

MICHIGAN STATE
UNIVERSITY

Project Plan

O.P.E.N. v2.0: Smart Order Picking

The Capstone Experience

Team Phoenix Group

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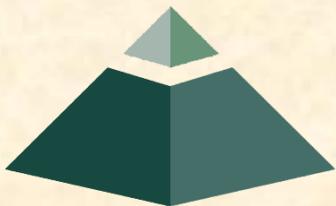
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*From Students...
...to Professionals*

Functional Specifications

- The Phoenix Group is a POS device distributor
- Warehouse “pickers” collect items to fulfill tickets
- Pickers have a tablet and a barcode scanner
- Goal 1: Find and display the most efficient path to all pick ticket items
- Goal 2: Track inventory in real time as items are scanned and tickets are fulfilled

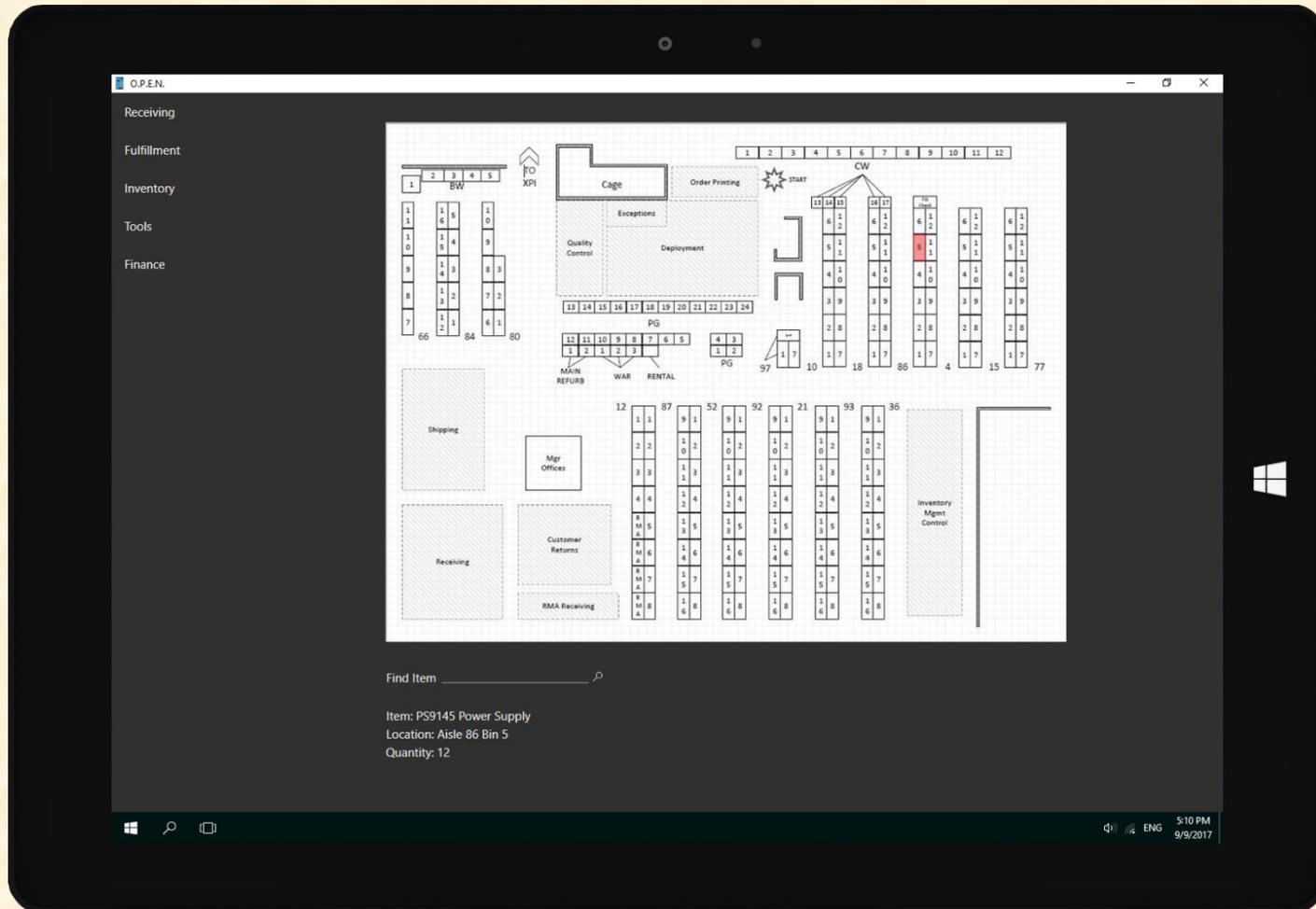


Design Specifications

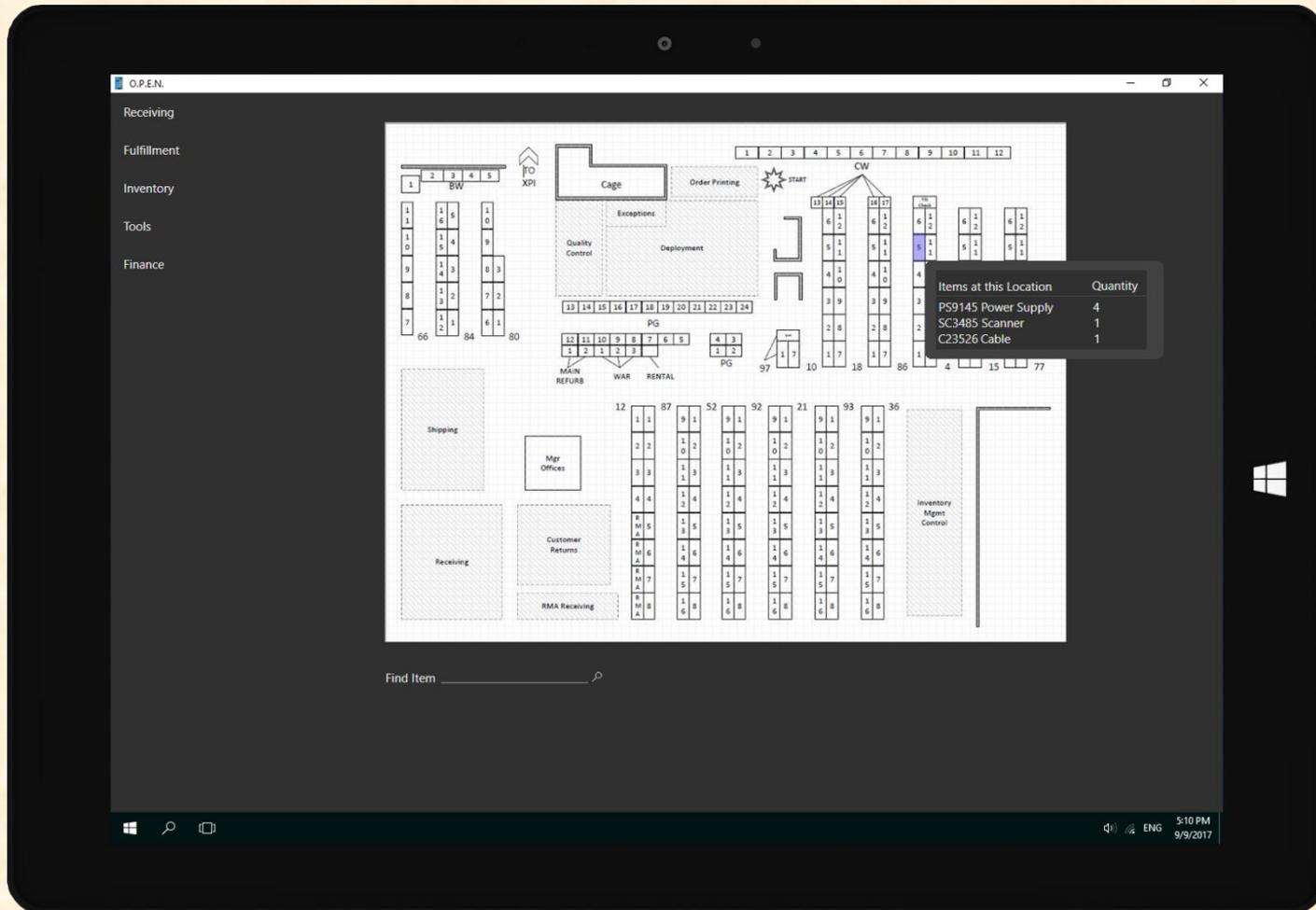
- Client App consists of two displays
- Order Fulfillment Display
 - Map with shortest route
 - Item queue display
 - Zoom/Move map feature
- Inventory Display
 - Click shelves on map for inventory details
 - Search for Items by name or number



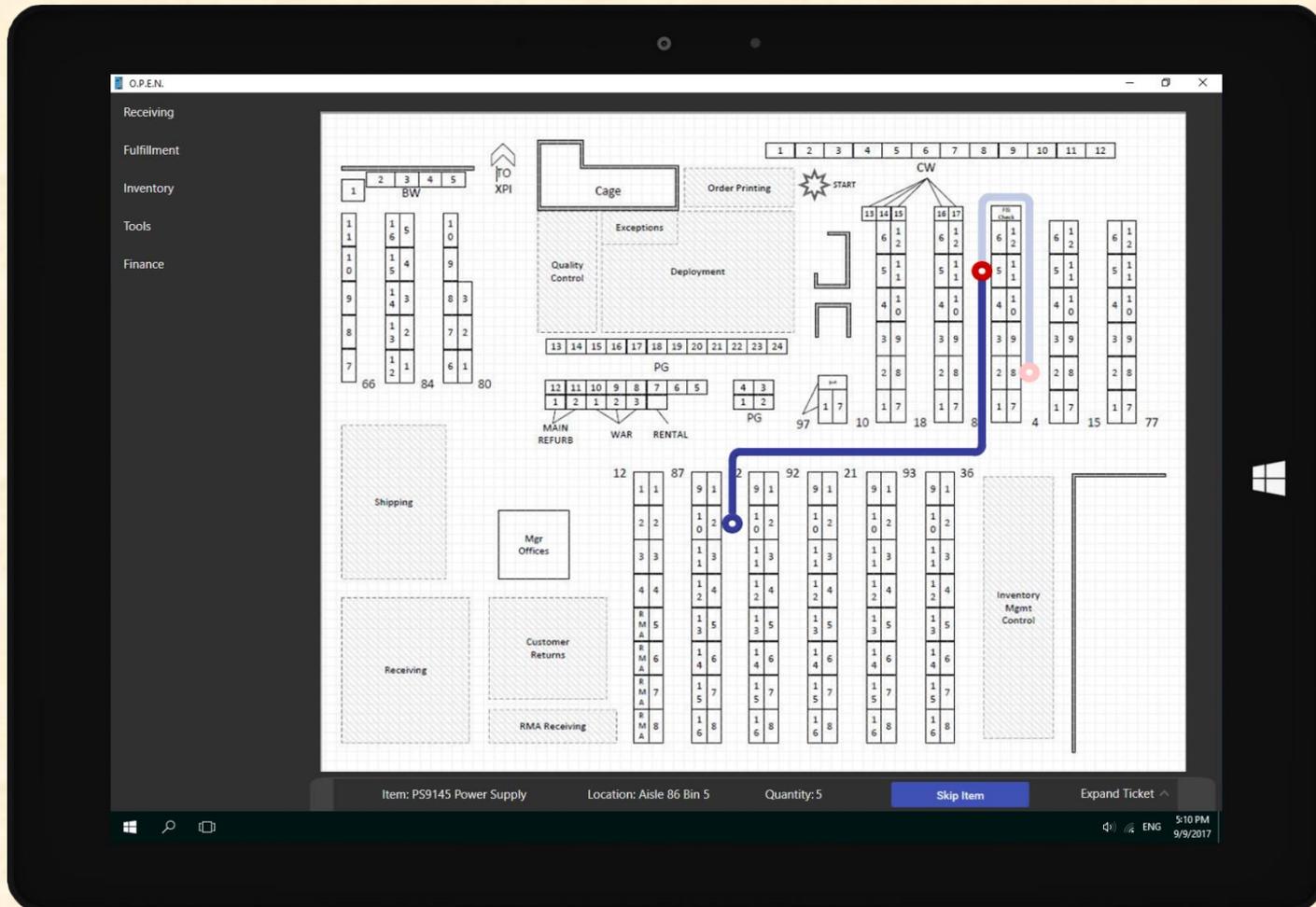
Screen Mockup: Inventory Display



Screen Mockup: Inventory Display



Screen Mockup: Order Fulfillment Display



Screen Mockup: Order Fulfillment Display

The screen mockup displays a warehouse floor plan with various zones and a navigation sidebar. A path is highlighted in blue, starting from a 'START' icon and moving through various aisles and workstations. A table at the bottom lists items with their locations and quantities, and buttons for actions like 'Skip Item', 'Move to Front of Queue', and 'Return to Item'.

Item	Location	Quantity	Actions
PS9145 Power Supply	Aisle 86 Bin 5	1	Skip Item
SC3485 Scanner	Aisle 4 Bin 8	4	Move to Front of Queue
PS9145 Power Supply	Aisle 86 Bin 5	2	Move to Front of Queue
C23526 Cable	Aisle 82 Bin 11	1	Return to Item

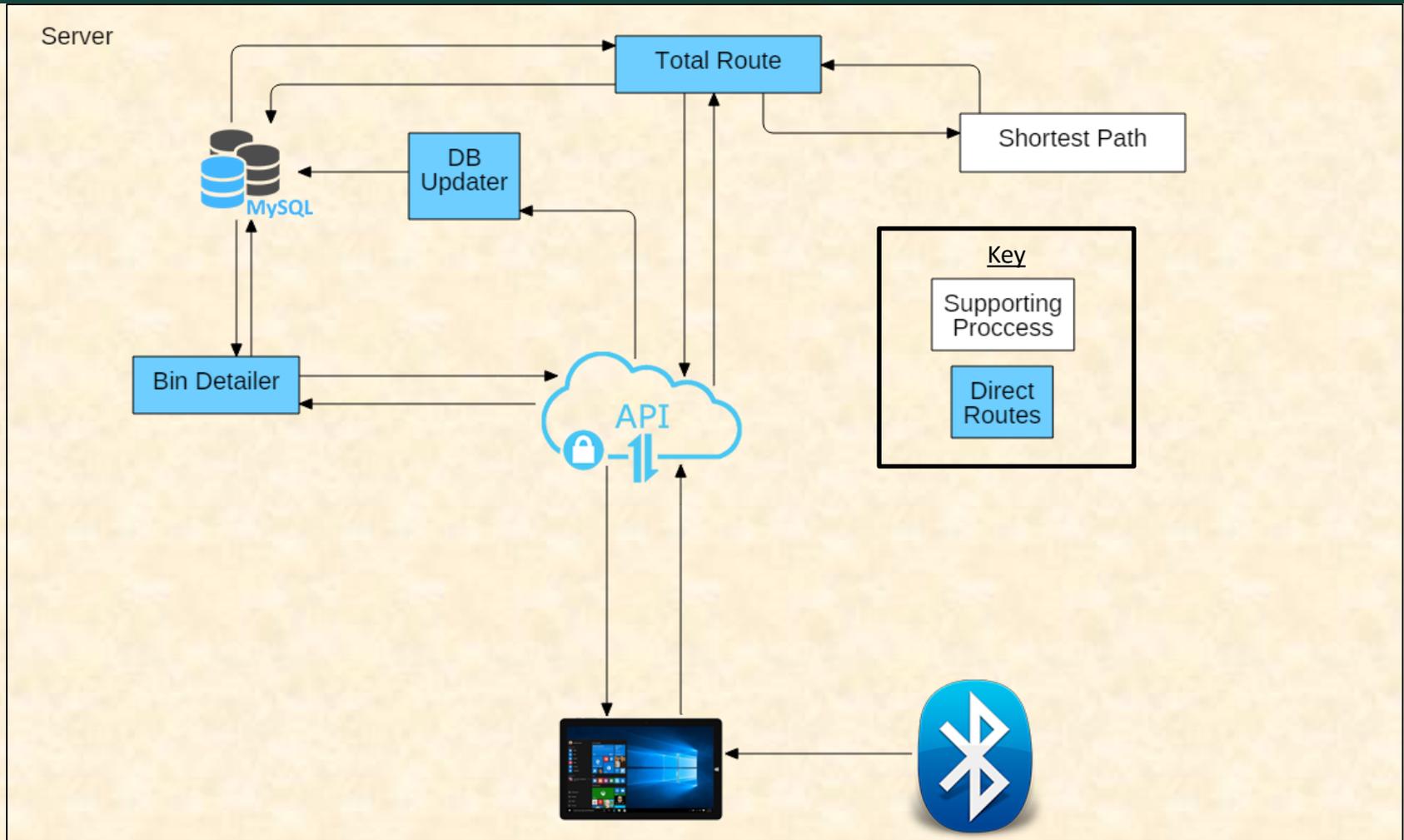


Technical Specifications

- **MySQL**
 - Holds all inventory data
 - Bluetooth Low Energy (BLE) Positions
 - Grid Layout
 - Exists on the Windows R2 Instance
- **Windows Tablet**
 - Self locates with BLE device Received Signal Strength Indication (RSSI)
 - Displays route and shelf inventory details
- **Windows R2 Server**
 - Service layer between the Database and the Tablet
 - Performs intensive routing calculations (shortest route)



System Architecture



System Components

- Hardware Platforms
 - R2 AWS Server
 - Windows Surface Pro Tablet
 - BLE Beacons
 - Barcode Scanner
- Software Platforms / Technologies
 - NodeJS / Express (API Communication backend)
 - MySQL
 - Windows Tablet Application (O.P.E.N. v2)



Testing

- Create a “warehouse map” of capstone lab to test the Bluetooth devices’ accuracy and range
- Test various routes to ensure our quickest-route algorithm efficiently picks the best path
- Test server under load with multiple clients
- Run use cases for usability of the front-end client application



Risks

- Shortest Path Algorithm
 - Finding the absolute shortest path could become too intensive.
 - Instead of finding the absolute best solution, find a good solution
- Beacon Hardware
 - Scalability and accuracy of readings of short range Bluetooth devices
 - Increase device density or use GPS.
- Tablet Power Consumption
 - Frequent network calls and receiving BLE signals
 - Condense data readings and backend calls to decrease network traffic



Questions?

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