Nakuja Internship

Avionics Progress Report

Week 2

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Tasks completed last week

- Communication channels
  - [x] [#Issue 40] : Test two reads over I2C
  - [x] [#Issue 41] : Test two writes over SPI (pending)
  - [x] [#Issue 42] : Test speed and bandwidth of I2C and SPI
  - [ ] [#Issue 1] : Data Transmission
  - [ ] [#Issue 43]: Test and receive over LoRa
  - [ ] [#44 Test send image over LoRa]
  - [ ] [#48 Test max distance of LoRa]
  - [ ] [#45 Test speed and bandwidth of LoRa]

Tasks completed last week

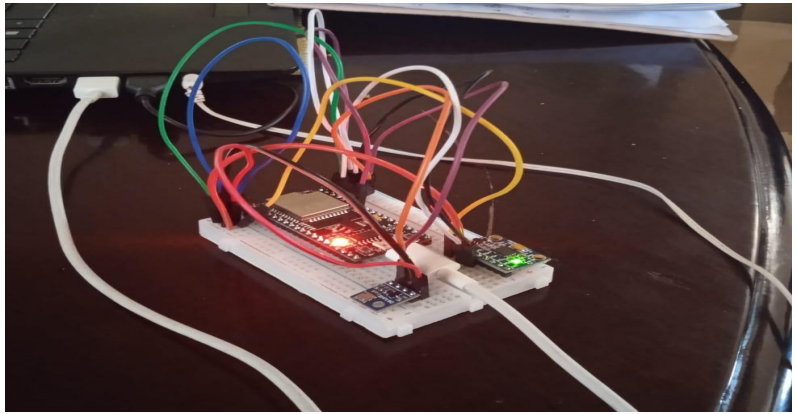
- [#Issue 2],[Issue50] : Research on ground station
- [#Issue 49] : Inquire about JKUAT Satellite (arising issue from [#Issue 1])
- [#Issue 51]: Inquire about GEGIS drone

Communication

- The essence of the issues regarding communication was to find a protocol of sending data (from the manager to on-ground microcontroller) and receiving data (from sensors to on-flight microcontroller) through our entire rocket.
- Data shall be read over I2C and written through SPI protocols.

1. [#Issue 40]- Test two reads over I2C

We connected the ESP 32 through 2 sensors (BMP180 and MPU6050) over I2C and read data over the serial monitor successfully



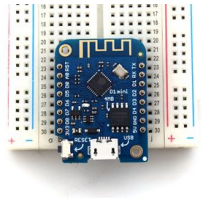
```
/*
This code tests for the addresses and number of slaves
connected to the master
*/

#include <Wire.h>

void setup() {
  Wire.begin();
  Serial.begin(115200);
  Serial.println("\nI2C Scanner");
}

void loop() {
  byte error, address;
  int nDevices;
  Serial.println("Scanning...");
  nDevices = 0;
  for(address = 1; address < 127; address++ ) {
    Wire.beginTransmission(address);
    error = Wire.endTransmission();
    if (error == 0) {
      Serial.print("I2C device found at address 0x");
      if (address<16) {
        Serial.print("0");
      }
      Serial.println(address,HEX);
      nDevices++;
    }
```

2. #43 Test and receive over LORA

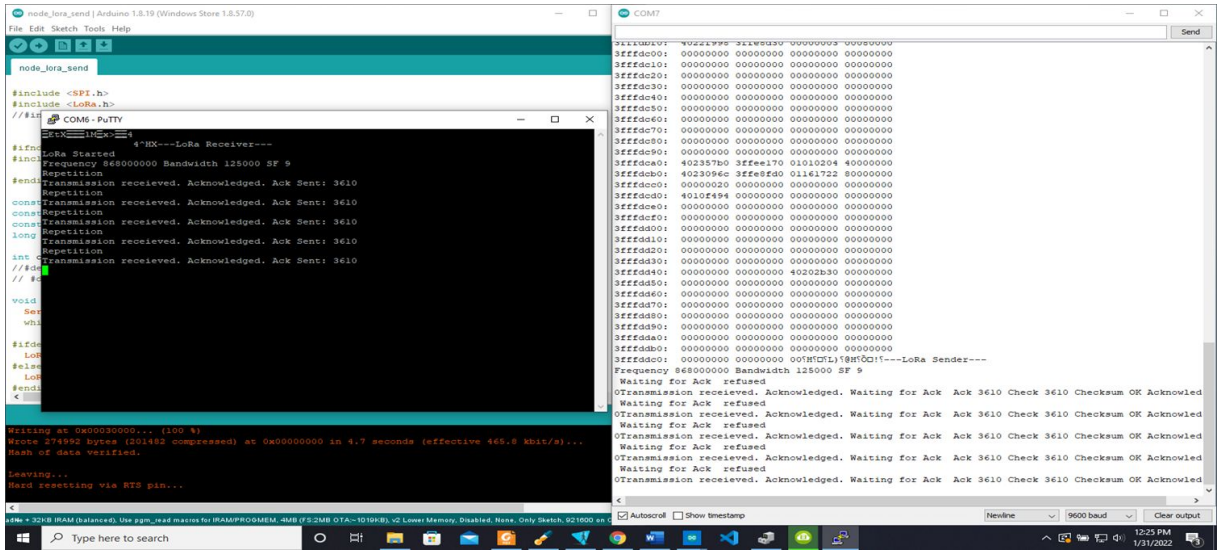
Hardware Used

RF96 LoRa Module

LOLIN(Wemos) ESP8266 board



- We tested the range to be within the apogee limit of N2 which is 500m
- The data recovery was found to be fairly bad in line with our requirements though I did not receive any faulty packets. The message was able to be transmitted as is.
- Speed of transmission was very low which rules out the need to use LoRa For transmission

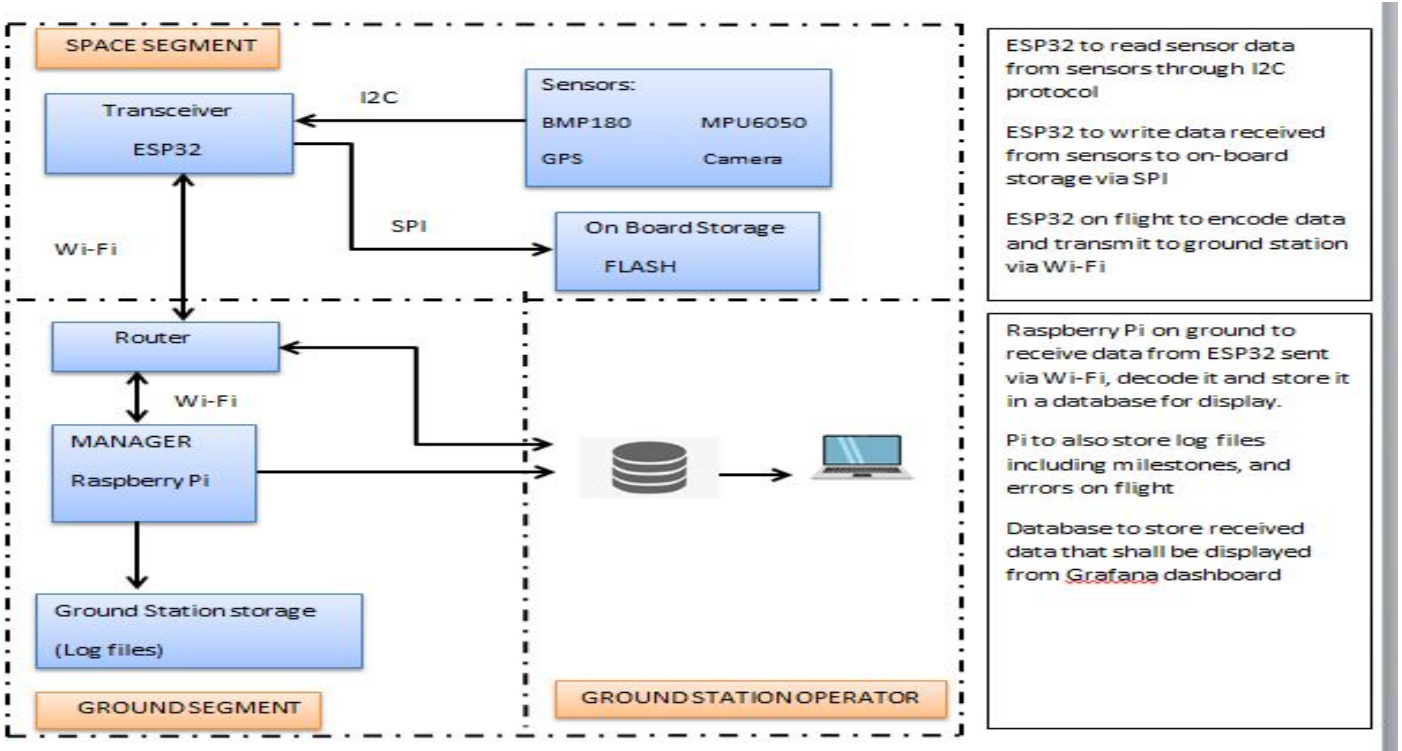


#44 Send and receive image over Lora

- Lora can support JPEG compressed image transmission without loss of data packets
- The downside is that it cannot support video transmission because of very low bandwidth and transmission speed

[#Issue 2]: Research on Ground Station

- A figure of how our ground station shall look like is as shown below



[#Issue 49]: Inquiry on JKUAT Satellite

- JKUAT Tech House is home to a satellite station that receives RF signals from a satellite on the lower orbit and transmits this signal as Wi-Fi through the university.
- On inquiry, we found that the satellite is able to hold speeds of up to 500gb/s, which would work for our high speed requirements for video transmission.
- A point to point bridge connection between Tech house and launch area to be set up, and router to create wi-fi network at said area.

[#Issue 51] : Inquiry about GEGIS Drone

- We approached the GEGIS department to allow use to use their drones for test purposes of the real time relay of data from our sensors and flight computer on the drone to the ground station, prior to launch.
- The drones are available for use , however a KCAA flight regulation policy of flying below 117m should be adhered to.

Tasks in this week

- [#23 Avionics bay design]
- [#18 Launch pad design]
- [#30 Research on camera module]

Timeline

Month	Intern week	Tasks
Jan	Week 1	Onboarding Getting acquainted with avionics and telemetry resources
	Week 2	Research on ground station & ground station dashboard Research on camera module Research on Data transmission
	Week 3	Avionics bay design Launch pad design
Feb	Week 4	Research on apogee detection logic Improve Kalman filter performance
	Week 5	Program Avionics and Telemetry boards
	Week 6	Test the boards
	Week 7	Testing and launch of N2