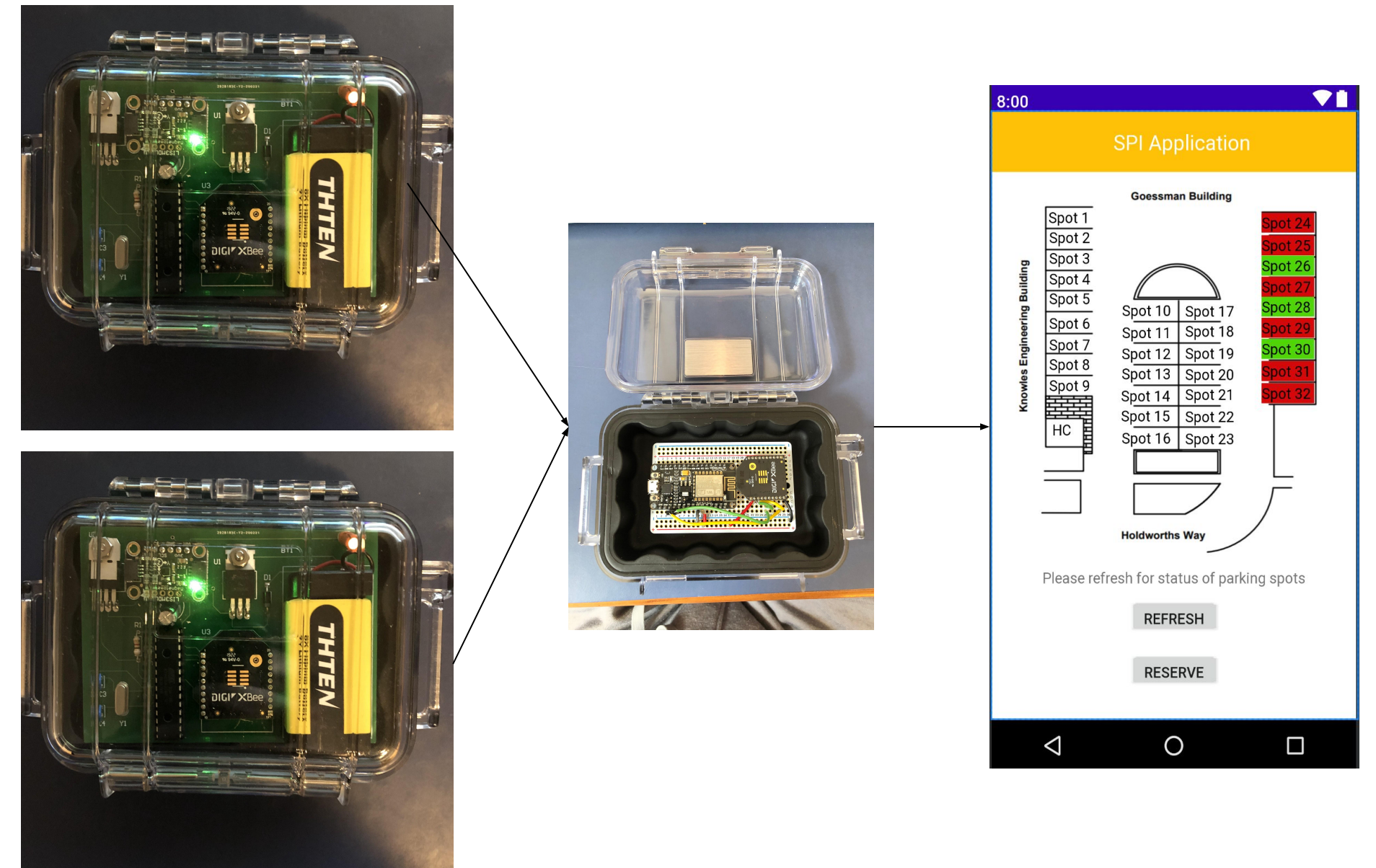# SPI

Alex Donadio, Edwin Munguia, Dan Perry, Mike Skaza
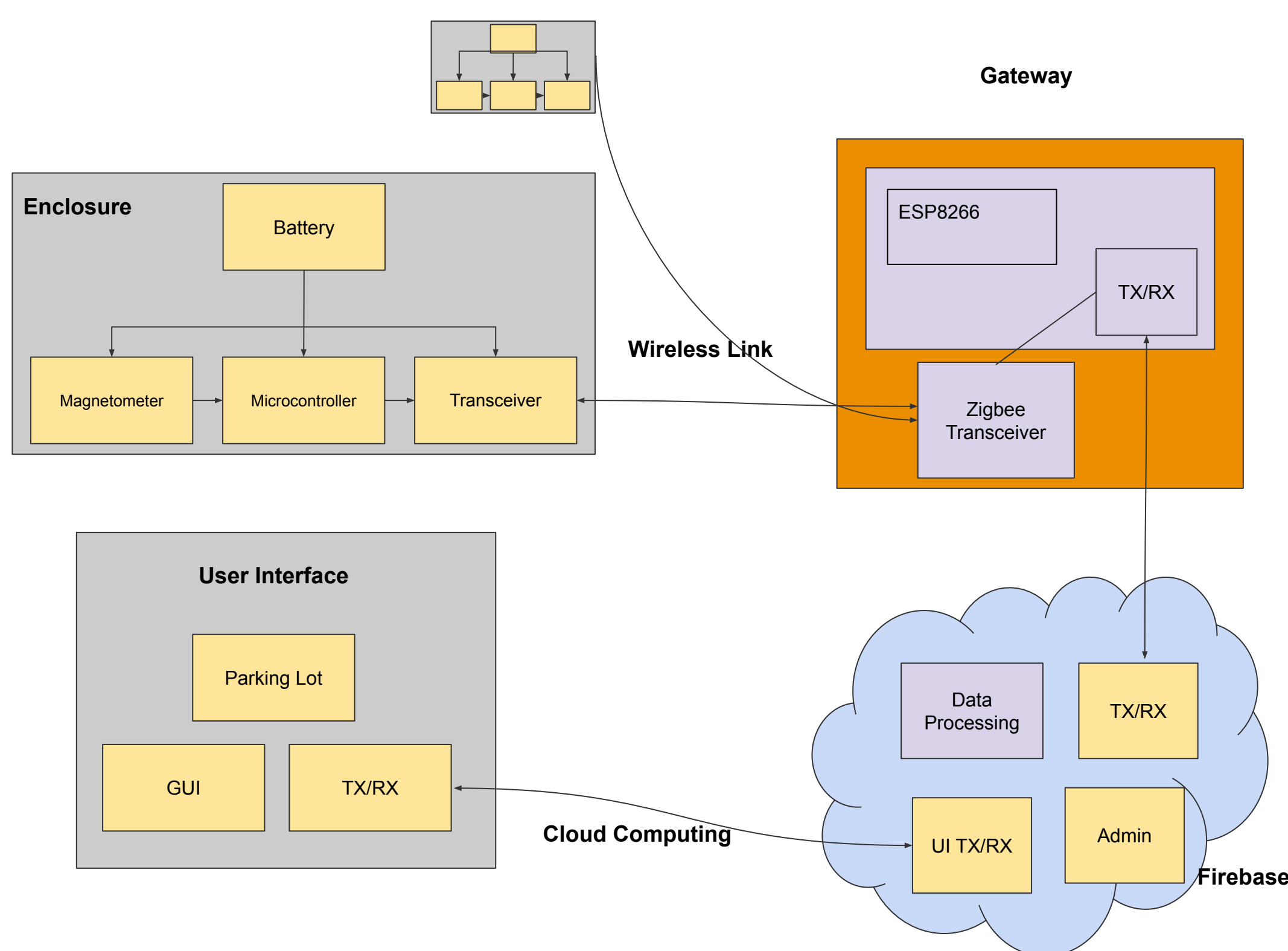**Faculty Advisor: Prof. Amir Arbabi**

Abstract

Daily drivers run into the constant problem when driving to a public place: PARKING. Finding parking, especially remotely is very difficult. Time spent wasted trying to find an open spot, increased carbon dioxide emissions, and overall personal stress are all main drawbacks of not having a smart parking infrastructure in place. Our product, SPI, is a sensor network that offers an application with real time analysis of open and occupied parking spaces. The system will allow you to see a map of the real time availability of spots in the designated destination.

Block Diagram

Specifications

1. Detect the presence of a vehicle with 90% accuracy.
2. The battery should last at least 6 months.
3. Every 1 minute the map is updated.
4. User interface is an android application that shows the status of the parking space.
5. Operable at all weather conditions and has IP67 rating enclosure and temperatures ranging from -20° F to 140°F.

System Overview

SPI employs reliable sensors which detect vehicle presence. By sensing changes in the magnetic field, we are able to relay that data to the to the app, showing the user spot availability in real time. Shown above, we have 2 sensor nodes which detect vehicle presence. Those then relay to our central gateway, which communicates to the cloud and updates the application accordingly.

Results

The SPI network is working satisfactorily. The sensor network can reasonably detect the presence of a vehicle, and then successfully relay that through Xbee chips to an ESP Gateway which is communicated to the Google Firebase. In this database, the computation to determine whether there is a vehicle present or not is decided, and the Android application is then updated, with the display showing green for a vacant spot, or red for an occupied spot. Everything was working successfully. For CDR we had successfully tested at **94% accuracy** and wanted to increase that to over 95% for FPR. The application was up and running and showed a map of one of the parking lots on campus.

Acknowledgement

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