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COS 301 - Indoor Mall Navigation SRS document

Brute Force

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1 Introduction

The scope of the project is to create a fully interactive mall guide of sorts which will allow users to easily find shops as well as act as a shopping companion, providing a list of available specials within a store based on location as well as allowing users to add items to a shopping cart to purchase and have delivered later. This system also aims to replace electronic maps using augmented reality to guide users to a selected store.

2 Glossary

Abbreviation	**Description**
AR	Augmented Reality
IoT	Internet Of Things
API	Application Program Interface
AOA	Angle of arrival
TOA	Time of arrival
QR	Quality Requirements

3 Domain Model

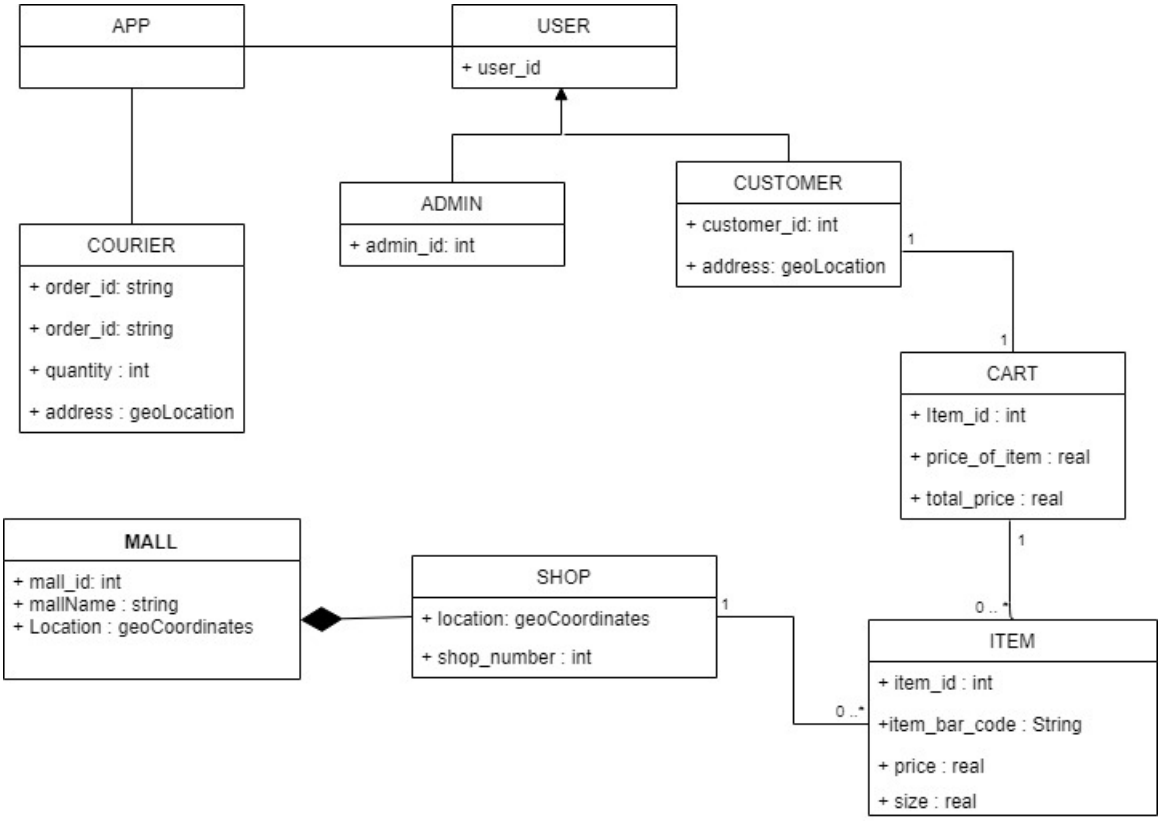

Figure 1: Domain Model.

4 User characteristics

4.1 Customer

This User will interact with the system in order to find a specific shop in a specific mall. The user will be navigated to the specific shop by use of AR. Depending on where the user is in the mall, items on special will be pushed onto the interface for them to see.

4.2 Maintenance

This User will update and maintain the system. If there are any shops being moved/renovated or the mall is being extended, this user will make sure that the system is up to date.

4.3 Delivery Personnel

This user will interact with the system in order to get the customer order from the shop and deliver it to the given location. This user will use the Google map feature integrated in our system to find the shortest route to the customers location.

5 Constraints

5.1 Battery Life

Beacon batteries don't last forever so when they die, they will gather no data. Which means that valuable data will be lost.

5.2 Costs

Estimote beacons can be quiet expensive so if we have to cover the entire mall, it will be very expensive.

5.3 Range of Beacons

The beacons that will be used for this system only have a range of up to a 100 meters. This will be a major problem when when we are dealing with large floors that also have many levels.

5.4 GPS Inaccuracy

Some mobile phones come with app notification features powered by both Geofences and GPS. The challenge here is that GPS can be inaccurate

6 Technology Decision

6.1 Database Server Management - Firebase

- We chose Firebase because it provides realtime synchronized data. this means a user can store data with NoSQL cloud Database. when a user goes offline on the app, data remains available across all customers in real time.
- Google also provides free Analytic's for mobile apps when using firebase so that the user can see which data is accessed or searched the most so that the developer can modify the app for better user experience.

6.2 Development - Native Android

- We chose Native Android because of it's superior beacon support.
- Native Android also ensure speed and agility for mobile Apps with responsiveness and great native app based UI
- Native Android applications are more interactive And intuitive. Native mobile apps run much smoother regarding user input and output. These types of apps inherit their devices' OS interfaces, making them look and feel like an integrated part of the device.
- Native Android applications tend to have fewer bugs during development.

6.3 Testing - Travis-CI

We chose to use Travis Ci for integration because of the following:

- It monitors GithHub projects very well.
- It easily allows deployment to cloud service
- It Runs tests and generates results quickly.
- It Easily identifies small and large changes.

7 Functional Requirements

7.1 Use cases

UC 1 Create Account
UC 1.1 create an account upon purchase or when adding an item to the wish list

UC 2 Customer Login
UC2.1. Registered users log in using their email and password.

UC 3 Navigate
UC 3.1. Navigate to chosen shop
UC 3.2. View current location
UC 3.3. Search for Restrooms.
UC 3.3. Find shortest path

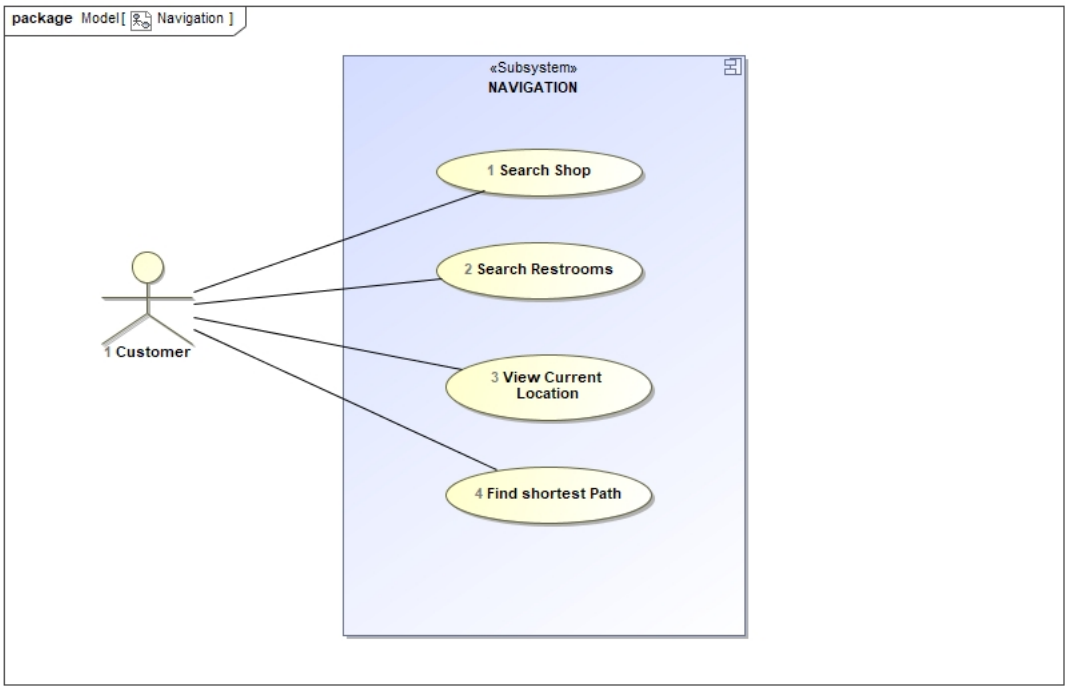

Figure 2: Navigation Use Case.

UC 4 Scan Barcode
- UC 4.1. Read product name and price from barcode
- UC 4.2. Add item to wishlist
- UC 4.3. Add item to cart

UC 5 Scan QRcode
- UC 5.1. Read product name and price from QRcode
- UC 5.2. Add item to wishlist
- UC 5.3. Add item to cart

UC 6 Customer Cart
- UC 6.1. add an item to cart.
- UC 6.2. remove an item from the cart.
- UC 6.3. checkout
- UC 6.3. Payment

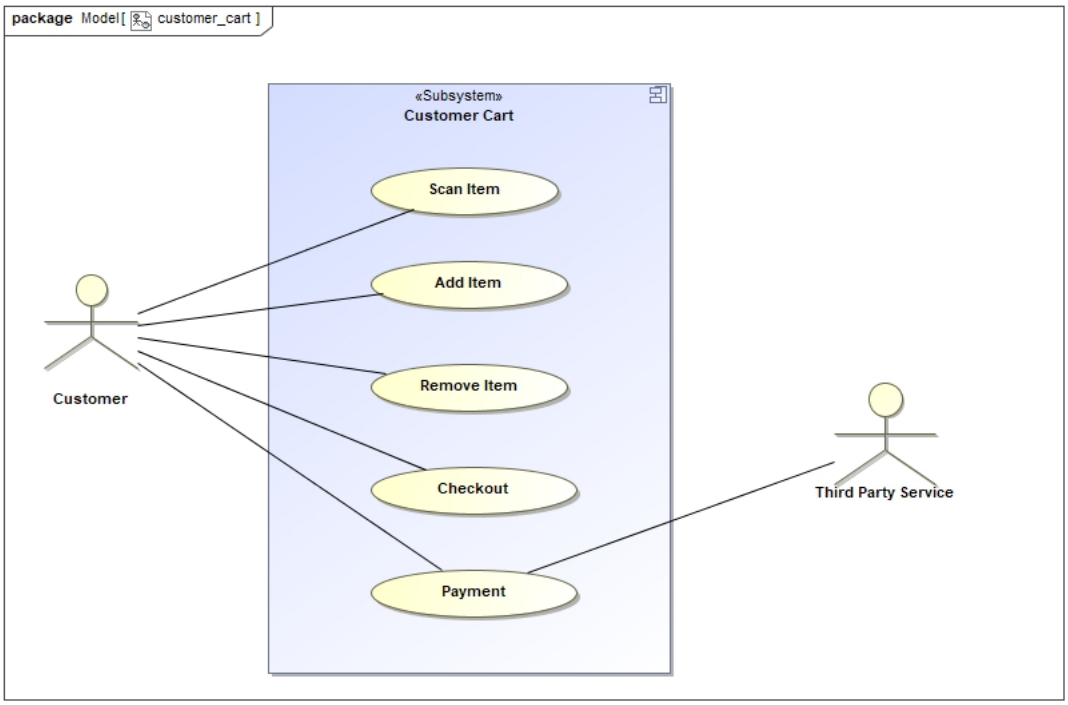

Figure 3: Customer Cart Use Case.

UC 7 Customer Wishlist
- UC 7.1. add an item to wishlist.
- UC 7.2. remove an item from the wishlist.
- UC 7.3. empty the wishlist.
- UC 7.4. move an item from wishlist to cart

UC 8 Delivery
- UC 8.1. accept order.
- UC 8.2. check delivery status.
- UC 8.3. select preferred time range.
- UC 8.4. payment

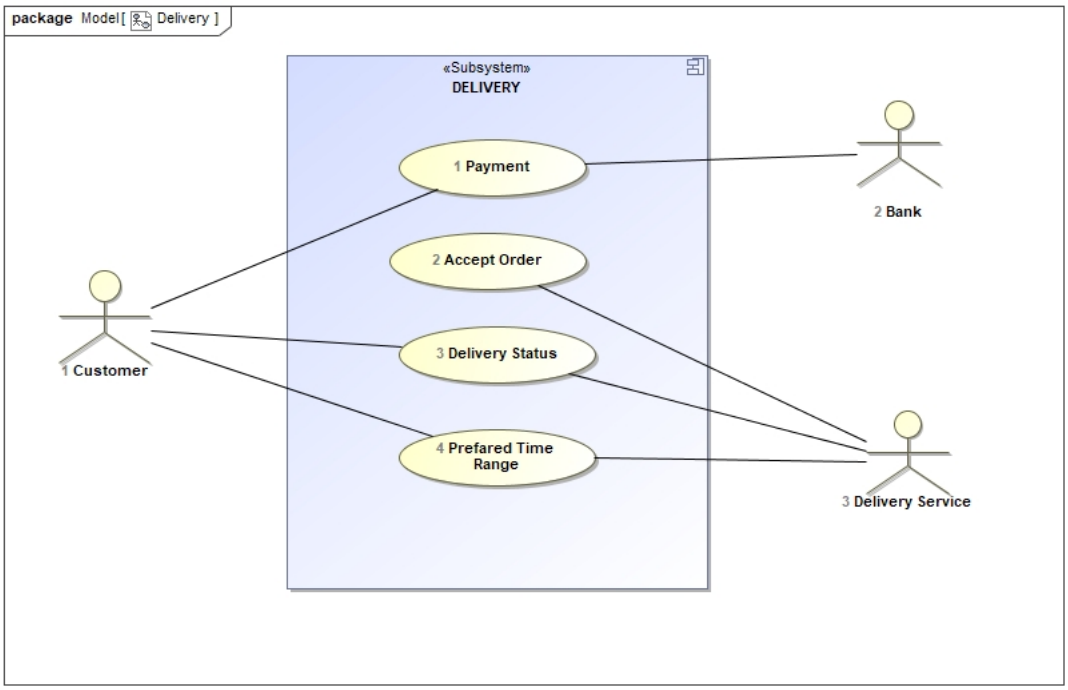

Figure 4: Delivery Use Case.

UC 9 Main

7.2 Requirements

R1. A User should be able to navigate to a desired store

R2. A User should be able to register on the system by creating an account

R3. A User should be able to log in once registered to view their profile and utilize other functionality.

R4. A User should be able to view their current location and navigate to a desired location.

R4.1. User should be able to search for a store in the mall and receive the shortest path according to their location

R4.2. User should be able to search for the nearest restrooms according to their location

R5. A User should be able to scan the barcode of a product

R5.1. User should be able to view the product name and price

R5.2. User should be able to add a product to wishlist after scanning barcode

R5.3. User should be able to add a product to cart after scanning barcode

R6. A User should be able to scan the QRcode of a product
R6.1. User should be able to view the product name and price
R6.2. User should be able to add a product to wishlist after scanning barcode
R6.3. User should be able to add a product to cart after scanning QRcode

R7. A User should be able to interact with their shopping cart
R7.1. User should be able to add an item from a particular store
to their shopping cart
R7.2. User should be able to remove an item from a particular store in their shopping cart or clear the entire cart
R7.3. User should be able to edit item specifications from a particular store in their shopping cart
R7.4. User should be able to checkout from the cart

R8. A User should be able to interact with their wishlist
R8.1. User should be able to add an item from a particular store
to their wishlist
R8.2. User should be able to remove an item from a particular store in their wishlist or clear the entire wishlist
R8.3. User should be able to edit item specifications from a particular store in their wishlist
R8.4. User should be able to move an item or all times from wishlist to cart

R9. A User should be able to have checked out items delivered.
R9.1. User should be able to check their delivery status

R10. The System should allow a CRUD functionality to admin (Maintenance) regarding a Mall's map

7.3 Subsystems Traceability Matrix

	User Account Subsystem	Navigation Subsystem	Shopping Subsystem	Delivery Subsystem	Augmented Reality Subsystem
R1		X			
R2	X				X
R3	X				X
R4					
R4.1		X			
R4.2		X			
R5					
R5.1			X		
R5.2	X				
R5.3			X		
R6					
R6.1			X		
R6.2	X		X		
R6.3			X		
R7					
R7.1			X		
R7.2			X		
R7.3			X		
R7.4			X		
R8					
R8.1	X				
R8.2	X				
R8.3	X				
R8.4	X				
R9					
R9.1				X	
R10		X			

8 Quality Requirements

8.1 Reliability (Q.1)

- The system should give accurate and precise direction to the user at all times.
- The system should retrieve accurate prices and products every time the user scans or is near a specific product.

8.2 Availability (Q.2)

- The system should be available for users at most times for navigation.

8.3 Security (Q.3)

- The Application should perform transactions successfully and secure regarding transaction performed on the application.

8.4 Scalability (Q.4)

- The application should be able to accommodate a large number of users as they'll be navigating all around different malls.
- The application should be able to accommodate large volume of scanning and retrieving items from database for quotes.

9 Architecture and Design

9.1 System Type

Our system is an event-driven system which relies on various changing states to accomplish use cases. These states are triggered based on certain system properties like device location.

9.2 System Architecture

Client-Server:
The system uses a centralised database server to ensure all devices remain updated with identical information during usage and allows the mobile android applications to remain lightweight.

Microservices:
Each element of the android mobile application is designed as a modular component that can be added, replaced or removed without affecting the system as a whole. These microservices, such as navigation, scanning and augmented reality modules work hand in hand to satisfy use cases.

Model-View-Controller:
Each microservice present on the android mobile application makes use of a model in the form of the centralised database, a view to display processed information to the shopper and a controlling module to determine the flow of data from the centralised database server.

Object Persistence Framework:
The system as a whole relies on a centralised database to ensure data is not lost between mobile sessions. Certain use cases, such as store locations and product data requires that these data persists outside of the client's individual usage sessions on the application.

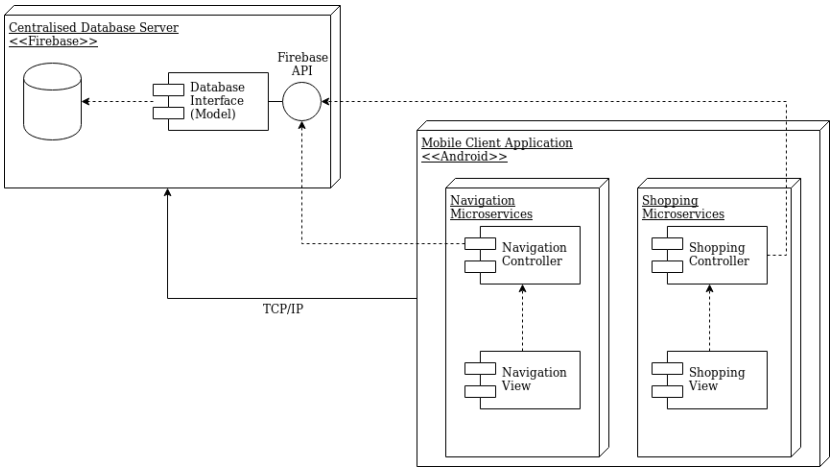

Figure 1: Figure 1: Model

9.3 Non-functional Requirements

Scalability
We intend to have a user interface that allows mall owners to add stores to the list as well as supporting expanding maps.
We plan to use Firebase to ensure that our Database can keep up with the needs of the system.

Reliability
We intend to use beacons for accurate indoor navigation to specific shops.

Availability:
We intend to use firebase cloud database hosting and offline synchronization to ensure that the

10 Trace-ability matrix - Requirements VS Subsystems

	User Account Subsystem	Navigation Subsystem	Shopping Subsystem	Delivery Subsystem	Augmented Reality Subsystem
R1		X			
R2	X				X
R3	X				X
R4					
R4.1		X			
R4.2		X			
R5					
R5.1			X		
R5.2	X				
R5.3			X		
R6					
R6.1			X		
R6.2	X		X		
R6.3			X		
R7					
R7.1			X		
R7.2			X		
R7.3			X		
R7.4			X		
R8					
R8.1	X				
R8.2	X				
R8.3	X				
R8.4	X				
R9					
R9.1				X	
R10		X			
QR	Q3,Q4	Q1,Q2	Q1,Q4	Q3	Q1