

Self-Logging Backpack

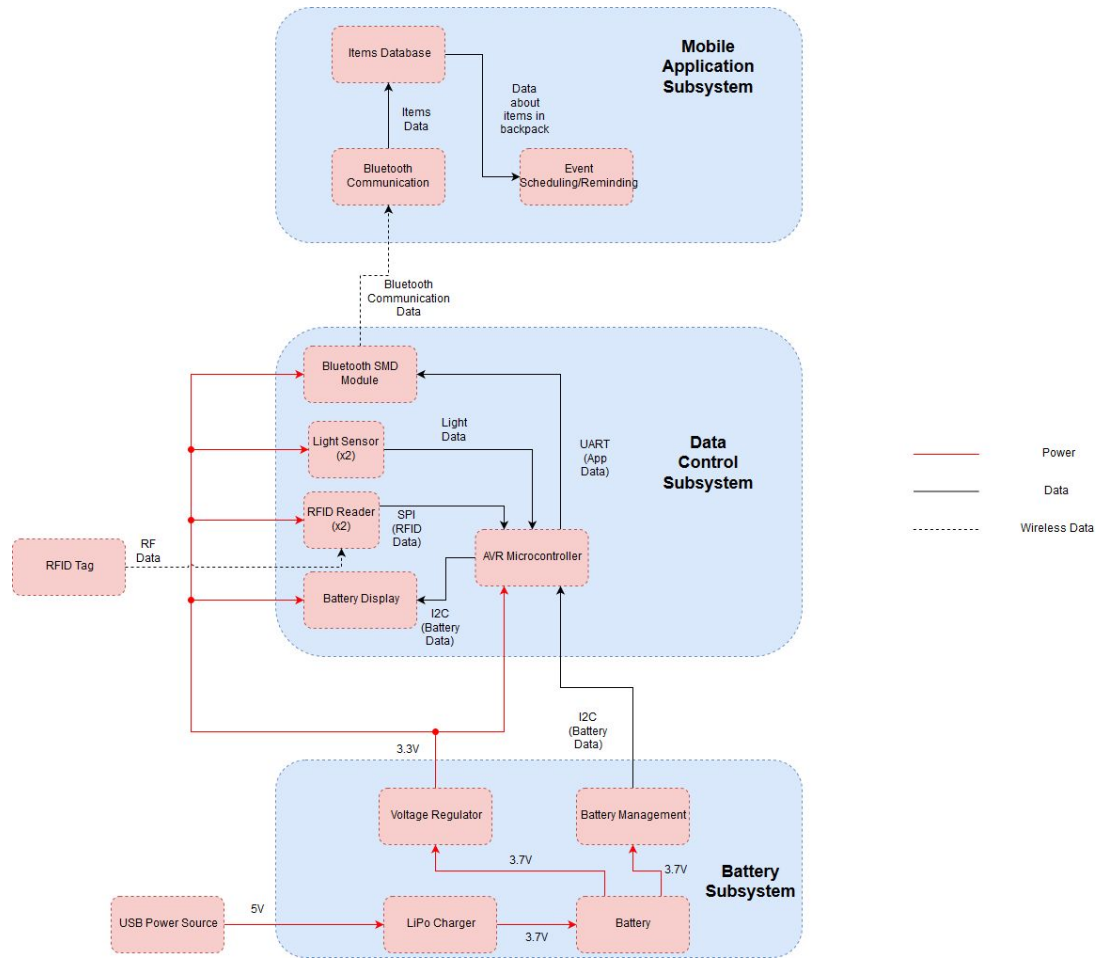
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Introduction

- Contents of your backpack are everything you have
- Forgetting or losing items are constant worries

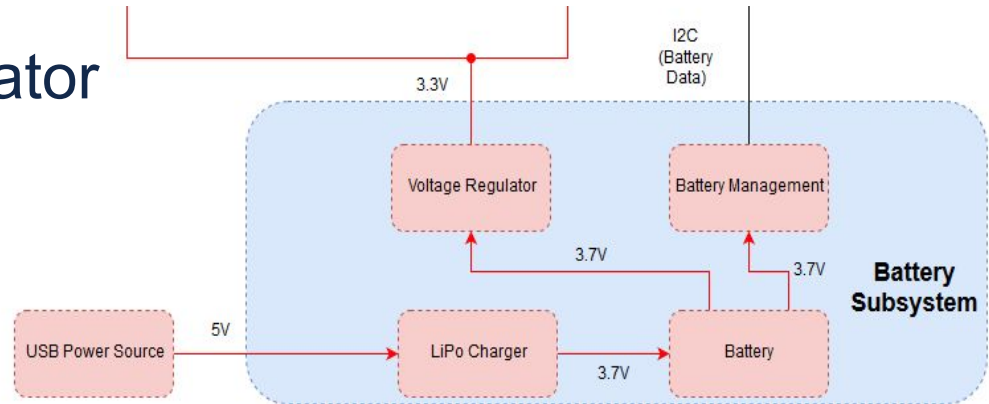
Features

- Automatically track items in and out of a backpack
- Notify the user when an item the user wants is missing



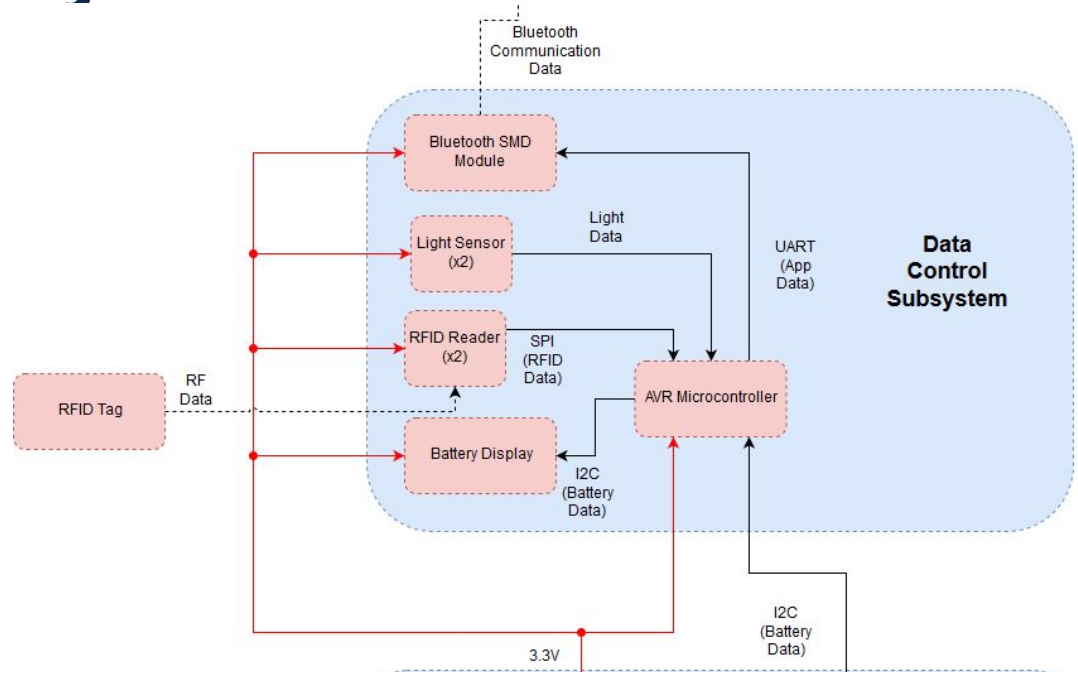
Battery Subsystem

- Lithium Ion Battery
- Lithium Ion Charging Unit
- LCD Display
- Linear Voltage Regulator



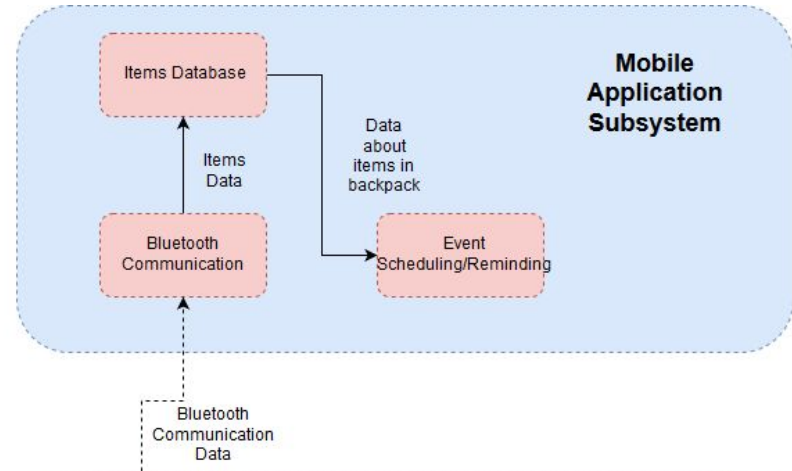
Data Control Subsystem

- RFID Readers
- Microcontroller
- Photoresistor
- Bluetooth module



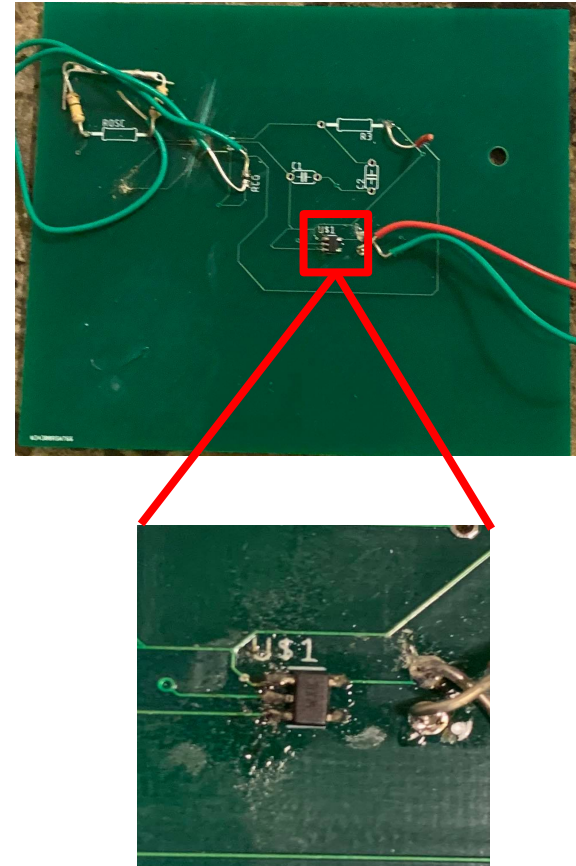
Mobile Application

- Maintain database of items
- Associate items with calendar events



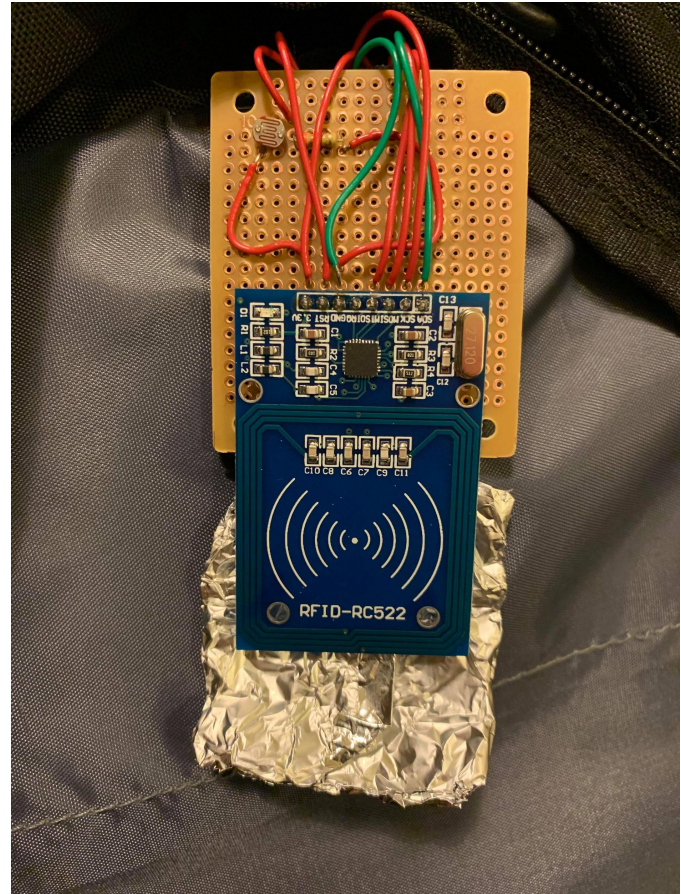
Battery Subsystem

- 130 mA consumption, 16 hour goal
- Battery, regulator met their constraints
- Regulator difficult to keep in good condition
 - Small footprint
 - Caused problems for voltage sensitive parts



RFID Reader/Photoresistor

- SPI communication
- Problems with initialization, interference
- Photoresistor voltage threshold tuning
- Problems in PCB design



Microcontroller

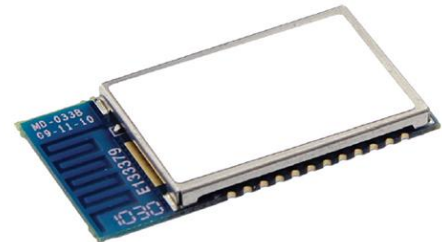
- Used SPI, I2C, and UART
- Reading photoresistor, battery voltage
- Difficulty reading 2 RFID tags
 - Polling to interrupt driven
- Halting for double-reads from RFID

Bluetooth Module

- Difficult to set up
- SPP vs iAP
- Workaround



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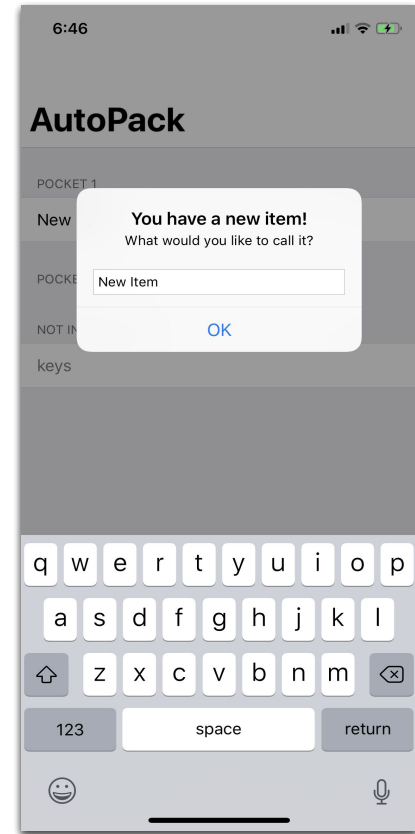
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Local Server



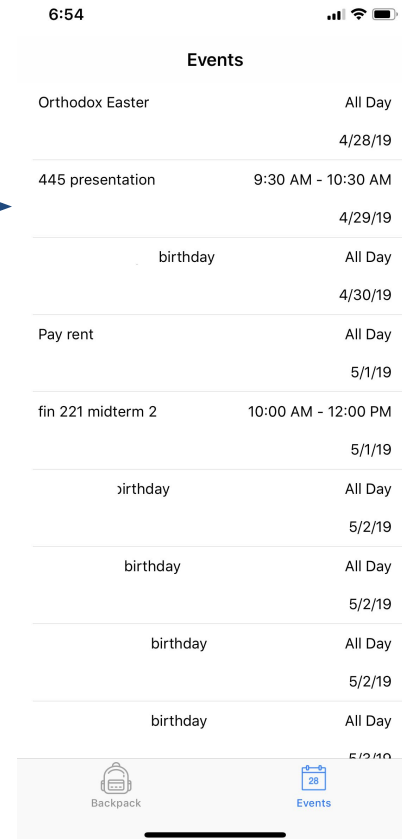
Items Database

- Responsibilities split between server and app
- Server
 - Connect to bluetooth module and get info
- App
 - Prompt user with new items



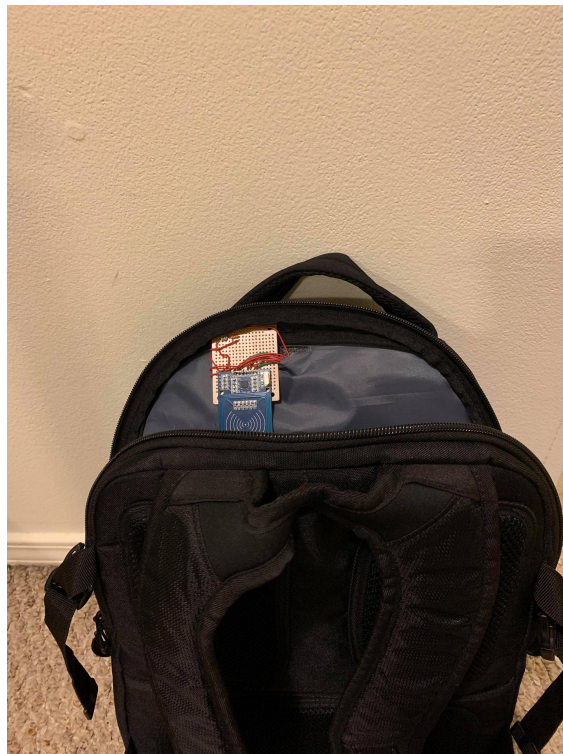
Event Planning

- More limitations of iOS
- Background Fetch
- Push Notifications



Final Product

- External power source
- Battery display did not read charge
- RFID readers, photoresistor, microcontroller, bluetooth worked
- Bluetooth to server to application
- Application worked



Improving the Hardware

- Voltage regulator tolerance
- RFID readers antennas
 - HF, 13.56 MHz with better antenna for read distance
- Bluetooth module can be generalized

Improving the Software

- Item database is the starting point
- Machine learning
 - Location
 - Time
- Forgotten Items

Product-Market Fit

- Backpacks ignored by IoT community
- Sounds unnecessary -> becomes essential



Thank You.

