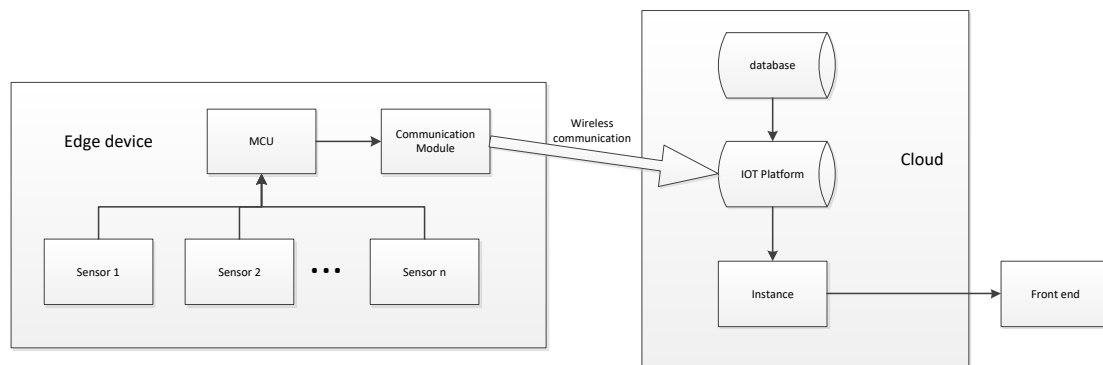# VIP Team MIoT Project

This project requires the team to develop an IoT system to monitor the environment using cutting edge technologies.

Description:

The following figure shows the structure of a viable system. It mainly contains two parts: the edge device and the cloud.

The edge device consists of a Core module which consist a micro-controller (MCU), a communication module and some sensor modules (including thermometer, gas detector etc.). The MCU may control the communication module and sensors via SPI, IIC, UART and GPIO.

The MCU edge device would collect data from the sensors and send it to the cloud via a low-power wide-area network (LPWAN). The data is stored in an IoT platform and an instance can access the data and provide any notification or alarm if required.

The cloud side service is based by GeoSense+ framework contributed by a startup company Redwood Technology. The current version of GeoSense+ framework depends on two public cloud services, Firebase (a Google's mobile and web development platform) and The Things Network (aka. TTN, a global LoRaWan network service). Basically, when a GeoSense+ application starts, it listens to TTN's events to receive messages from firmware, then parse the messages to get data and persist the data to Firestore database, which is a document database inside firebase service.

Requirements:

Design the hardware of the edge device with modular sensors. It is expected that sensors can be assembled or disassembled physically on request (like Lego)

Develop the firmware of the MCU so that the edge device can perform the above functions.

Develop the instance and any front-end program so that the data can be displayed, and the user can be notified when the edge device detects an emergency. An IoT platform will be provided by our industry partner, you are only required to integrate the API of the platform and

develop the server program on application level.

Develop a server application based on GeoSense+ framework to handle network messages sent from TTN and save the parsed data to firestore database.

Research to use local LoRaWan services to replace TTN cloud dependency, see:

https://thethingsstack.io

https://www.chirpstack.io/

Resources:

MCU options:

STM32F1/L1 https://www.st.com/en/microcontrollers-microprocessors/stm32f1-series.html

Arduino   https://www.arduino.cc/

Nrf52832https://www.nordicsemi.com/Products/Low-power-short-range-wireless/nRF52832

LPWAN modules:

Lorawanhttps://www.rakwireless.com/en-us/company/communication-technologies/what-is-lora

NBIOT/eMTC   https://www.quectel.com/product/bg96.htm

Wi-Fi   https://www.espressif.com/en/products/hardware/esp32/overview

Server:

Docker