

System Specification

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Software Engineering project

[PICK ME UP]



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1. Customer Statement of Requirements (CSR)

a. Problem Statement

Rather, put yourself into a customer's role, and write your CSR as if your imagined customer would write it! We went one step further and asked real future customers questions and concerns about what they expect or would find suitable on a taxi application. Our way forward in discovering the problem statement was by first analyzing the constant issues UB students, civilians, GOB employees and teachers face on a daily basis. First, we gave a basic input on the project prototype and avoided further disclosure to ensure the interview was not biased.

Below is their input:

Ingrid - UB student



"As a female at the University of Belize, safety has been one of my greatest concerns. Often, I found myself late at night without a ride home or being offered a ride by a complete stranger. Females often find themselves in danger of being a victim of verbal abuse or kidnap. Having a reliable taxi application that can be of great use not only to ensure my safety and others which would also provide accountability of who the driver, type of vehicle the passenger was last in. The idea of holding taxi drivers responsible or linked to whom they are picking up or dropping off is both beneficial to the driver and passenger since not often do you hear that taxi drivers go missing since they often are forced to pick up random individuals who they have no idea off or vice versa which end up being a complete set up or bad experience which can also lead to death".

Anivar - Visiting Tourist



"Often do I find myself in different countries with no remote idea of who the locals are. This taxi application, even though in its development stage can provide great and useful information to both locals and future tourists. The idea of having a centralized system not only would provide positive feedback to the operators involved but it would also encourage future tourists to embark to such countries where at least having to worry about the tour operators, or taxi drivers would not be an issue. Often, we have to rely on

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unknown individuals to transport us to the different sites Belize has to offer but have no idea of who the people driving are. The rating system would ensure that these drivers provide a level of expertise where they will be ranked accordingly therefore ensuring future business and customer satisfaction.

Bernard - GOB Employee

"As a past UB student and now a GOB employee; for four years transportation was indeed one of my major setbacks. Am originally from Benque and reaching UB was always a top priority. Often, I found myself in a taxi with complete strangers since I needed to reach work because of unreliable taxi drivers that would state they are 10 minutes apart or wouldn't even bother to reach and pick me up. I would indeed like for an application that can show if the driver is indeed available as he/she claims to be and at least to have a better understanding of how far they could be. I believe that every taxi driver should be held accountable for their doing and if stating they are available or never reach is both a bad experience to go through which is something to be held accountable for. A bad rating or review would be of importance since other drivers shouldn't be generalized by what one driver is doing.

b. Glossary of terms

Client – anyone who would want service from the taxi (taxi's clients)

GOB – acronym for Government of Belize

Live Tracking – to keep up with the location of the Taxis

Taxi States – the current state of the driver, if driver is available for accepting requests, if the driver is busy or is carrying a client(s), or the driver is offline, the driver cannot/isn't available for requests (could be breakdowns, lunch, etc.)

Drop-off Location – the client's destination.

Map – a map of the current town/city of the Driver and the Client

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2. System Requirements

Priority Weight	Description
5	Very Important
4	Important
3	Neutral
2	Low importance
1	No Importance

a. Enumerated Functional Requirements

Identifier	Priority level (1-5)	Requirement
REQ1	1	The System Shall Show Available Taxis on the Map.
REQ2	1	The System Shall Live Track All Taxis.
REQ3	4	The System Shall Show the Shortest Path from Current Position to the Drop-off Location for the Taxi Driver.
REQ4	3	The System Shall Allow Administrators to Manage Taxis Driver Accounts.
REQ5	3	The System Shall Allow Administrators and Drivers to login
REQ6	5	The System Shall Allow a Taxi Driver to Accept Pick-up Request.
REQ7	4	The System Shall List Clients Requesting Pick-up to the Taxi Drivers.
REQ8	2	The System Shall Allow Drives to switch states: Available, Busy and offline.
REQ9	3	The System Shall Give Information about the Vehicle and Driver to the Client when their Request is Accepted.
REQ10	3	The System Shall Allow the Clients to Rate the Driver.

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REQ11	4	The System Shall Allow Client Pick-up Request to be Canceled.
REQ12	4	The System Shall Allow Clients to Pick a Drop-off Location, and Read their Current Location when Doing a Request.

b. Enumerated Nonfunctional Requirements

Identifier	Priority level	Requirement
REQ13	5	The system shall be at least 90% of the time up. (Performance)
REQ14	5	The system shall automatically provide the location of the client (pick-up location) when doing a request. (Functionality)
REQ15	3	The system shall notify the client when their request has been accepted. (Functionality)
REQ16	3	The system shall also provide basic information of the taxi vehicle and driver when request is accepted. (Functionality)
REQ17	2	The system shall provide the option to rate the driver. (Functionality)
REQ18	1	The system shall show all active drivers on the map when the client requests, saving the data of the client. (Performance)
REQ19	2	The system shall have a simplistic user interface design. (Usability)
REQ20	1	Drivers which are inactive or busy shall not be shown on the map. (Functionality)
REQ21	1	Driver's Police Record and other personal information shall be saved onto the database for security reasons. (Functionality)
REQ22	2	The system shall be supported on any Operating System. (Supportability)
REQ23	4	The system shall not allow clients to make more than 1 request at a time. (Functionality)

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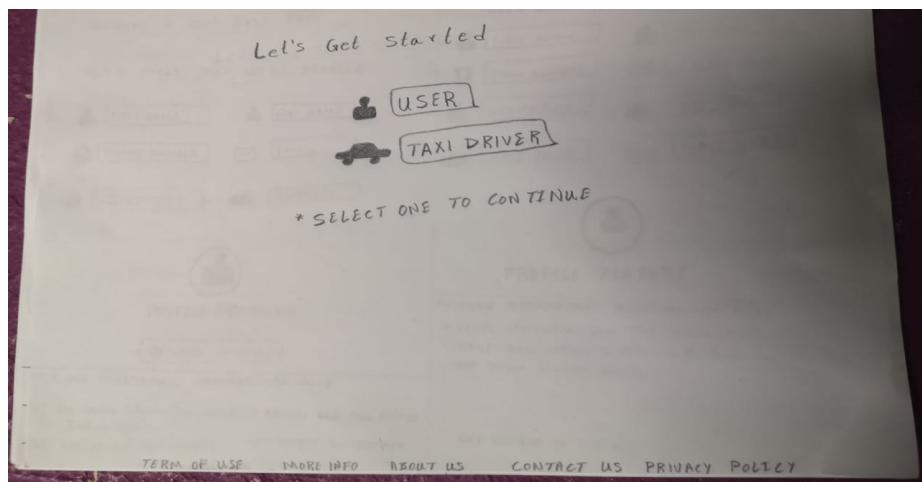
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REQ24	5	The system shall prevent 2 or more drivers to accept the same client. (Functionality)
REQ25	4	The system shall notify the taxi drivers of new requests within 2 seconds (dependent on the data/internet speed). (Performance)
REQ26	2	The system shall request GPS to be turned on when opening app

c. On-Screen Appearance Requirements

Identifier	Priority Level	Description
ONSREQ1	5	Map With Ability to move and zoom.
ONSREQ2	5	Map with ability to show taxis.
ONSREQ3	4	Information on Specific Taxis.
ONSREQ4	4	Toggle Between Different Driver Mode.
ONSREQ5	4	Rating System.

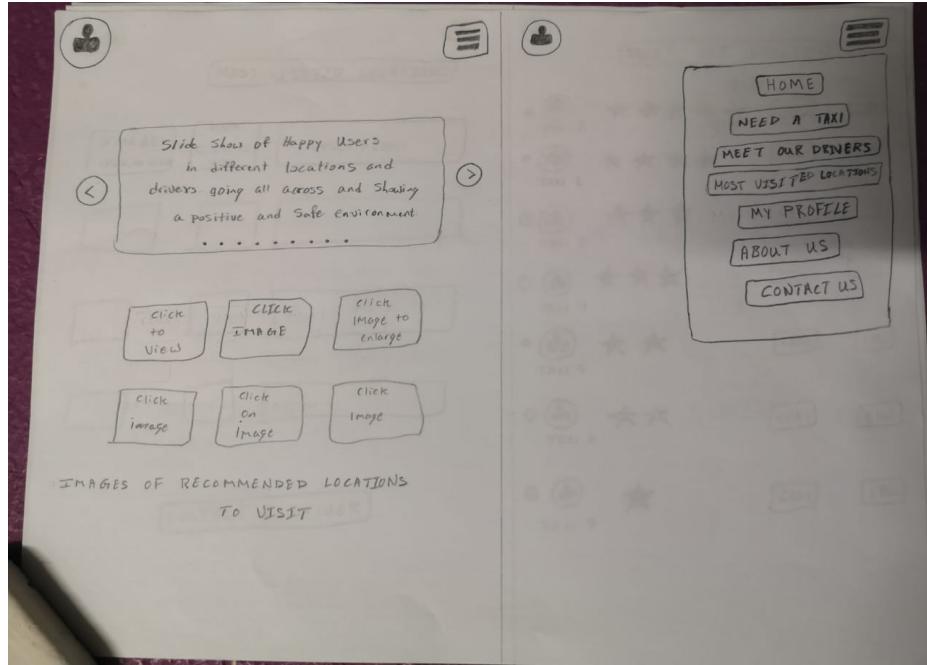
- Create an account either a user or taxi driver



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- After a user is logged in this page would provide a background of the past users comments and services pick me up offers.

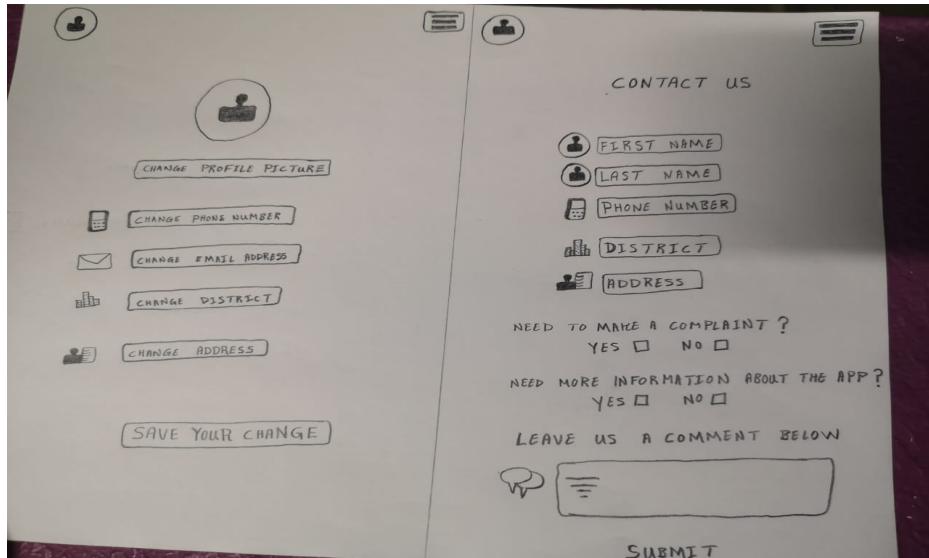


- Expected platform for user or driver registration and information required to register to the taxi app.

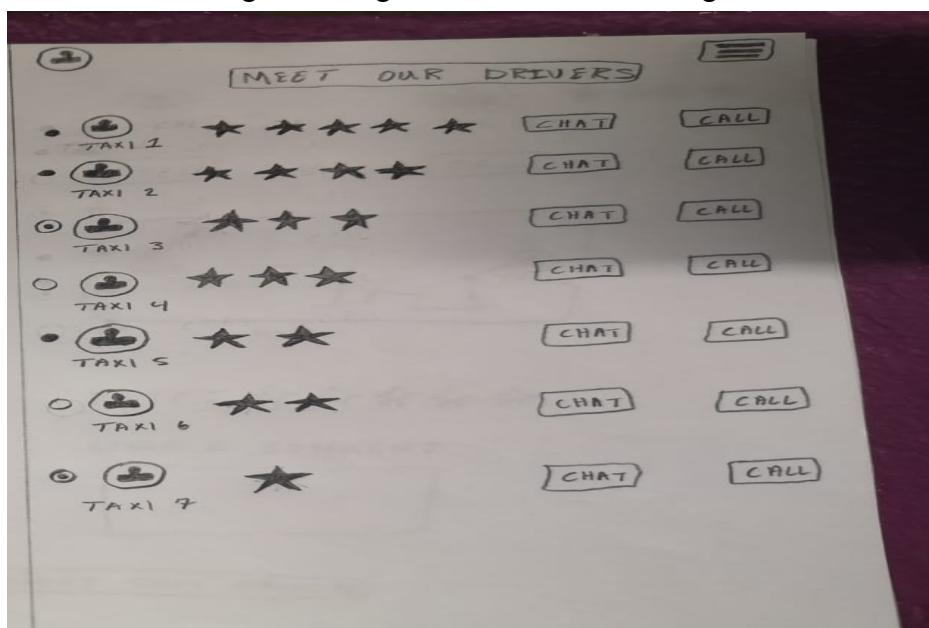
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- User required information along with contact details in case assistance is needed



- A representation of ranking according to taxi drivers and background information.



This selected interface would let the user or taxi driver create an account. Once logged in the users can view the taxi drivers along with their ratings. Users comments can also be displayed as to their experience using our services which should motivate future customers. After selecting the taxi needed once available the FIFO method would be applied, once the driver is notified of your location he/she can then proceed to picking the passenger up.

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3. Functional Requirement Specification

a. Stakeholders

- Association for taxi drivers
- Taxi drivers
- Clients (anyone who will be requesting pickups)
- Developers

b. Actors and Goals

Actor	Roles	Types	Goals
Admin	<ul style="list-style-type: none">• Add Driver Information• Update Driver Information• Delete Driver Information	<<initiate>>	Modify database
Driver	<ul style="list-style-type: none">• Accept client requests• Change Status	<<initiate>>	Get clients
Client	<ul style="list-style-type: none">• Request Pick-up• Cancel Pick-up	<<initiate>>	Get to his/her destination
Map API	<ul style="list-style-type: none">• Show current Location• Show routes	<<participating>>	Show routes to current client location or destination.

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c. Use Cases

i. Casual Description

Use case	Description	Requirement
UC-1: AddDriver	<ul style="list-style-type: none">Allows the administrator to add new taxi drivers into the database.	REQ4, REQ5
UC-2: DeleteDriver	<ul style="list-style-type: none">Allows the administrator to remove exiting taxi drivers from the database.	REQ4, REQ5
UC-3: UpdateDriver	<ul style="list-style-type: none">Allows the administrator to edit existing information of taxi drivers into the database.	REQ4, REQ5
UC-4: Login	<ul style="list-style-type: none">Allows the Admin and Drivers to login to their account.	REQ5
UC-5: ViewTaxiInfo	<ul style="list-style-type: none">Allow the Administrator to view the information about a specific driver.	REQ5
UC-6: RequestPickup	<ul style="list-style-type: none">Allows the commuter to request for a taxi at a given location.	REQ12
UC-7: CancelPickup	<ul style="list-style-type: none">Allow the commuter to cancel the request for a taxi at a given location.	REQ11
UC-8: RateDriver	<ul style="list-style-type: none">Allows the client to rate the taxi after a successful transaction has been completed.	REQ10
UC-9: ActivateTaxi	<ul style="list-style-type: none">Allows the taxi Driver location to be seen on the map.	REQ8, REQ5
UC-10: DeActivateTaxi	<ul style="list-style-type: none">Allows the taxi Driver location be hidden on the map.	REQ8, REQ5
UC-11: ViewTaxi Location	<ul style="list-style-type: none">View all locations of nearby taxis.	REQ1, REQ2

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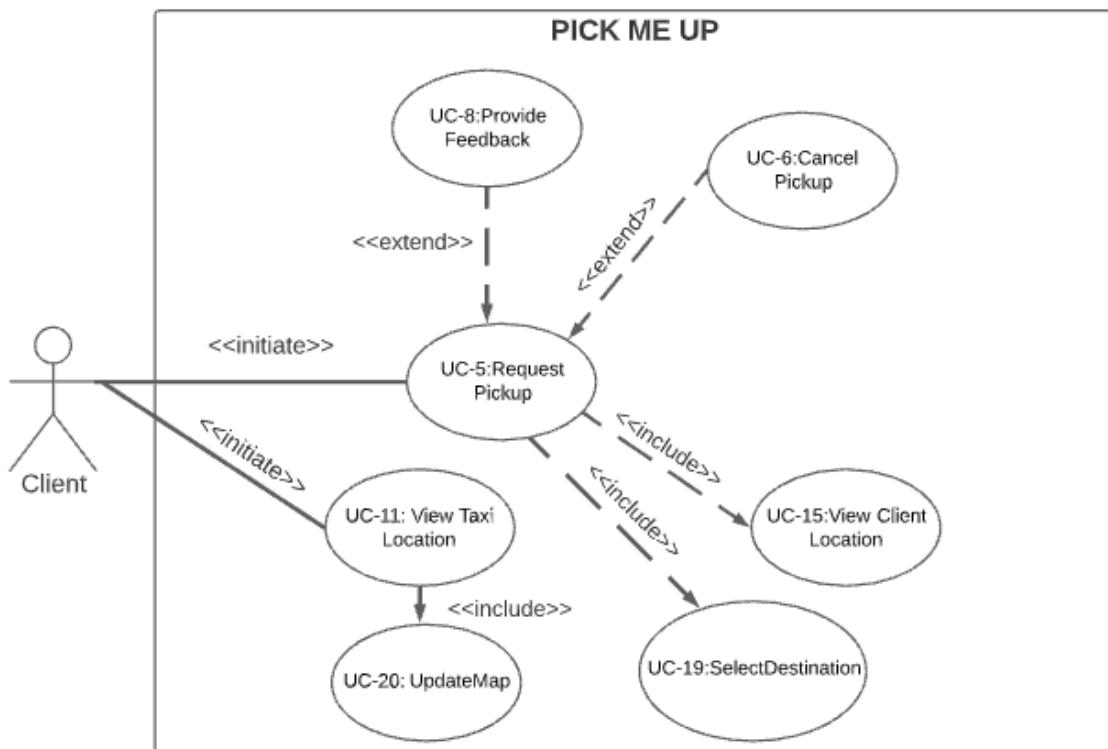
UC-12: ViewTaxi Information	<ul style="list-style-type: none"> Allow the client to see information about the driver such as vehicle color, licence plate and name of the driver. 	REQ9
UC-13: viewPickup	<ul style="list-style-type: none"> See the location of the requested pickup. 	REQ12
UC-14: selectDestination	<ul style="list-style-type: none"> Lets the client select his/her destination. 	REQ12
UC-15: viewRating	<ul style="list-style-type: none"> Allows the taxi driver to view the ratings they have received. 	REQ10
UC-16: viewPath	<ul style="list-style-type: none"> create/show the shortest path to the client's destination 	REQ3, REQ12
UC-17: listRequest	<ul style="list-style-type: none"> List a request of waiting clients needing a pickup to the driver. 	REQ7, REQ5
UC-18: AcceptRequest	<ul style="list-style-type: none"> Accepts the request the client submitted 	REQ6, REQ5
UC-19: updateMap	<ul style="list-style-type: none"> Updates the map to show the location of the taxis. 	REQ1, REQ2

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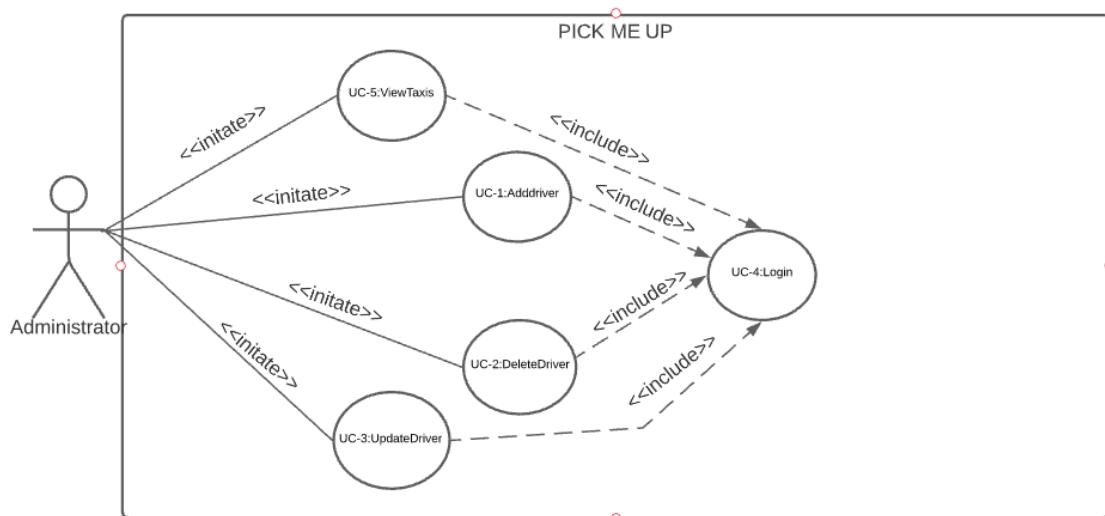
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ii. Use Case Diagram

1) Client Use case Diagram

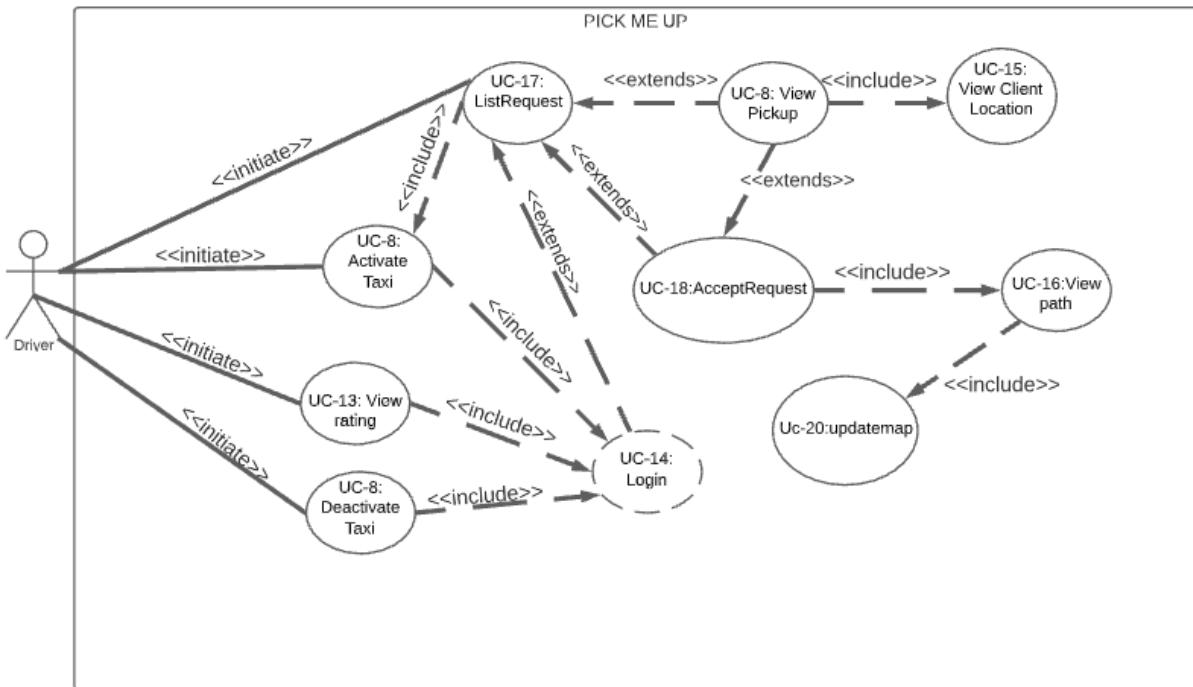


2) Administrator Use Case Diagram



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3) Driver Use Case



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a. Traceability Matrix

Requirements	P W	UC 1	UC 2	UC 3	UC 4	UC 5	UC 6	UC 7	UC 8	UC 9	UC 10	UC 11	UC 12	UC 13	UC 14	UC 15	UC 16	UC 17	UC 18	UC 19
REQ1	1										X									X
REQ2	1											X								X
REQ3	4																			X
REQ4	4	X	X	X																
REQ5	4	X	X	X	X	X				X	X								X	
REQ6	5																	X	X	
REQ7	4																		X	
REQ8	2									X	X									
REQ9	3																	X		
REQ10	3							X											X	
REQ11	4							X												
REQ12	4						X									X	X		X	
Total Weight		8	8	8	4	4	4	4	3	6	6	2	3	4	4	3	8	9	9	2

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iii. Fully-Dressed Description

Use Case 1 - Add Driver	
Related Requirements	REQ4, REQ5
Initiating Actor	Administrator
Actor's Goal	To add a driver into the database.
Participating Actor	Database, system
Preconditions	Wifi or Data is turned on Admin has already logged in - in home page
Postconditions	Driver is in the database and can now serve the people
Flow of events for main success scenario	
← → ← ← → →	<ol style="list-style-type: none">1. Admin clicks on the “Add New Driver” button.2. Add New Driver form pops up.3. Admin fills the form with valid information and submits.4. a) System adds the driver into the database b) Responds with a confirmation c) Redirects to the home page.
Flow of events for extensions(Alternate Scenario)	
→ ← → →	<ol style="list-style-type: none">3a. Admin Clicks on cancel. System asks for confirmation of action. Admin cancels. Redirects to the home page.3b. Form not completed. Highlight fields missing.4a. Data not added into the database due to no internet connection/connection lost.

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Use Case 2 - Delete Driver

Related Requirements	REQ4, REQ5
Initiating Actor	Administrator
Actor's Goal	To remove a driver from the database.
Participating Actor	Database, personal device(phone, PC)
Preconditions	Wifi or Data is turned on Admin has already logged in - in home page
Postconditions	Driver is no longer visible, nor can use the system

Flow of events for main success scenario

← → ← → ← → ← →	1. Admin clicks on “View Drivers” button 2. A list of drivers shows up. 3. Admin Selects the driver. 4. System shows driver details 5. Admin clicks on the “Delete Driver” button 6. System asks for confirmation 7. Admin confirms 8. a) System removes the driver from the database b) Responds with a confirmation c) Redirects to the home page.
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Flow of events for extensions(Alternate Scenario)

	5a. Admin cancels 7a. Admin cancels 8a. System doesn't delete data - no internet connection
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Use Case 3 - Update Driver

Related Requirements	REQ4, REQ5
Initiating Actor	Administrator
Actor's Goal	To edit the driver's information in the database.
Participating Actor	Database, personal device(phone, PC)
Preconditions	Wifi or Data is turned on Admin has already logged in - in home page
Postconditions	Driver's information is updated or rectified.

Flow of events for main success scenario

← → ← → ← → ← →	<ol style="list-style-type: none"> 1. Admin clicks on the “View Drivers” button 2. List of Drivers shows up. 3. Admin Selects the driver 4. System shows driver details 5. Admin clicks on the “Edit Info” button 6. System display driver's information 7. Admin edits/update the data fields and presses “Save Changes”. 8. a) System updates the driver's data in the database b) Responds with a confirmation c) Redirects to the home page.
--------------------------------------	--

Flow of events for extensions(Alternate Scenario)

←	<ol style="list-style-type: none"> 5a. Admin cancels 7a. Admin cancels 7b. Data field(s) left empty. System signals the empty data fields
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Use Case 5 - View Taxi	
Related Requirements	REQ5
Initiating Actor	Administrator
Actor's Goal	To view the driver's information
Participating Actor	personal device(phone, PC)
Preconditions	Wifi or Data is turned on Admin has already logged in - in home page
Postconditions	See all of the driver's information.
Flow of events for main success scenario	
← → ← →	<ol style="list-style-type: none"> 1. Admin clicks on the “View Drivers” button 2. List of Drivers shows up. 3. Admin Selects the driver 4. System shows driver details
Flow of events for extensions(Alternate Scenario)	
	2a. List doesn't show due to no internet

Use Case 6 - Request Pick-up	
Related Requirements	REQ12
Initiating Actor	Client
Actor's Goal	To request service.
Participating Actor	personal device(phone)
Preconditions	GPS and Wifi or Data is turned on
Postconditions	Request is seen by all drivers.

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Flow of events for main success scenario

← → ← →	<ol style="list-style-type: none"> 1. Client clicks on “Request pick up” 2. System loads map for drop-off location 3. Client selects location and confirms 4. a) System signals drivers b) redirects client to home page
Flow of events for extensions(Alternate Scenario)	
	3a. Client cancels

Use Case 18 - Accept Request

Related Requirements	REQ5, REQ6
Initiating Actor	Driver
Actor's Goal	To give service to client
Participating Actor	personal device(phone)
Preconditions	GPS and Wifi or Data is turned on Driver is active Client has requested service
Postconditions	Driver heads to the client's location

Flow of events for main success scenario

← → ← → ← →	<ol style="list-style-type: none"> 1. Driver clicks on “Requests” 2. System loads a list of requests 3. Driver clicks on a request 4. System loads page with the client's current and drop-off location 5. Driver accepts the client's request 6. a) Client's request is removed from the list b) System sets the driver as busy c) System notifies client of acceptance d) System presents to client the driver's car and name
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e) Shows direction to client

Flow of events for extensions(Alternate Scenario)

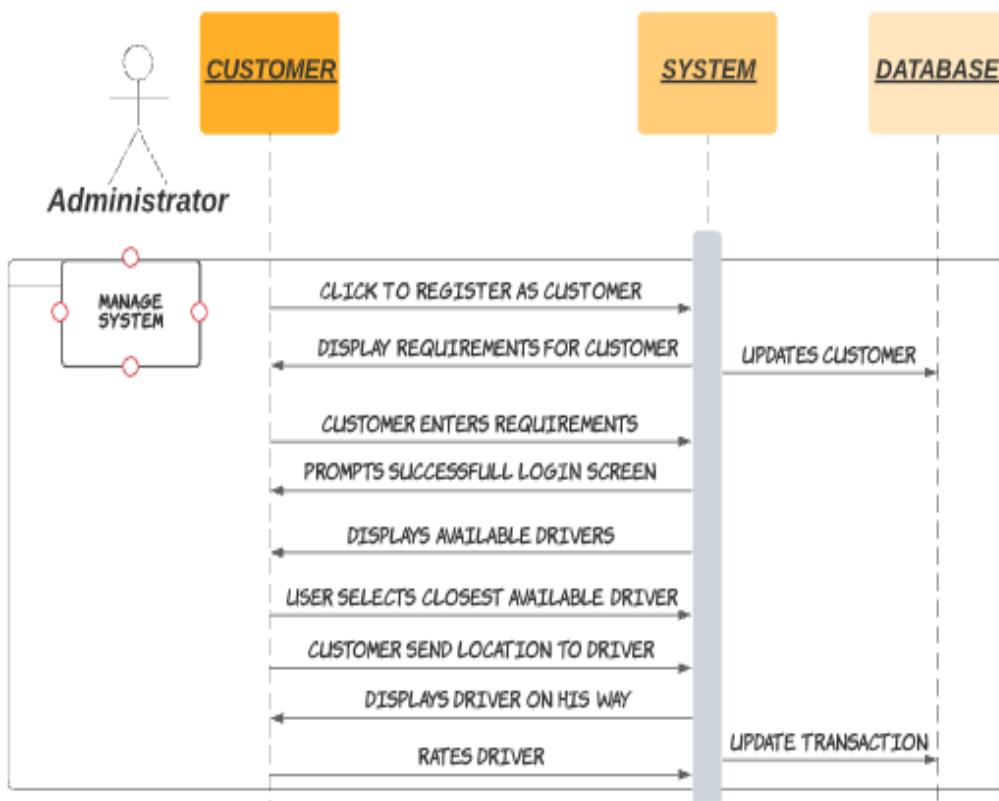
→

- 1a) Driver closes list
- 2a) List is empty, no requests at the moment.
- 4a) Driver clicks on “close”
- 6a) Request was accepted seconds earlier
System replies with “Sorry, request has been accepted”

d. System Sequence Diagram

System Sequence Diagram: customer

USE CASE 1

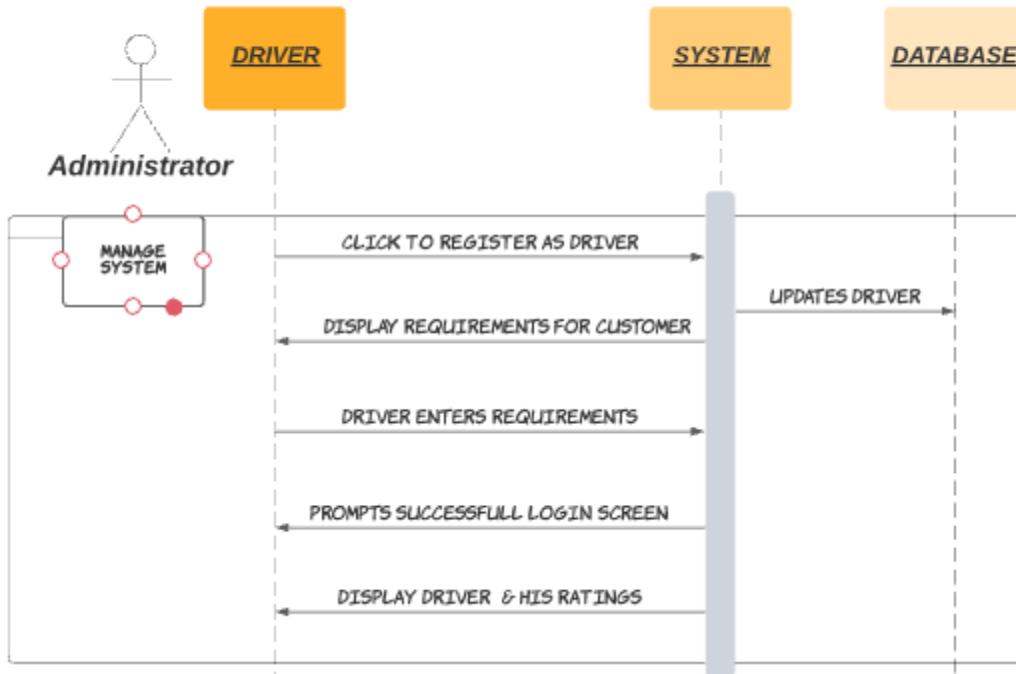


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System Sequence Diagram : Driver

USE CASE 2



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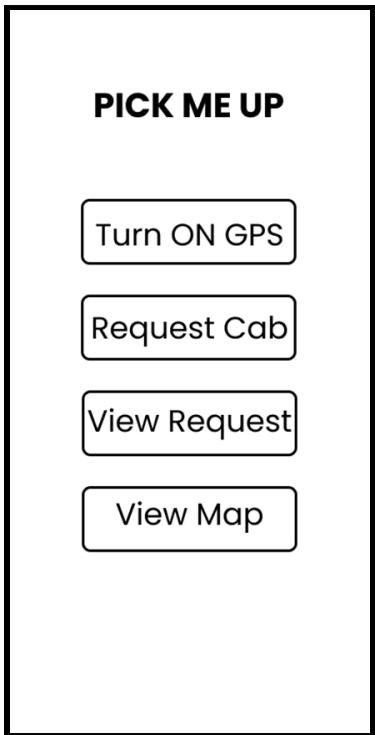
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a. User Interface Specification

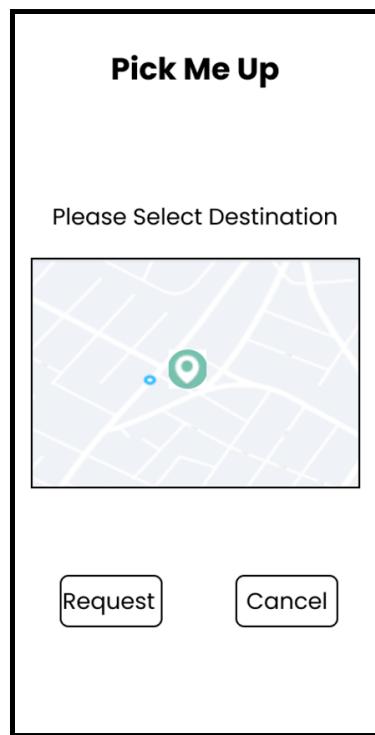
a. Preliminary Design

CLIENT PAGE

Home page



Requesting Cab



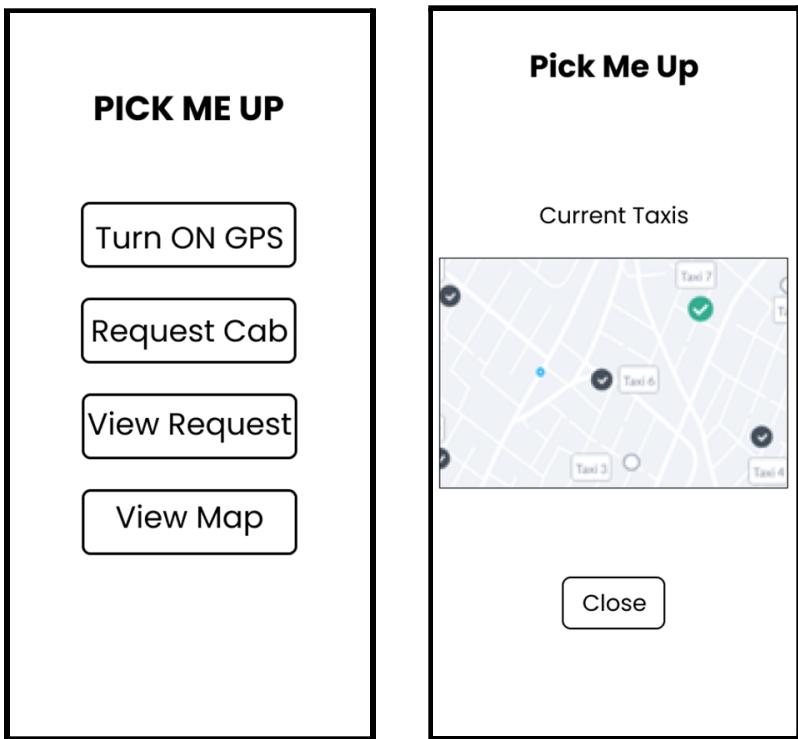
After Requesting



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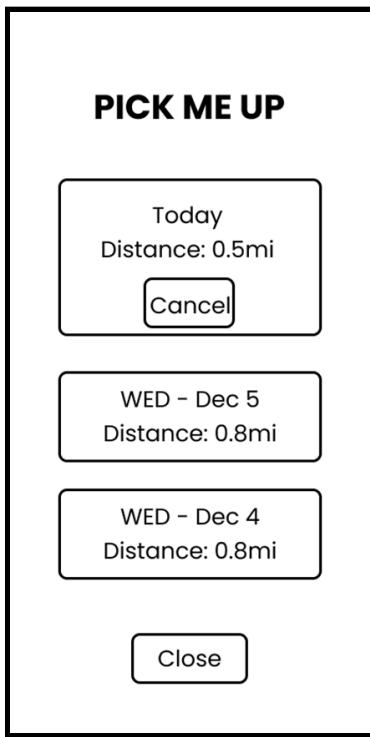
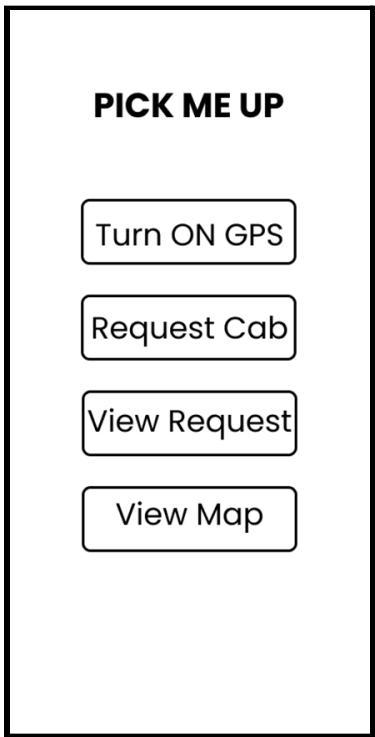
Viewing Map



Viewing requests

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ADMIN PAGE

Adding Driver

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PICK ME UP

Add Driver
View Drivers
View Map

Log Out

Add New Driver

First Name
Last Name
Address
Contact Number
Driver's Licence Number
Vehicle Licence Plate

Add Cancel

Driver Details

John
Doe
16 Street, Bmp
667 2109
CY-12548
Please Fill Field

Rating: 4.5 ★

Save ✓ **Cancel**

Delete Driver

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The wireframe illustrates a mobile application interface for managing drivers.

- PICK ME UP Screen:** Contains buttons for "Add Driver", "View Drivers", "View Map", and "Log Out".
- View Drivers Screen:** Shows a list of drivers with their names and badges:
 - John Doe - BMP
 - Jane Doe - SI
 - Francis Smith - BMPA "Close" button is located at the bottom right.
- Driver Details Screen:** Displays driver information in fields:
 - First Name: John
 - Last Name: Doe
 - Address: 16 Street, Bmp
 - Phone: 667 2109
 - License Plate: CY-12548
 - Vehicle ID: C-54932Includes a rating of "Rating: 4.5" with a yellow star icon, and "Edit" and "Delete" buttons.
- Delete Confirmation Modal:** A modal window asks "Are you sure you want to delete driver?" with "Confirm" and "Cancel" buttons. It also lists the driver's license plate (CY-12548) and vehicle ID (C-54932). The "Delete" button from the previous screen is highlighted with a red border.
- Small Overlay:** A small rectangular overlay shows a rating of "4.5" with a yellow star icon and a "Delete" button.

Update Driver

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PICK ME UP

Add Driver

View Drivers

View Map

Log Out

View Drivers

Tap to view details

John Doe - BMP

Jane Doe - SI

Francis Smith - BMP

Close

< Back

Driver Details

John

Doe

16 Street, Bmp

667 2109

CY-12548

C-54932

Rating: 4.5 ★

Edit **Delete**

Driver Details

John

Doe

16 Street, Bmp

667 2109

CY-12548

Please Fill Field

667 2109

CY-12548

C-54932

Rating: 4.

Edit

missing fields

Save ✓

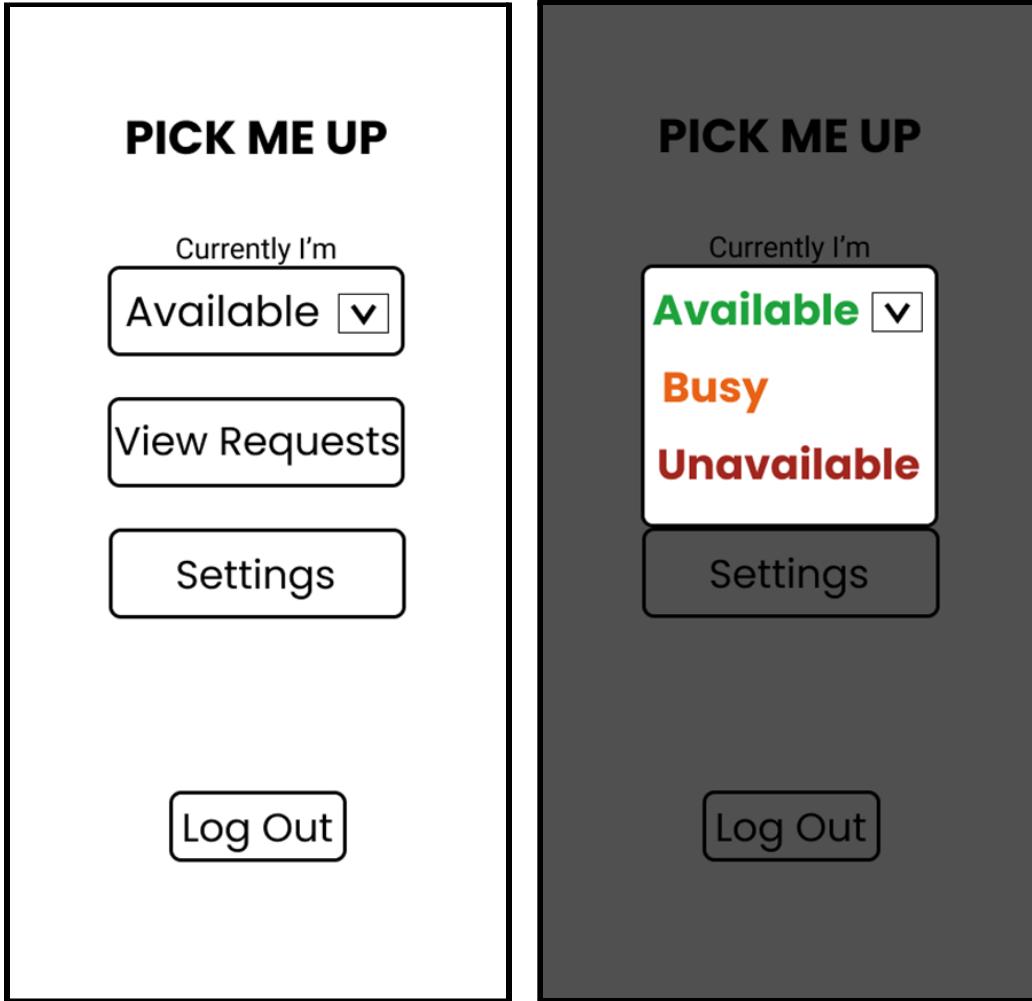
Cancel

DRIVER PAGE

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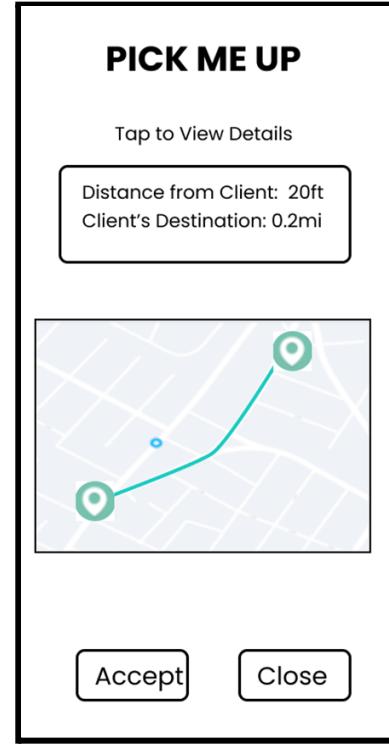
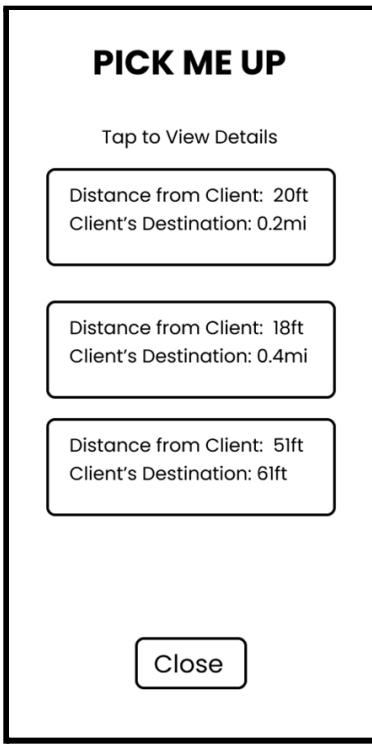
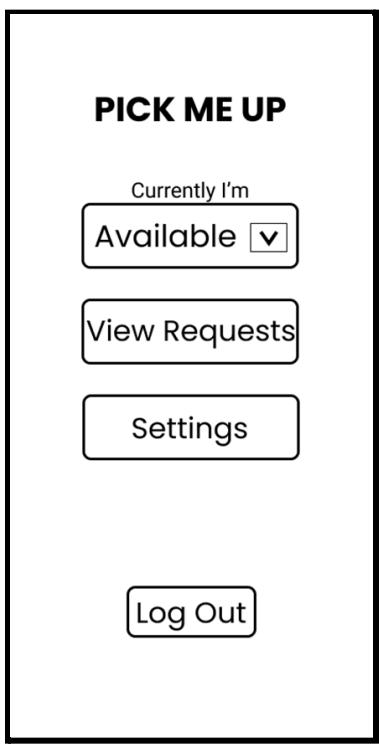
Toggling Availability



Viewing Requests

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b. User Effort Estimation

Scenario 1: User Request taxi

Navigation: 3 clicks

- a. Click on the 'request' button.
- b. Click location.
- c. Click confirm.

Scenario 2: Accept request

Navigation: 3 clicks

- a. click on request
- b. click/select request
- c. click accept

Scenario 3: Login

Navigation: 2 clicks

- a. click text box
 - after completing data entry--
- b. Click 'login' button

Data Entry: data_entry + 1

- a. Enter username keystrokes
- B. press tab to move to the next textbox
- c. enter password keystrokes

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4. System Architecture

a. Identifying Subsystems

The system will be compatible with both mobile and desktop applications, such as Windows.

Due to this, the primary subsystems revolve around functionality of the system. We will implement a web app solution for the front end, a server side solution for the main backend, and we will make use of Google Maps to provide most of the primary mapping technology. We will also be using a database in order to store and retrieve information. The clients, drivers and administrators will all be performing actions on the front end view, while all calculations and management will be done by the server.

The overall package flow of the project can be seen below.

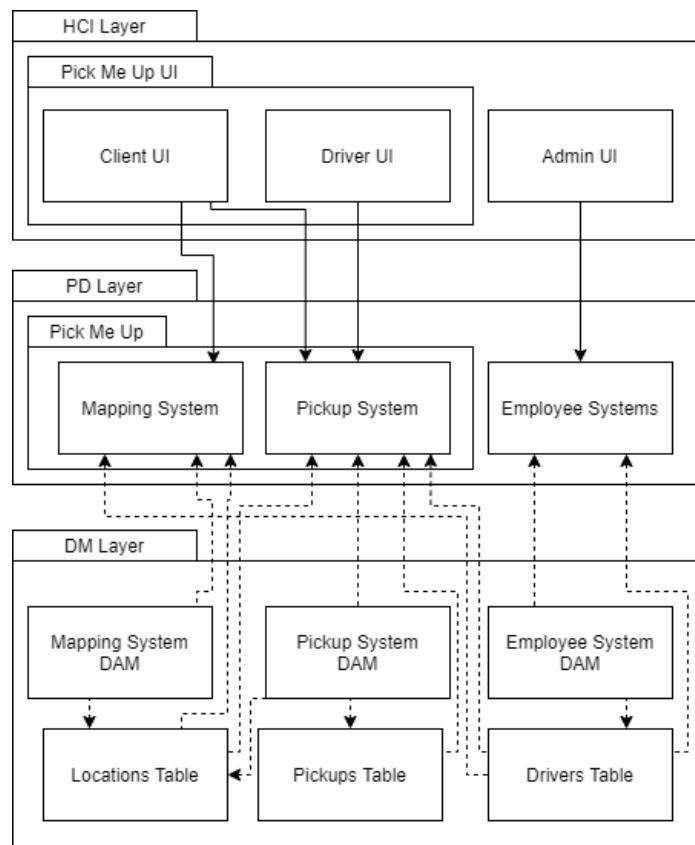


Diagram Showing Simplified Overview of the Package Diagram System

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Our primary focus will be on the management of locations and pickups within the Pick Me Up system. A separate, driver management oriented system will be required in order to impact the drivers table. This would most likely be handled by the party affiliated with the administration of the drivers. Particularly, a taxi driver association member that would focus on regulating the admission, removal, and updating of taxi information.

Inside Pick Me Up, the main services revolve around the Map Location Viewing System and the Pickups System. In order for further clarification to be provided on how these systems would interact with each other, as well as be built, view the diagram below.

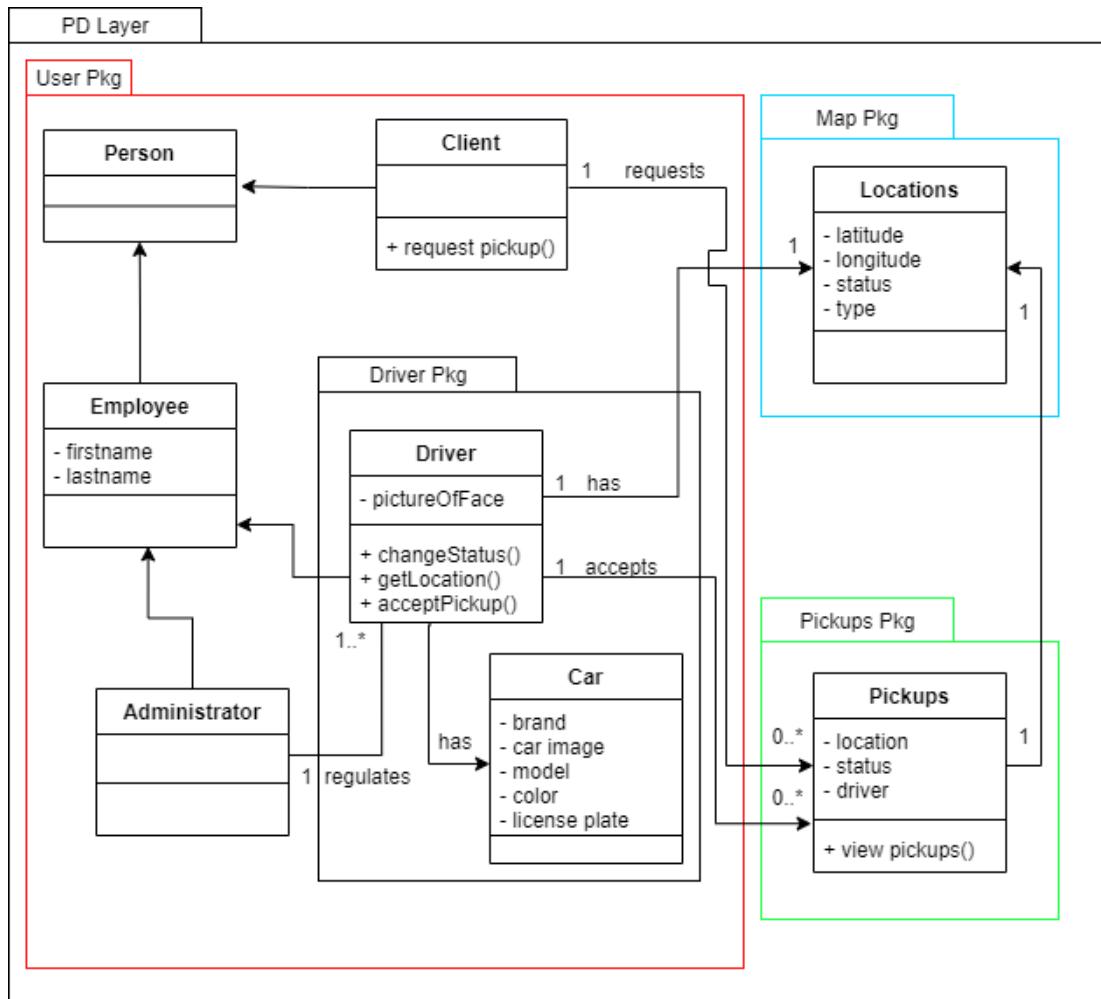


Diagram Showing UML Package Diagram of the Interactions Between the Pickup, Map, and the Systems Users

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b. Architecture Styles

In the case of most web applications, the Pick Me Up system will implement a Server & Client Architecture, also known as the Master & Slave Architecture. The client will primarily focus on rendering information regarding the maps and locations on the maps. The client will also be responsible for retrieving the location of the client end hardware to be used within the computational aspects of processes. The server will primarily focus on storing the information of drivers, locations of all drivers currently being managed, as well as retrieving and interacting with the data being sent by the active users. The server/client architecture's selection was primarily due to the accessibility of information. Since most information regarding the locations and pickups will be the same, it would be more efficient, secure, and reliable to have the information at a single, primary system.

The Pick Me Up system will also be using the MVC architecture (Model, View, Controller) as its framework for building the project. The models would be separated into the subsystems shown in the identification of subsystems, such as the Pickups model, the User model, and the Locations model. The views will be the interfaces that both clients and drivers will be using in the final product. Isolating the view allows for modification of the view at any point in time to allow for tweaking and improvement throughout the project. The controllers will be the flow controllers of the system, such as in the Pick Me Up section of the PD layer in the Simplified Package Diagram. These are the Mapping System and Pickup System, who will both interact within their respective domains to accomplish their objectives while also talking to each other in order to provide a smooth experience.

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c. Mapping Subsystems to Hardware

The system's nature, being a web-based system will require the system to be split between different machines. The subsystems are: the Client and the Server.

The Client

The client will be the subsystem that ordinary users will interact with through a traditional web browser. These include Chrome, Firefox, Opera, etc. Android devices will also be acting as clients within the system. This area will primarily be HTML, CSS, and JS. Since these do not provide much functionality and are instead for use with display, most of the processing will be done at the server side. JS will be used for basic display optimization and effectiveness, and managing the incoming and outgoing requests from the server.

The Server

The Server will contain the web server as well as the database server. The server will be responsible for handling all incoming and outgoing requests. Incoming requests involve the accepting of pickups, the sending of locations, etc. Outgoing requests involve sending the web displays to different clients. The database server will also be hosted on the server, allowing for efficient communication between the web server and the database.

d. Connectors and Network Protocols

The connectors used in the systems web application will be HTTPS, as it is a secure way of transferring information over the internet. Since it is likely the database will be hosted externally but its primary focus will be for this system, a connector will be required to connect the database to the system. It will be necessary to allow for communication between the client and server. Following the CRUD standard, requests will use GET, POST, PUT, and DELETE. Due to the database requirements, data on the client end will be formatted as JSON file.

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e. Global Control Flow

Execution Orderliness

The Pick Me Up System will be an event-driven system. This is because a user can do almost any action at any point in time. For example, even if there are no active taxi drivers, a client can still request a pickup. Since none of the tasks present require much follow up, it is easy for any action to be completed independently.

Time Dependency

The system will be real-time. This is because the live tracking requirement of the system requires constant monitoring and updating of the databases in order to get accurate and fluid functionality from the system. As having the https requests happening constantly could both be taxing on the client end, as well as require much processing on the server end, the real-time tasks will be done at short intervals, for example, a 10 second wait period between location gathering.

f. Hardware Requirements

PC Windows

Windows 7, Windows 8, Windows 8.1. Windows 10 or later

An intel pentium 4 processor or later that's SSE3 capable.

Linux

64-bit Ubuntu 14.04+, Debian 8+, openSUSE 13.3+, or Fedora Linux 24+

An intel pentium 4 processor or later that's SSE3 capable.

Android

Android Lollipop 5.0 or higher

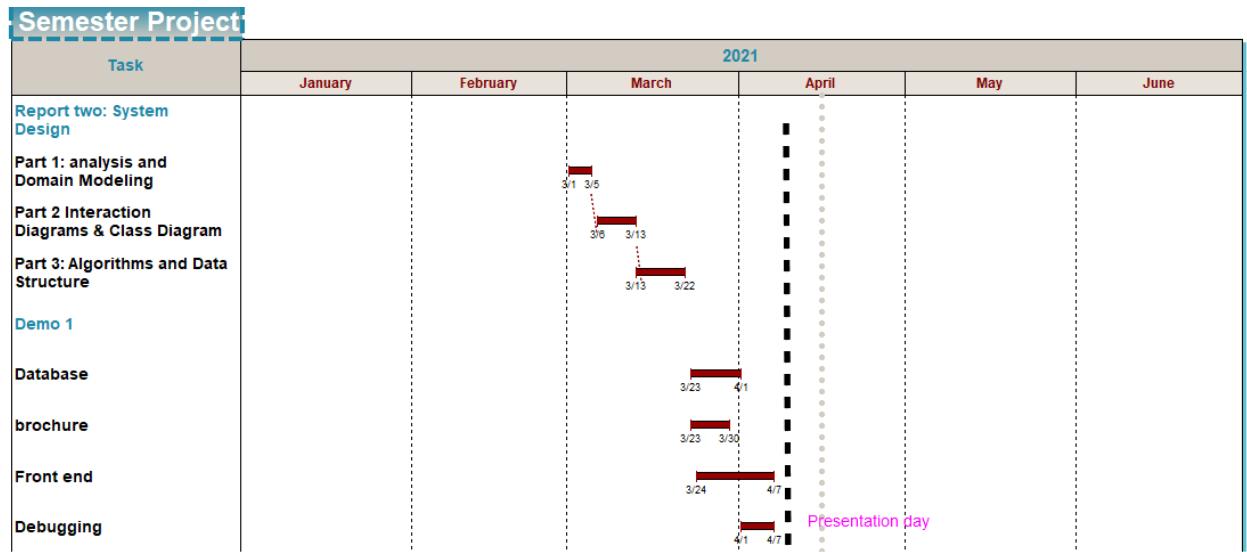
Screen of at least 426dp x 320 dp

Color Display Required

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5. Plan of Work



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Effort-Breakdown Table

	Team Member Names				
	Pablo Cawich	Hector Castellanos	Osmer Escarraga	Austin Shaw	Michael Sanchez
Project Management(10 points)	0%	50%	50%	0%	0%
Sec.1: Customer Statement of Requirements (9 points)	0%	0%	0%	0%	100%
Sec.2: System Requirements (<i>6 points</i>)	20%	30%	30%	10%	10%
Sec.3: Functional Requirements Specification (<i>30 points</i>)	10%	38%	38%	7%	7%
Sec.4: User Interface Specs (<i>15 points</i>)	30%	0%	40%	10%	20%
Sec.5: System Architecture (<i>15 points</i>)	70%	0%	0%	30%	0%
Sec.6: Plan of Work (<i>5 points</i>)	0%	0%	0%	100%	0%

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a. References

<https://support.google.com/chrome/a/answer/7100626?hl=en>