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# Team Bumblebee Final Presentation

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## Overview

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- Project Goals
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## Background and Motivation

The Bumblebee Weatherbox is a second generation communications module designed to relay meteorological data collected by the other weatherboxes. Its purpose is to increase the effective range of the weatherboxes.



## Project Goals

- Populate PCBs
- Deploy 2 Bumblebee boxes
- Do more extensive Xbee field tests

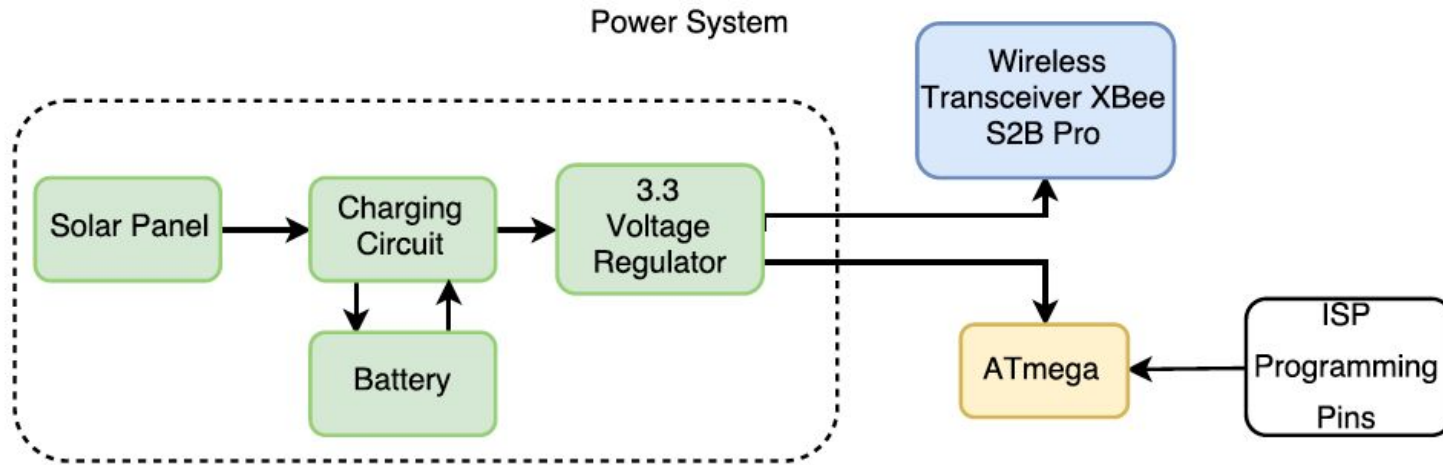




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## Block Diagram (Power)

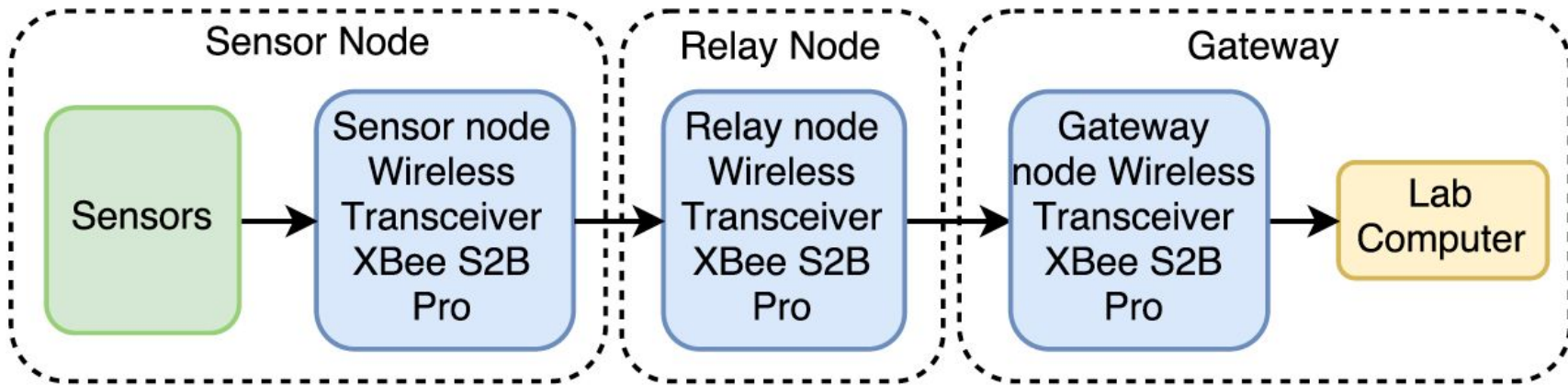




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## Block Diagram (Signal/Communication)



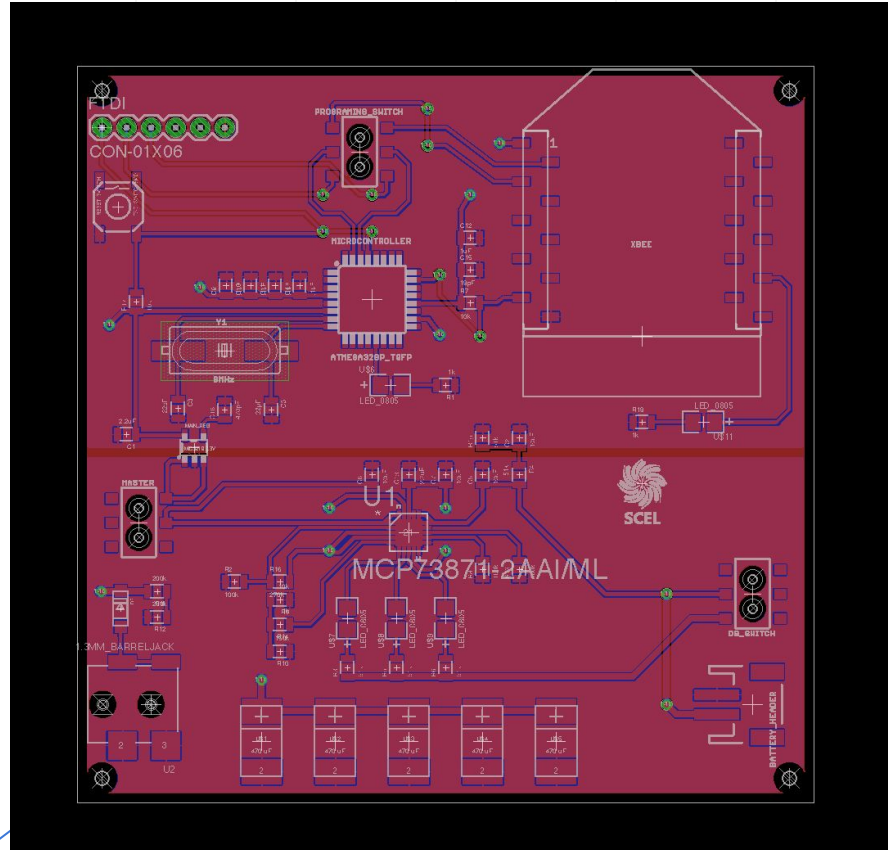


# PCB



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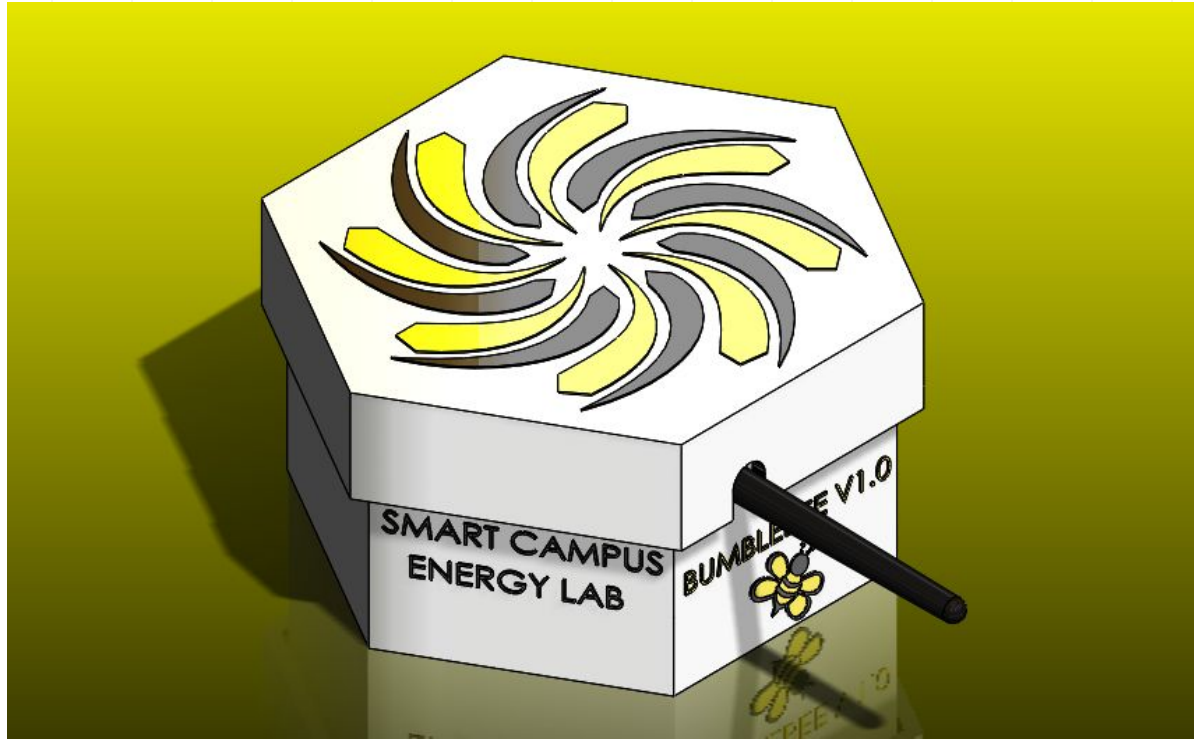


# Housing



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# Gateway Simulation



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```
void loop() {
```

```
    struct ga_packet{  
        uint16_t schema = 1;  
        uint16_t node_addr = 1;  
        uint32_t uptime_ms = 1;  
        uint16_t batt_mv = 1;  
        uint16_t panel_mv = 1;  
        uint32_t bmp085_press_pa = 1;  
        int16_t bmp085_temp_decic = 1;  
        uint16_t humidity_centi_pct = 1;  
        uint16_t apogee_w_m2 = 1;  
    };
```

```
Checking Schema  
1:22  
apogee_w_m2: 0.25  
batt_mv: 1  
humidity_centi_pct: 1  
node_addr: 1  
panel_mv: 1  
press_pa: 1  
schema: 1  
temp_c: 1  
time_received: 2017-04-27 12:55:09.069993  
uptime_ms: 1
```



# Problems Encountered



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## Problems

- No ISP programming pins
- Bootloading
- Xbee configuration
- Faulty solar panel connection
- Box would not transmit when in the sun

## Solutions

- Soldered wires to microcontroller
- Worked with Andrew
- One of the ground solder joints was bad
- Replaced Solar Panel



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# Power Budget

**Bumblebee Power Budget**

Part Name	Idle Current (mA)	Typical Current (mA)	Max Current (mA)	Voltage (V)	Avg Power (mW)	Max Power (mW)
XBee Transmit	15.00	205.00	220.00	3.3	484	726
XBee Receive				3.3		
V. Reg 3.3V (Main)		0.35	0.90	3.3	1.375	2.97
Atmega 328P MCU	0.70	1.70	2.70	3.3	5.61	8.91
<b>Total</b>	<b>15.70</b>	<b>207.05</b>	<b>223.60</b>	<b>13.2</b>	<b>490.985</b>	<b>737.88</b>

Battery	Voltage (V)	Current (mAH)	Useable Energy (%)
6600 mAh Li-ion 3.7	3.7	6600	80.0%

Battery	Energy (mWH)	V. Reg Efficiency (%)	Max Power Consumption (mW)	Max (Hrs)	Max w/ V. Reg Efficiency (Hrs)
6600 mAh Li-ion 3.7	19536	80.0%	75.99	257.1	205.67

<b>Run Time (Hrs)</b>					<b>21.18067979</b>
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# Bill of Materials

Team Bumblebee's Bill of Materials

Part Name	Part Name/Vendor Number	Package Type	quantity	Unit cost	Total Cost
Xbee Breakout Board	<a href="#">BOB-08276</a>	THRU	1	\$2.95	\$2.95
Microprocessor	<a href="#">ATMEGA328P-PU-ND</a>	THRU	1	\$2.14	\$2.14
Xbee Pro S2B	<a href="#">602-1180-ND</a>	THRU	1	\$29.00	\$29.00
Duck Antenna	<a href="#">730-1005-ND</a>	EXT	1	\$10.50	\$10.50
Solar Panel	<a href="#">1525</a>	EXT	1	\$59.00	\$59.00
Charging Chip	<a href="#">MCP73871-2CCI/ML-ND</a>	SMD	1	\$1.84	\$1.84
Battery	3.7V 6600mAh / 353	EXT	1	\$29.50	\$29.50
LEDS	<a href="#">160-1415-1-ND</a>	SMD	3	\$0.35	\$1.05
8 Mhz clock crystal	<a href="#">887-1263-1-ND</a>	SMD	1	\$0.59	\$0.59
(sliding?) switch	<a href="#">401-2002-2-ND</a>	SMD	1	\$0.26	\$0.26
3.3V regulator	<a href="#">LM1086</a>	SMD	1	\$2.12	\$2.12
Passive Components	Various			\$30.00	\$30.00
				<b>Total Parts Cost</b>	<b>\$138.95</b>



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## Final Status

- Two complete Bumblebee boxes
- Able to relay Cranberry packets to the gateway simulation
- Planning to deploy next Friday



# Completed



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## Future Work

- Print Housing
- Redesign PCB to include ISP programming pins and reset capacitor for FTDI
- Have different networking modes
- Develop multiplexing scheme



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# QUESTIONS?

