Cranberry

EE396 Final Presentation

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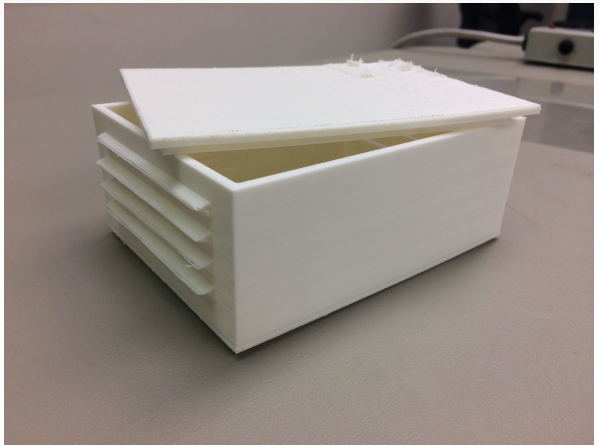
Overview

- Motivation & Goals
- Overall Design
- Block Diagram
- Problems and Solutions
- Progress
- Planned Improvements
- Remaining Work

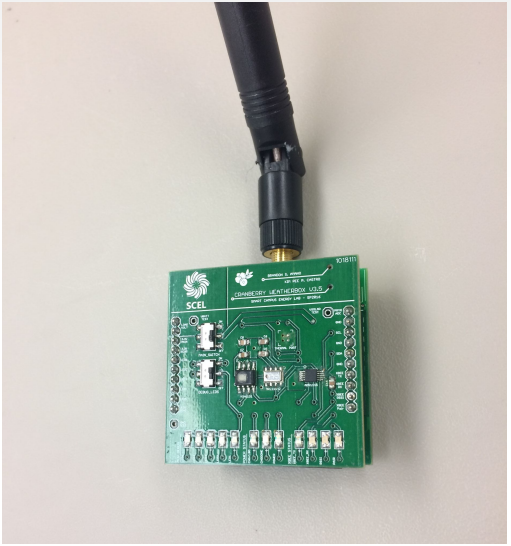
Team Motivation

- Improve hardware of first generation weatherbox
  - Create more efficient power system
  - Reduce size
  - Lower cost



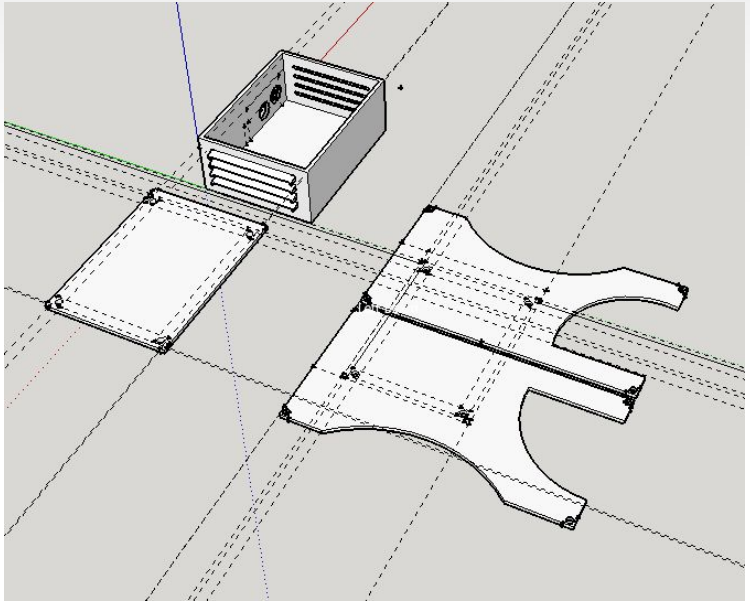
Semester Goals

- Understand Cranberry (parts, connections)
- Create housing design
- Test, debug, and deploy Cranberry 3.5
- Design a new Cranberry board



Overall Design

- 2” X 2” stacked boards
- Top: Sensor Board
- Bottom: Main Board
- Housing Design
  - Two main parts: box and panels
  - Mounting piece



Block Diagram

Power Budget

Device Name	Ave. Current (mA)	Max. Current (mA)	Ave. Power (mW)	Max. Power (mW)
XBee Transmit	15.02	220.00	49.57	49.57
XBee Receive	0.00		0.00	0.00
Barometer	0.01	0.01	0.02	0.02
Humidity	0.33	1.00	1.07	3.30
+3.3V V. Reg.	0.18	0.90	0.58	2.97
ATEMEGA	1.20	2.70	3.96	8.91
ADC	0.08	0.30	0.26	0.99
Total	16.98	225.81	56.04	68.73

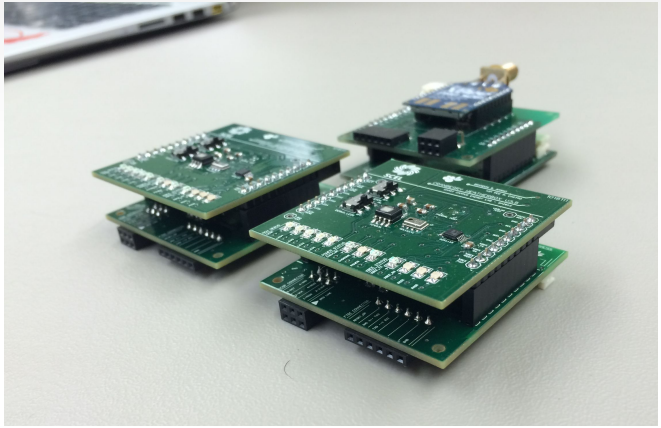
Bill of Materials

#	Part Name	Unit Cost	Quantity	Sub-Total
1	Solar Irradiance Sensor	$235.00	1	$235.00
2	PCB Manufacturing Costs	$30.00	2	$60.00
3	6V Solar Panel	$59.00	1	$59.00
4	Solar Irradiance Leveling Plate	$35.00	1	$35.00
5	3.7V Lithium Ion battery	$29.00	1	$29.50
6	XBee Pro S2B	$29.00	1	$29.00
7	Humidity Sensor	$15.13	1	$15.13
8	Polarized 470 uF Decoupling Capacitors	$2.26	5	$11.30
9	External Temperature Sensor	$9.95	1	$9.95
10	Solar Irradiance ADC	$6.51	1	$6.51
11	Barometer Sensor	$5.10	1	$5.10
12	Status and Debugging LEDs	$0.38	12	$4.55
13	ATMEGA328P MCU	$3.70	1	$3.70
14	XBee Pin Headers	$1.48	2	$2.96
15	Polarized 2.2uF Decoupling Capacitors	$0.69	4	$2.76
16	Mechanical Sliding Switches	$1.37	2	$2.74
17	Miscellaneous Discrete Components			$17.74
	Cranberry v3.5 Total Cost			**$529.94**

18	GPS Receiver GP-20U7	$15.95	1	$15.95
19	RTC Module	$14.95	1	$14.95
	Cranberry v4.0 Possible Total Cost			**$560.84**
20	GPS Module Copernicus II DIP	$74.95	1	$74.95
	Cranberry v4.0 Possible Total Cost			**$604.89**
21	Adafruit Ultimate GPS Breakout	$39.95	1	$39.95
	Cranberry v4.0 Possible Total Cost			**$569.89**

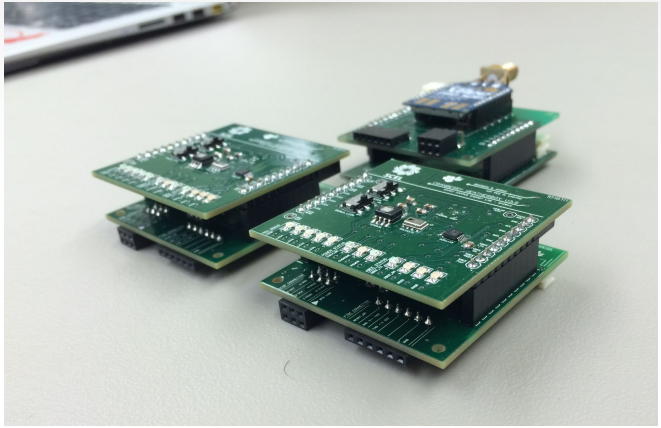
Problems & Solutions

- Wrong Clock
  - Changed to 8Mhz
- Inaccurate sensor readings
  - Resoldered Barometer
  - Rewired solar irradiance
- Battery voltage reading
  - Voltage divider



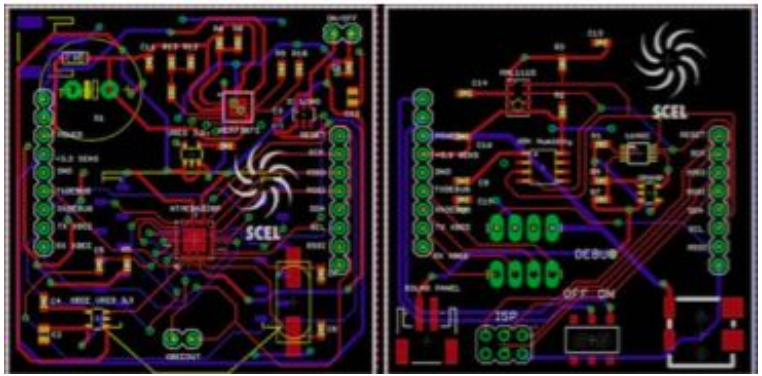
Problems & Solutions

- No voltage to XBee
  - Voltage regulator enable tied to XBee Sleep ON/OFF
- Solar panel & cover flew off box
  - Need to redeploy Cranberry 3.5



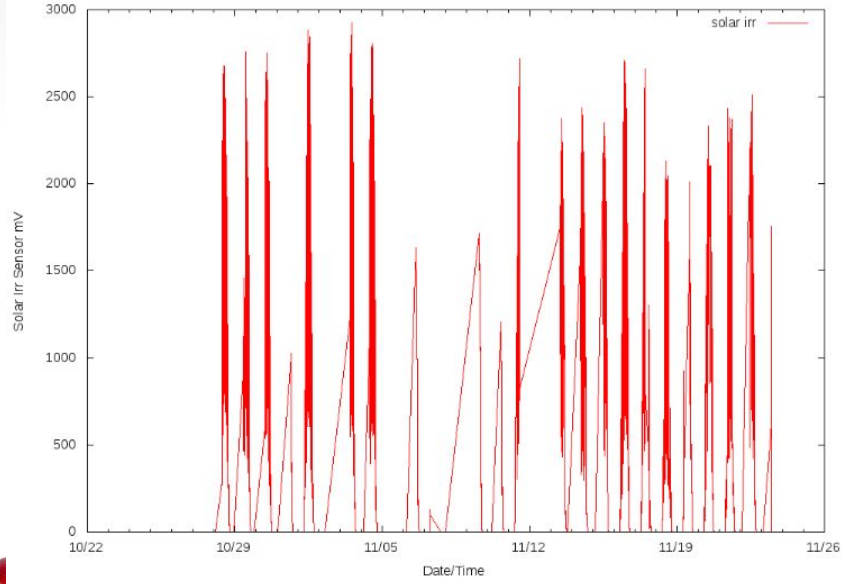
Progress

- Deployed Cranberry v3.5 Red
- Planned board improvements
- Retested Cranberry v3.5 Red, ready to redeploy
- Almost finished Eagle schematic
- Almost finished populating another Cranberry 3.5

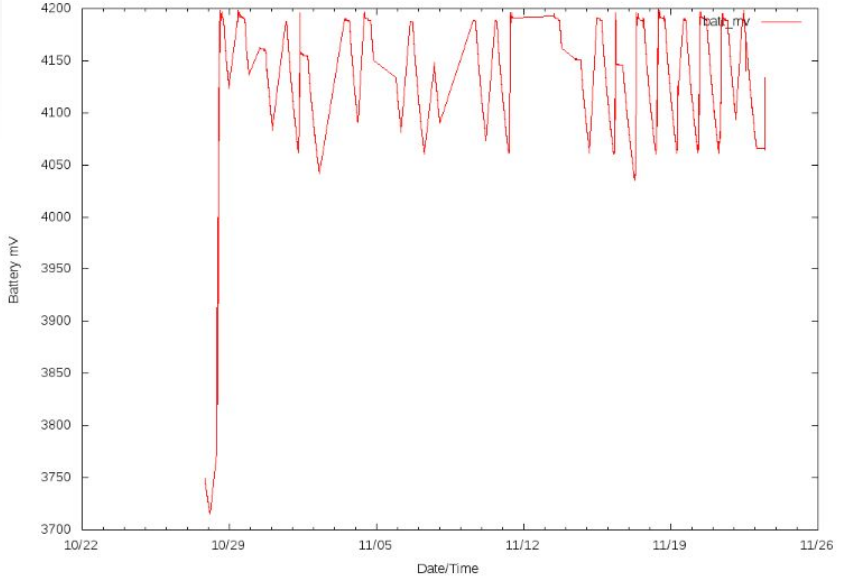


Cranberry Data

Solar Irr



Battery Voltage

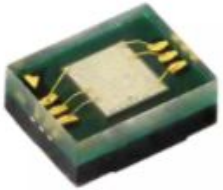


Updated Schedule

	10/3	10/10	10/17	10/24	10/31	11/7	11/14	11/21	11/28	12/5	Finals
Finish Debug 3.2 & 3.5	X	X	X	X							
Deploy				X							
Research Improvements				X	X						
Making Parts on Eagle					X	X					
Building 2nd Board						X	X				
Design Schematic								X	X		
396 Paper										X	

Planned Improvements

- Add GPS and Real Time Clock
- Make PCB bigger (2.5 X 2.5 in.)
  - Create new parts, packages, and schematics
- Add more test points for debugging
- Keeping the charging chip



GPS Comparisons

Copernicus II DIP (12 Channel)

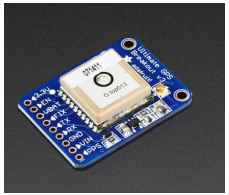
- Real time clock that works in standby mode
- 3.3 volts
- Header pins
- Requires an external antenna
- Expensive

GPS Receiver - GP-20U7 (56 Channel)

- Standby mode
- Needs an external real time clock
- 3.3 volts
- jst connector
- Cheaper

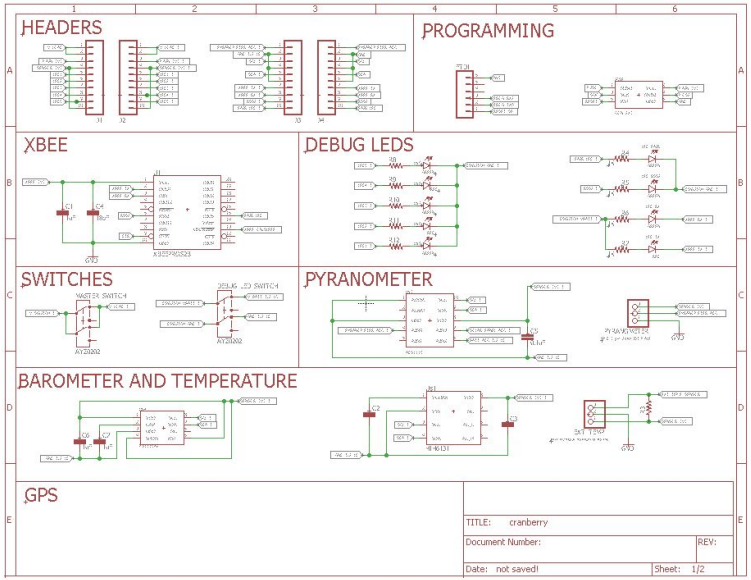
Adafruit Ultimate GPS Breakout - 66 channel w/10 Hz updates - Version 3

- Standby Mode
- Needs an external real time clock
- 3.3 volts
- Medium cost



Remaining Work

- Redeploy Cranberry 3.5
- Complete the new board design for Cranberry 4.0



Any Questions?