



(WIP) Self Sufficient Routing Module for Mesh Sensor Network

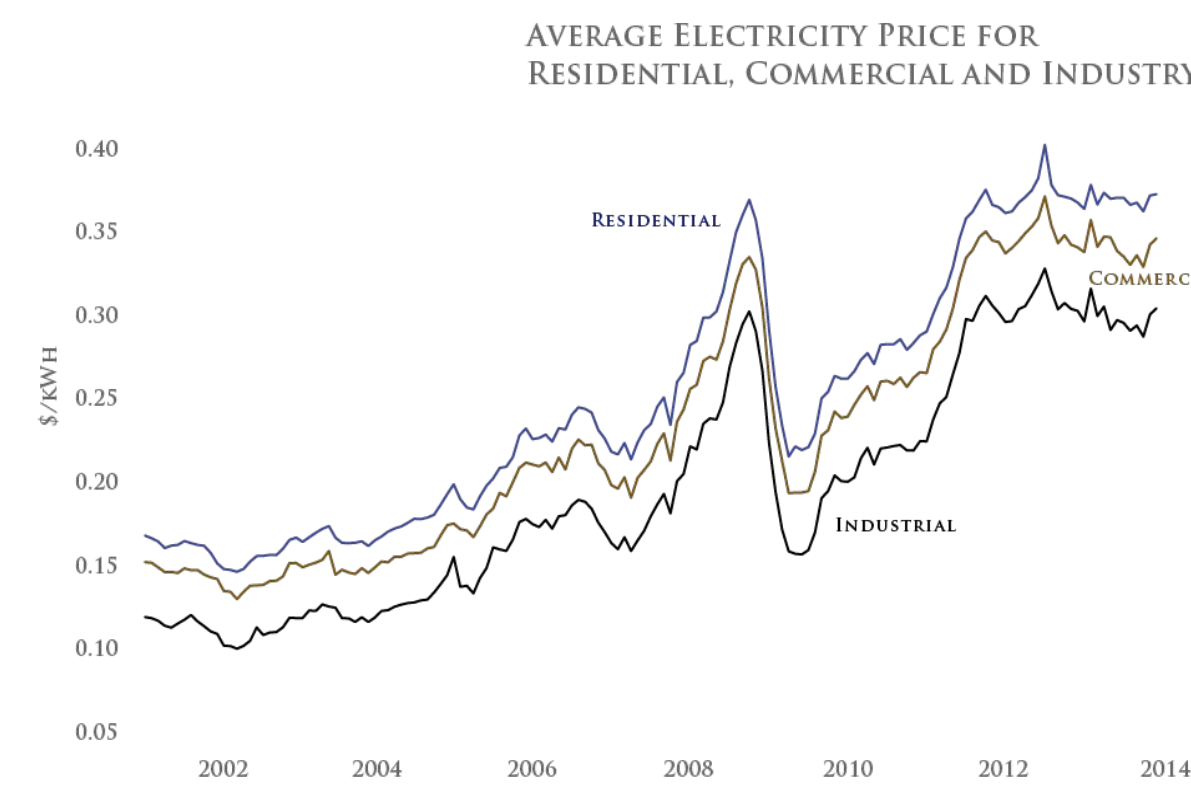
Smart Campus Energy Lab (SCEL)

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Introduction & Motivation

- In 2012, the University of Hawaii at Manoa (UHM) paid **\$35 million** electricity. Despite the implementation of energy efficient measures, UHM paid **\$34.3 million** for their electricity bill in 2014, due to the fact that the price of electricity per kilowatt hour has increased greatly.
- To address this concern, SCEL is developing a **wireless environmental sensor network** to collect data on various weather characteristics, such as solar irradiation, temperature, humidity, and pressure, across the UHM campus. This data will be used to forecast solar irradiation patterns and determine optimal places to install renewable energy sources on campus.
- This project aims to develop a communication module that acts as a router to relay meteorological data collected from weather boxes.



Source: University of Hawaii Economic Research Organization

Design

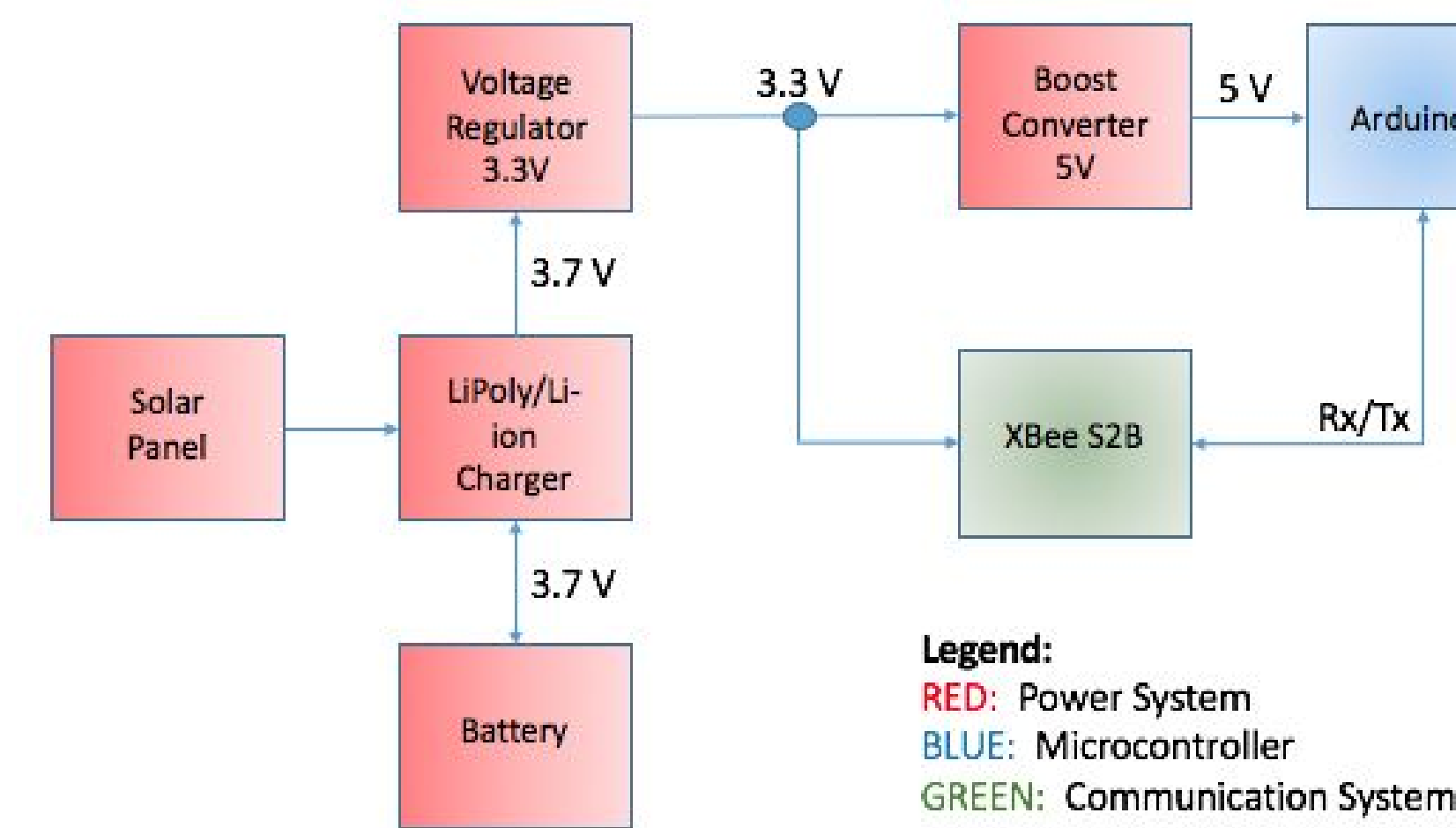


Figure 3: Overall block diagram of system

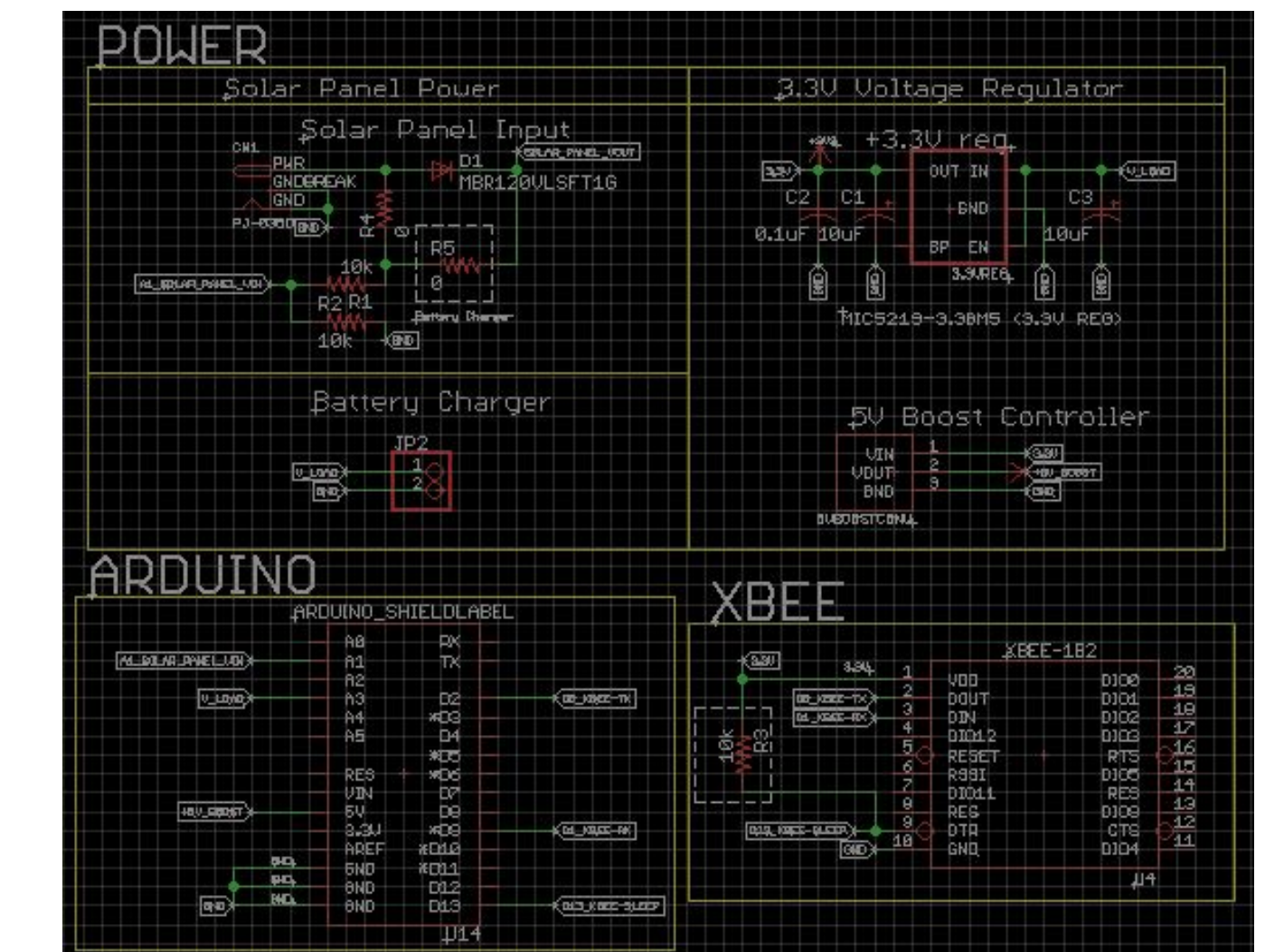


Figure 4: Eagle schematic of sub systems

Project Description

Objective: Design a communication module to relay meteorological data collected as well as behaving as a router.

- Extend communication range for weather boxes
- Communication between weather boxes under different weather conditions
- Develop a low cost and reliable communication module that is connected to all weather boxes within range
- Documentation of final design, results, issues and solutions
- Passing down current work to future members

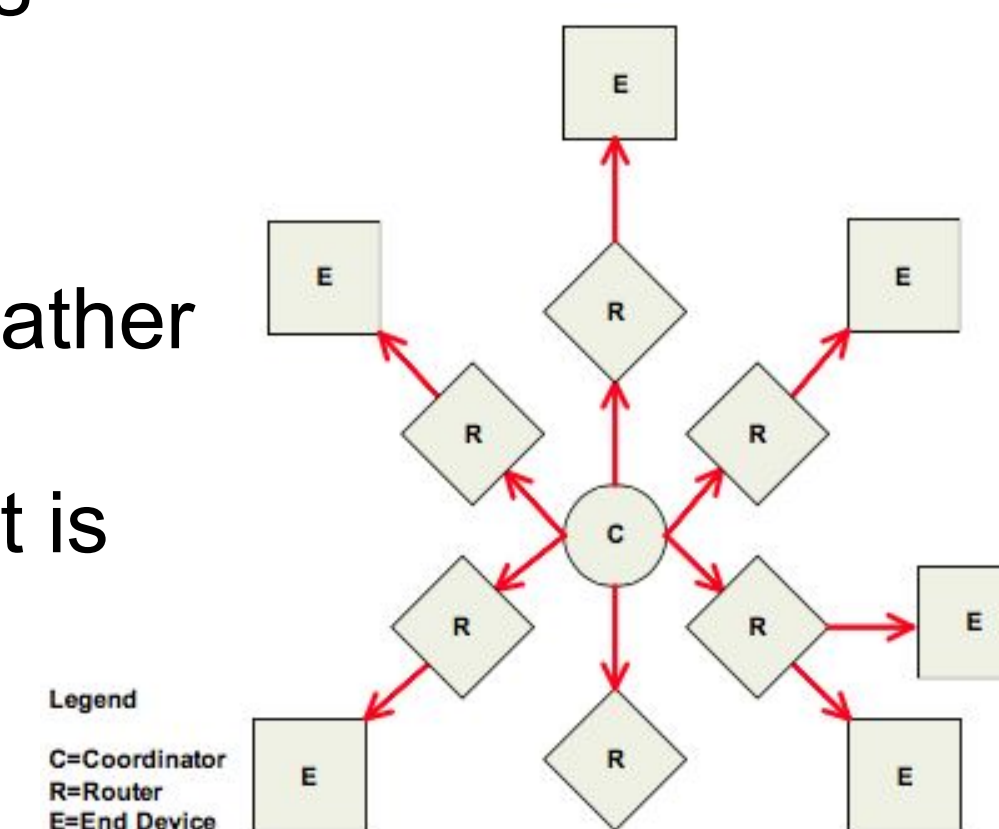


Figure 1: Broadcast data transmission diagram

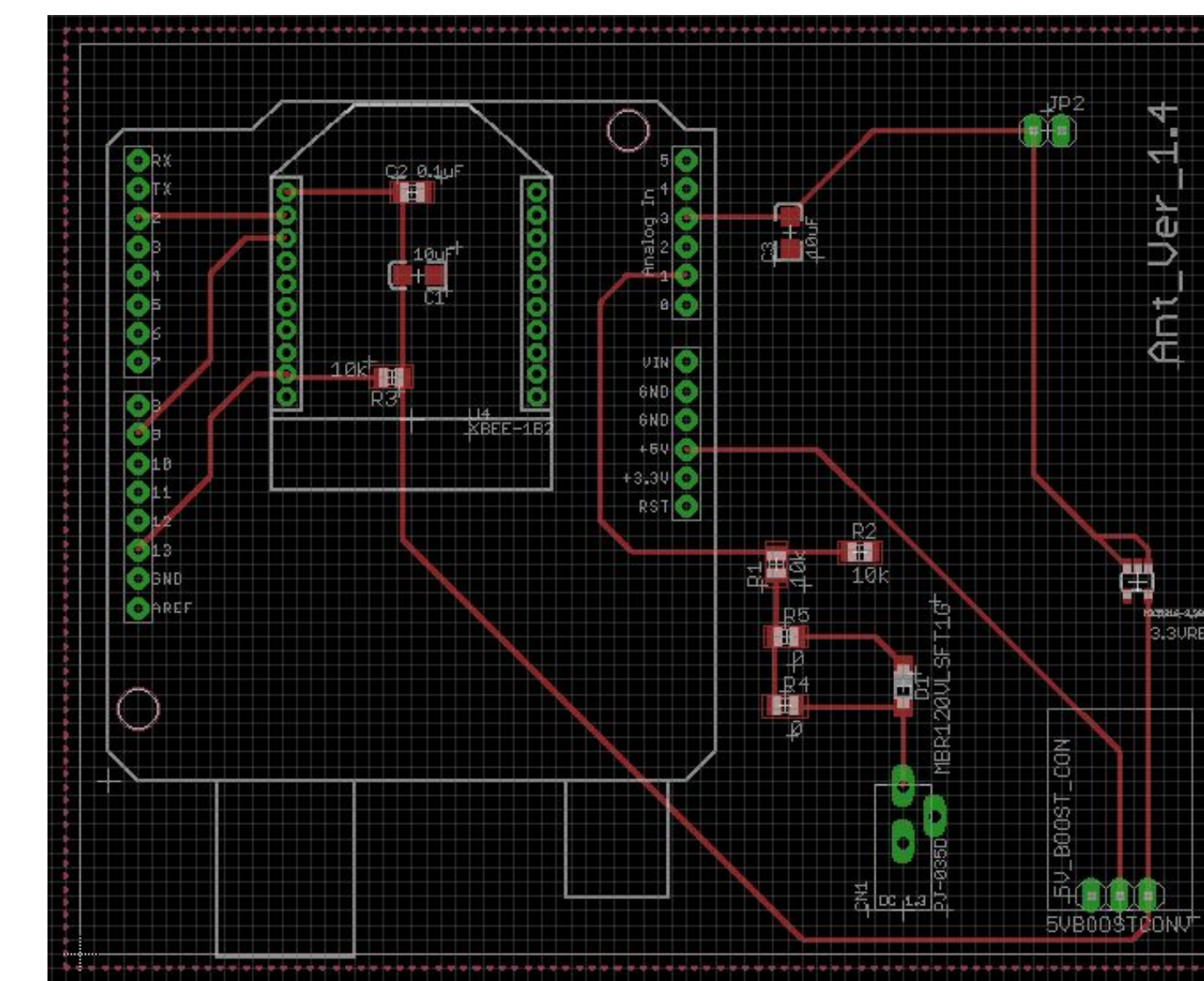


Figure 5: 4th version PCB board schematic

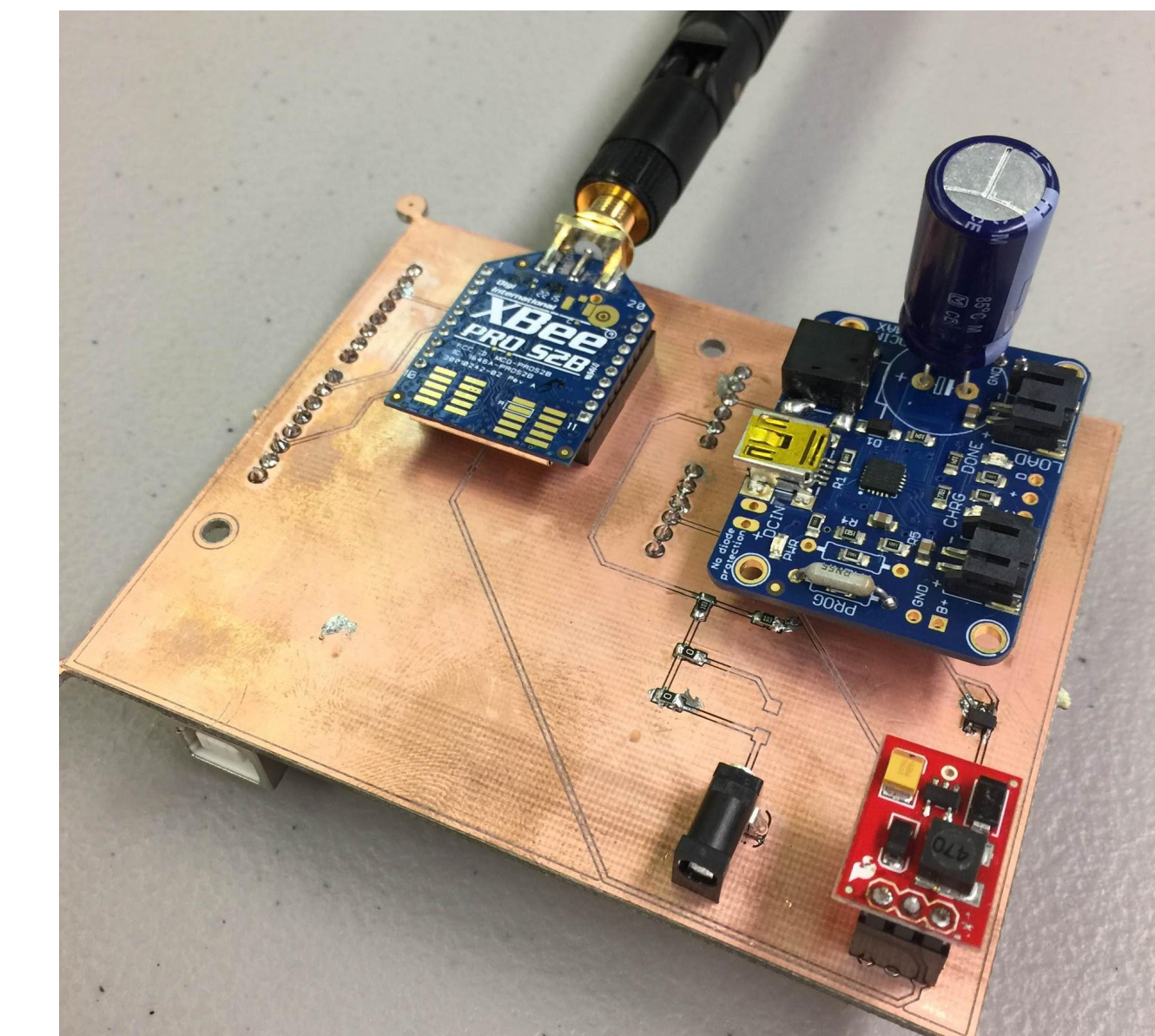


Figure 6: Fabricated PCB board

Results

- Redesigned previous weather box's circuit schematic to reduce complexity
 - Removed sensor components, a voltage divider and an ON/OFF switch
- Configured 2 Xbee S2B as coordinator and router
 - Coordinator connected to computer act as data transmitting module
 - Router setup on breadboard act as receiving module
- Successful data transmit and receive on both module
 - Xbee communication tested 50m apart

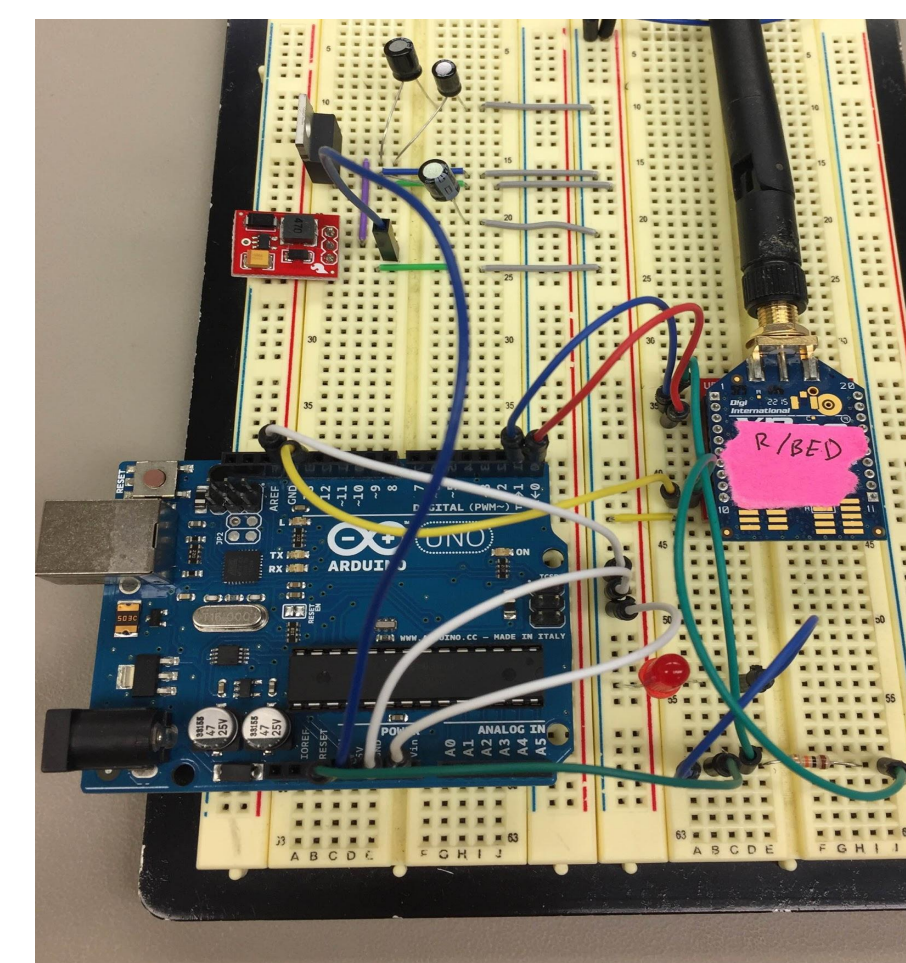


Figure 2: Breadboard prototype testing Xbee communication

Conclusion

- Key results**
 - Designed communication module to relay data collected
 - Reduced complexity by removing components that weren't needed
 - Design functional within 900m indoors and 2 miles outdoors
- Future work**
 - Use another microcontroller such as the ATmega ACU
 - Less functionalities, smaller in size ⇒ Reduce complexity, cost
 - Deployment and test data transmission

22	21:21:27.109	17	Remote Command Response
23	21:21:27.109	15	Remote AT Command Request
24	21:21:27.209	16	Remote Command Response
25	21:22:03.945	16	Transmit Request
26	21:22:04.021	7	Transmit Status
27	21:22:06.836	16	Transmit Request
28	21:22:06.931	7	Transmit Status
29	21:22:07.921	16	Transmit Request
30	21:22:07.994	7	Transmit Status

Figure 7: Data packets transmission log

Acknowledgments

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