

# Final Presentation

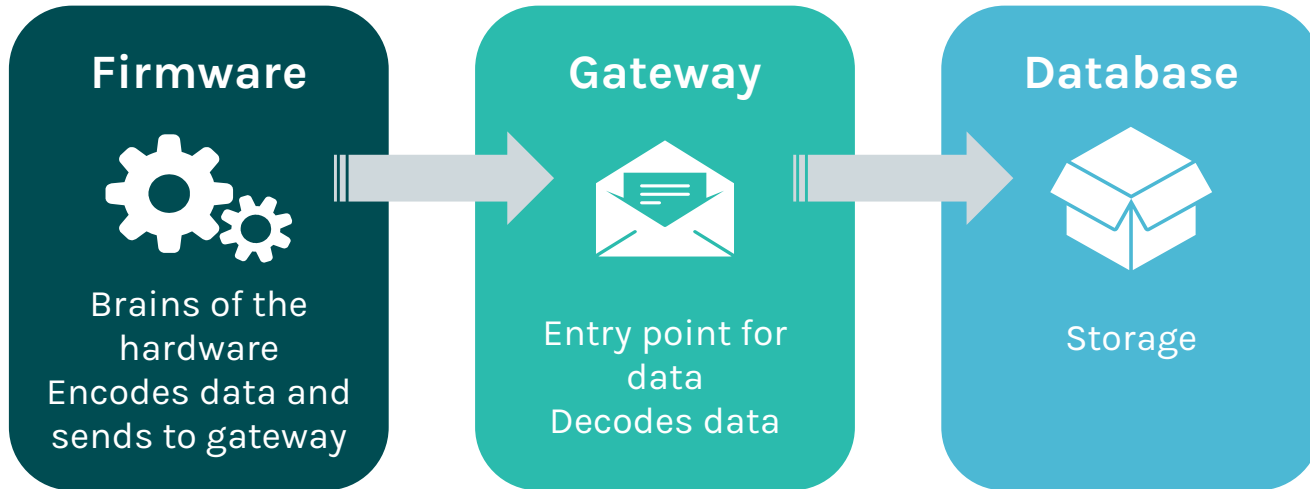
## Unified Software Team

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**Advisor: Dr. Kuh**

# Overview

- Project Overview
  - Motivation
  - Overall Project Goals
  - Overall Block Diagram
  - Firmware
  - Gateway
  - Database
- Overall Design  
Final Status  
Problems/Issues  
Future Improvements

# Project Overview



# Motivation

- Have the tools and background to make changes to the system
- Ensure that past and current work can be passed down to future members
- Contribute to renewable energy initiatives
  - Reliable, accurate and low-cost sensor modules

# Goals

- Improve understanding of existing software system
- Improve system to gather, transmit and store weatherbox data
- Incorporate version control and code reviews into workflow
- Communicate with other teams
- Improve documentation

# Functional Overall Block Diagram



2.

# Firmware

# Firmware Design Block Diagram





# Firmware Functional Block Diagram



# Goals

- Improve modularity of firmware code
- Create new sensor drivers
- Develop deployable versions of weatherbox firmware
- Improve power efficiency of weatherboxes

# Firmware Algorithms

## Initialization

- Create and initialize board struct and run Power On Self-Test

## Execution

### Heartbeat Packets

- Sample Diagnostic data, then construct and send packets

### Data Packets

- Sample Sensor data, then construct and send packets

### Command Mode

- Interrupt execution, perform task based on user input

# Firmware - Problems and Solutions

- Understanding the existing firmware
  - Datasheets and documentation
- Confirming accurate data readings from sensors

# Firmware - Problems and Solutions

- Apple
  - GPS Library memory heavy
  - SRAM memory filled
- Cranberry
  - Confirming accurate data readings from sensor
  - Ensuring proper transmission of packets
  - Temperature data type overflow
- Dragonfruit
  - Inconsistent packet transmission
  - Inconsistent documentation (ADC module)

# Firmware - Final Status

- Apple
  - Successful deployment
  - Implemented GPS Library
  - Rewrote XBee Library
- Cranberry
  - Successful deployment until heavy weather damaged box
  - Exploring Low Power Mode
  - Working on GPS device driver
- Dragonfruit
  - Successful deployment until heavy weather damaged box
  - Developing Low Power Mode
  - Working on GPS device driver

# Firmware - Future Improvements

- Communicate with weatherbox hardware teams to prepare device drivers for next versions of weatherboxes
- Create detailed documentation and user manual
- Increase sampling period to 1 minute
- Reduce the power consumption
- GPS and Real-Time Clock Integration

The background features a series of overlapping, angular shapes in various shades of green and teal. A large, dark teal shape is at the top, followed by a lighter green shape, and another dark teal shape at the bottom. The central area is a solid teal color.

# 3. Gateway



# Gateway - Goals

- Successfully retrieve data packets sent by weatherbox devices
  - All weatherbox generations
- Accurately decode data packets
- Store collected data into a database
- Implement system for testing Gateway functionality

# Gateway Block Diagram



# Gateway Pseudocode

while no packets to process:

    wait for packets

extract rf data from packet

determine schema number

If schema is 0

    decode as heartbeat packet

else if schema is 1

    decode as apple packet

else if schema is 2

    decode as cranberry packet

else if schema is 3

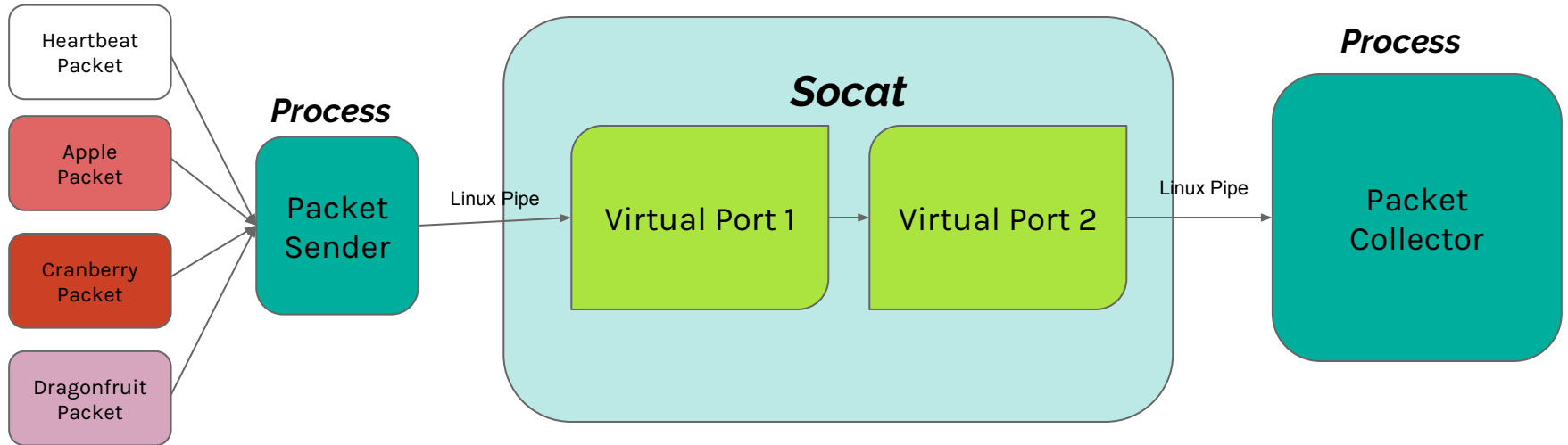
    decode as dragonfruit packet

Print data to stdout

Add data to respective .csv file

Write data to respective database table

# Simulation Process Diagram



# Gateway - Current Status

- Collects and decodes all packet types
  - Heartbeat, Apple, Cranberry, Dragonfruit
- Data output
  - Console
  - .csv File
  - Database
- Simulation with pseudo packets

# Gateway - Problems & Solutions

- Gateway process crashing constantly
  - Attempted hardware fixes
  - Modified Gateway to monitor status
    - Threading.py
    - Re-initialize Gateway if bad status detected

# Gateway - Future Improvements

- Work with Firmware to incorporate latest packet changes
  - GPS, RTC, etc.
- Implement data transfer with socket connections
  - Remove need for storing in memory
- Improve pseudo packet collection process



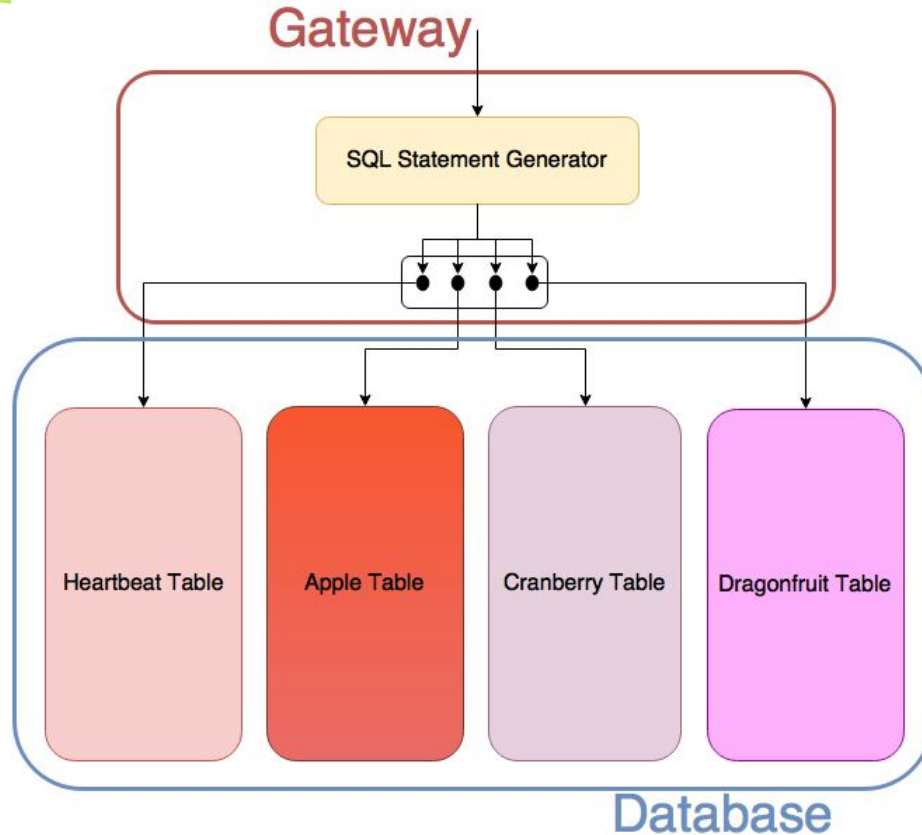
# 4. Database



# Database - Goals

- Create a database to store weatherbox data
  - Each generation stored in unique table
- Provide a way for lab members to access data

# Database Block Diagram



# Database - Current Status

- Initialized database on computer in lab
  - Receiving and storing data from gateway
- Multiple tables for each generation and heartbeat
- Script to format data for forecasting team

# Database - Issues and Problems

- Focusing on other aspects of the software system first
  - Limited time

# Database - Future

- Modify existing tables or add new tables when needed
- Implementing Indexes in the database
- Integration of methods to access data
  - Dashboard App

# Gantt Chart

Week	1	2	3	4	5	6	7	8	9	10	11	12	13
Date	9/10/2016	9/17/2016	9/24/2016	10/1/2016	10/8/2016	10/15/2016	10/22/2016	10/29/2016	11/5/2016	11/12/2016	11/19/2016	11/26/2016	12/3/2016
<b>Presentations</b>													
Proposal													
Design Review													
Critical Design Review													
Demonstration/Final Presentation													
<b>Research</b>													
Firmware													
Gateway													
Database													
<b>Firmware</b>													
Initial Apple Deployment Firmware													
Initial Cranberry Deployment Firmware													
Initial Dragonfruit Deployment Firmware													
Apple GPS													
Dragonfruit GPS													
Reduction of Power Consumption													
Documentation for All Generations													
<b>Gateway</b>													
Packet Decoder w/ Test													
Fake Packets													
Script Reset													
Parse Time													
<b>Database</b>													
Initialize Basic Database													
Test Writing to Database													



Questions







