SYSTEM ANALYSIS AND PROJECT MANAGEMENT PROJECT ON

VBIKE - ENHANCEMENT

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1. Executive Summary

This project gave us the opportunity to understand how a bike-sharing system works. The system is sometimes called public bicycle system where bicycles are made available for the registered customers to use for short term basis. It gives the customers the freedom to leave the bicycle at any locations after use. The project discusses a bike sharing system called Vbikes, based in Dallas.

Vbikes is a dockless bike hire system where all the bikes have locks which are integrated on to the frame and does not require a docking station. It has gained a lot of traction in the main areas of the city and on huge campuses.

The project is intended towards solving the existing problems that Vbike platform has in terms of parking, payments and other features that can been a gap in the current system.

The users can request for v bikes through mobile app. V bikes can search for nearby bikes, v bikes offer smart lock which can be unlocked using phone app. After riding the bike, smart lock can be manually returned to locked position.

Some important features offered by v bikes app are

1) My trips - Previous trip information
2) My Wallet - Current balance in the wallet, subscription offers
3) My coupons - Information regarding the coupons if available
4) User guide - Guide providing information on packing, unlock functionality, return functionality
5) Customer service - It's possible to report any issue faced by use

The existing system lack some useful features which if implemented can lead to positive customer experience and satisfaction.

The new features that we are proposing:

1) Need for docking station and getting rid of Bluetooth
2) Provide more payment options for user, currently user can only recharge through PayPal and credit/debit card
3) Allow wallet funds to be refunded back to account
4) Allow users to enter payment amount

All different actors, inputs, outputs and data has been identified to implement new features in proposed system. These new features can increase number users for V bikes.

2. Problem Statement

1. Current system requires Bluetooth to use the bikes:
- VBikes require Bluetooth to unlock the bicycle and should be turned on throughout a user's journey
- Bluetooth consumption makes it difficult for a user to use the feature when the battery is low.
- Also, the user should be physically present to unlock the bike and he cannot book the bike for someone else
- Furthermore, it prohibits us to lock the cycles after each use as Bluetooth is required to end the journey and lock it.

2. Current system does not have reserved parking locations:

- Vbikes do not have reserved parking locations to park the bikes
- This causes inconvenience in locating the bikes as the user may park it wherever he wants
- Thus making the other user less probable to find the bike at a specific location

3. Limited payment options:

Current system provides only 2 options to recharge the wallet.

- PayPal
- Credit/ Debit card

Having such limited options makes it inconvenient for a user with the payment process.

4. Wallet funds are non- refundable:

- Wallet refunds in current system are limited only to the VBikes wallet.
- This is a great inconvenience since the user cannot transfer wallet balance back to the bank account.

3. Business need

With the introduction of the functionality will help Vbikes :-

1) It will help saving the battery life of the phone as use of Bluetooth technology will be replaced.
2) Will make it easier for customer to find Vbikes as they will be parked at specific locations.
3) Will be a great step to saving environmental pollution as implementing the usage of bikes across the city.
4) Will be able to invest more into its infrastructure and thus will be able to invest more into higher-category of the bikes thus categorizing based on the user-requirement.
5) Forms the platform for further expansion of the business in future depending on the revenue generated.

4. Objective

The Main objective of enhancing the current version is to add new features/functionalities by introducing the new and the latest technological implementations in order to achieve the new business related functionalities that were missing in the prior version.

Objectives of proposed system are:

1) Recharge wallet with more payment options
2) Create docking stations and allow users to search for nearby docking station
3) Refund the recharge amount back to account if requested
4) Allow user to enter recharge amount instead of predefined amount options

5. Scope

The scope of new proposed enhancements are as follows:

1) The project would primarily focus on making mobile application more user centric and user friendly, enabling user to be more flexible while booking for a bike.
2) Presenting user with new features like dock stations, more payment options, refundable wallet, which would ultimately help user.
3) These new functions will allow company to contribute to customer satisfaction in turn increasing company revenue.

6. Data Collection

Sample user reviews and ratings were collected from app store for understanding user experience and the feedback is used to enhance the features of the platform and provide a better customer experience.

Data was collected by interviewing different UTD students who used this service more frequently.

The questions discussed are stated below:

1) How frequently do you use VBike service?
2) Is the app user friendly?
3) What were the difficulties you faced in hiring the bike?
4) How easy/difficult was it to find a bike by referring to the map
5) Do you think the docking station would help you find a bike?

7. Function Specifications

1) The proposed system will help in getting rid of Bluetooth for riding the bike
2) The functionality will provide users with reserved docking stations
3) The new functionality will provide more payment options for user
4) The functionality will also allow wallet funds to be refundable to bank account

8. Proposed Solution

We analyzed the existing system and proposed new functionality based on feasibility for company and user, to make service more user-friendly and flexible. The various functionalities proposed in system are as follows:

1) Unlock bike using pin/code instead of Bluetooth

   User will be provided with pin/code after booking a bike. So, user can use that code to unlock the bike. This will prevent use of Bluetooth throughout the journey.

2) Park bike at reserved parking locations

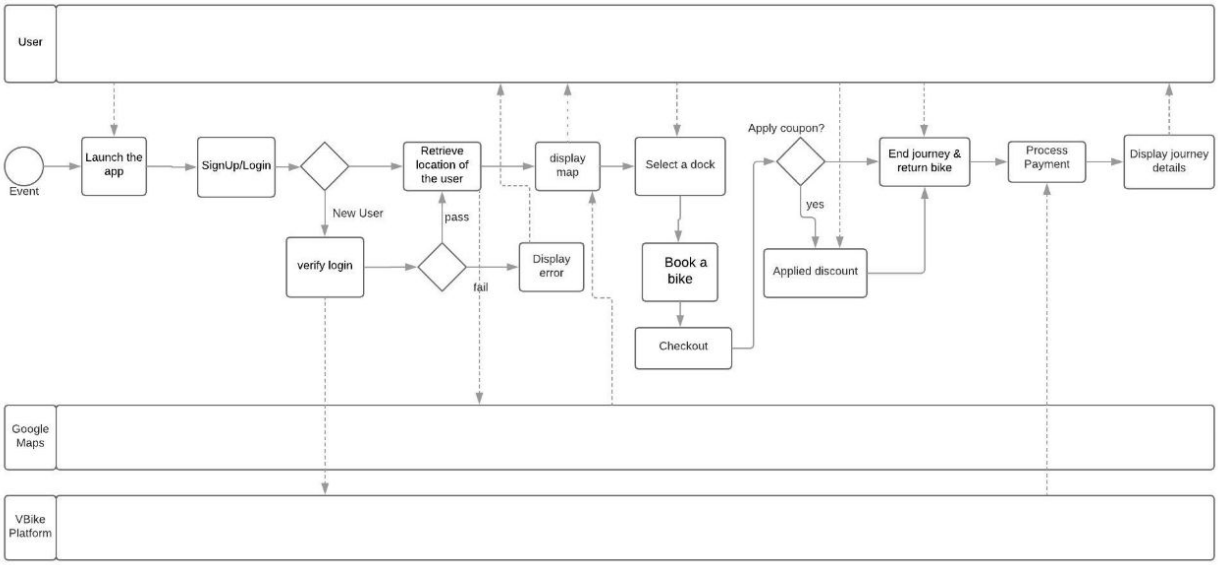
3) Display more payment options for recharge

   Currently only 2 payment options are available for user - PayPal and credit/debit card. More payment options can help user to be more flexible.

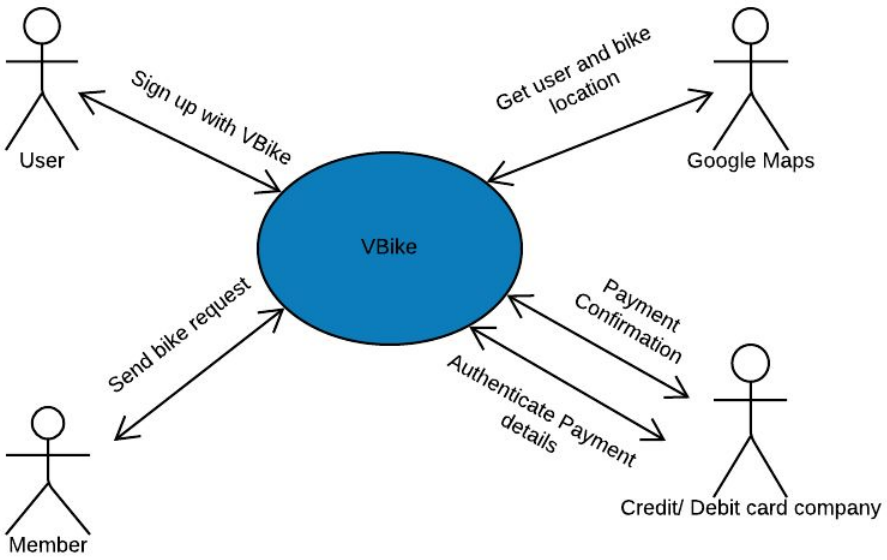
4) Make wallet funds refundable

5) Allow user to enter recharge amount

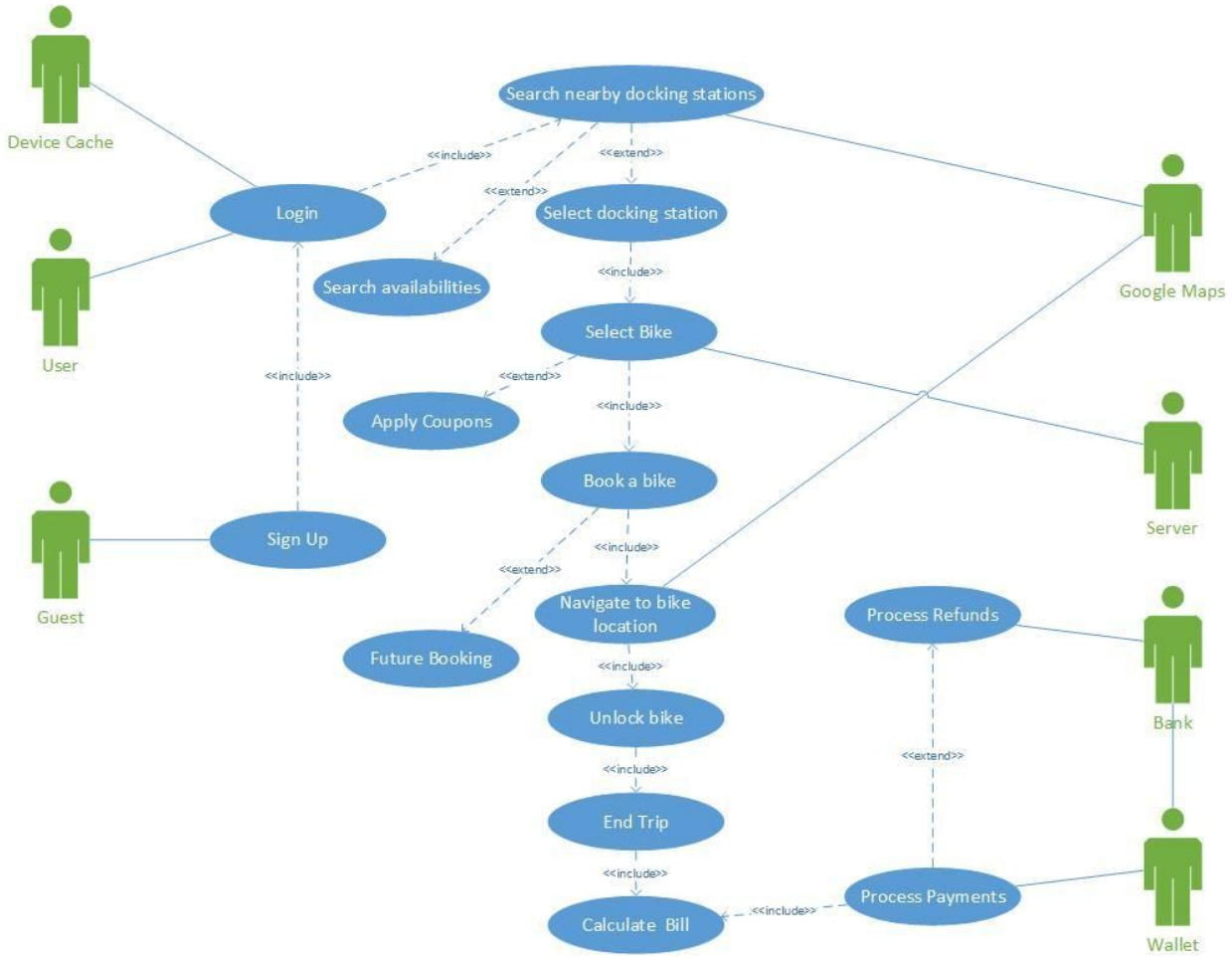
9. BPMN Diagram/ Choreography diagram



10. Context Diagram



11. Use case diagram



12. Use case description

1. Use Case Name: Sign Up

Primary Actor: Users

Description: New users sign up

Trigger: User wants to sign in and use the Vbikes app

Relationships:

Includes: Login

Extends:

Normal flow of events:

- Display login screen.
- User enters phone number, First Name, last name, password
- Signup request is sent to server which stores user credentials and the user is routed to the vbike application

Exceptional Flow:

- If phone number is not verified, then display Failed Authentication message, sign up again

2. **Use Case Name:** Login

Primary Actor: Members

Description: Authenticates members

Trigger: A member wants to sign in

Relationships:

Includes: Search nearby docking station, user sign up

Extends:

Normal Flow of events:

- User open his Vbike application.
- Verify phone number, First Name, last name, password using member data file

Exceptional Flow:

- If Invalid Verification, Then display Failed Authentication message and Login Screen

3. **Use Case Name:** Search nearby docking stations

Description: Displays docking stations location

Trigger: A member wants to search for nearest docking station

Relationships:

Includes: Login

Extends: Select docking stations, Search availabilities

Normal Flow of events:

- Update Location
- Doc stations information is retrieved at the interface and different doc stations are displayed to the user

4. **Use Case Name : Search Availabilities**

Description: Displays the availability of Vbikes in different docking stations

Trigger: Docking station's locations are updated as per the location of the user

Relationships:

Includes:

Extends: Search nearby docking stations

Normal Flow of events:

- Displays Doc stations information for every dock station as per user location
- Displays available bikes in respective dockstatons

Exceptional Flow:

- User can directly go and select Dock Station

5. **Use Case Name:** Select docking station

Description: Selecting the docking station as per the location and availability of Vbikes

Trigger: User clicks on a particular docking station

Relationships:

Includes: Select Bikes

Extends: Search nearby docking station

Normal Flow of events:

- Accept Doc station information for selected docking station info

6. **Use Case Name:** Select Bike

Description: After selecting the docking station user wants a select an available bike

Trigger: User wants to select a bike

Relationships:

Includes: Select docking station, Book a bike

Extends:

Normal Flow of events:

- Display available bikes with respect to selected docking station info

Exceptional Flow:

- User can also apply Coupon, if the coupon is verified message Applied Coupon displays
- If coupon is not verified, Coupon not verified is displayed.

7. **Use Case Name:** Future Booking

   Description: User can book a bike for a future use

   Trigger: User clicks on Future Booking

   Relationships:

   Includes:

   Extends: Book a bike

   Normal Flow of events:

- User chooses the location
- Repeat Steps 3,4,5 and 6

8. **Use Case Name:** Book a bike

   Description: User books one of the available bikes in the selected docking station

   Trigger: User clicks on a bike to book it

   Relationships:

   Includes: Select Bike, Navigate to bike location

   Extends: Future Booking

   Normal Flow of events:

- Displays available bikes
- User book a bike and reserve it
- Reserved Bike info from available bikes is retrieved

9. **Use Case Name:** Navigate to bike Location

   Description: After reserving a bike , user physically goes to bike's location

   Trigger: User clicks on navigation to reach to the bike's location

   Relationships:

   Includes: Book a bike, Unlock Bike

   Extends:

   Normal Flow of events:

- Retrieve selected docking station info and navigate to the dockstation with map info

10. **Use Case Name:** Unlock Bike

    Description: User after reaching the docking station enter a unlock code for a particular bike

Trigger: User enters an unlock code

Relationships:

Includes: Navigate to bike location, End Trip

Extends:

Normal Flow of events:

- Interface displays bike's unlock code
- User enters unlock code for reserved bike info at selected docking station, if its verified lock opens
- After unlocking the bike, Clock Start time is automatically stored

Exceptional flow:

- If the code entered at the docking station is not correct then Failed Authentication message gets displayed

11. **Use Case Name:** End Trip

Description: After reaching the destination and keeping the bike in docking station by locking it .

Trigger: User clicks on End Trip

Relationships:

Includes: Unlock a bike, Calculate Bill

Extends:

Normal Flow of events:

- After completing the trip , user returns the bike at the docking station and select End trip.
- Clock finish time is stored
- Location updation , Reserve Bike info, docking station info is updated and verified

12. **Use Case Name:** Calculate Bill

Description: Displays the total bill for the journey

Trigger: User wants to see the bill

Relationships:

Includes: End Trip, Process payments

Extends:

Normal Flow of events:

- Calculate trip cost, trip time
- Displays trip amount and trip time

13. **Use Case Name:** Process Payments

Description: Payment is done to Vbike after completing the journey

Trigger: User click on Process Payments to pay for the journey

Relationships:

Includes: Calculate Bill

Extends: Process Refunds

Normal Flow of events:

- Retrieve trip cost and check Wallet amount
- If Wallet amount >= trip cost, then deduct amount
- Display message Payment Success

Exceptional Flow

- If Wallet amount < trip cost, then display message Insufficient Balance

14. **Use Case Name:** Process Refunds

Description: In order to get back the money stored in the wallet, user request refunds

Trigger: User clicks on get refund to get back the money in bank account

Relationships:

Includes:

Extends: Process Payments

Normal Flow of events:

- user requests transfer funds to linked bank account, check Wallet amount , if transfer funds is equal to the Wallet amount, process refunds to the linked bank account
- Verify bank details, if successful Deduct amount
- Display message Success

Exceptional Flow

13. If transfer funds is not equal to the Wallet amount, message Insufficient money

14. If bank details are not verified, message Authentication Failed

13. Data dictionary

Signup User

Signup = First Name + Last Name + [Phone Number | Email Id] + Password + Confirm Password

Login User

Login = [Phone number | Email Id] + Password

Search docking station

Search Nearby Docking Stations = [Search by Location | Search By Bike]

Select Docking Station

Select Docking Station = [Dock1 | Dock2 | Dock3...Dock N]

Future Booking

Booking = date + time +Bike Type

Book a Bike

Book Bike = Select Dock + Select Bike

Unlock a Bike

Unlock Bike = First Digit + Second Digit + Third Digit + Fourth Digit

Wallet Information

Enter Card Details = Card Number + Expiry Date + Security Code

Wallet Money

Enter Amount = [5 | 10 | 20 |50 |others]

Select Payment Method

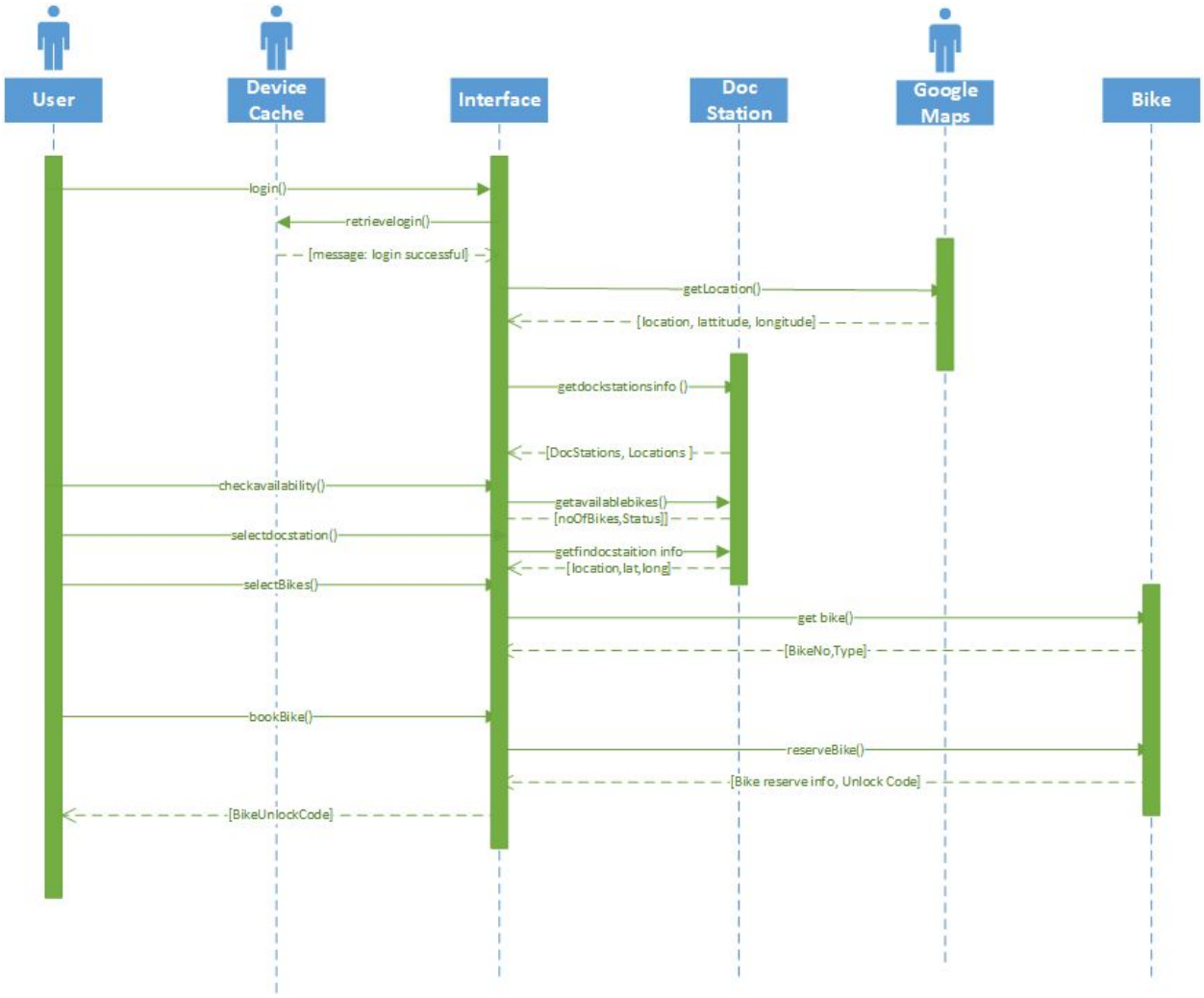
Payment Method = [Paypal | Credit/Debit Card | Wallet Money]

Recharge Amount

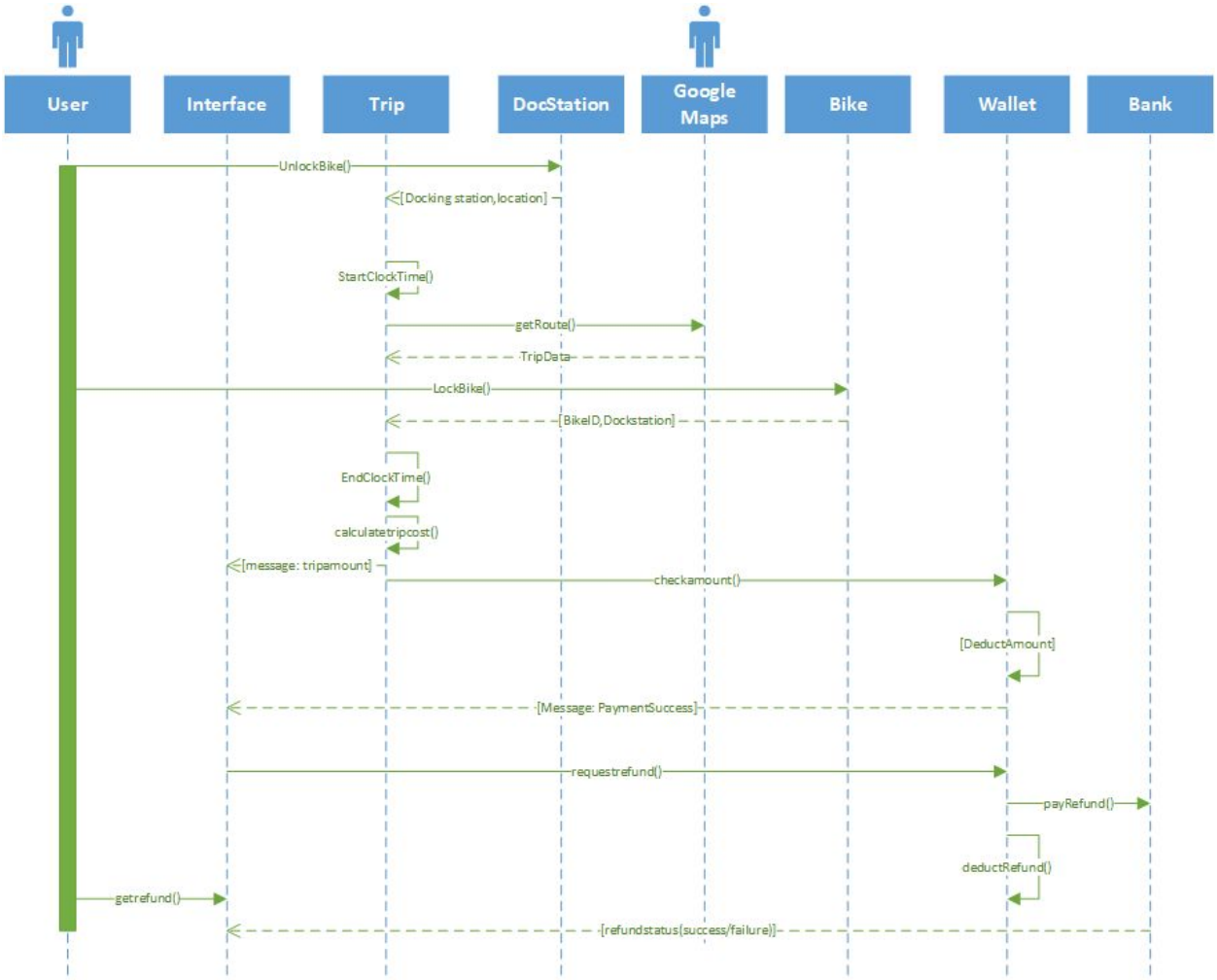
Enter Amount = [5 | 10 | 20 |50 |others]

14. Sequence diagram

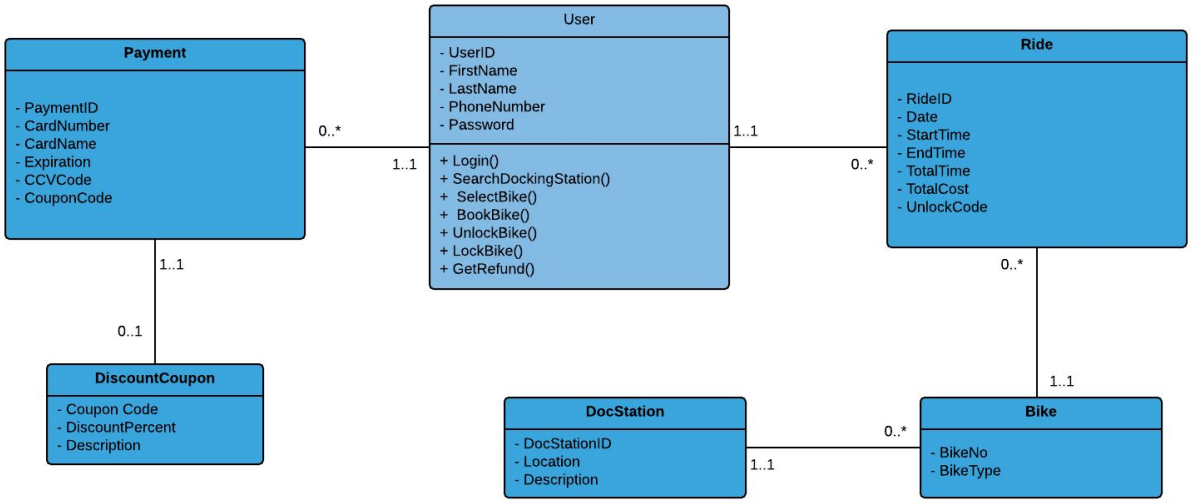
Sequence Diagram 1: Booking a bike



Sequence Diagram 2: Processing Refunds



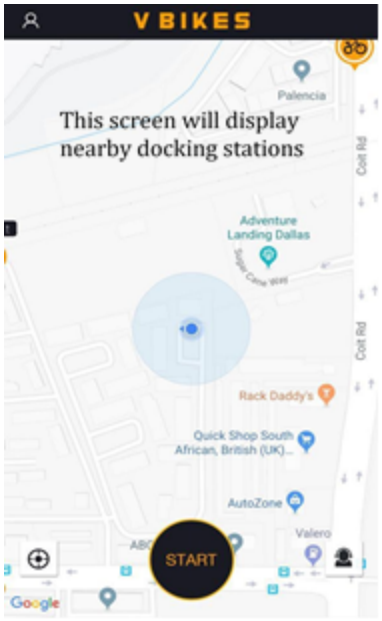
15. Class Diagram



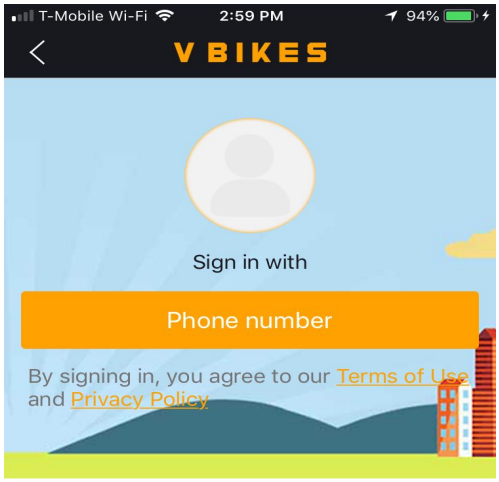
16. Interface Design

The sample user interface for proposed system is shown in the form of screenshots:

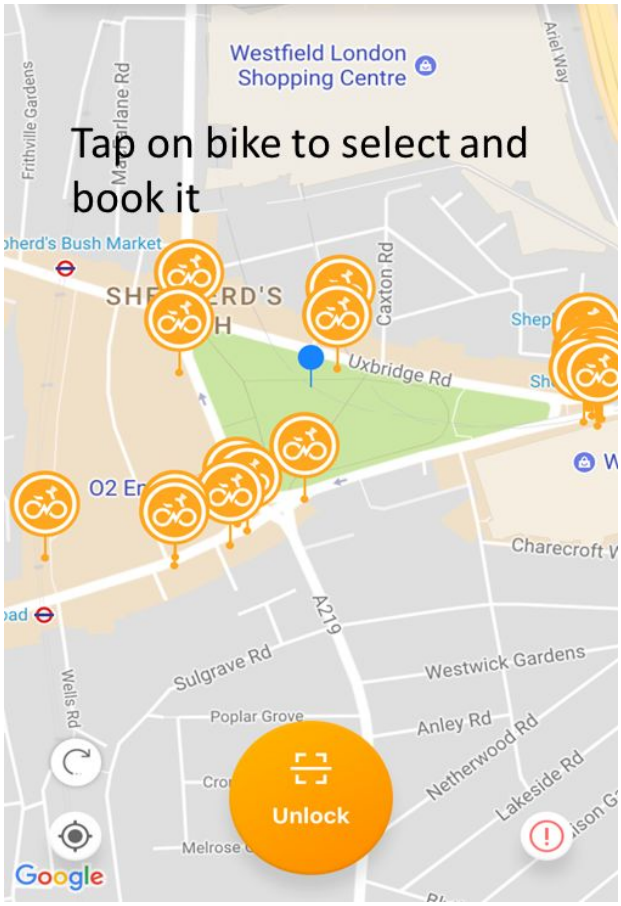
1) Main screen will display nearby docking stations, when clicked on app



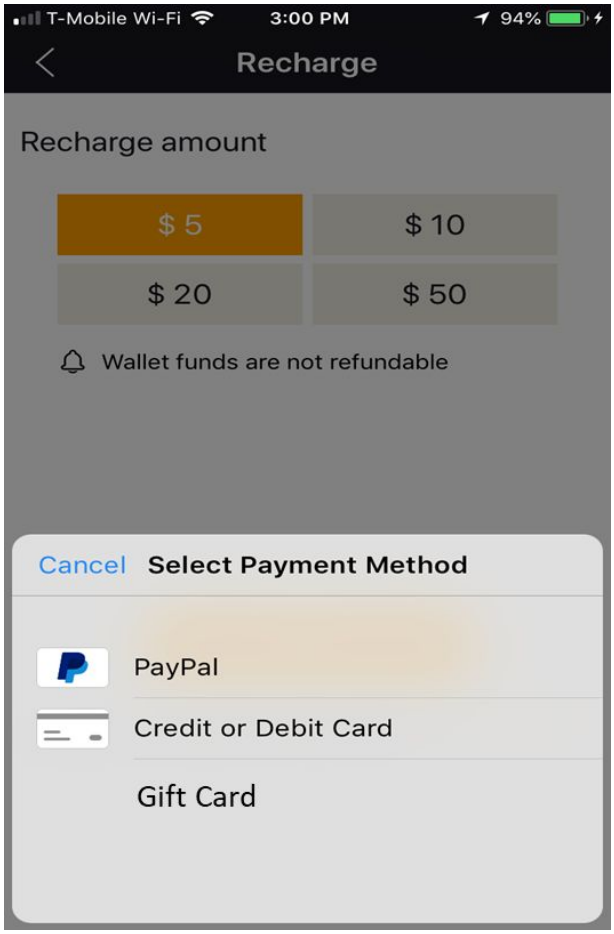
2) When clicked on start, if user haven't registered yet, sign up page will be displayed



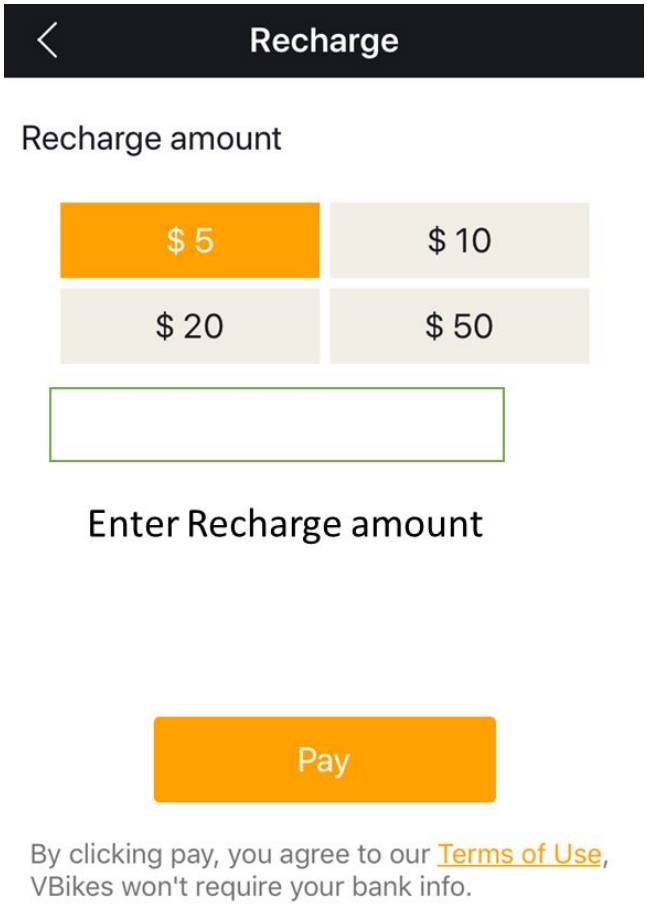
3) After selecting docking station, user can select and book a bike. After booking a bike, pin will be generated and sent to registered mobile number



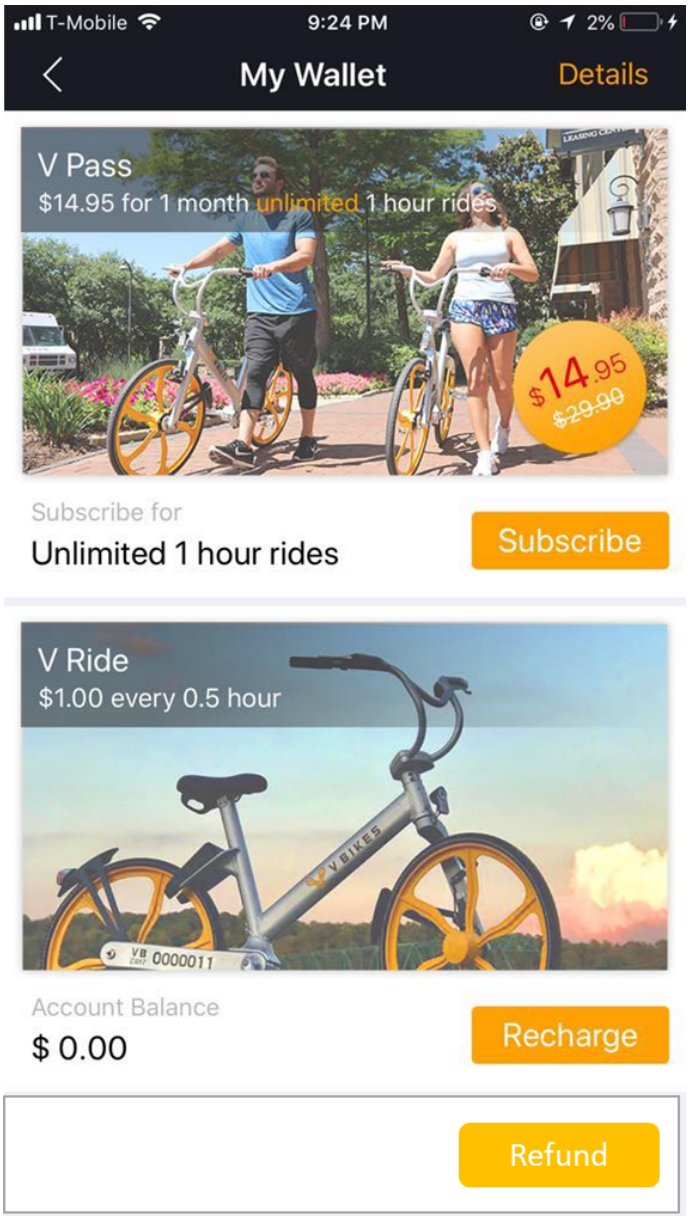
4) A payment window where user can select payment method



5) Recharge wallet: User will be able to enter the amount



6) Refund from the wallet: User can apply for refund from the wallet


T-Mobile
9:24 PM
2%
My Wallet
Details
V Pass
$14.95 for 1 month unlimited 1 hour rides
$14.95
$29.90
Subscribe for
Unlimited 1 hour rides
Subscribe
V Ride
$1.00 every 0.5 hour
VBIKES
0000011
Account Balance
$ 0.00
Recharge
Refund

17. Database design

- User (**UserID**, FirstName, LastName, PhoneNumber, Password)

  UserId should be unique and not null

- Ride(**RideID**, Date, StartTime, EndTime, TotalTime, TotalCost, UnlockCode, *CouponCode, DocstationID, BikeNo*)

  RideId should be unique and not null

- Payment(**PaymentID**, CardNumber, CardName, Expiration, CVVCode, CouponCode)

  Payment ID should be unique and not null

- DiscountCoupon(**CouponCode**, DiscountPercent, Description)

  CouponCode should be present in Ride class

- Docstation(**DocstationID**, Location, Description)

  DocstationID should be unique and not null

  It should be present in Ride class

- Bike(**BikeNo**, BikeType)

  BikeNo should be unique and not null

  It should be present in Ride class

18. Software design

getlocation

FETCH longitude and latitude using google maps

getavailablebikes

For selected docking station

If dockingstation_status = lock

Increase the count

calculatetripduration

Starttime, Endtime

Calculate travel time using Start and End time

Calculatetripcost

Tripcost = $1 for every 30mins

19. Weekly Project Timeline

Weekly Schedule	**Tasks**
21st May– 27th May	Exchange phone numbers and discuss project ideas
28th May – 3rd June	Finalized "VBike" and plan scheduling of project
4th June – 10th June	Discussed business and technical feasibility and documented it
11th June – 17th June	Identified actors, processes. Modeled BPMN diagram, context diagram
18th June – 24th June	Reviewed and updated (if required) previous work, documented use case diagram, use case description

25th June – 1st July	Documented data dictionary, sequence diagram and class diagram
2nd July – 8th July	Interface design
9th July – 15th July	Design database: Tables, attributes, keys and constraints if any
16th July – 22nd July	Functional specification and software design contract method and pseudo code
23rd July – 29th July	Documentation, Report writing

20. Minutes of Meeting

Meeting 1: 05/21/2018 7 PM CST (1 Hour)

Meeting Agenda	Introduction	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Exchanged phone numbers,created a WhatsApp group for better communication, discussed project ideas	
Action Items	Responsible person	Timelines
Search for potential project ideas	All Team members	05/27/2018

Meeting 2: 05/28/2018 7 PM CST (1 Hour)

Meeting Agenda	Select a project
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh
Discussion	Selected "Vbike" enhancement project after discussion and planned further action plan for project

Action Items	Responsible person	Timelines
Discuss enhancements	All Team members	06/03/2018

Meeting 3: 06/04/2018 7 PM CST (1 Hour)

Meeting Agenda	BPMN Diagram, context diagram	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Discussed all enhancements required and identified actors, processes, feasibility analysis	
Action Items	Responsible person	Timelines
Perform feasibility analysis	All Team members	06/10/2018

Meeting 4: 06/11/2018 7 PM CST (1 Hour)

Meeting Agenda	Identify actors, processes	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Process diagram and context diagram	
Action Items	Responsible person	Timelines
Process Diagram	Pravin	06/17/2018
Context Diagram	Sanika	06/17/2018

Meeting 5: 06/18/2018 7 PM CST (1 Hour)

Meeting Agenda	Review previous work, use case diagram, use case description
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh

Discussion	Review of context diagram, process diagram. Discussed flow, methods for use case diagram and use case description	
Action Items	Responsible person	Timelines
Use case diagram	Rasika/Kriti/Saurabh	06/24/2018
Use case description	Kriti	06/24/2018

Meeting 6: 06/25/2018 7 PM CST (1 Hour)

Meeting Agenda	Review previous work, data dictionary, sequence diagram, class diagram	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Review of use case diagram and use case description. Discussed data dictionary, sequence diagram and class diagram	
Action Items	Responsible person	Timelines
Data Dictionary	Saurabh	07/01/2018
Sequence Diagram	Kriti/Rasika	07/01/2018
Class Diagram	Sanika	07/01/2018

Meeting 7: 07/02/2018 7 PM CST (1 Hour)

Meeting Agenda	Review previous work, interface design	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Review of data dictionary, sequence diagram and class diagram. Discussed interface design	
Action Items	Responsible person	Timelines
Interface Design	Sanika/Pravin	07/08/2018

Meeting 8: 07/09/2018 7 PM CST (1 Hour)

Meeting Agenda	Review previous work, database design	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Review of interface design. Discussed database design	
Action Items	Responsible person	Timelines
Database Design	Rasika	07/15/2018

Meeting 9: 07/16/2018 7 PM CST (1 Hour)

Meeting Agenda	Review previous work, Software design	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Review of database design. Discussed software design	
Action Items	Responsible person	Timelines
Software Design	Sanika/Pravin	07/22/2018

Meeting 9: 07/23/2018 7 PM CST (1 Hour)

Meeting Agenda	Review previous work, report writing	
Attendees	Sanika, Rasika, Kriti, Pravin, Saurabh	
Discussion	Review previous work.	
Action Items	Responsible person	Timelines
Report writing	All team members	07/29/2018

21. References

https://www.vbikes.com/