

DOSI XCHANGE

A MODERN SOLUTION TO A LABORIOUS EASTER EGG HUNT

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BACKGROUND

In order for researchers at SLAC to develop their globally-recognized work on particle accelerators and such, they must adhere to the regulations outlined in the Occupational Radiation Protection Program (10 CFR 835) by the U.S. Department of Energy's Office of Environment, Health, Safety, & Security. One of these requirements is to monitor areas that are or may be exposed to radiation. To do so, SLAC's Radiation Protection Department is tasked with managing dosimeters (pictured below) at over 700 locations across the SLAC campus.



an area dosimeter such as one deployed at SLAC; used to measure an absorbed dose of ionizing radiation

THE PROBLEM

Managing area dosimeters at SLAC is no simple feat. Because of the difficulty of locating a single dosimeter within a 426 acre industrial and laboratory facility, the biannual cycle of exchanging dosimeters is colloquially referred to as an "easter egg hunt."

THE ORIGINAL SYSTEM

The original method for managing dosimeters involved technicians hand-recording dosimeter barcodes onto a hard-copy list of locations assigned to them. This sublist, pulled from a master list of locations, would then be manually reincorporated back into the master list using Microsoft Excel.

THE CURRENT SYSTEM

Version 0 of the dosimeter exchange app, referred to as the "Guthrie App" in honor of the intern who completed the project, essentially took the original process and turned it into an app. While the Guthrie App eliminated pen and paper from the operation, it did little to improve the efficiency of the job. Technicians were now assigned one file (sublist) per iPod device. Managing dosimeters this way still required an administrator to manually consolidate the files at the end.

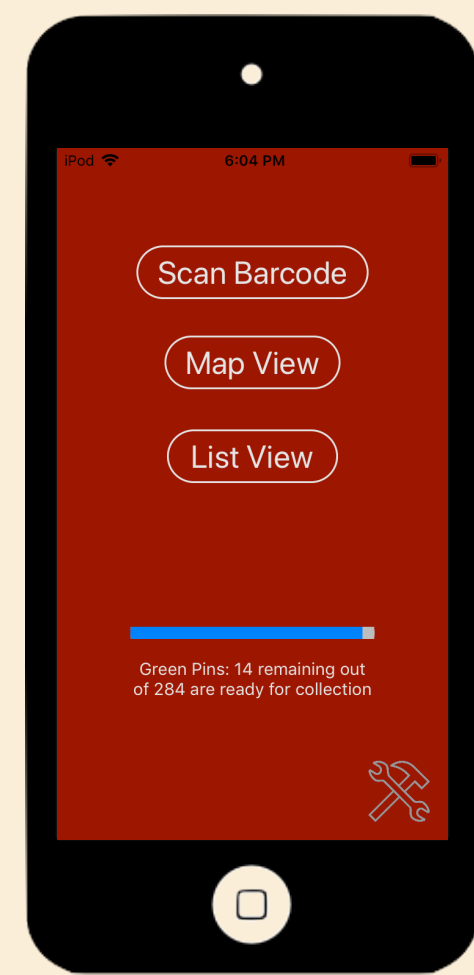
RECURRING ISSUES:

- **SLOW** - operation takes 1-2 months to complete
- **INEFFICIENT** - each sublist can only be edited by one technician at a time
- **PRONE TO HUMAN ERROR** - more than 5% of records contain some kind of error
- **DIFFICULT TO MANAGE** - an overwhelming amount of time is taken to manage the master list

THE SOLUTION

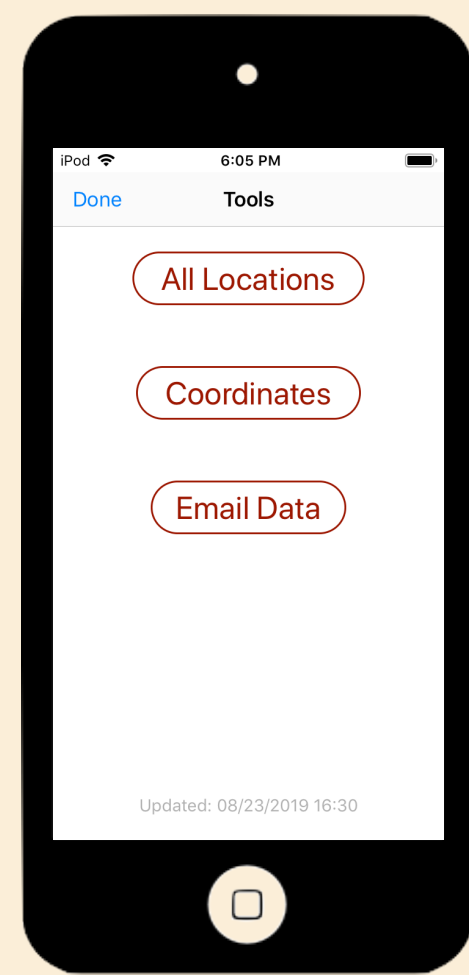
With the problems listed above in mind, Ryan Ford had a vision to create a user-friendly iOS application that would greatly improve the efficiency of the operation and make it easier to manage 700 locations. This new app, called "Dosi Xchange", was written in Swift 4.0 using Xcode, an integrated development environment developed by Apple.

APP FEATURES



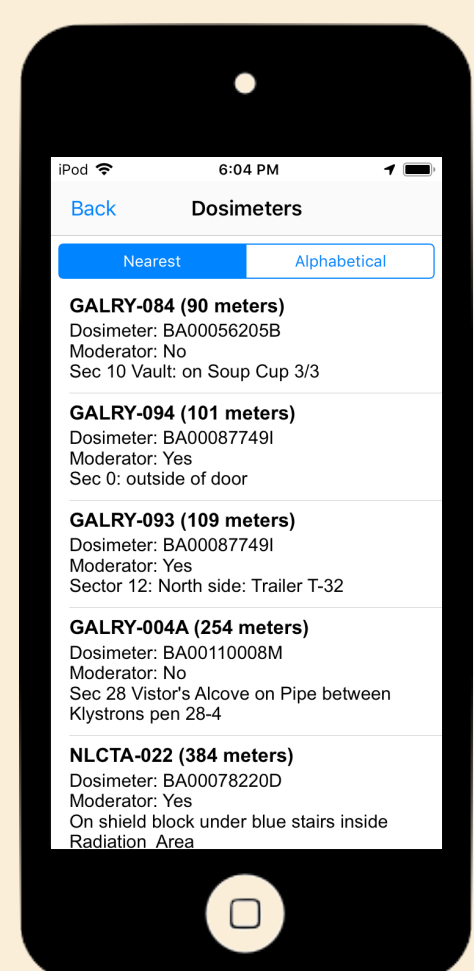
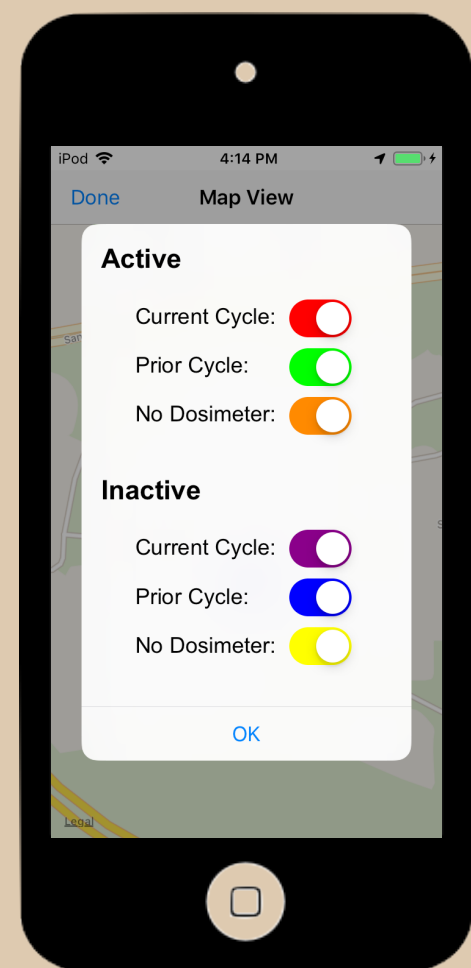
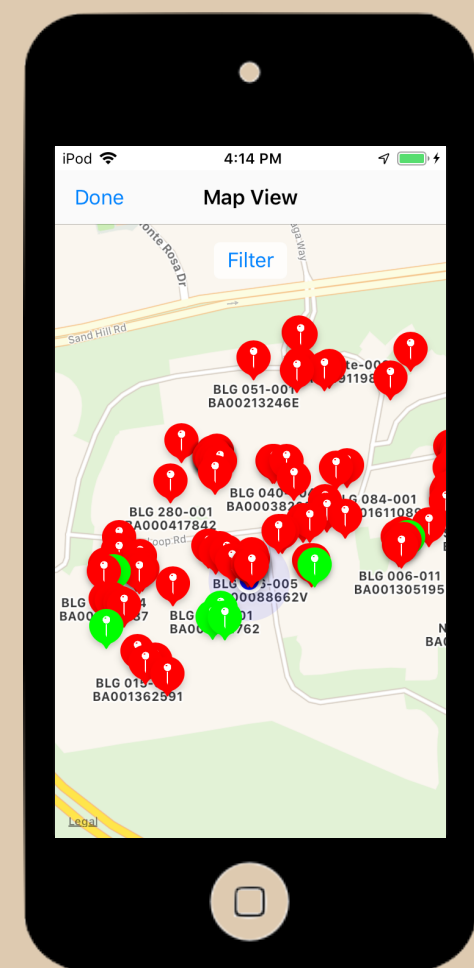
MAIN SCREENS

The home page features a user-friendly minimalist view with access to the app's main functions as well as a tools page with additional capabilities. The home page also displays the current progress of the biannual easter egg hunt.



MAP VIEW

Dosimeters are mapped out using the MapKit framework available to iOS developers. Users can see how many dosimeters are nearby visually, navigate to dosimeters, and filter the pins displayed on the map based on the status of the location. The user's current location is displayed as well.

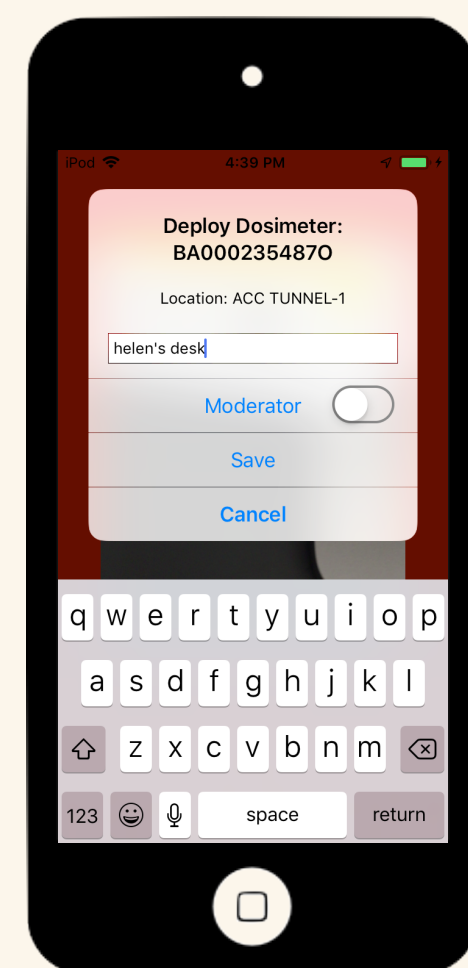
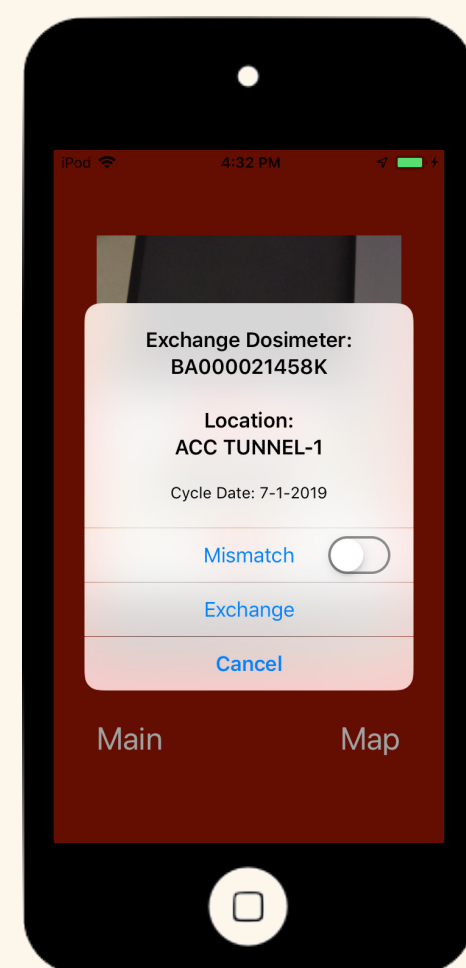
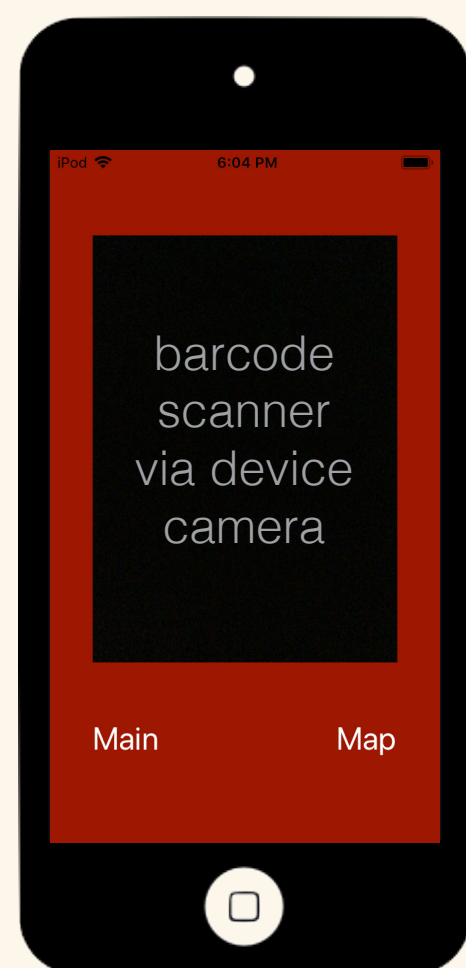


LIST VIEW

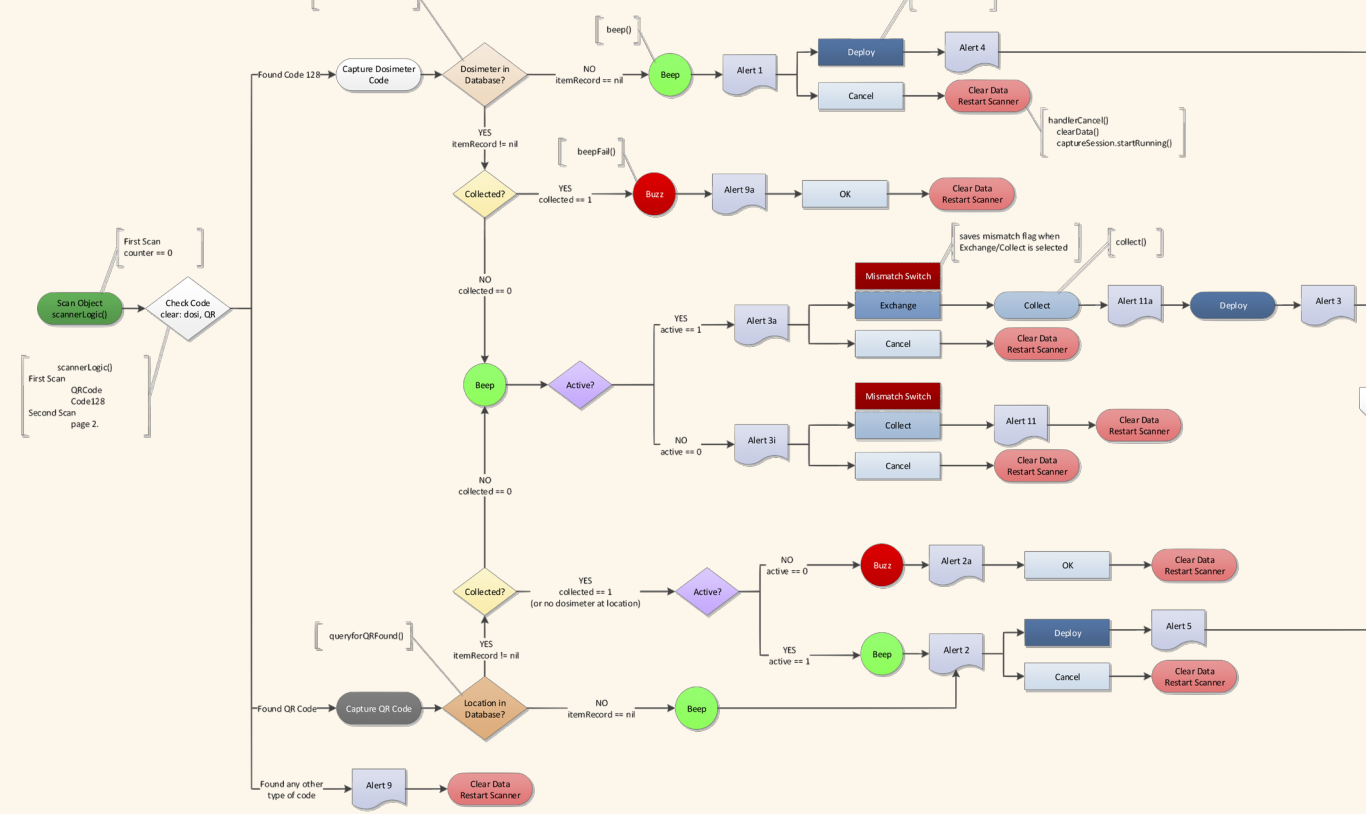
Dosimeters that are ready to be exchanged or collected are listed. Locations can be sorted by distance from the user or alphabetically for easy navigation.

SCANNER

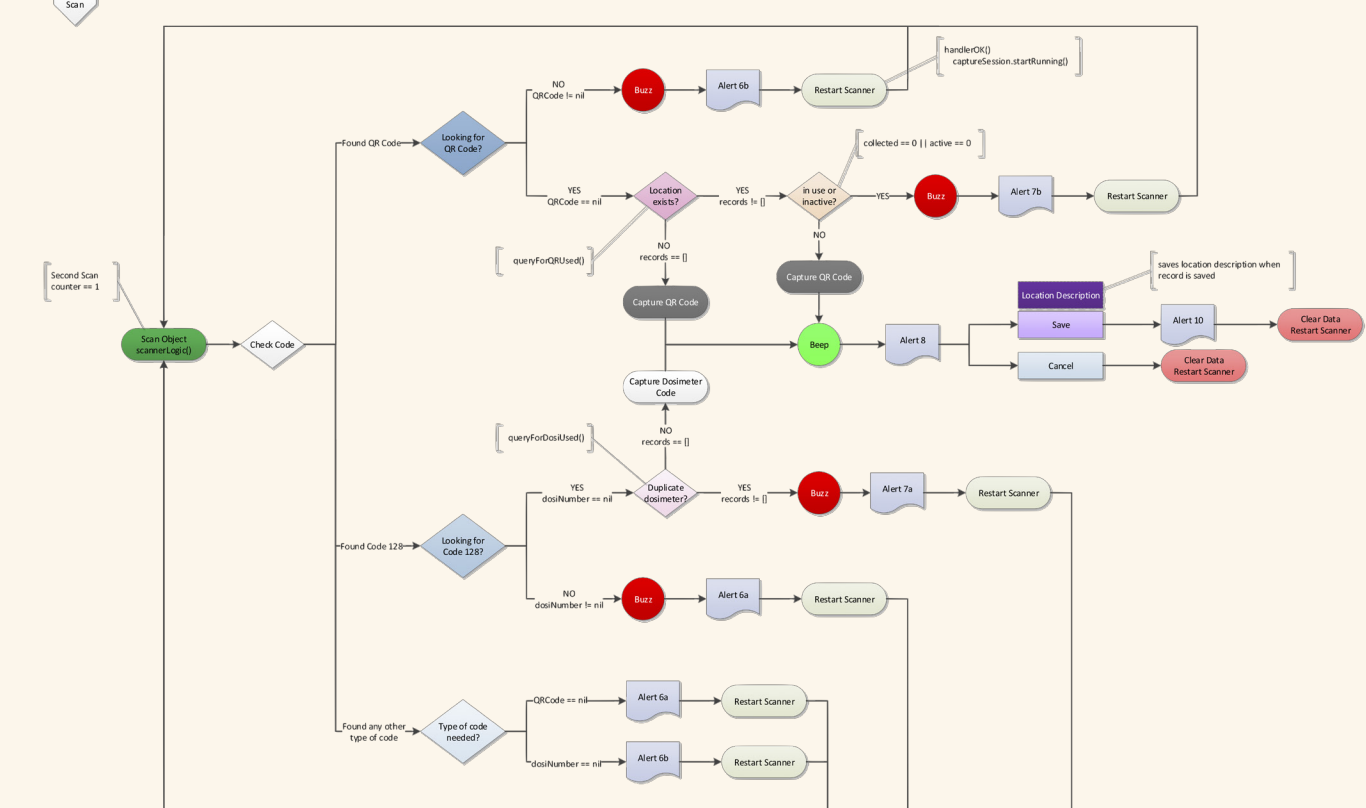
The barcode scanner eliminates all manual entry of barcodes and location QR codes, and allows the user to scan either type of code to begin the exchange process. A multi-step 2-scan logic is implemented to guide the user through the appropriate actions based on the status of the location and its dosimeter.



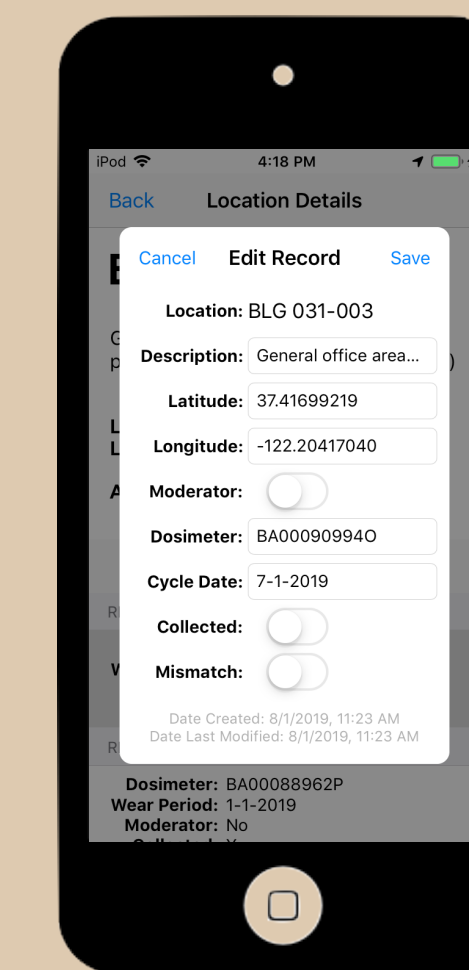
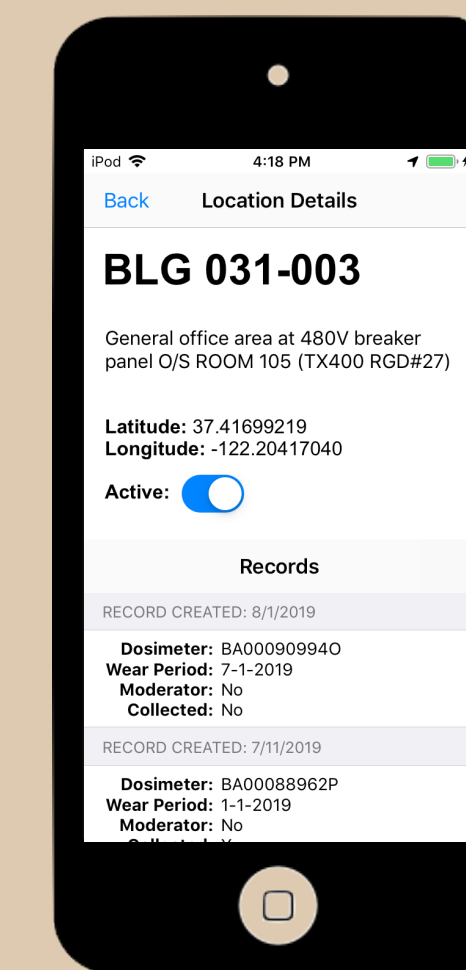
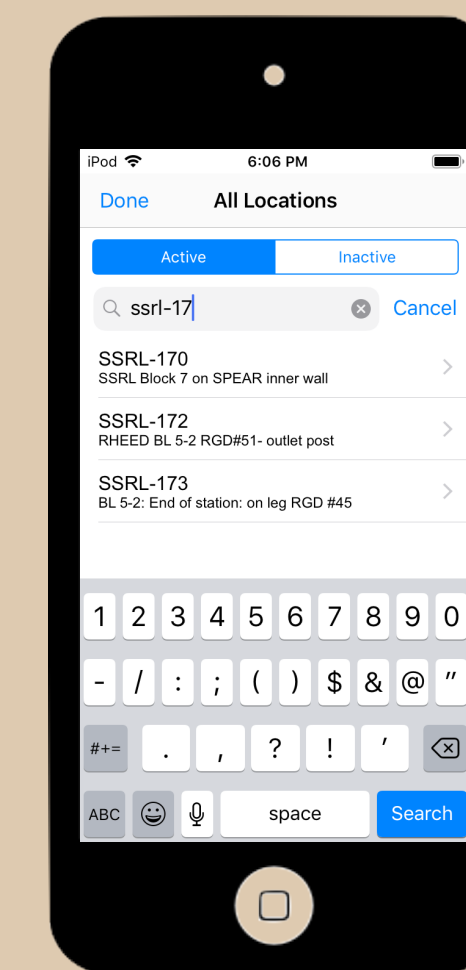
First Scan Logic Tree



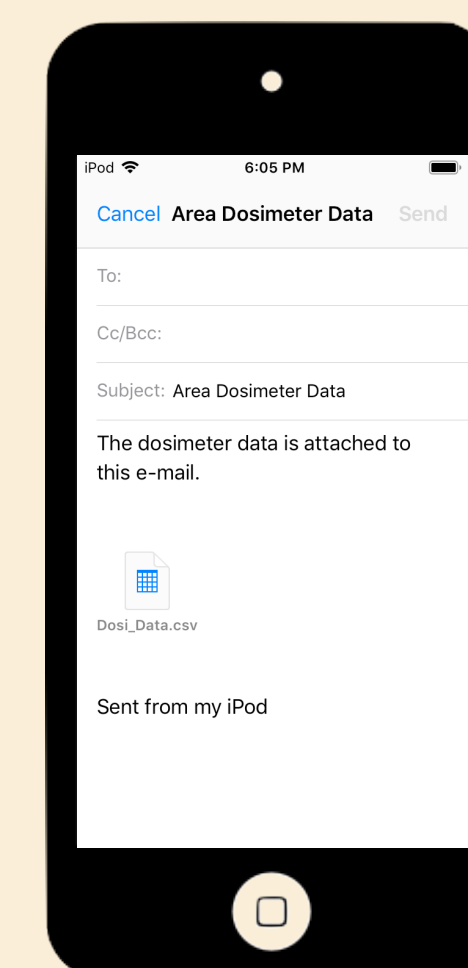
Second Scan Logic Tree



ALL LOCATIONS

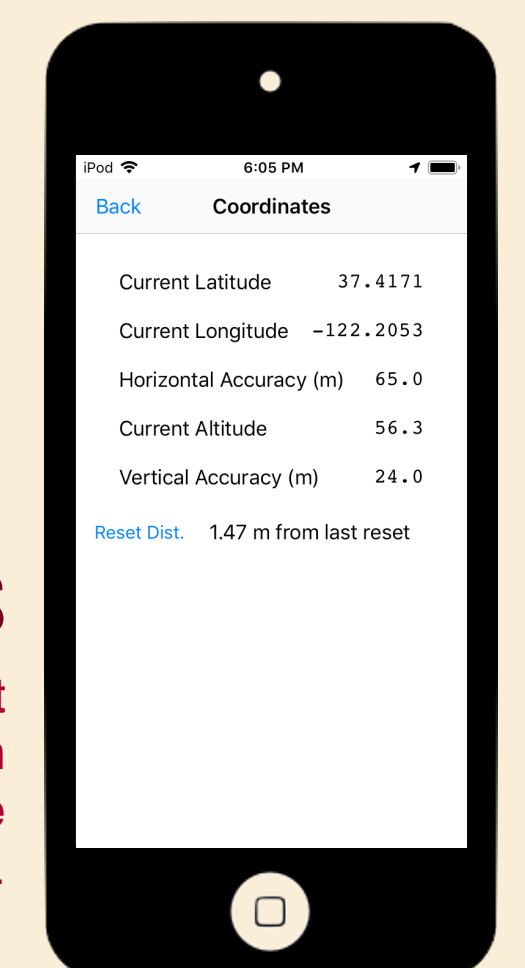


All 700+ locations are listed by status (active/inactive). Users can search for a location by QR Code or location description as well as activate/deactivate any location. For each location, records of all dosimeters deployed to that location are listed. These records can be edited by both technicians and administrators. This greatly reduces the work required of an administrator to edit and manage a master list.



EMAIL DATA

All dosimeter data stored in the database can be emailed from any device to any administrator for management.



COORDINATES

The device's current location and location accuracy is available to the device's user.

CLOUDKIT



With the Dosi Xchange app, data is centrally managed in the CloudKit Database. The use of a virtual database eliminates the need for an administrator to manually manage a master list. Multiple users can now edit records at once, maximizing labor efficiency.

ACKNOWLEDGEMENTS

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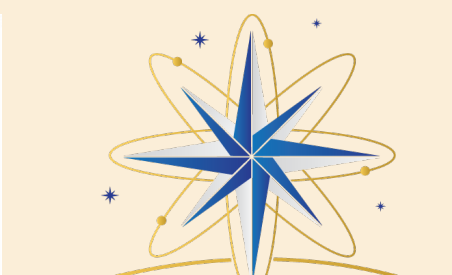
Special thanks to my mentor, Ryan Ford, whose vision I helped make a reality.



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