Software Engineering and Project

Software Requirements Specification

D&N

Pik Chi Mok (a1718493)
Jing Liang Chong (a1731309)
Hei Nok Cheung (a1722769)
Yanran Du (a1701762)
ZiYang Ye (a1707805)

<Version 1>

<Last Updated 26 October 2019 3:49 pm>

Table of Contents

Version History

Date	Version	Changer	Description
24/8/2019	0.1	Pik Chi Mok, Hei Nok Cheung, Jing Liang Chong	Finalised the introduction and user requirements
25/8/2019	0.1	Yanran Du Ziyang Ye	Write use cases
23/10/2019	1	Pik Chi Mok, Hei Nok Cheung, Jing Liang Chong	Updated functional requirements, non-functional requirements and system requirements
26/10/2019	1	Yanran Du Ziyang Ye	Update use cases based on the end of product development

Introduction

Scope

Purpose: There are many limitations to access the GPS data by the applications, for example, the security issues and the power consumption problem. To solve these questions, a new application is needed to locate where the phone is.

Scope: To develop a web-based application that able to find the location of phone without using GPS.

Intended audience

Intended audience:
This document is intended for all the stakeholders and the project team working on the project. The project team involves the developers, testers, project manager, etc. The stakeholders are the customers who paid for this project. Stakeholders in other departments including marketing department, sales department, etc. This document will help the stakeholders and project team understand the requirements through the specification.

References

https://cellidfinder.com/articles/how-to-find-cellid-location-with-mcc-mnc-lac-i-cellid-cid?fbclid=IwAR3I6rVOZFQat_AcaJBmEN1jzHb6L0z_UwQ7ztDqKDP5eQuxuMDy_iFQayw
https://us.norton.com/internetsecurity-mobile-can-a-mobile-phone-battery-track-you.html?fbclid=IwAR3u6VbMQOgnysWC8rNAze8GZHbsZHfRbt2PtHYoqRrRTick1MZ1e8am4WI

Glossary

I/O: Input/Output

Functional Requirements

FR0001: To find the location of the phone without using GPS

Description

As mentioned in the project scope, the first requirement must be to find the location of the phone without using GPS. Therefore, the information of the phone tower id is the technique that is used in the project. User have to install the application on their phone and allow the application to send the details of connected phone tower to the server. When the user type the phone number and carrier company name in the web page, then the current location of the device will show in the Google Map.

Rationale

Since using GPS to track the location will cause various issues, such as power consumption and security. However, using the information of connected phone tower can solve these problems.

Acceptance criteria

This requirement can be verified by input a target mobile phone number and its carrier company name to the web application. Before that, the user has to open the application in their device. After that, by comparing the actual location of the phone and the location demonstrated in the web page, to see if the result is matched or not.

Source

Sourced from the client meeting

Priority

High

FR0002: To store the last 10 times of phone’s location for each user

Description

The application shall support the history of location for each user. The user shall be able to check the last ten records of location stored. The history of location shall be stored in the user database.

Rationale

The record will be used for user to keep track of their account, to check if there is any unusual record that is not made by them.

Acceptance criteria

First, to find the location of the target phone in 10 times with different place by using the application. Then, by comparing the 10 location of the phone and the location shown in the web page, to see if the result is correct or not.

Source

Sourced from group meeting

Priority

Low

FR0003: To log user access to tracking service

Description

The system shall support each logging of time for each user. The time data shall be stored in the user database. The admin shall be able to access the user database with limited information, such as user name and the time data. Also, the admin shall be able to check the data at any time.

Rationale

Admins may want to keep tack on the activity of all users to determine when the user has access to the web application for purposes, such as security, administration, etc.

Acceptance criteria

This requirement can be verified by the team member by logging into the system as a user and the admin can check the database to see if the user access has been logged.

Source

Sourced from group meeting

Priority

Low

Non-functional Requirements

NFR0001: Login System (Security)

Description

The login system is for users to register their devices in their own account. First, users need to register an account, have to provide their name, mobile phone number, the name of the carrier company and set up a password. These information data shall be stored in our user database. After registration, the user will receive an SMS with a unique code to verify the user is the owner of that device.

Rationale

The main purpose of the login system is to prevent someone who has others' phone number can track others' location. By comparing the phone number and carrier company of user, to check if the database have the same information already. Since, it is impossible to have the same number and carrier company, then the input is invalid.

Acceptance criteria

This requirement can be verified by registering new account for the team member and adding devices in their account. Next step is to compare the information given by the user, which is to ensure that the input is valid. Finally, if everything is satisfied, then to ensure that the information is stored in the database successfully

Source

Sourced from the group meeting

Priority

Low

NFR0002: Ease of use (Usability)

Description
A good user experience is the most vital aspect that we seek to provide in the web application. A user should use the web application without feeling confused and the important feature should be obvious to the user.

Rationale
The reason for this is because if the user has to think twice when using the web application, that means that the web application developed has failed to provide a good usability to the user. This may cause the user to stop using the web application.

Acceptance criteria
A feedback form can be provided to the user after using the web application for the first time. Developers can use the feedback from the user as a guide to improving the web application.

Source
Sourced from the group meeting

Priority
High

NFR0003: Login System (Usablility)

Description
To provide a login system for the user, so that more than one mobile device number can be registered to the user database.

Rationale
A user may have more than one phone number for different usage and may want to register more than one phone number in their account.

Acceptance criteria
A user can register multiple phone numbers to the user database and verify if the location tracking service works for all the phone numbers that are registered.

Source
Sourced from the group meeting

Priority
Low

System Requirements

SR0001: Database

Description
Database will be used to store the most recently updated cell information such as cell ID (CID), and location area code (LAC).

Rationale
The android application needs the user to open the application on the phone to send the cell information (LAC and CID) to our server, hence, a database is needed to store the most recently updated cell information.

Acceptance criteria
System admin can access the database by logging into the database and looking at the entries of corresponding phone number.

Source
From discussion with group members.

Priority
Medium

SR0002: API

Description
API is needed as the service of other web applications needs to be used as well. For example, google map’s service will be used to display the location of the cell location. Open-source database from OpenCellID which will contain the location of cell tower locations will be utilized as well. Its database will contain a lot of information on a cell tower id, such as the signal strength, last updated, latitude, and longitude, etc.

Rationale
API ensures that we do not have to worry about the complexity of constructing a service on our own, instead we can just use a service that is already provided to us by another company. It also reduces the load on our server as our server would need to store all the resources.

Acceptance criteria
User can make an API call to google map to see if a map is obtained. For the OpenCellID database, the user can make an API call to the database and make sure an error message is not received.

Source
From discussion with group members.

Priority
High

SR0003: I/O

Description
The input is the information of the connected phone tower, which is collected from the Android application in the phone. The data shall be sent to the firebase database, then passed to the server. After that, the output is the latitude and longitude of the phone's location. Finally, set a pin by using the output and demonstrate it in the Google Map.

Rationale
I/O is needed since the application cannot collect the details of connected phone tower without an application, then the service is hard to implement without these information. Moreover, user has to know the location by using a Google Map to show the pinned location of the phone.

Acceptance criteria
This requirement can be verified by showing the data in the firebase and showing the pin in the Google Map. Then, compare the actual information with the data shown in the application and see if it is correct or not.

Source
Sourced from client meeting

Priority
High

Use Cases

Use Case 001 - Repositioning Android phones without using GPS.

Brief Description

The customer want to use a web-based application that works for Android phones
that is able to determine where a phone is located from its sensor data history but without GPS.
A simple diagram shows the relationship between customer, web-based application and server in Figure 1.

Actors

The customer is anyone who wished to reposition their phone(s), did not use GPS but prefer using sensor data.

Preconditions

This use case assume customer is in Australia and their phone(s) are loaded with Android.
The Android phone(s) that need to be repositioned has been connected to the web-based application.

Basic Flow

1. The customer open the web-based application.
2. The customer click the button on the web page.
3. The web-based application analyzes various sensor data uploaded by mobile phone(s)
4. The web-based application shows the current location of the phone

Alternate Flows

- The customer wants to reposition another phone without interrupting the current analysis
- The sensor data collected is not enough to analyze the location
- The web-based application can not locate the location because of unknown reason

Exception Flows

- The web-based application crashes while analyzing data
- The web-based application gets the correct position but it does not show up on the map

Post Conditions

The customer must have a google map mark of the location at the end.

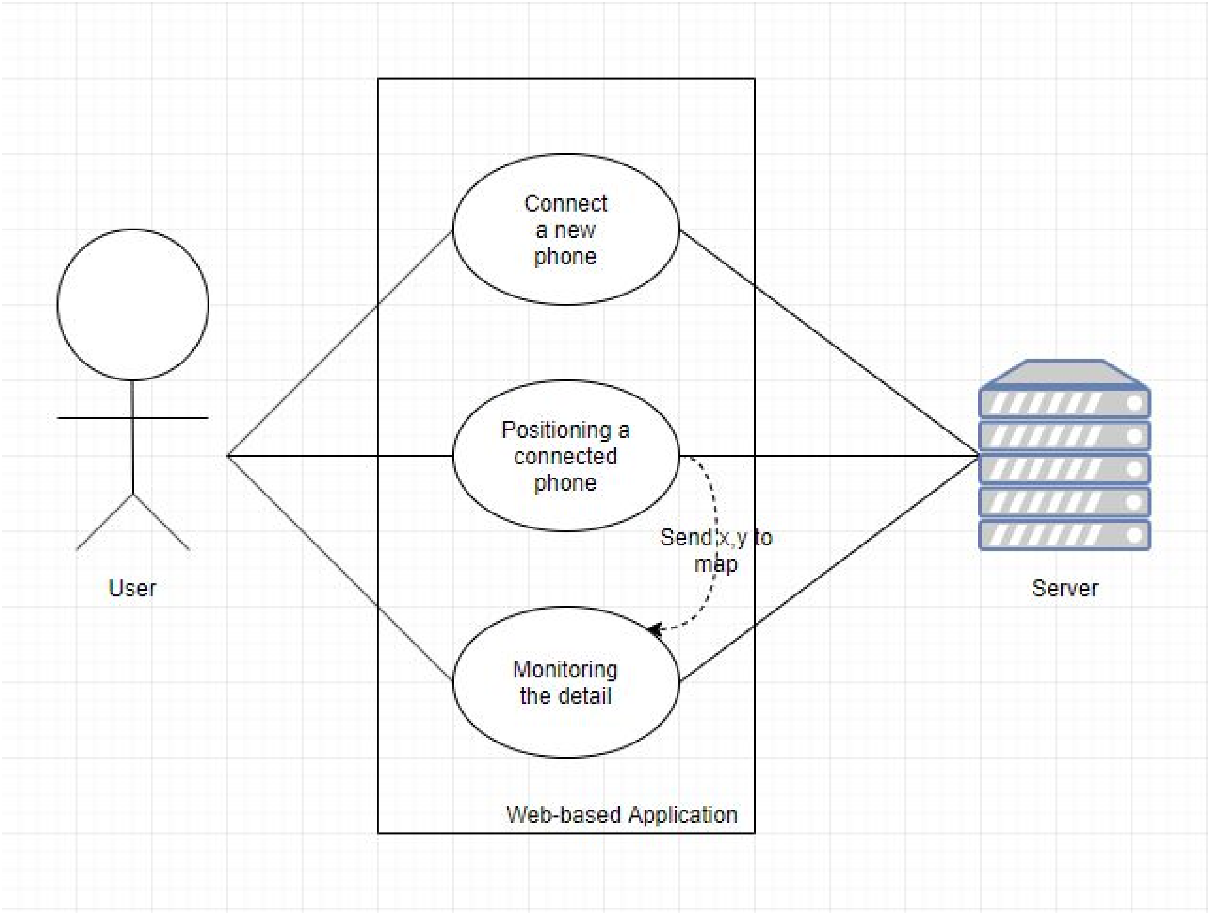

Figure 1. The overview of the use case 1

Use Case 002 - Connected Android phones to server

Brief Description

The customer want to connect their Android phones to our server which serves both Android and Web application. The server is able to share data between a phone and a web page.
A simple diagram shows the relationship between customer, web-based application, android application and server in Figure 2.

Actors

The customer is anyone who wished to connect their phone(s) to our server.

Preconditions

This use case assume customer is in Australia and their phone(s) are loaded with Android.
The Android phone(s) that is able to download and install our Android apk pack.
The Android phone(s) give our Android application permission to access location services.

Basic Flow

1. The customer download the android apk pack and install it.
2. The customer give our android application permission to access location services in settings->applications->perimission
3. The customer open our android application
4. The android application send cell data to our server and display the currently connected base station information.

Alternate Flows

- The customer wants to connect another phone to our server
- The android application crashes because of no perimisiion to access location info
- The customer can not install our android application because of expired system

Exception Flows

- The android application can not send data to our server becuase of unknow reason
- The android application crashes although it gets permission to access location information

Post Conditions

The customer must have a android application installed and showing the current connected base station information at the end.

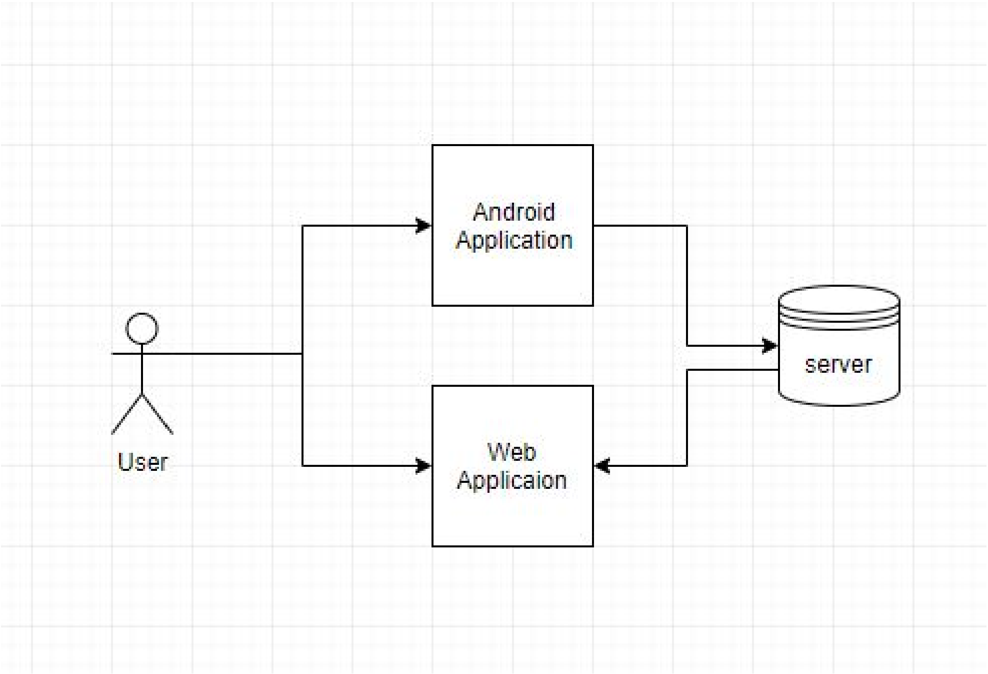

Figure 2. The overview of the use case 2

Use Case 003 - Registering a phone number in our web application

Brief Description

The user would register their own phone number to the web application's database that stores all the phone number. This is used as an unique id to determine the user.

Actors

Anyone who would like to register their phone number to our web application.

Preconditions

This use case assume customer is in Australia and their phone(s) are loaded with Android.
The Android phone(s) that is able to download and install our Android apk pack.
The Android phone(s) give our Android application permission to access location services.

Basic Flow

1. User navigate to our web application's register page
2. Put in their phone number that they would like to register to our web application
3. Web application server checks if the number that is inputted already exists in the database
4. Web applicaiton server will send a confirmation pin to the phone number
5. User inputs the confirmation pin to the prompt
6. Server puts the phone number into the database

Alternate Flows

- User inputs a phone number that does not exist
- User inputs a phone number that does not belong to him/her.
- User input an incorrect confirmation pin.

Exception Flows

- The server cannot send a confirmation pin to the phone number that the user inputs.
- The server finds a phone number that already exists in the database
- User closes web application when in confirmation pin prompt page.

Post Conditions

There will be an entry of the phone number that the user entered in the server's database.