Option B: Weather Client - Progress Report

John Maksuta   
Computer Science Department  
CS 370-801  
Colorado State UniversityFort Collins, CO  
jmaksuta@colostate.edu  
  
Ali Fayed  
line 2: *dept. name of organization (of Affiliation)*  
line 3: *name of organization (of Affiliation)*line 4: City, Country  
line 5: email address or ORCID  
Matthew Boin  
line 2: *dept. name of organization (of Affiliation)*  
line 3: *name of organization (of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

*Abstract*—This is the first progress report for the Term Project for CS370-801 for our group 8B. The project objectives and justifications are introduced. Description of the Hardware, Software Environment, Project Design, and Software development. (*Abstract*)

Keywords—component, formatting, style, styling, insert (key words)

# Introduction

The project objective is to develop and evaluate a system built using a single-board computer. The hardware requirement specifications are a single board computer, a sensor device, and communicating with at least one other computer. The single-board computer must have both Wi-Fi and OS boot capability.

Our project will measure, monitor, and report environmental factors, such as temperature, air pressure, humidity, and air quality over the Internet to a client machine. This progress report describes the current status of the project and our intent to evaluate quantitative information about the project. At the end of the project, we will submit a final report and a demonstration of the application we have produced.

We have chosen the Raspberry Pi 3 Model B+ for our single board computer [9]. It is the final revision of the third-generation single-board computer with Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC 1.4GHz processor, and 1GB LPDDR2 SDRAM. They are running the Raspberry Pi OS, formerly “Raspbian”, which is a “Debian-based operating system optimised for the Raspberry Pi hardware” [10].

For our sensor, we have chosen Adafruit BME688 - Temperature, Humidity, Pressure, and Gas Sensor - STEMMA QT [1]. The sensor features the Bosch BME680 Low power gas, pressure, temperature & humidity sensor [2]. Which is a precision device capable of measuring “humidity with ±3% accuracy, barometric pressure with ±1 ℎ𝑃𝑃𝑃𝑃 absolute accuracy, and temperature with ±1.0°𝐶𝐶 accuracy,” and can be used as “an altimeter with ±1 meter or better accuracy!” [1].

# Progress

## Obtaining the Hardware

Due to our remote team location, our team chose to obtain hardware separately rather than having a shared device to develop with. Although working individually, we have the same hardware board and sensor. We chose the Raspberry Pi 3 B+ model computer board [8] and the Adafruit BME680 sensor board [1].

## Software Environment

Identify applicable funding agency here. If none, delete this text box.

We are developing individually using Visual Studio Code IDE, and our code is maintained in a repository on GitHub (<https://github.com/CS-370-801-Fall24-Term-Project/Fall2024TermProject.git>). We are developing directly on the board, through ssh protocol from our development machines.

## Project Design

Identify applicable funding agency here. If none, delete this text box.

Our design has two components, primary and secondary. The primary component of the design is to have a website using a Node.js React client-side with a Java Spring-boot server-side. The server-side code will have direct communication to the sensor using I2C communication to the Adafruit BME680 sensor board. The Java interface to the sensor will use Pi4J to gain access to the GPIO headers on the Raspberry Pi and use I2C communication pins to communicate directly with the sensor board. A client will use the React UI to make a REST API request to the server side that will communicate directly with the sensor and obtain live data, returning it to the client and displaying it to the user.

The secondary design component is an application or service running in the background, separate from the primary component website client-server environment, that polls the sensor periodically and saves data to a database. This allows the client side to make requests to the server for historical data. For historical data client requests, the server side will directly access the same database that the background service will be inserting records into.

## Software Development

Identify applicable funding agency here. If none, delete this text box.

We created the base code for our website using NPX create-react-app template. The server-side base code was created using the Spring Initializer [3]. We added a basic API endpoint using the Spring Framework to demonstrate the technology [4][5]. We created the project for the Adafruit BME680 interface using Pi4J library for communicating using the I2C communication protocol through the computer’s onboard GPIO header pins [8]. This project will be packaged as a JAR and referenced as a dependency in the server-side backend.

# Development

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## Qualitative Analysis 1

Describe the first qualitative analysis here.

## Qualitative Analysis 2

Describe the second qualitative analysis here.

## Figures and Tables

1. John Maksuta’s Adafruit BME680 Sesnor Board and Pi Case.
2. John Maksuta’s Raspberry Pi Board and case, with GPIO header exposed and sensor leads connected.

##### Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

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