Grocery Assistant

Increasing accessibility in grocery stores

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Agenda

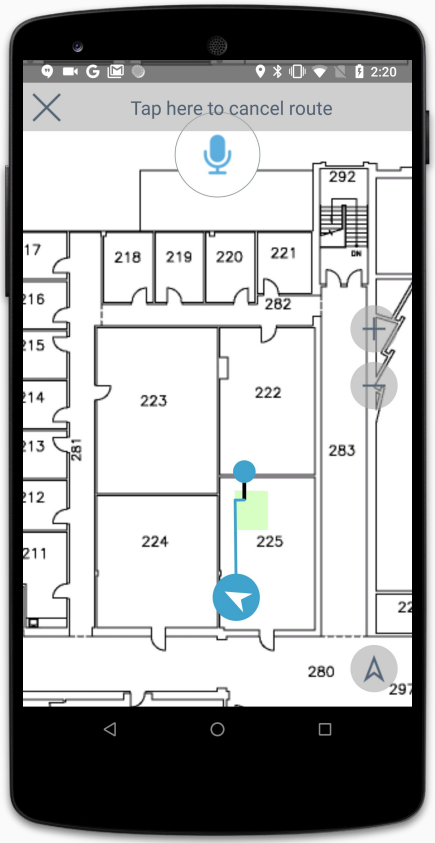
1. INTRODUCTION
2. DEMO
3. ARCHITECTURE
4. TECHNOLOGY
5. COST
6. HAZARDS
7. CONCLUSION AND QUESTIONS

Problem

Helping the visually impaired grocery shop, hence giving them a sense of independence.

Motivation

- Grocery stores are inaccessible to the visually impaired
- Currently, there is no product on the market to help them



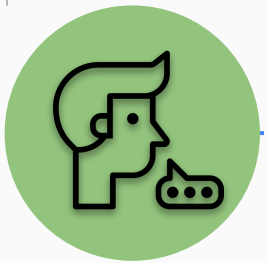
Solution

Build an application to interact with the visually impaired using voice instructions to help them navigate around the grocery store

How It Works

Step 1

User requests directions to an item in the grocery store



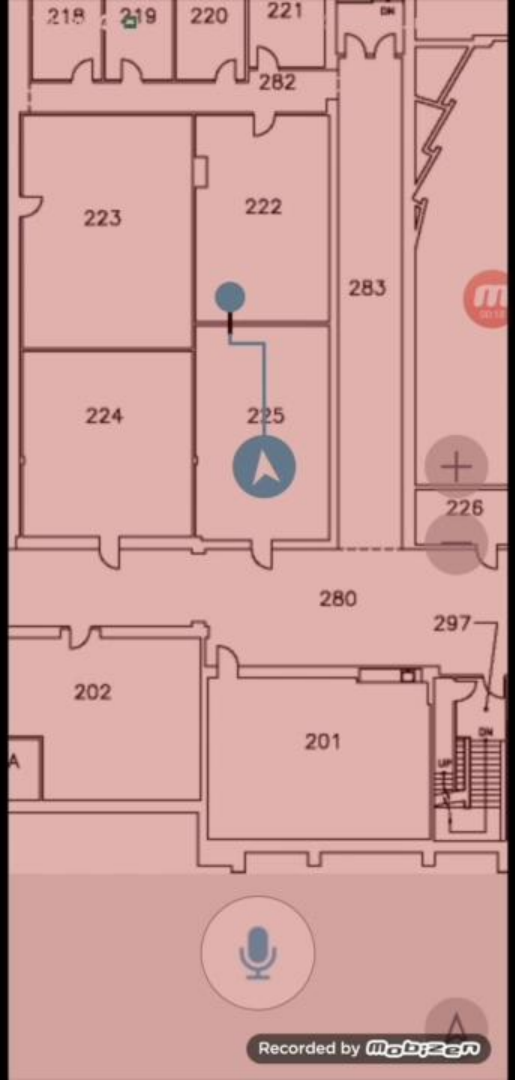
Step 2

Backend retrieves the coordinates of the item from the database

Step 3

A path is calculated between the user's position and the position of the item

Demo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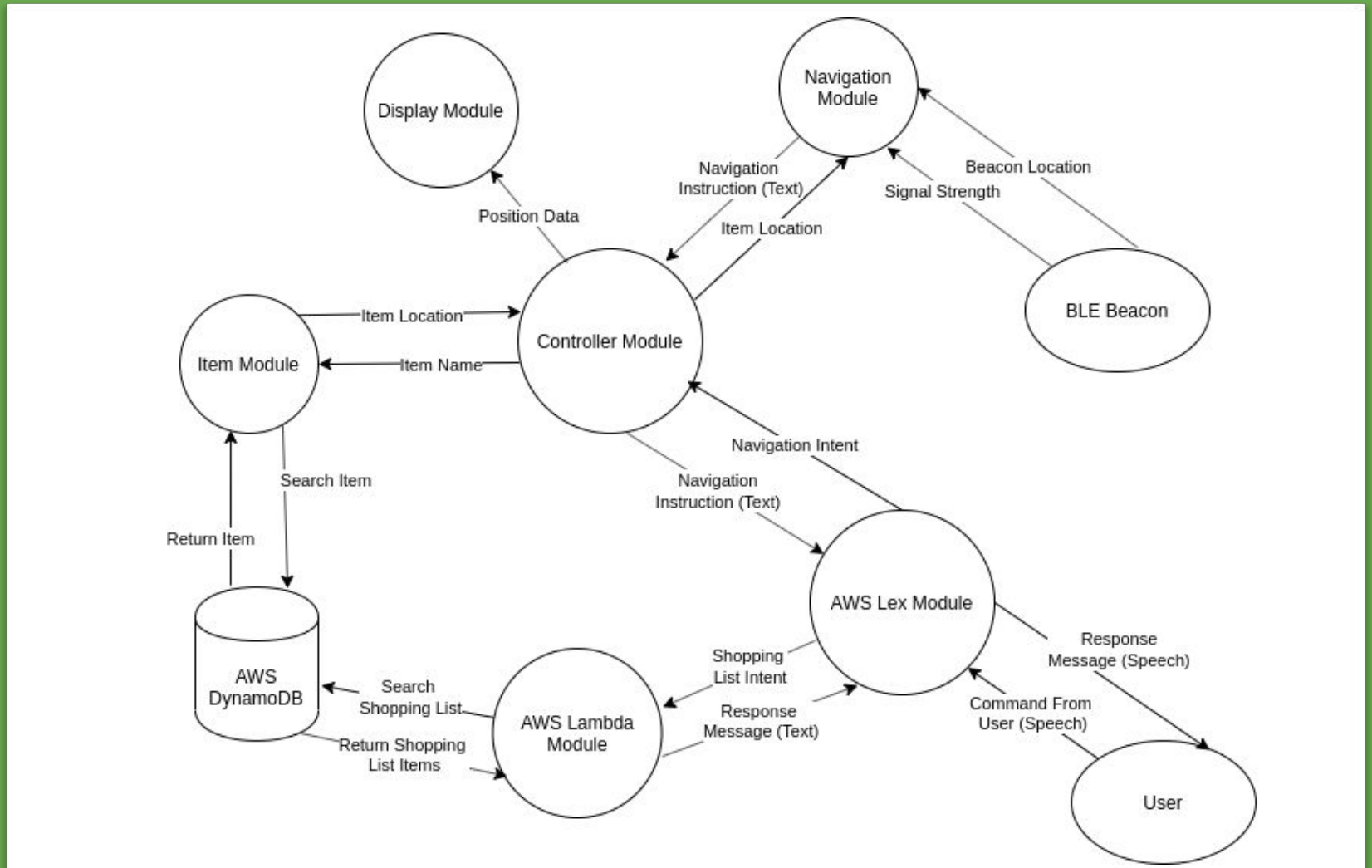
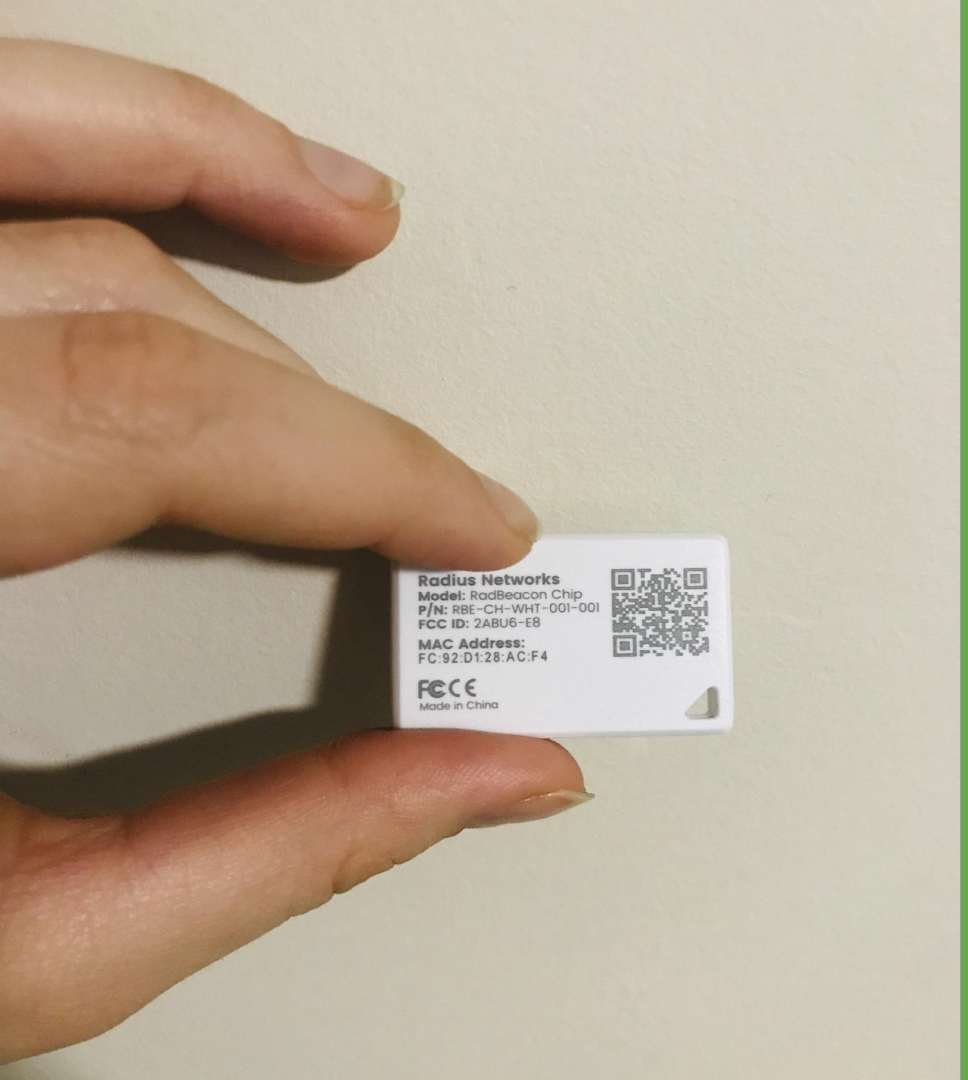
Recorded by Mobizen

Architecture

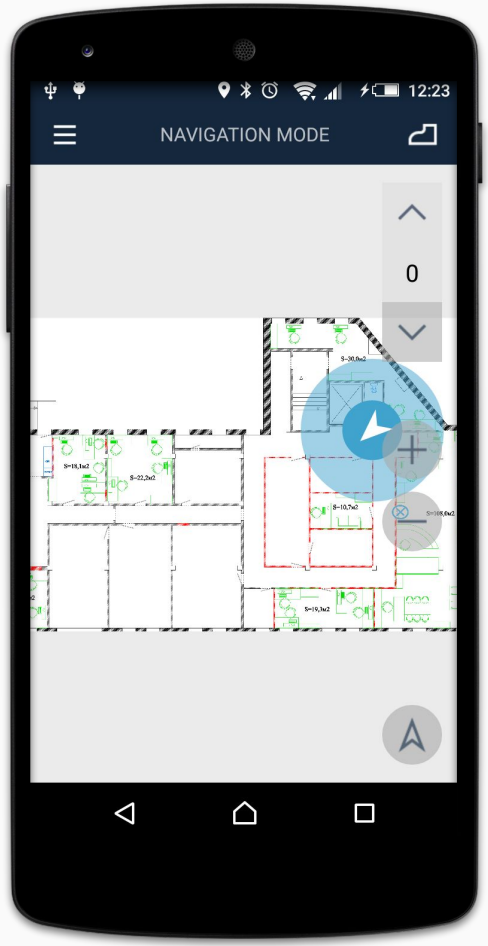

Display Module
Navigation Module
Navigation Instruction (Text)
Beacon Location
Signal Strength
Position Data
Item Location
BLE Beacon
Item Location
Item Module
Item Name
Controller Module
Navigation Intent
Search Item
Navigation Instruction (Text)
Return Item
AWS Lex Module
Response Message (Speech)
Shopping List Intent
AWS DynamoDB
Search Shopping List
AWS Lambda Module
Response Message (Text)
Command From User (Speech)
Return Shopping List Items
User

The Technology



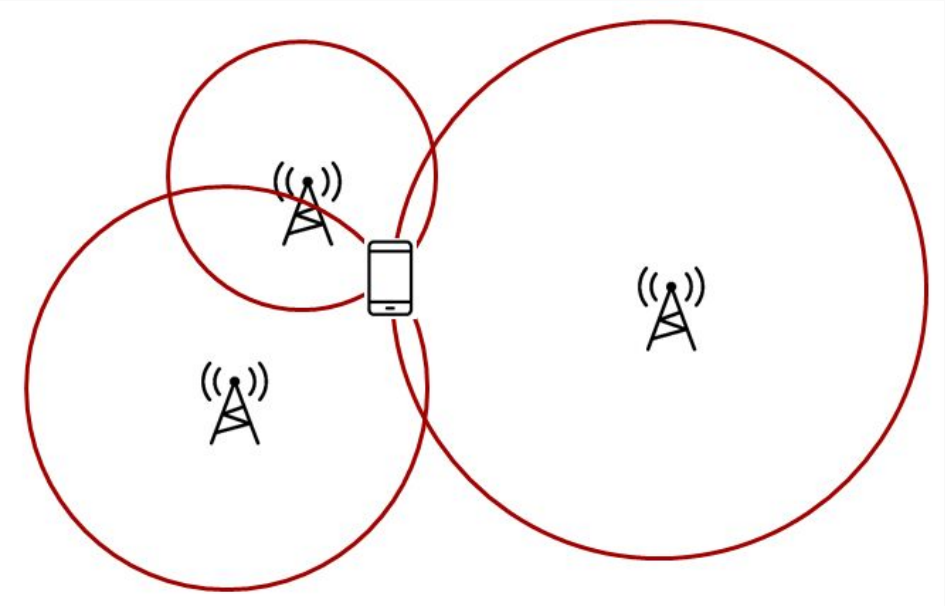
BLE Beacons

- Accurate and Reliable
- Transmission range of 50 meters
- Open source SDKs



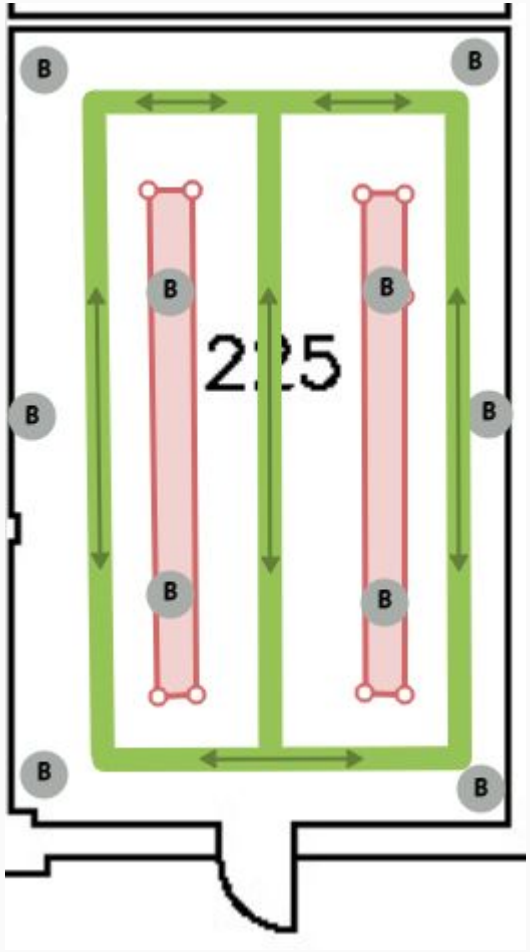
Navigine SDK

- Indoor positioning and navigation services
- Create location map in Navigine and download from their server using the SDK



Trilateration

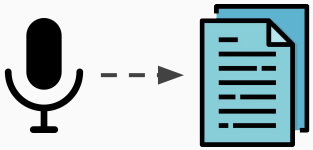
1. The position of the beacons is known
2. The distance between the device and beacons is estimated
3. The position of the device is computed



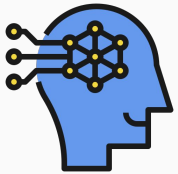
Pathfinding

1. Get Device Location
2. Get Destination point from the shopping list
3. Generate path between two points

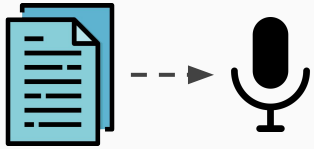
Voice Interface



Speech-to-Text



Natural Language Processing

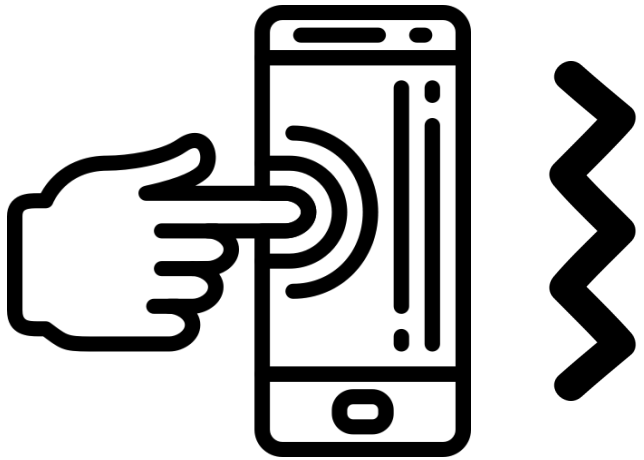


Text-to-Speech

Haptic Feedback

Vibration patterns communicate events to the user.

- Fast, all patterns are under 300ms
- Does not rely on vision
- Is effective in loud environments

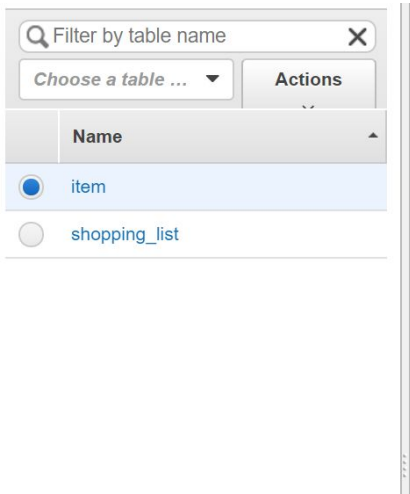


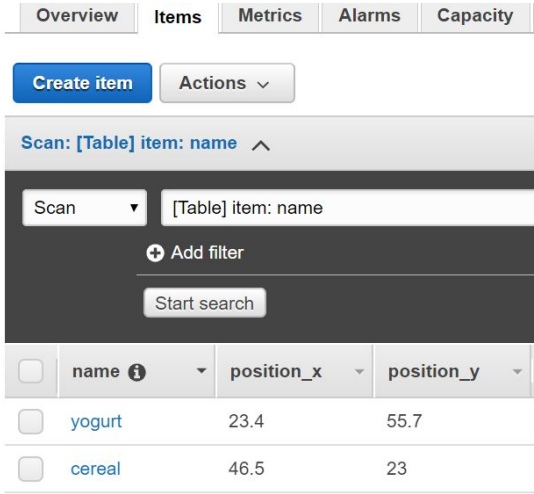
Database

- Table 1 (item):
  - names and locations of store items
- Table 2 (shopping list):
  - items in the user's shopping list
- Easily updated by administrators

DynamoDB

amazon web services™





Costs

- Beacons: $2.00 - $5.00 / m^2
  - Price depends on the manufacturer and quality of beacons

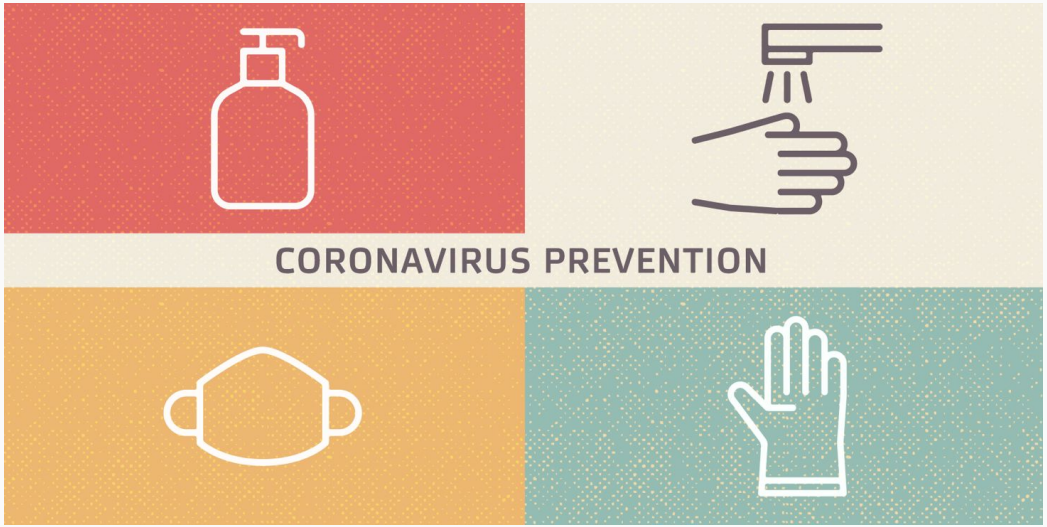
- Navigine SDK Licensing: $300 / month
  - Pricing above is an estimation based on similar SDK’s
  - Contact for pricing
  - Discounts with more venues

Hazards

- User walking into an obstacle causing injury and/or damage
  - Adding complete store map
- Navigating to wrong item which may cause a purchase causing allergic reactions
  - Frequent positional updates to users
- Application failures due to network outage or bugs causing incorrect purchases
  - Verbal notifications to user of app failures

Tasks Not Accomplished Due to COVID-19

- Testing for accuracy of app
  - Unable to get a space to test
  - Beacons were split up
- Testing with actual users
  - Unable to go out and actually receive real user feedback
- Navigation instructions
  - Unable to match position to correct instructions due to Bluetooth inaccuracy



Future Features

- Improve accuracy
- Make suggestions according to user’s health needs
- Get stores involved
- Optimize path for completed shopping list

Questions?