MICHIGAN STATE UNIVERSITY

Project Plan

Picking and Fulfillment Efficiency

The Capstone Experience

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From Students…
…to Professionals

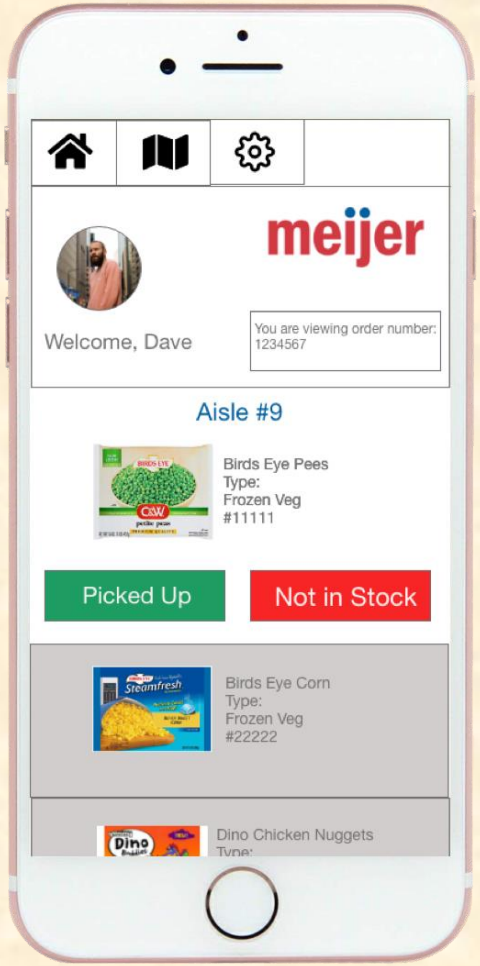
Functional Specifications

- Improves professional shoppers' fulfillment efficiency
- A path finding algorithm is used to create optimal shopping routes
- Assist professional shoppers to navigate the store based on an ordered grocery list
- Machine learning to increase route efficiency overtime using data collection

Design Specifications

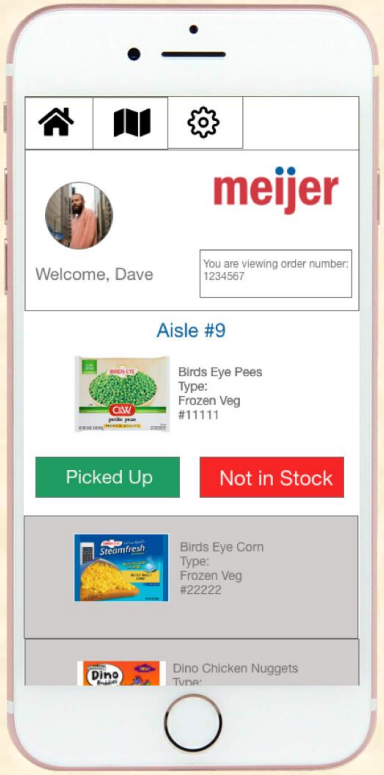
- Take existing professional shopper's online orders and produces an optimal shopping route
- Algorithm will take frozen, refrigerated, and unique items into account
- Application will track the time it takes to fulfil orders, evolving to reduce this time
- A map of the store layout will be provided

Screen Mockup: Main Page



Screen Mockup: Scroll and Navigation

1



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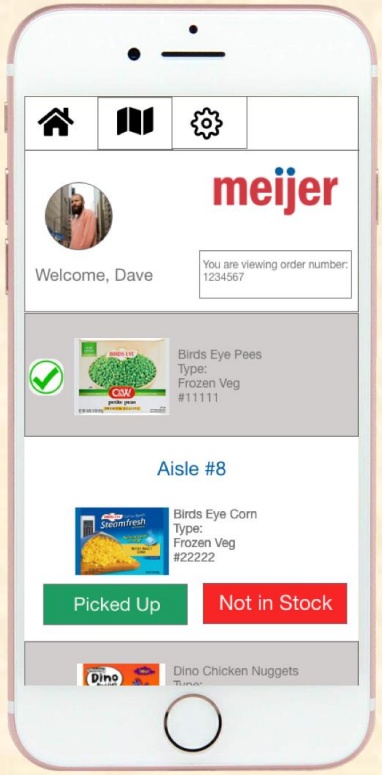

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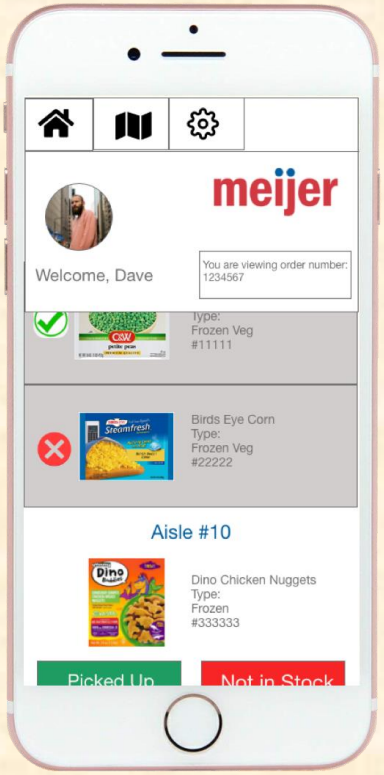
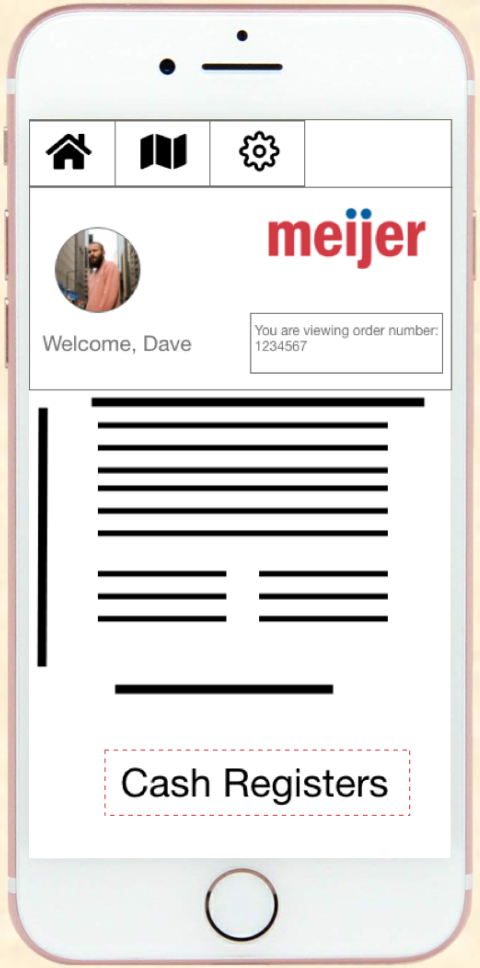
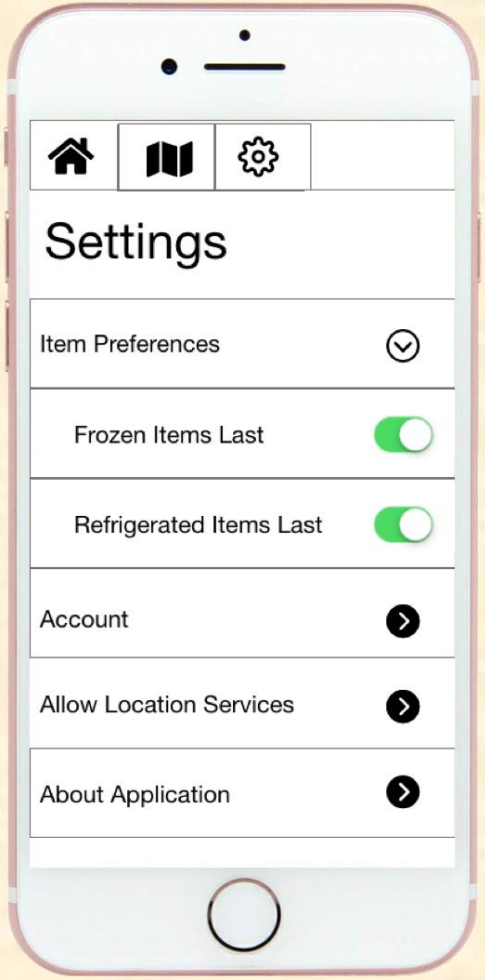


Screen Mockup: Store Map



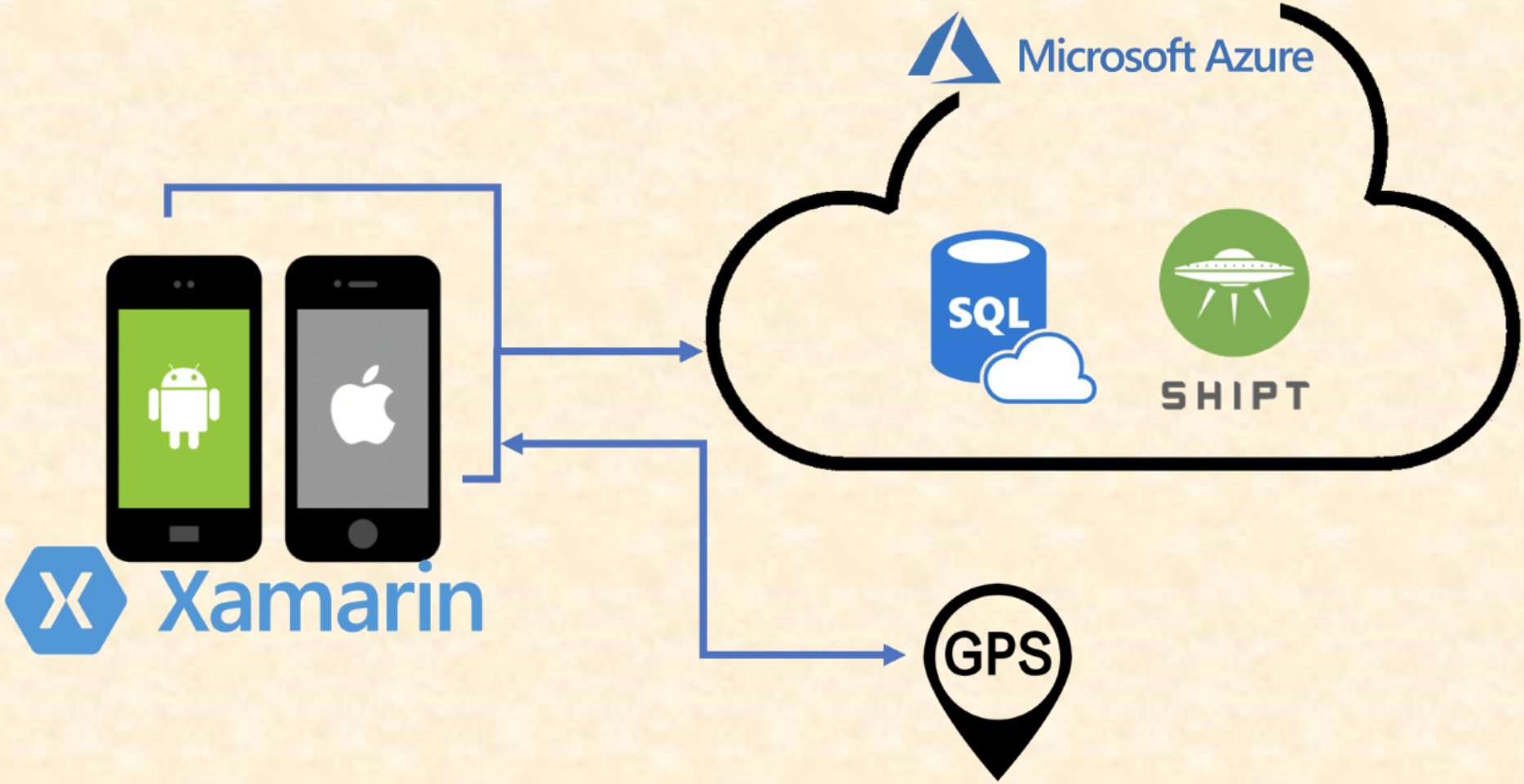
Screen Mockup: Settings



Technical Specifications

- Android and iOS development on Xamarin
- Builder pattern to create items
- Data collection to improve route optimization
- Machine learning
  - Perceptron training
- Picking algorithm
  - S-Shape heuristic
  - Largest Gap heuristic

System Architecture



System Components

- Hardware Platforms
  - iOS devices including iPad
  - Android devices
- Software Platforms / Technologies
  - Visual Studio's Xamarin mobile development
  - Azure SQL database hosting
  - Azure DevOps Git application version control

Risks

Establishing database communication

Description: The app must communicate with Azure Databases to gather product information, that is dependent on each store.

Mitigation: Create a test app to pull data from Azure. Gain insight from the developers at Meijer.

Applying machine learning

Description: Sample size too small.

Mitigation: Research ML using small sample sizes. Implement data collection early.

Unique store layouts and future layout changes

Description: Stores may have unique layouts and changed frequently. This will affect algorithm and how we suggest the shopper navigate the store.

Mitigation: Team Meijer will contact the client and how the store solves similar issues. While modifying the algorithm with unique edge cases.

Unable to find items

Description: There will be times when items in the database cannot be found this may be due to incomplete store records or incorrect edge cases for the algorithm.

Mitigation: Make sure item location databases are up to date. As well, create a product demo that handles lost items in a specific way.

Questions?