

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING  
THE UNIVERSITY OF TEXAS AT ARLINGTON**

**PROJECT CHARTER  
CSE 4316: SENIOR DESIGN I  
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**DR. CODERS  
PICK BINS**

**BIPUL KARKI  
HIMAL BASNET  
SAILESH THAPA  
SUYASH GHIMIRE  
UTSAV DHUNGANA**

## REVISION HISTORY

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## 1 VISION

In today's world, waste management has become one of the main problem that we have to deal with everyday. Everyday tons of waste product are picked up by various waste management agency from the door step of our houses. But there are some problems with existing system. First, there is a lack of flexible schedule to pick up the waste. Second, house owners are never notified about the arrival time of the waste company to collect the trash. The major issue is that the trash can full of waste remain exposed to the environment for several hours. In some cases, such as, the pick up truck misses to collect the waste from a neighborhood, the waste remains for several days. This leads to sanitation and hygiene issues. So, the vision of this project is to create a communication channel between the home owners and the waste management company. This channel will serve to manage a schedule to collect the trash and notify the user about the arrival time of the pick up vehicle. This will enhance to get rid of waste quickly and keep the surrounding clean.

## 2 MISSION

To tackle the issues mentioned in the vision, this project aims to create a communication link between the waste management company and its users. We are going to build an mobile application which serves as a communication channel. The goal of this application is to inform its users about the schedule to collect the waste. The application will be cross-platform i.e it can run on iOS and android phones. The application will be deployed in App Store and Google Play Store. The user can easily download the application and start using it. Application will receive a notification from a waste company server which includes information such as pickup time of the waste from user location. With this information, the users can dump the garbage and the pick up vehicle will collect it. In case, the user miss the notification, they can send a request via the application to pick up the trash from their location. And the waste company will serve this request by sending the nearest or quickest driver from the location available to pick up the waste. Real time location of the driver will also be shown through the application in case one want to see how far is the driver. Main motive of creating the application is to make the task of waste management easier and efficient which can save time and make our environment cleaner.

## 3 SUCCESS CRITERIA

Upon completion of the prototype system, we expect the following success indicators to be observed on application software through GUI:

- A multiple platform based application that user's can easily get.
- Through the application user can request for waste to be picked up from their house.
- User can pick time for waste collection from the given hours of operation.
- See waste retrievers and their vehicle identification and location.
- Increased efficiency of waste collection around the places where the application is used.

Within 6 months after the prototype delivery date, we expect the following success indicators to be observed:

- Expansion of user opting in to use the application from starting level to city wide.
- Increased level of efficiency in waste management with the increase of application usage.
- Decrease in operating cost with the introduction of algorithm that finds quickest and shortest measure to retrieve the waste from location requested.

Within 12 months after the prototype delivery date, we expect the following success indicators to be observed:

- Expansion of application usage from city wide to county.
- Addition of features like on the spot waste collection, green waste rewards.

## 4 BACKGROUND

Every household produce nearly 30-45 gallons of waste per day. These wastes are either dumped into the garbage container or left on the curbside to be collected by a waste management company. The major issue is that these wastes are exposed to the environment for several hours or days. This causes the waste to undergo biochemical reaction that produces the foul smell. This often leads to sanitation and hygiene issues. The solution to this problem is simple, get rid of the waste quickly. However, there is flaw in the waste management system which lead to the waste being uncollected for several days. Most waste management company has their own operational policies to collect the waste from a neighborhood. For example, some companies requires residents to leave the trash cart at the curb by 7 am on the pickup day. If the residents miss the deadline, they will have to wait certain days for their waste to be collected again. Most companies offer a customer service if the resident missed the waste collection. However, the response time takes at least 24 hours depending on the company. The goal of this project is to help residents to get rid of the waste as quickly as possible. To achieve this goal, there should be an effective communication channel between the waste management company and the resident. Through this communication channel, the company can send the notification to its customer regarding the arrival time of the garbage collecting vehicle. So that customer will not miss the waste collection. Even if the customer miss the waste pick up day, they can send a waste pickup request to the company and the company response to this request promptly. This communication channel can enhance the company to deliver the service the customer quickly and efficiently that can promote their business.

## 5 RELATED WORK

There exists several waste management companies providing clean trash pickup service to the neighborhood. However, they lack to provide service effectively. Most of the company's reviews reveals that it's customers are disappointed because often the waste pickup time is delayed causing the waste to be left on the curb for several days. The operational cost and fees are expensive. Every waste management company are adapting the technology to promote their business. For example, Waste Management is the leading provider of comprehensive waste management in North America. It provides mobile application to support the customer service. The app contains information about the services, payments, and notifications. However, it does not fully solve the problem. Because, the app still lacks the real time exchange of the information such as the position and arrival time of the pick up vehicle. IRecycle app launched by Earth 911 promotes the benefits of recycling waste products. This app helps users to locate the nearest recycle centers. Gimme 5 is an app that helps users to identify the recyclable plastics. Recycle Nation app provides news portal services that contains environmental trends and news. It provides user a tracking service to view their contribution to recycling movement. My Waste is an app similar to Gimme 5 which provides information about the recyclable products.

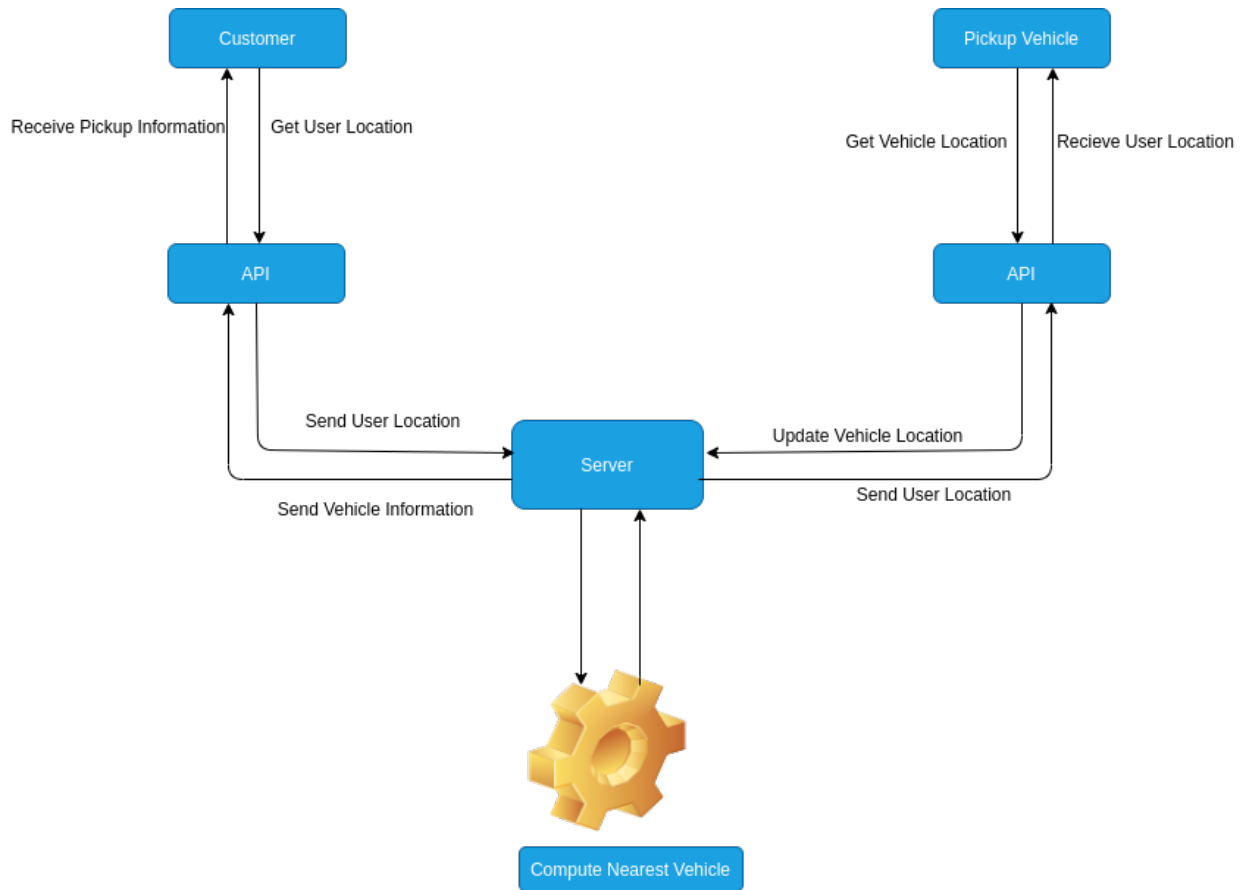
## 6 SYSTEM OVERVIEW

The goal of this project is to build a mobile application which serves as a communication link between waste management company and its customers. Following are the implementation detail of the project:

- The application will be modeled as a client-server architecture.
- The server will handle all the client request and respond it back. An example of a client request would be a pick up request from a client's location. Upon the request, REST API will accept client's location as in input and send it to server for processing. The server will calculate the nearest vehicle from the client's location. The server will send response to the client with information about the pickup vehicle.



- The server will update the location of pick up vehicle. This will speed up the process of dispatching the nearest vehicle to the client's address.
- The server will send a notification to information and pickup schedule to every client. The information include the exact time of pickup.
- The client can be of two types: customer and employee. Upon the pickup request, the client customer will receive the response from the server regarding client employee information. And the server will also respond to client employee regarding the pickup location of client customer.
- The client employee and the client customer shall communicate via the server.



## 7 ROLES & RESPONSIBILITIES

Initially the stakeholders of the project will be general public who lives in houses. Others stakeholders can be waste management agencies. This is not a sponsored project so basically we will be working together as a team to achieve our mission. Team members working towards the project are Bipul Karki, Himal Basnet, Sailesh Thapa, Suyash Ghimire and Utsav Dhungana.

Sailesh Thapa will be our team leader who will have the responsibility of overseeing the project and collaborating with all the parties involved.

Our scrum master will be Utsav Dhungana responsible for maintaining the goal of agile process while we perform our iteration every two weeks.

Communication is crucial when working as a team. Point of communication will be handled by Bipul Karki who will maintain communication within the team member and between any other parties that will be involved.

Suyash Ghimire will make sure every file and document are up-to-date and maintained in the version control system.

Himal Basnet will Keep track of time and making sure we stay within the criteria of project without being diverted or distracted.

All the role will remain constant through out the project unless in cases where one wants to trade role with another member for the best of their knowledge. Beside handling individual role each member will work equally towards the planning, designing, implementing, testing and maintain the application adhering to the principle of agile development. This is a team project so we will work as a team to solve the problem and come out with a solution giving our best.

## **8 COST PROPOSAL**

Our project is sponsored by Chris Conley. We will have a total budget of \$800 dollars for the project. The budget will be managed properly according to the software requirements. The major expenses for our project would be buying software licenses.

### **8.1 PRELIMINARY BUDGET**

Final preliminary budget will be updated later. Below is our assumption.

<b>Item</b>	<b>Percentage</b>
Software Licenses	80
Hardware	20

Table 1: Assumption of preliminary budget

### **8.2 CURRENT & PENDING SUPPORT**

The only funding source for this project For now is from CSE department of \$800. Since the final product will not have much of hardware stuff given amount of primary budget should be enough for the project.

## 9 FACILITIES & EQUIPMENT

For this project we will be developing application software, so there will be no need of any lab space and equipment's. But at last we may require very few amount to deploy our app.

## 10 ASSUMPTIONS

We cannot assume that our project will be perfect as we view from surface. It is a real time response app. None of us has worked before in development of such app. So, we all are learning the material we need to build this application. For now its going well and we hope that it will come near as we have expected. The most critical assumptions related to our project are:

- All of the team member have agreed to meet in timely manner according to schedule.
- In this time, consulting with team members it is assumed that we all will learn material needed for project with in a month or two.
- The prototype of the project will be ready by the 3rd sprint cycle.
- By the 5th sprint cycle our application may function but won't be ready for normal use.
- With the help of this application we are trying to solve problem of many countries and cities. So, we hope it will come in real use if it goes as expected.

## 11 CONSTRAINTS

This app is mainly based on Django, React, and React Native frameworks. We will build full application including back end restful API, front-end web app and mobile apps on both Android and iOS. The following list contains key constraints related to the implementation and testing of the project.

- First and foremost thing is that all of us are not familiar with the languages and frameworks we are going to use. So, it may take time for everyone to work together in same pace and complete the project in time.
- The most important part of the app will be to collaborate front end with back end since we are using two different languages and their frameworks.
- Other than that handling data received from Google Maps API and make them to response in real time would be challenging.
- We are not aware how long will it take for an app to response. Will it be fast enough for the normal use?
- The client server communication channel may be challenging.

## 12 RISKS

Risks are certain. Nothing can be achieved without risks. Since we are trying to build something that we have never built before and for which we have to learn a lot of new materials. There are some risks listed below and we will have a mitigation plan for it:

Risk description	Probability	Loss (days)	Exposure (days)
All the team members have not learned the required materials	0.50	20	10
To make front end and back end work properly and together	0.20	14	2.8
Google map API not compatible with our app as our design	0.30	9	2.7
Optimization of the functionality of the app	0.10	20	2.0
Client server do not communicate in real time	0.15	10	1.5

Table 2: Overview of highest exposure project risks

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## 13 DOCUMENTATION & REPORTING

### 13.1 MAJOR DOCUMENTATION DELIVERABLES

#### 13.1.1 PROJECT CHARTER

Document will be updated whenever there is any changes during the sprint in any part of the project. Each sprint will be of two weeks so changes are expected every two weeks. The Initial version of the document will be delivered on 07/14/2020 and the final version will be delivered on 8/15/2020.

#### 13.1.2 SYSTEM REQUIREMENTS SPECIFICATION

Whenever any change needs to be done concerning features or when some requirement cannot be achieved we will have to update the requirements. They will be changed during sprint if necessary. The Initial version of the document will be delivered on 07/28/2020 and the final version will be delivered on 8/15/2020.

#### 13.1.3 ARCHITECTURAL DESIGN SPECIFICATION

This document will be updated with the changes made to requirements and design of the application. The Initial version of the document will be delivered on 8/13/2020 and the final version will be delivered on 8/15/2020.

#### 13.1.4 DETAILED DESIGN SPECIFICATION

This document will be updated with changes made in design of the application along the sprint of the project. The Initial version of the document will be delivered during month of August.

### 13.2 RECURRING SPRINT ITEMS

The following items will be documented and maintained during each individual sprint.

SRS (System Requirements Specification) ADS (Architectural Design Specification) DDS (Detailed Design Specification) Product Backlog Sprint Backlog

#### 13.2.1 PRODUCT BACKLOG

All of the important and feasible requirements will be listed from SRS to product backlog. Items will be prioritized based on difficulty level figuring out the critical path. Difficult task will be given more time and done first. Group vote will decide on product backlog. Possibly Slack will be used to share the product backlog between team members and stakeholders.

### 13.2.2 SPRINT PLANNING

Each sprint will be planned based on the product backlog details. There will be around 6-7 sprints through out the project based on time given.

### 13.2.3 SPRINT GOAL

We will setup a feedback platform to get feedback from customers and based on the feedback whole team will discuss to decide on sprint goal.

### 13.2.4 SPRINT BACKLOG

All team member will discuss each product backlog to decide if it makes to sprint backlog. Collaboration software Slack will be used to share and maintain backlog.

### 13.2.5 TASK BREAKDOWN

Team members will voluntarily claim a task from sprint backlog if no volunteers comes up then task will be assigned by scrum master. Time spent on tasks will be documented on task table.

### 13.2.6 SPRINT BURN DOWN CHARTS

Scrum Master is responsible for generating the burn down charts for each sprint. Each individual working on a task have to report the amount of time worked and accomplishment made using some form of application. This way effort of each individual can be calculated by scrum master.

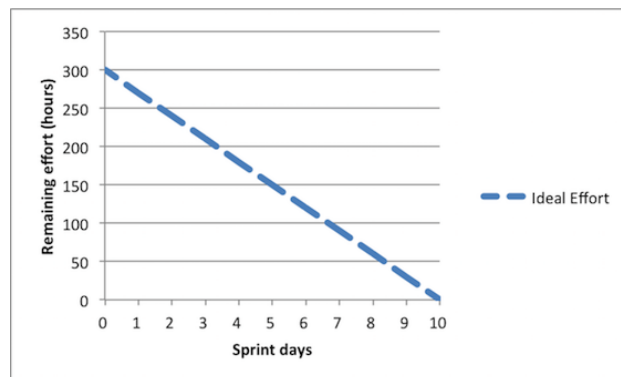


Figure 1: Example sprint burn down chart

### 13.2.7 SPRINT RETROSPECTIVE

Sprint retrospective will be done after every sprint and it will be discussed among team members during meeting.

### 13.2.8 INDIVIDUAL STATUS REPORTS

What sort of status will be reported by each individual member, and how often will it be reported? What key items will be contained in the report?

Information like hours worked on a task, percentage of task completed, list of task completed, list of error occurred during work will be included in Individual Status Reports. It will be updated every week.

### 13.2.9 ENGINEERING NOTEBOOKS

How often will the engineering notebook be updated, at a minimum, by each team member? What is the minimum amount of pages that will be completed for each interval, and how long will that interval

be? How will the team keep each member accountable? Who will sign off as a "witness" for each ENB page?

The engineering notebook will be updated every week after the team meeting and according to the recent feedback from the customers.

### **13.3 CLOSEOUT MATERIALS**

The following materials, in addition to major documentation deliverables, will be provided to the customer upon project closeout.

#### **13.3.1 SYSTEM PROTOTYPE**

Final system prototype will include a multiple platform software application. We are planning to demonstrate this sometime during first week of December in-person if possible else using online platform. We are not sure if there will be a Prototype Acceptance Test (PAT) yet, but it will be updated later. There will not be a Field Acceptance Test (FAT) for our project.

#### **13.3.2 PROJECT POSTER**

Poster will include name of the project, Team member names, name of application, purpose and features of the application. Final dimensions is yet to be figured out. The poster will be delivered during second week of August.

#### **13.3.3 WEB PAGE**

Our project will be available in github, and it will also have a web page. The project web page will have a description of product, poster, downloadable version, and copyrights. We will be updating the web page throughout the sprint cycle.

#### **13.3.4 DEMO VIDEO**

Demo video will show how to get the software application in various platform, and it will also show how to use various features of the application. Yes, we might as well include B-reel footage. Video will be of around 5-7 minute long mostly it will cover the working of various features of the application.

#### **13.3.5 SOURCE CODE**

How will your source code be maintained? What version control system will you adopt? Will source code be provided to the customer, or binaries only? If source code is provided, how will it be turned over to the customer? Will the project be open sourced to the general public? If so, what are the license terms (GNU, GPL, MIT, etc.). Where will the license terms be listed (in each source file, in a single readme file, etc.).

Our source code will be maintained using version control system possibly GitHub. Source code will be provided to the public using some online platform. License terms will be GNU and will be listed in each source file.

#### **13.3.6 SOURCE CODE DOCUMENTATION**

We will be using Doxygen for source code documentation, and the final project documentation be provided PDF or browsable HTML.

#### **13.3.7 HARDWARE SCHEMATICS**

Our software will be purely software based.

#### **13.3.8 CAD FILES**

Our software will be purely software based.

### **13.3.9 INSTALLATION SCRIPTS**

There will be a web document provided to the public which will have instruction on how to get the software to install in various devices.

### **13.3.10 USER MANUAL**

Will you customer need a printed or digital user manual? Will they need a setup video? Decide now what will be provided and discuss. A digital user manual for our project will be provided. A video tutorial on how to install the application will be provided.

## REFERENCES

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