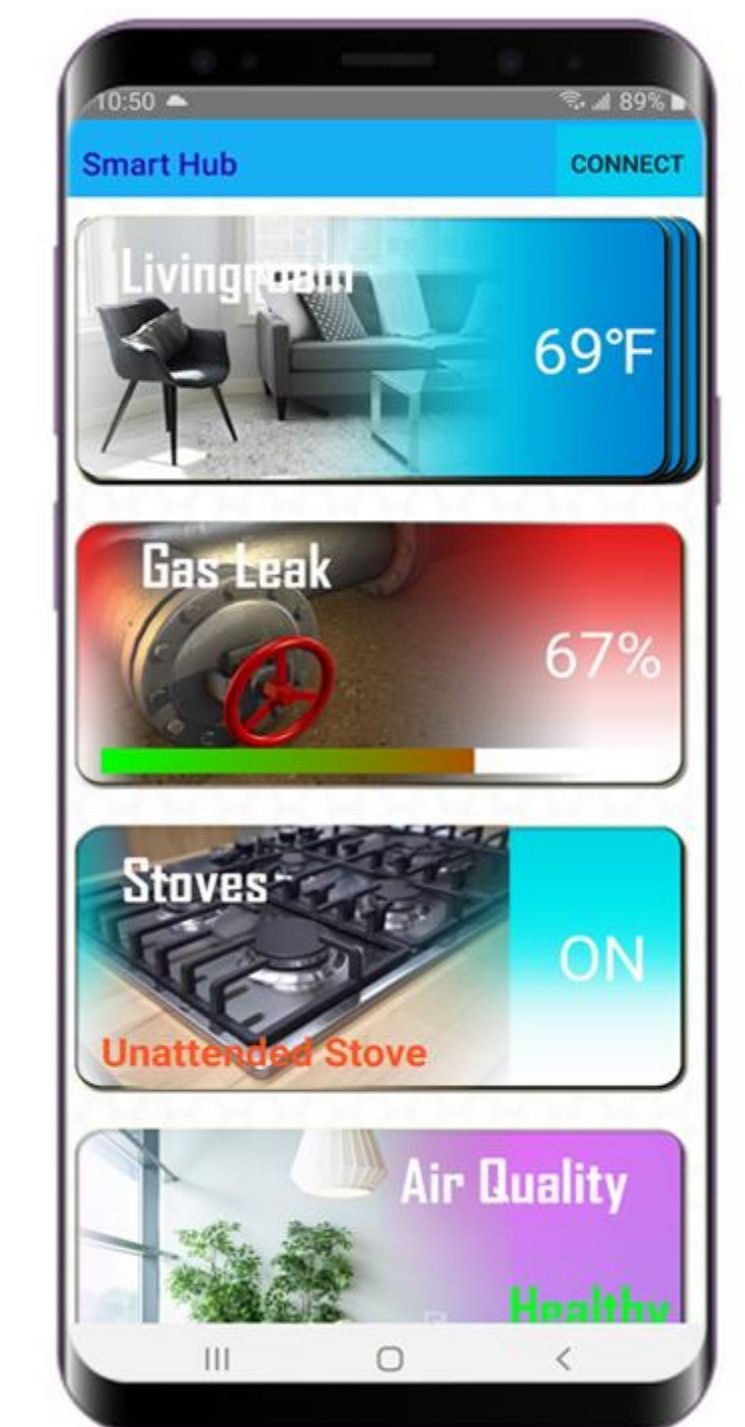

Fig 4. PCB Layout

Fig 5. 3D Enclosure

Fig 6. Smart Hub

- → Small PCB Footprint : 50 mm x 42 mm
- → Multi-Purpose Android Application: Air Quality Monitor, Gas Leak , Room Temperature, Unattended Stove use.

Glossary

IoT: Internet of things.
MQTT: Message Queuing Telemetry Transport.
AWS: Amazon Web Services.
PIR: Passive Infrared Sensor.
PCB: Printed Circuit Board.
LDO: Low-Dropout Voltage Regulator.

Acknowledgement

Team: 404!