Bluetooth Low Energy Location Services

Overview
At many FedEx package processing hubs, data integrity issues arise when employees scan packages from the sorting system into outbound trucks if the employee’s scanning device is not properly synchronized. Currently, this is a manual process, where employees must enter their location into their scanning device each time that they move locations. In instances where employees move to a different location only for a short time, this process is often forgotten. As such, although being routed to the correct location, some packages are being recorded as in transit to an incorrect location.

Objectives
• To develop a proof-of-concept solution consisting of hardware and software to automatically prompt employees register a change of location after moving.
• To prove the utility of Bluetooth low energy (BLE) devices and consider additional uses to increase FedEx’s business operations.

Approach
A proof-of-concept application was developed in Android, the operating system of the scanning devices FedEx currently owns. Kontakt.io BLE beacons were used for their consistency, cost-effectiveness, and ease of use. The application utilizes the beacon software development kit (SDK) to access beacon identifying and distance measurement information. An asynchronous task repetitively collects information about beacons in the nearby environment. A closest-distance algorithm was implemented to compute the nearest beacon in near real time, presenting a dialog to the user whenever his or her location changes from what is currently registered. Accuracy was improved using a finite state machine and quickened beacon broadcast rates.

Outcomes
The Android application developed by this team is able to identify the closest BLE device. Once identified, a message appears on the Android device prompting the operator to confirm that he or she will begin loading at the door associated with that BLE device. One BLE device will be allocated to each door and will be place at the top center of the opening.
• Allows frequent changes in loading door and route matches
• Reduces loading reparation time
• Improves data accuracy and integrity
• Assists in collecting useful data for performance management and process improvement efforts.