Phase 3: Development Part 1

This project endeavours to create an efficient and cost-effective air quality monitoring system that leverages cutting-edge sensor technologies and modern data transmission methods. The system integrates various sensors, including the BME280 for temperature, humidity, and pressure measurement, the SI1145 for UV index readings, and the CCS811 for the quantification of carbon dioxide (CO2) and volatile organic compounds (VOCs).

Sensor Selection and Integration:

Sensor Selection:

The project utilizes three primary sensors for air quality monitoring:

1. BME280: A digital sensor from Bosch Sensor Tec that provides temperature, humidity, and pressure measurements.
2. SI1145: A UV sensor manufactured by Adafruit that measures UV index.
3. CCS811: A gas sensor from AMS AG specifically designed for CO2 and VOC measurements.

Sensor Integration:

The sensors are connected to a Raspberry Pi microcontroller. The BME280 is interfaced using the I2C protocol, while the SI1145 and CCS811 are also connected via I2C. The sensors are powered through the Raspberry Pi's 3.3V GPIO pins, and their data pins are connected to specific GPIO pins.

Python code:

```
import time

import requests

import board

import busio

import adafruit_bme280

import adafruit_si1145

import adafruit_ccs811

# Firebase project configuration

FIREBASE_URL = 'airqualitymonitoring-1ad53.firebaseapp.com'

FIREBASE_AUTH = 'AIzaSyA9kVZFHpicT1HrIHSvKuZvP1EFdtN_1yw'

# Initialize the sensors

i2c = busio.I2C(board.SCL, board.SDA)

bme280 = adafruit_bme280.Adafruit_BME280_I2C(i2c)

si1145 = adafruit_si1145.SI1145(i2c)
```

```
ccs811 = adafruit_ccs811.CCS811(i2c)


def send_sensor_data_to_firebase(temperature, humidity,
pressure, uv_index, co2, tvoc):
    data = {
        "temperature": temperature,
        "humidity": humidity,
        "pressure": pressure,
        "uvIndex": uv_index,
        "co2": co2,
        "tvoc": tvoc
    }
    firebase_url =
f'{FIREBASE_URL}/.json?auth={FIREBASE_AUTH}'
    try:
        response = requests.post(firebase_url, json=data)
        if response.status_code == 200:
            print("Firebase Response: Data sent successfully")
        else:
            print("Error in Firebase POST request")
    except Exception as e:
        print(f"Failed to send data to Firebase: {str(e)}")
while True:
    # Read sensor data
    temperature = bme280.temperature
    humidity = bme280.relative_humidity
    pressure = bme280.pressure
    uv_index = si1145.read_uv()
    if not ccs811.data_ready:
        continue
    co2 = ccs811.eco2
    tvoc = ccs811.tvoc
    # Send sensor data to Firebase
```

```
    send_sensor_data_to_firebase(temperature, humidity,
pressure, uv_index, co2, tvoc)


  time.sleep(10)  # Adjust the delay as needed for your specific application
```