Cranberry
EE496 Final Presentation

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Overview

- Motivation & Goals
- Overall Design
- Block Diagram
- Housing Design
- Power Budget and BOM
- Semester Progress & Final Status
- Problems and Solutions
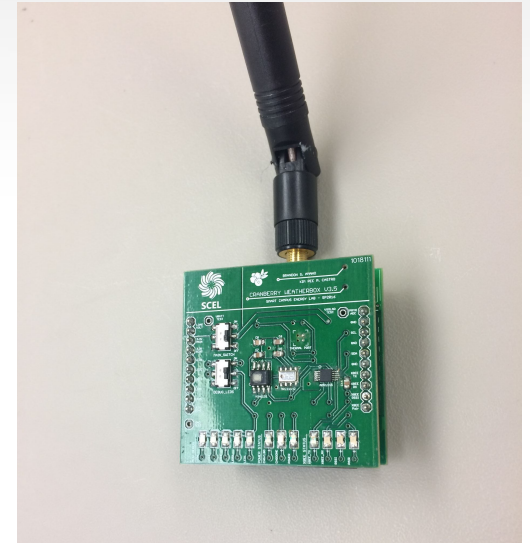- Remaining Work & Future Improvements

Team Motivation

- Improve hardware of first generation weatherbox
  - Add functionality
  - Lower cost
- Deploy Cranberry 4.0

Semester Goals

- Deploy Cranberry v4.0

- Fix design problems (Cranberry v4.1)

- Populate Cranberry v4.1

Overall Design

- 2.25" X 2.25" stacked boards
- Top: Sensor Board
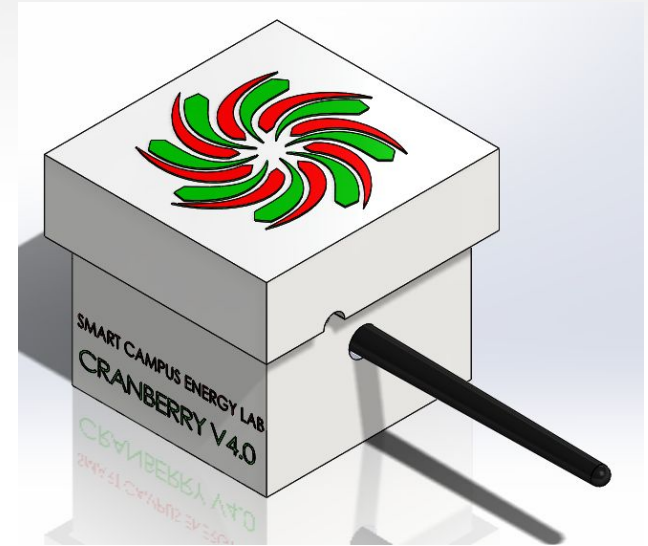- Bottom: Main Board
  - GPS and RTC

Block Diagram

Housing Design

- New housing design by housing team
  - Printers broken
- Bought commercial housing for immediate deployment

Power Budget

Device Name	Idle (mA)	Typical Current Draw (mA)	Max Current Draw (mA)
XBee Transmit	15.00	205.00	220.00
XBee Receive			
Barometer	0.01	0.01	0.01
Humidity (HIH6031)	0.00	0.65	1.00
V. Reg 3.3V (Main)		0.35	0.90
V. Reg 3.3V (Xbee)		0.35	0.90
Atmega 328P MCU	0.70	1.70	2.70
Irradiance ADC	0.01	0.15	0.30
Irradiance Op Amp		0.80	2.20
Adafruit GPS (MTK3339)		20	
RTC (DS3231)	0.11		0.2
Total Current Draw (mA)	15.83	229.01	228.21
Supply Voltage (V)	3.30	3.30	3.30
Total Power Consumption (mW)	**52.23**	**755.72**	**753.08**

Cranberry Data

time_received	schema	node_addr	uptime_ms	batt_mv	panel_mv	apogee_w_m2	temp_ck	humidity_pct	press_pa
2018-04-19 18:45:42.689888	2	9	439753175	3532	3027	5	29820	74	309710
2018-04-19 18:45:12.307858	2	9	439723175	3532	3131	5	29823	74	309710
2018-04-19 18:44:41.910603	2	9	439693174	3532	3239	5	29823	73	309710
2018-04-19 18:44:11.514024	2	9	439663173	3532	3351	5	29821	73	309710
2018-04-19 18:43:41.118198	2	9	439633172	3532	3465	5	29826	73	309710
2018-04-19 18:43:10.725484	2	9	439603171	3532	3583	5.5	29824	73	309710
2018-04-19 18:42:40.32524	2	9	439573170	3532	3702	12.5	29826	73	309710
2018-04-19 18:42:09.942778	2	9	439543169	3537	3791	131	29828	73	309710
2018-04-19 18:41:39.576278	2	9	439513169	3558	3826	471	29830	73	309710
2018-04-19 18:41:09.194373	2	9	439483168	3608	3837	645.5	29831	73	309710
2018-04-19 18:40:38.810824	2	9	439453167	3655	3834	671	29833	73	309710
2018-04-19 18:40:08.42614	2	9	439423166	3678	3830	682.5	29836	73	309710
2018-04-19 18:39:38.043996	2	9	439393165	3686	3830	686	29836	73	309710
2018-04-19 18:39:07.659362	2	9	439363164	3701	3826	690	29838	73	309710
2018-04-19 18:38:37.261154	2	9	439333163	3708	3830	692	29840	73	309710
2018-04-19 18:38:06.879408	2	9	439303161	3716	3830	694	29841	73	309710
2018-04-19 18:37:36.561771	2	9	439273160	3723	3826	694	29841	73	309710
2018-04-19 18:37:06.117799	2	9	439243159	3723	3826	697.5	29843	73	309710
2018-04-19 18:36:35.719573	2	9	439213158	3723	3826	697.5	29844	73	309710
2018-04-19 18:36:05.322493	2	9	439183157	3723	3826	695.5	29844	73	309710
2018-04-19 18:35:34.955097	2	9	439153156	3723	3826	694	29845	73	309710
2018-04-19 18:35:04.556378	2	9	439123156	3708	3830	694	29847	73	309710
2018-04-19 18:34:34.160504	2	9	439093155	3708	3826	690	29850	72	309710
2018-04-19 18:34:03.776641	2	9	439063154	3708	3830	694	29850	72	309710
2018-04-19 18:33:33.380232	2	9	439033153	3723	3826	694	29851	72	309710
2018-04-19 18:33:03.012731	2	9	439003152	3731	3822	697.5	29854	72	309710
2018-04-19 18:32:32.6497	2	9	438973151	3739	3822	699.5	29854	72	309710
2018-04-19 18:32:02.285105	2	9	438943150	3731	3822	697.5	29855	72	309710
2018-04-19 18:31:31.933307	2	9	438913150	3731	3826	697.5	29858	72	309710
2018-04-19 18:31:01.56811	2	9	438883149	3731	3826	697.5	29860	72	309710

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
18	Adafruit Ultimate GPS Breakout	$15.95	1	$15.95
19	RTC Module	$14.95	1	$14.95
	Cranberry v4.0 Total Cost			**$545.89**

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Progress

- Finished populating Cranberry v4.0
  - Deployed in Kaneohe
- Completed Eagle design of v4.1
  - Improve board layout
  - Fix manual rewiring
- Populated v4.1
  - Still need to debug
- GPS and RTC firmware currently being implemented
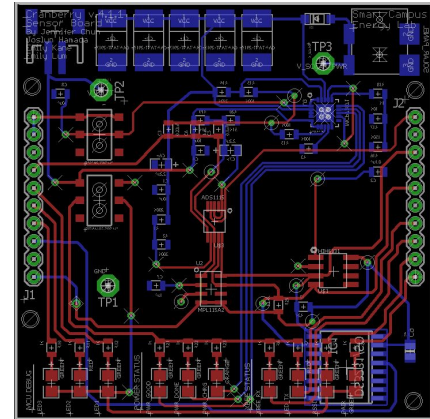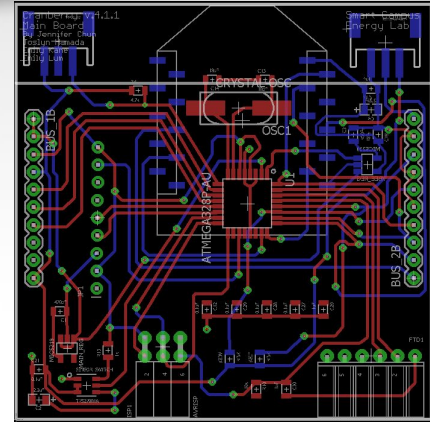
Problems

- Panel voltage readings incorrect
  - Reading from wrong pin
- Issues with 3D printer
  - Waited for housing box to be shipped
- Voltage regulator heating up on v4.1
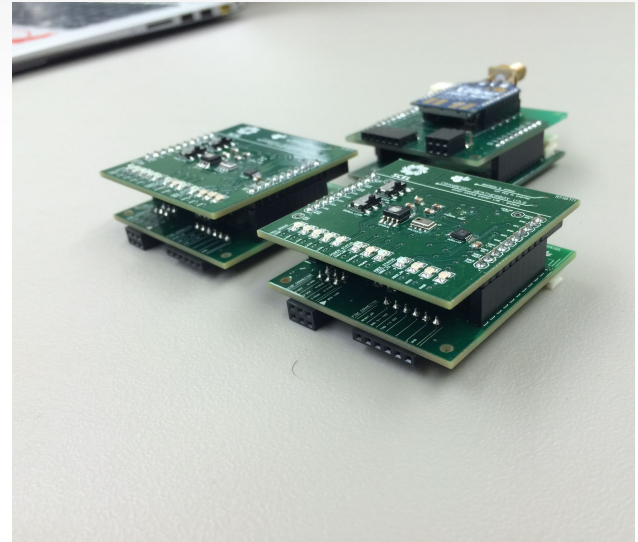 - Potential short
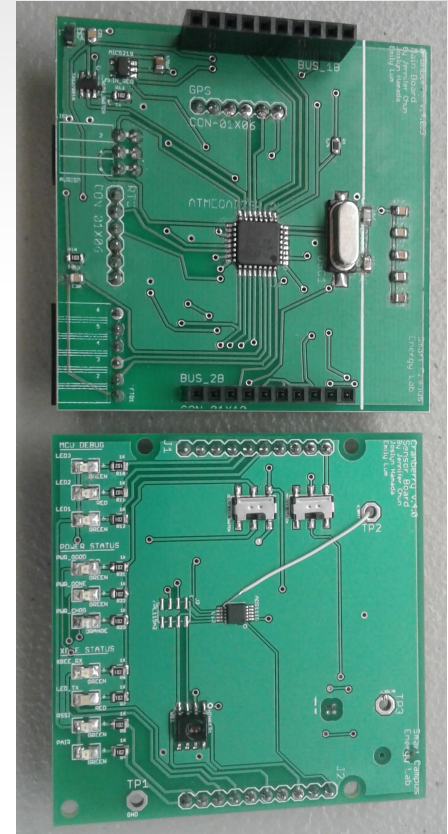
Remaining Work

- Move deployed Cranberry to the roof

- Fix voltage regulator issue

- Debug more potential issues with v4.1

- Finish implementing GPS and RTC

Future Work

- Debug and deploy v4.1
  - Implement firmware
- Start designing v4.2
  - Minimize size
  - Potential issues with v4.1
- Mass deploy

Any Questions?