



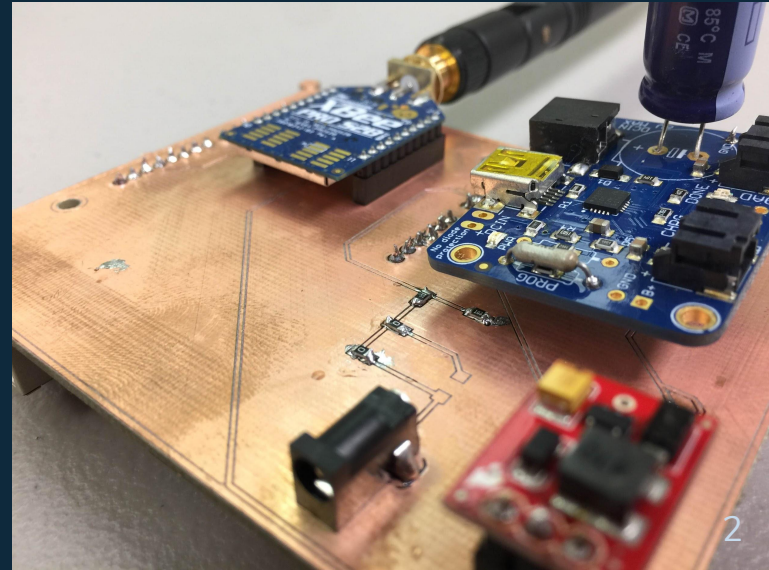
# Final Presentation

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12/03/16



# Overview

- Project Overview
- Motivation and Goal
- Block Diagram
- Overall Design
- Power Budget
- Bill of Materials
- Remaining issues
- Final Status
- Future Improvements





# Project Overview

- Design, build and test a communication module to relay meteorological data collected





# Motivation and Goal

## Motivation:

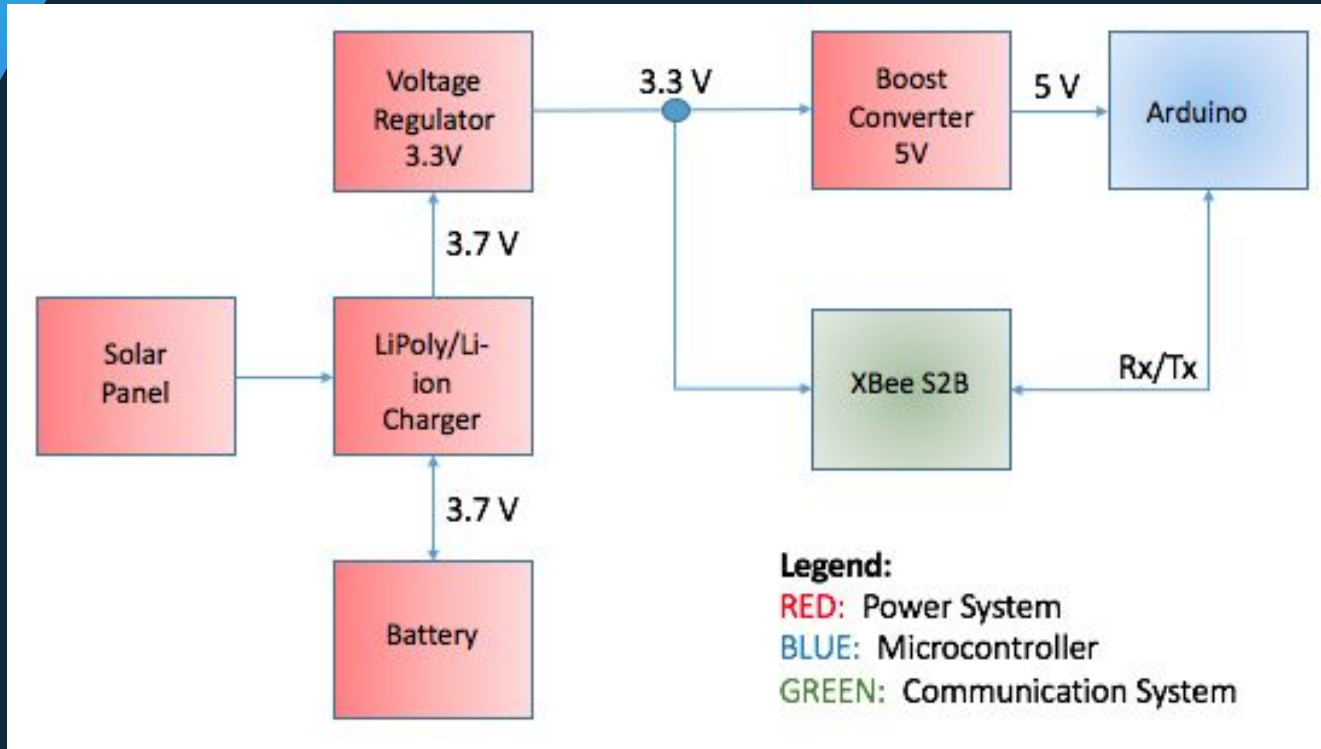
- Extend communication range for weather boxes

## Goals:

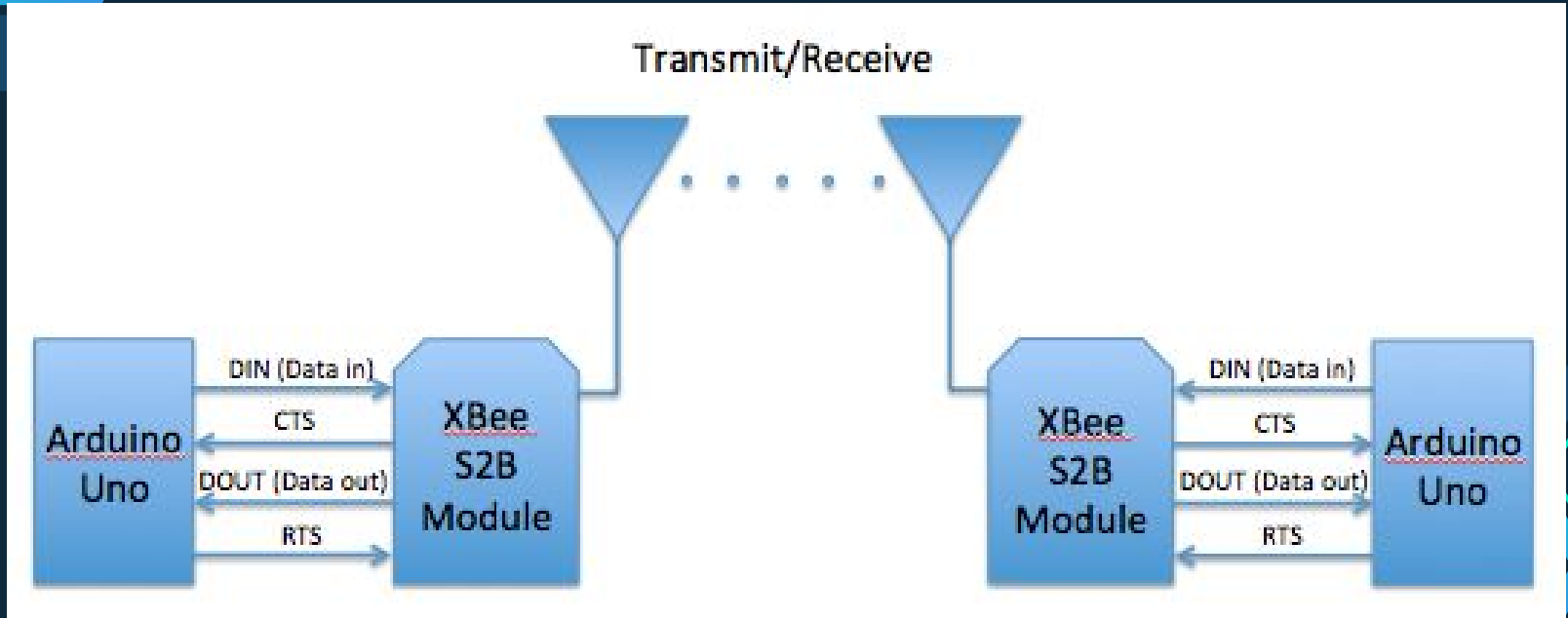
- Communication between weather boxes under different weather conditions
- Document final design, results, issues and solutions



# Overall Block Diagram



# System Data Flow Diagram





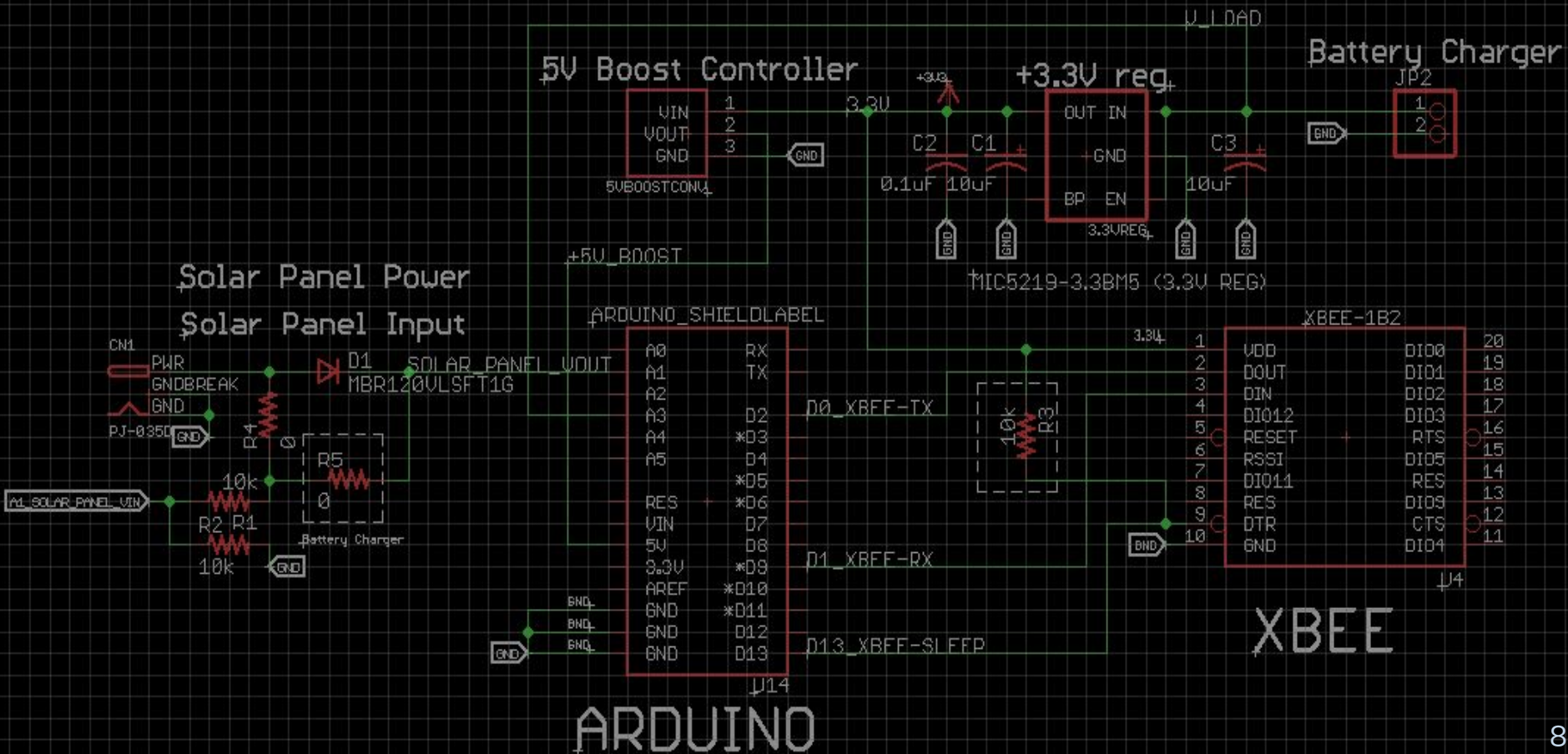
# Overall Design

- ◇ Referenced Apple's design
  - Improved scalability because did not need any sensor components
- ◇ Testing design on breadboard
  - Testing Tx and Rx Arduino code
  - Conducted range testing
- ◇ PCB design
  - Milled board





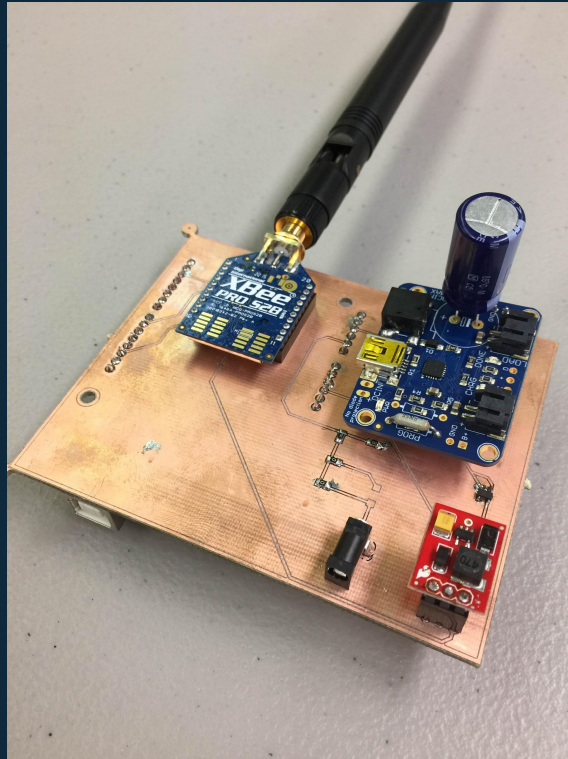
# Ant Circuit Schematic







# Ant Board Fabricated



# Power Budget

Ant Board Power Budget			
<b>5V Module</b>	Data Sheet Values		
<b>Part Name</b>	<b>Idle Current (mA)</b>	<b>Typical Current (mA)</b>	<b>Max Current Draw (mA)</b>
Arduino Uno R3	0.0001	20	50
<b>Total:</b>	0.0001	20	50
<b>3V Module</b>	Data Sheet Values		
<b>Part Name</b>	<b>Idle Current (mA)</b>	<b>Typical Current (mA)</b>	<b>Max Current Draw (mA)</b>
XBee Pro S2B	0.0035	15	220
<b>Total</b>	0.0035	15	220
Battery Supply			
<b>Part Name</b>	<b>Supply Voltage (V)</b>	<b>Discharge Rate (mAh)</b>	<b>Usable Energy</b>
3.7V 6600 mAh	3.7	6600	80%



# Bill of Materials

## Apple Board Bill Of Materials Version III

#	Part Description	Part Name	Vendor	Product ID/#	Unit Cost	Quantity
1	Microprocessor	Arduino Uno R3	Adafruit	50	\$24.95	1
2	Wireless Transciever	Digi International XBee Pro S2B	Adafruit	967	\$37.95	1
3	Duck Antenna	2.4GHz Duck Antenna RP-SMA - Large	Sparkfun	558	\$9.95	1
4	Battery	Tenergy Li-Ion 18650 3.7V 6600 mAh	Adafruit	353	\$29.50	1
5	Solar Charging Circuit	USB LiPoly/Li-Ion Charger (3.7/4.2V) MCP73871	Adafruit	390	\$17.50	1
6	Solar Panel	Large 6V 3.4W Solar Panel 3.4 Watt	Adafruit	500	\$39.00	1
7	Voltage Booster	5V Boost Converter: NCP1402-D	Sparkfun	<a href="#">10968</a>	\$5.95	1
8	Voltage Regulator	3.3V Regulator: MIC5219	Digi Key	<a href="#">SOT23-5</a>	\$0.74	1
	<b>Unit Sub Cost</b>					
	<b>\$165.54</b>					



# Problem and Solutions

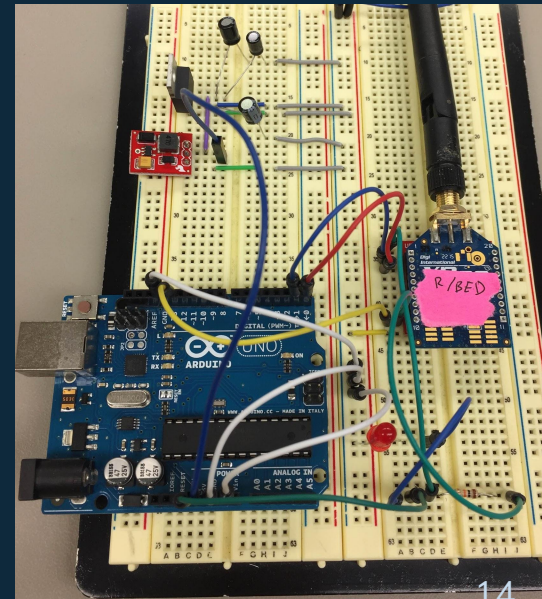
- ◇ Tx and Rx pin connected in reverse
  - Assigning wrong pins in code
- ◇ Pins connected to ground wasn't actually grounded





# Remaining Issues

- ◇ Arduino's Tx and Rx code bugs out
- ◇ Arduino software bugs out
  - Can't recognize usb connection
- ◇ LED indicating received doesn't flash but XCTU confirms that data is received





# Final Status

- ◇ Redesigned circuit
  - Completed PCB design and milled it
- ◇ Have to edit Arduino code to test hardware
- ◇ Testing PCB and range testing with PCB
- ◇ Design a housing for the Ant board

# Future Improvements

- ◇ Use another microcontroller such as ATmega MCU
  - Less functionalities
  - Smaller ⇒ Reduce scalability
- ◇ Power budget
- ◇ Documentation





Any Questions?





# References

## Websites:

- <http://www.digi.com/products/xbee-rf-solutions/xctu-software/xctu>

## Images:

- <https://cdn.sparkfun.com//assets/parts/4/8/9/3/10419-01.jpg>