Data Oriented Gateway Engine

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1 Summary

The goal of this project is to develop a framework for managing and testing a network of wireless sensors. The components of the network will be encapsulated so that a user can easily test different aspects such as topology, traffic management, and communication protocol.

1.1 Hardware

Two types of nodes were developed for this project: the BoosterPack Node and the Leaf Node. The BoosterPack Node is based on Texas Instrument's CC110L RF BoosterPack kit and uses a 915MHz radio along with an optional 2.4GHz radio. The Leaf Node is a custom board with an LPC812 microcontroller and 2.4GHz radio. Both nodes include a temperature sensor.

To assist in adding new nodes to the network, two smaller boards were made to provide power and environmental sensors. The Power Subboard provides a 3.3V supply derived from USB, single-cell LiPo battery, or a coin cell. The three power sources are hot-swappable and the current power source is represented by two open-drain outputs. Hardware-based undervoltage LiPo protection and charge circuit are also included.

The Sensor Subboard integrates several common sensors into a small package. It includes pressure, altitude, temperature, relative humidity, ambient light, IR light, UV index, and a microphone with digitally controlled amplifier. The sensors share the same I2C bus and all interrupt pins are broken out to the breadboard-compatible header.

1.2 Software

Currently the network is managed from an Intel Edison board with both a 915MHz and 2.4GHz radio. An Arduino sketch interfaces with the radios and posts its data to a Python thread via shared memory. The data is formatted and sent over a socket to a webserver running on Edison. The webserver is able to plot certain aspects of the network in real time.

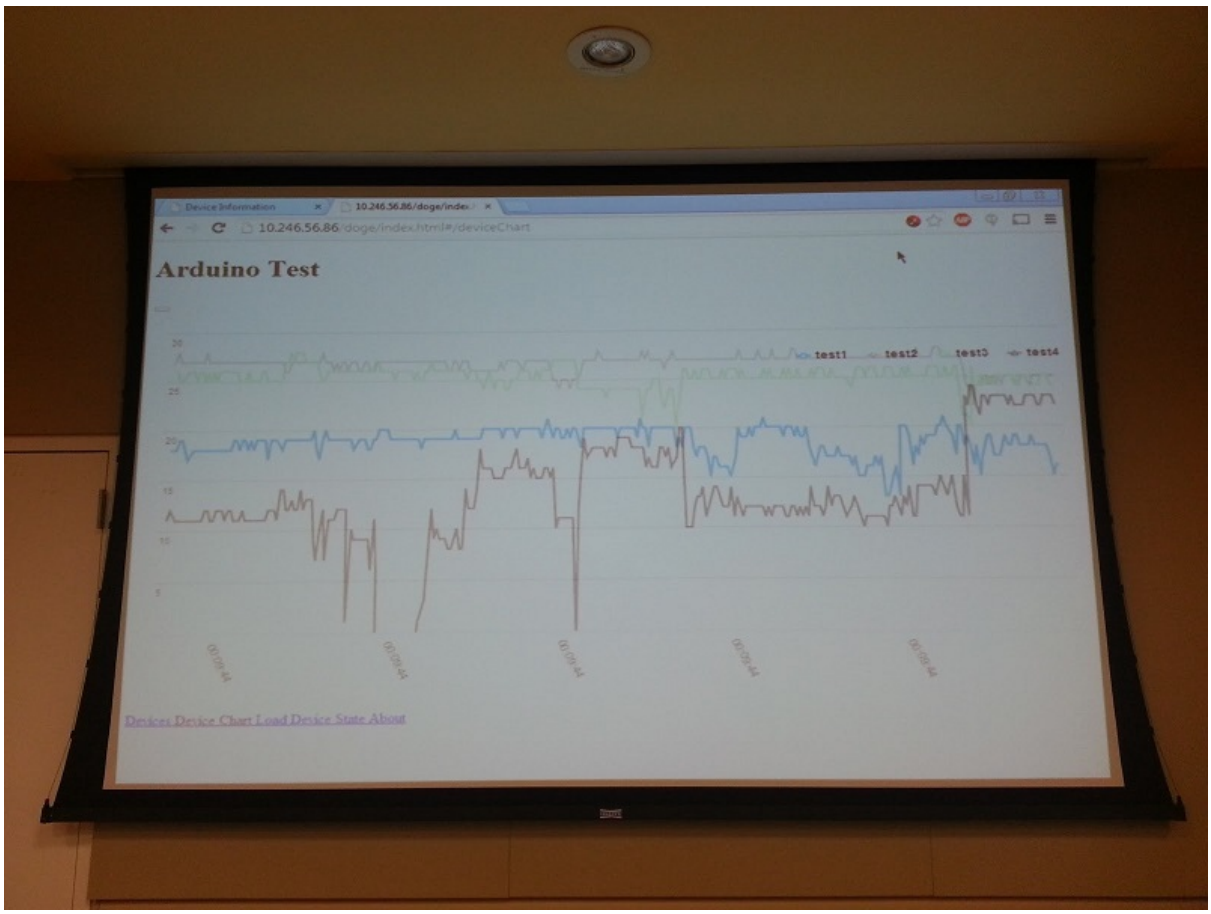

Figure 1: Plot of signal strength from 4 915MHz nodes over time via the webserver.

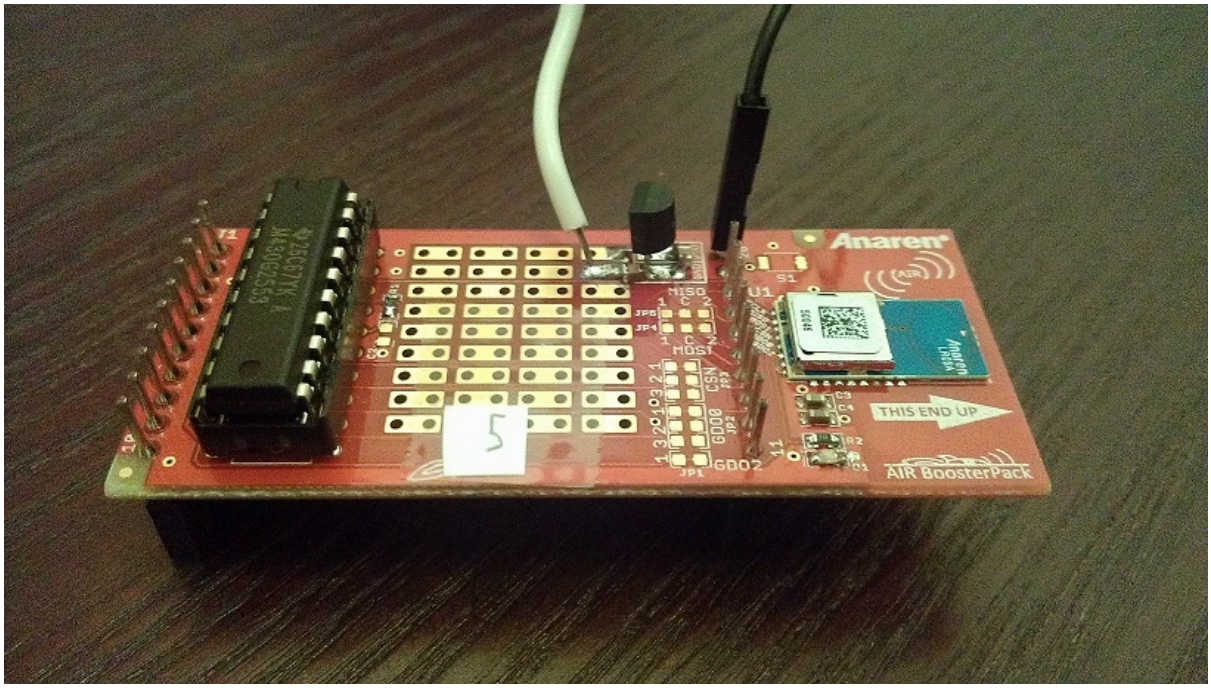

Figure 2: MSP430, 3.3V LDO, temperature sensor, and 915MHz radio.

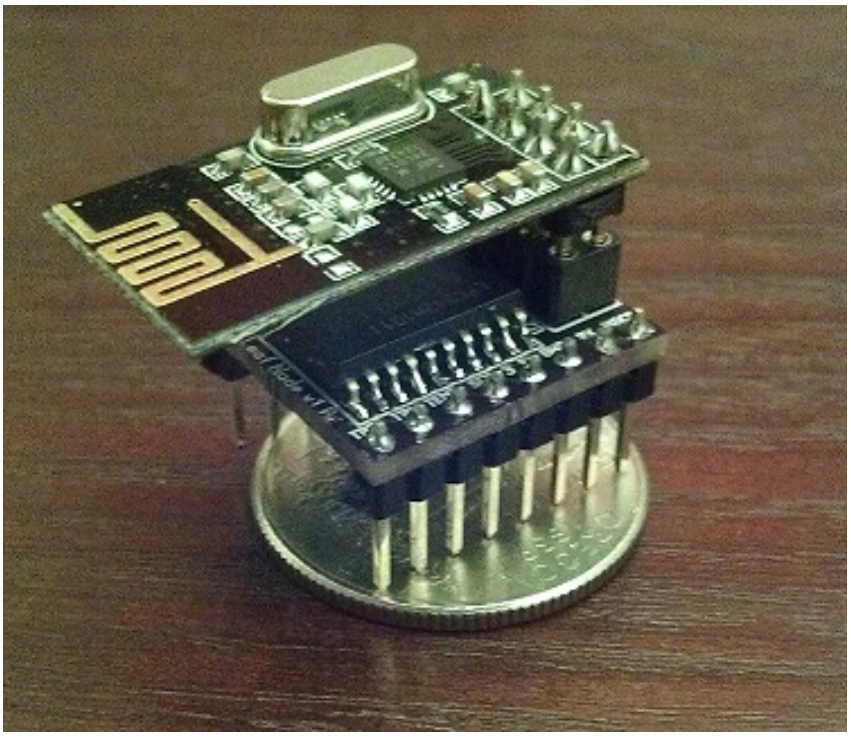

Figure 3: LPC812, temperature sensor, and 2.4GHz radio.

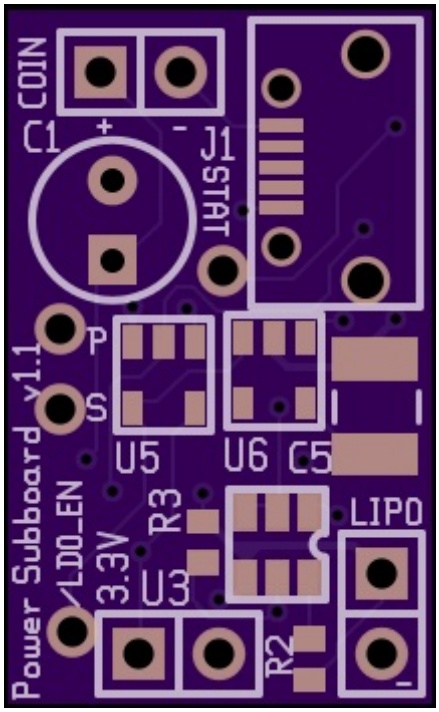

Figure 4: Power Subboard

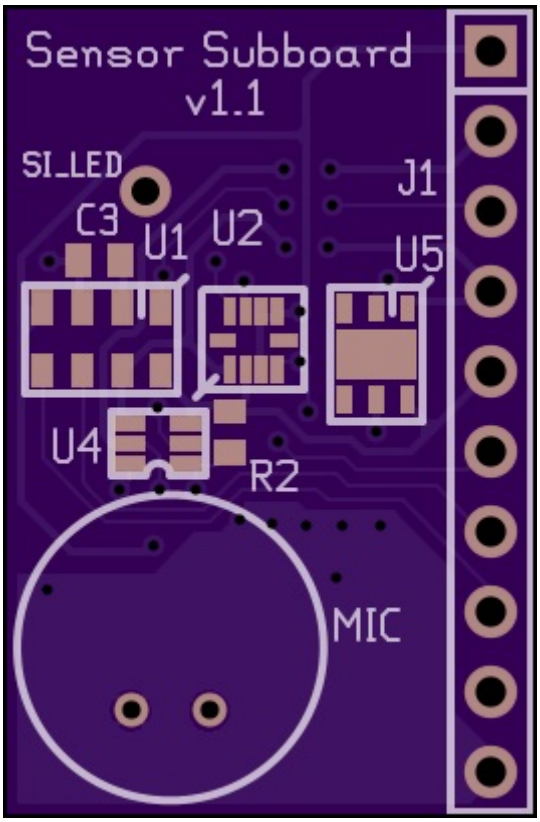

Figure 5: Sensor Subboard