EE/CprE/SE 4920 STATUS REPORT 6

04APR2025 – 17APR2025
Group number: sdmay25-04
Project title: Wireless Mesh Network for Pesticide Spray Monitoring and Mapping

Client: Claussen Lab- Iowa State University

Advisor: Nathan Niehart

Team Members/Role:
Software Team

- **Ashley Falcon:** IDEs and Microcontrollers, Group Communicator
- **Drew Scheidler:** Mesh Networking; Note Taker
- **Henry Hingst:** Mesh Networking; Group Leader

Hardware Team

- **Hector Perez Prieto:** Microcontroller; Circuit Design and Testing
- **Yok Quan Ong:** Circuit Design and testing; Microcontroller
- **Wesley Smith:** Circuit Design/Simulation; Microcontrollers; Note Taker

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Period Summary

- Hardware Team Summary:

After a long wait, the hardware team has put together a PCB and have begun working on the test plan. This plan tests many parts and components of our circuit, including voltage regulators, ADCs, and various resistors. We have also begun working on organizing the documentation that we have used thus far in order to help the researchers understand our circuit and the components that are being used.

- Software Team Summary:

The software team has moved into the home stretch of organizing our network scheme. We created code that allows the network to distinguish microcontrollers via addresses, and outlined code for the user interaction over this network. We also implemented directories to organize measurements and data structures better. These structures will simplify the interaction between the hardware and networking prototype on the measurement nodes. Finally, we made leaps and bounds in the final documentation steps of our project in order to create a comprehensive user manual that will be provided to the researchers.

Past Period Accomplishments

Our hardware and software teams met milestones and accomplishments over the past two weeks. Here are our individual contributions:

- Ashley Falcon:
    - Refined ADC code once more
        - Removed interrupts entirely
        - Made changes to accommodate other segments of code, such as including error messages
        - Included universal pin configurations
    - Organized documentation plan for the rest of the semester
        - Made significant changes to the design document
            - Added missing sections
            - Refined old text
        - Planned progress and expectations with the advisor
        - Begin the user manual draw up

- Drew Scheidler:
    - Wrote code to differentiate between MCs by their unique MAC
    - Wrote a device_config file to associate MAC addresses with values to give each MC a unique device ID and sensor ID's
    - Wrote basic skeleton for base node user interaction, only executed if the MC is identified as the base node by device ID
    - Wrote code to create and use a new directory for each recording run
    - Wrote code for hardware team to test each switch configuration

- Henry Hingst:
    - Continued work on have neared completion of the networking prototype from the previous status report
        - Each of the six packet types has been implemented and shown to function correctly
        - Currently there isn't any user interaction with the base station, it just goes through a set of commands to show that they all work
    - Implemented some data structures to store sensor readings, as well as a stack type and functions into the code
        - This will greatly simplify the interaction between the hardware and networking prototype on the measurement nodes
        - Hardware side will push sensor readings onto the stack
        - Networking side will pop readings off to send to the base station

    - Tweaked certain aspects of the project
        - Sensor reading resistance values were originally stored using 16 bits since the ADCs are 16 bits, however we changed this to 24 bits since the calculations from different sensor ranges give us a resistance range of 0 to 300,000 ohms
        - Sensor reading times were originally stored as a 16 bit number that represented how many seconds since recording started had passed when the reading was taken. This has been changed to still be a 16 bit number but now it represents much time has passed since the previous reading, in increments of 10ms.

- Hector Perez Prieto:
    - Helped build one of our PCBs
    - Began working on our Test Plan and testing various parts of our boards
        - Used multimeters to test resistances and voltages
        - Recorded all values in Excel
        - Extensive troubleshooting
    - Hardware documentation for better understanding of our circuit

- Yok Quan Ong:
    - Build one of the PCB
        - Measure the voltage and resistances
        - Troubleshooting ADC that didn't work well on the PCB
        - Record the value that measured
    - Documentation

- Wesley Smith:
    - Helped build one of the PCBs
        - Stenciled PCB
        - Soldered through hole portions
        - Ensured all pieces made it on the board and fit
    - Helped in testing the PCB
        - Measured voltages and resistances to gauge error in the board
        - Troubleshot ADC which needs to be re-soldered

NAME	**Individual Contributions**	**Hours this Period**	**Cumulative Hours**

Ashley Falcon	Documentation organization	**16**	**74**
Drew Scheidler	Main Prototype Work	**29**	**114**
Henry Hingst	Networking Prototype Work	**20**	**82**
Hector Perez Prieto	Test Plan and PCB Testing	**15**	**71**
Yok Quan Ong	PCB Building and Testing	**15**	**75**
Wesley Smith	PCB assembly and testing	**15**	**69**

Plans for the upcoming period

- **Hardware Team**
    - Continue testing our PCB
        - Voltages of certain components
        - Resistance values
        - Making sure the switches are functioning as they should
    - Document all our testing and work on creating a way to relate Voltages and Resistances in each range of our circuit
    - Put together more PCBs and troubleshoot them as needed
- **Software Team**
    - Iron out rough prototype main code
    - Work on putting together networking prototype and main code
    - Start putting efforts towards writing instructions for a user of our system
    - Test code
        - Test ADC driver
        - Test switching
        - Test LoRa

Summary of Weekly Advisor Meetings

- Week 10 (Apr 8)
    - Discussed ordering a new PCB due to ETG error
        - ETG ordered the wrong board
        - Will cause delays
    - Went over updates in testing plan
    - Determined next steps for the software team
        - Create directories for data collection
        - Write code for each switch configuration
        - Determine unique identifiers

    - Start documentation to avoid pile-up
- Week 11 (Apr 15)
    - Hardware Team
        - Continue working on and troubleshooting our boards
        - Organized and put together documentation for our circuit and the components on our boards
    - Software Team
        - Start writing instructions for the user
        - Resistance reading changed to 32 bit int
        - Figure out how to convert from float to 32 bit int
        - Ranges need to be fixed