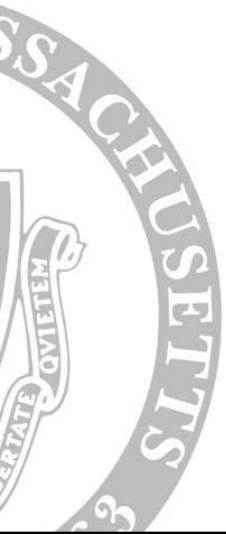


LoadOut: PDR

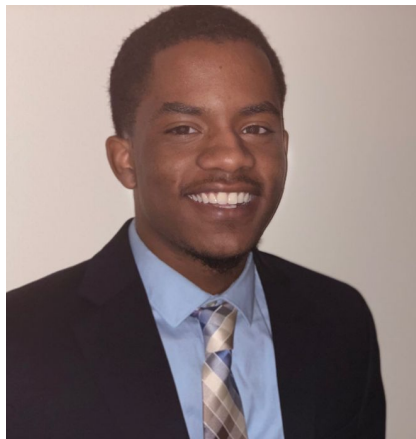
SDP21 Team 12



The LoadOut Team



Neyissa Exilus
CompE



Smeel Milien
CompE



Joshua Teixeira
CompE



Wilson Tran
CompE

PROBLEM STATEMENT:

Tired of forgetting something at home or packing it in the wrong bag?
Tired of losing your valuables? Tired of TSA or malicious agents opening and rummaging through your checked bags without your knowledge?

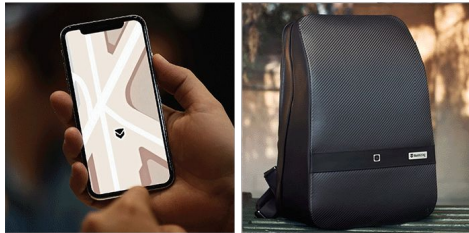
LoadOut offers a convenient way to pack while maintaining organization, security and peace of mind about your belongings. Using RFID technology, items can easily be tracked by attaching a tag and registering it into an application. LoadOut seeks to eliminate the hassle of micro-managing a checklist by tracking and monitoring travel essentials as you pack. It also offers peace of mind with travel logs notifying you if your bag has been tampered or compromised.

Competing Solutions in the Marketplace

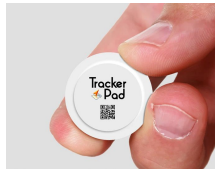
The T-Track Anti-Theft backpack: This backpack device provides GPS tracking and item tracking via keychain tags. However, it seems to have not made it to market and does not offer precision tracking.



LUMZAG: This bag claims to provide GPS and item tracking, but never quite explains how they do it. It also has failed to deliver any items to backers.

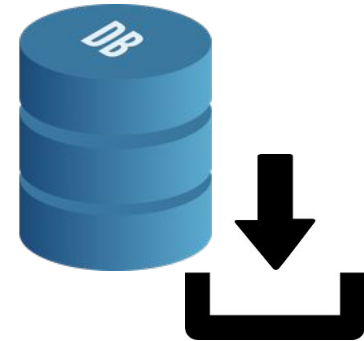
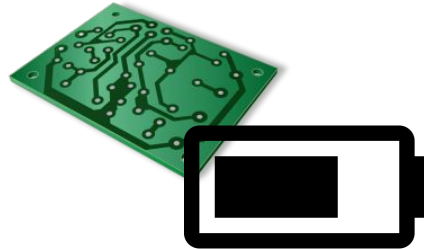


Tile: Tile well known for its tracking products. However, they rely on bluetooth connection and each of the tracking instruments are expensive and have a non rechargeable battery.



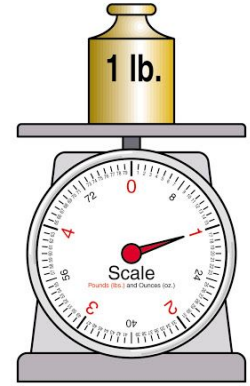
TrackerPad: This item claimed to provide GPS tracking support via an app using only a small sticker GPS unit. It was shut down during the planning phase for not providing any proof of functionality.

System Specifications



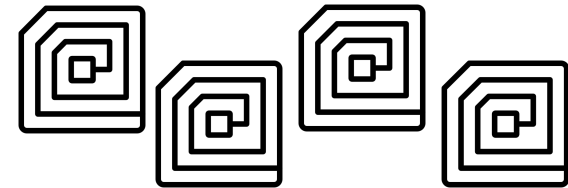
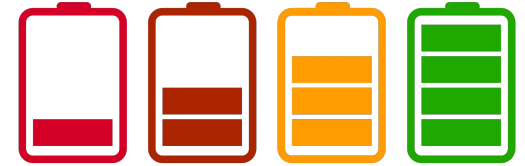
PHYSICAL SPECIFICATIONS

- No more than 4lbs
- Device should be resilient to outside RFID interference and attacks
- Final Prototype will be non intrusive and easy to store and pack



HARDWARE SPECIFICATIONS

- Must have at least 24 hours of battery life
- Must be capable of tracking ~20 items without substantial error
- LoadOut should work in the presence of metals and liquids
- Device should be able to determine if the container has been opened, and if so, if anything has been disturbed

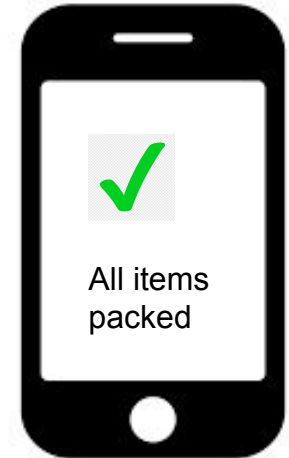


SOFTWARE SPECIFICATIONS

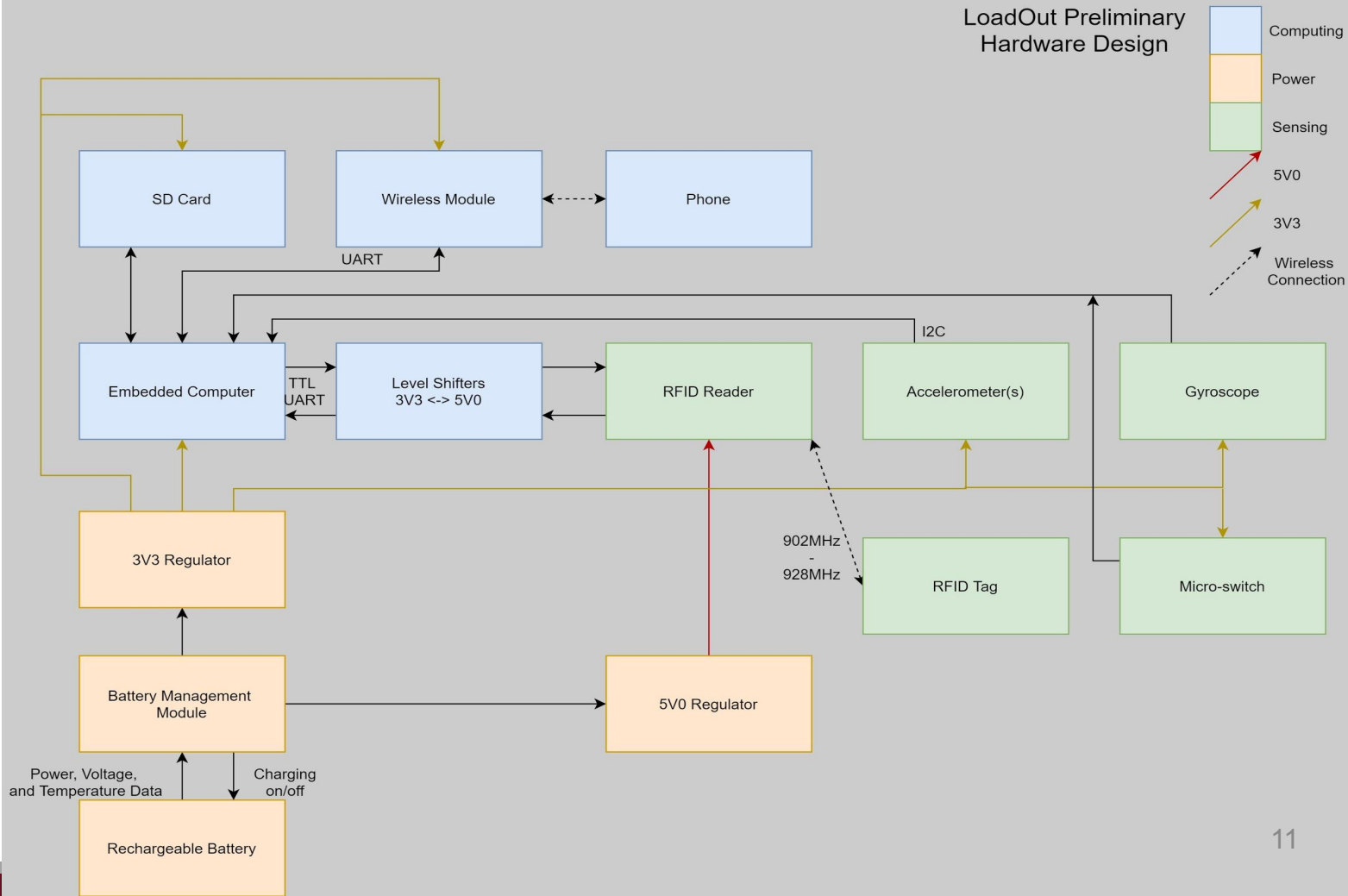
- User should be able to dynamically add/remove items from database
- Device should be capable of recording and storing information about the status of the items and bag while out of wireless range of the user
 - An interaction log will be recorded onto a SD card and uploaded to the cloud



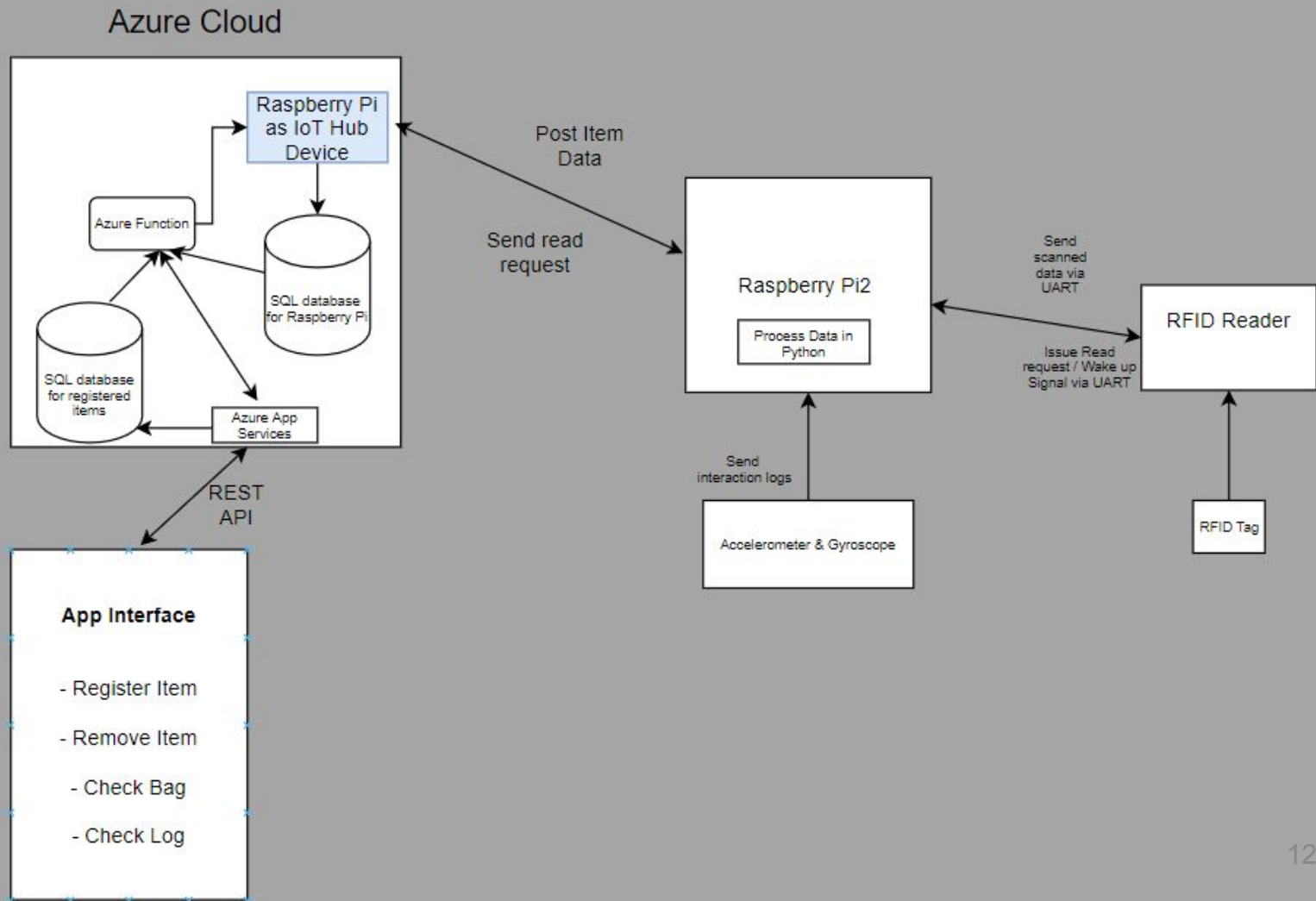
Real Life Representation



PRELIMINARY HARDWARE DESIGN FLOWCHART:



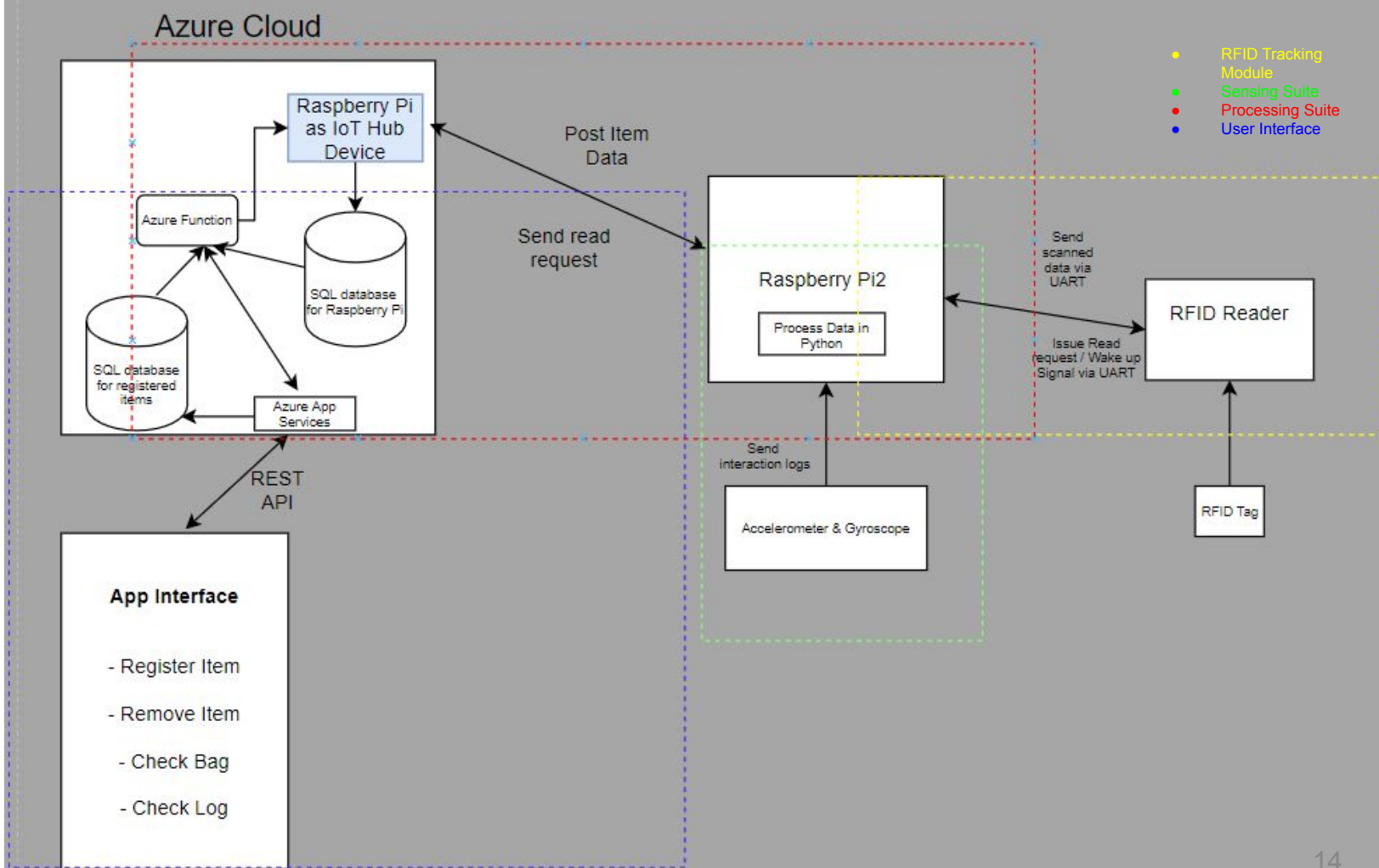
PRELIMINARY SOFTWARE DESIGN FLOWCHART:



Our Solution: LoadOut

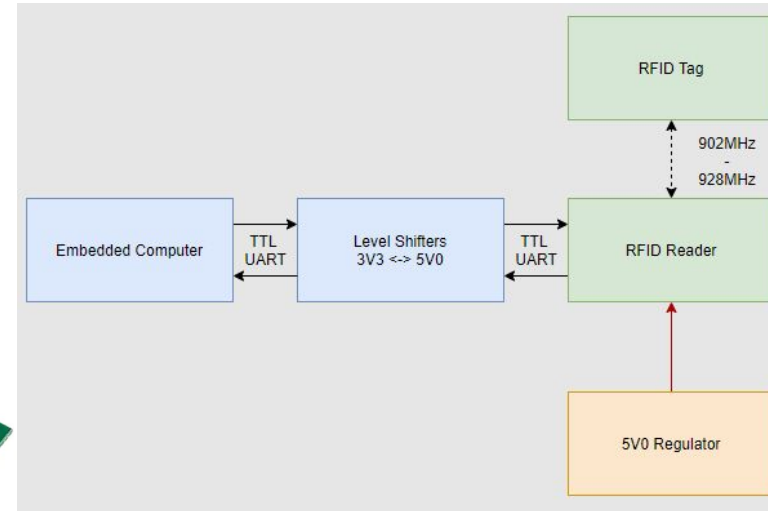
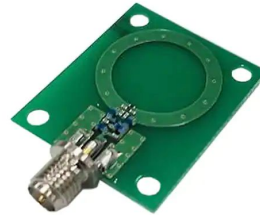
- **RFID Tracking Module**
 - Passively tracks if items are in your suitcase
- **Sensing Suite**
 - Records key safety and security data about your items
- **User Interface**
 - Can add and remove items on the fly from mobile device
- **Processing Suite**
 - Handles sensor and RFID data, digests and delivers it to the cloud

PRELIMINARY SOFTWARE DESIGN FLOWCHART:



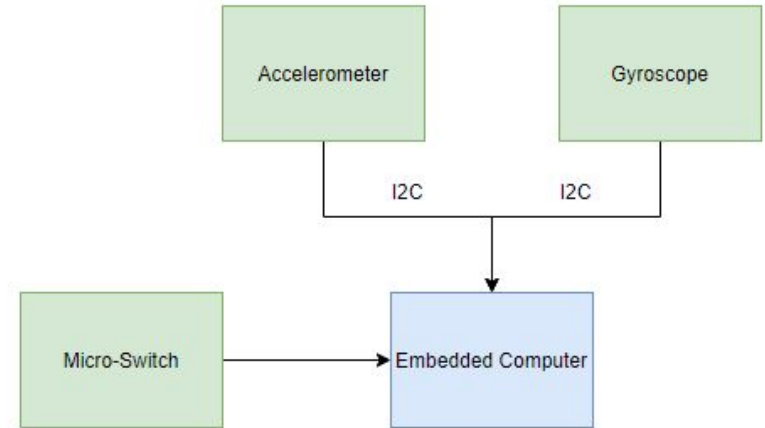
Subsystem: RFID Tracking Module

- RFID Tracking Module
 - Passively tracks if items are in your suitcase
- Hardware Used
 - ThingMagic Far Field RFID Reader
 - RFID Tags
 - Antenna



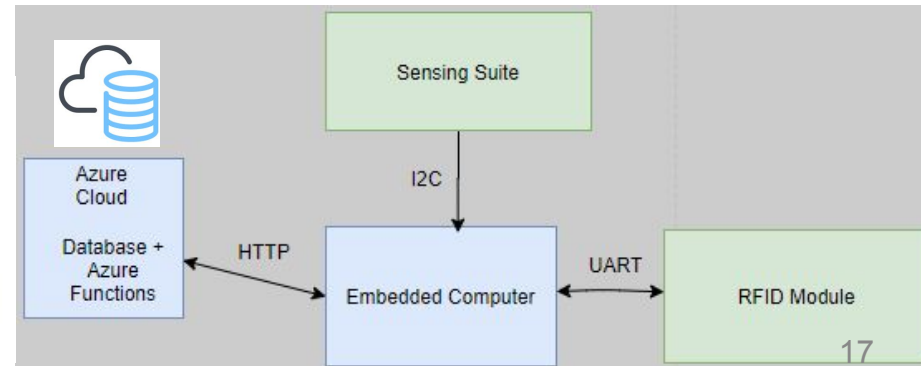
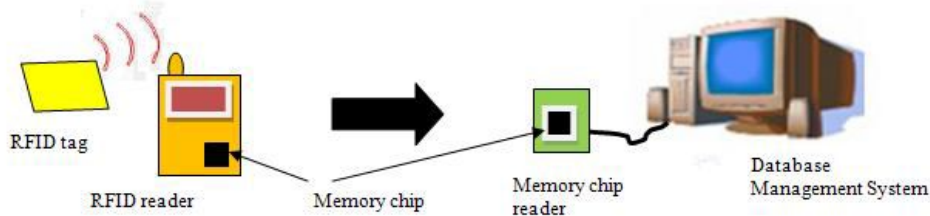
Subsystem: Sensing Suite

- This module pertains to implementing a security aspect to LoadOut. To ensure the safety of the belongings and user's peace of mind.
- Hardware used
 - Accelerometer
 - Gyroscope
 - Microswitch



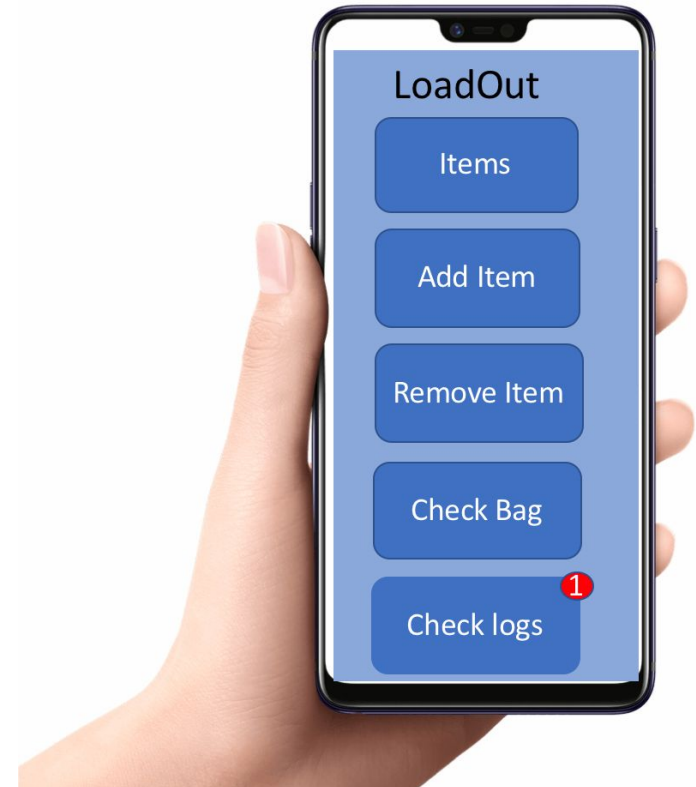
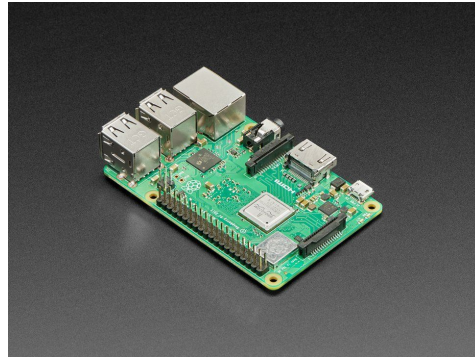
Subsystem: Processing Suite

- Processing Suite
 - Handles sensor and RFID data, digests and delivers it to the cloud
- Hardware Used
 - Embedded Computer



Subsystem: User Interface

- User Interface
 - Can add and remove items on the fly from mobile device
- Hardware Used
 - Smartphone/Virtual Phone
 - Embedded computer



Cost Estimates

- ThingMagic Far Field RFID Reader ~\$240
 - Development Boards LOANED
 - Antennas \$50
 - Coaxial Cable \$6
- RFID Tags
 - 25 Tags \$9
- Bluetooth/Wifi enabling connection device - \$7
- Raspberry Pi - \$35
 - 16GB SD Card \$6
- Suitcases - PURCHASED
- RFID shield blocker Aluminum/RF Foam \$3/\$15
- Accelerometer(s) \$3/each
- Gyroscope(s) \$3/each
- Breadboards \$2.5/each
- PCB Design and Soldering Kits

Total Estimated Cost: ~\$385 w/o PCB

Remaining budget: ~\$115



Proposed MDR Deliverables

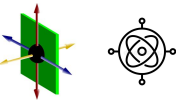
Joshua Teixeira

- Configure RFID reading module to read and write to item tags, display information legibly for computing module
- Create PCB prototype (shared task)



Wilson Tran

- Accelerometer & Gyroscope sensor extraction + processing
- Create PCB prototype (shared task)



Smeel Milien

- Process and store data on embedded computer
- Configure IoT Hub on Azure to integrate Raspberry Pi with cloud



Neyissa Exilus

- Write a script for uploading data to a cloud database
- Implement azure function to compare two SQL databases



Project Management

TASK	2020										
	August			September			October			November	
	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late	Early	Mid
						PDR		ChIn3		ChIn4	MDR
Brainstorming											
Finding an Advisor											
Identifying Core Engineering Challenges											
Designing system											
Deliverable for 2nd Check in											
PDR											
Obtain Parts											
Learning Technologies											
RFID System R/W to Embedded Computer											
Sensor Data Extraction and Formatting											
Embedded Computer Data Processing											
Configure System for IoT Hub Integration											
Sync Data To Cloud											
Designing PCB											
System Integration/Debugging											
Finalizing MDR Deliverables											
MDR											

Thank you!