

Software Engineering and Project
Software Design Document

D&N

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Version History

Date	Version	Changer	Description
1/9/2019	0.1	Pik Chi Mok, Hei Nok Cheung, Jing Liang Chong	Finalised Introduction and components design.
1/9/2019	0.1	Ziyang Ye, Yanran Du	Write some basic descriptions and draw 3 simple UI drafts for “Human Interface Design”
22/10/2019	1	Pik Chi Mok, Hei Nok Cheung, Jing Liang Chong	Modified components design description. Added detailed description of how entities communicate.
26/10/2019	1	Yanran Du, Ziyang Ye	Updated UI based on the end of product development

Introduction

Overview

Overview: In this document, components design and user interface design is provided. To give an overview of the system design and functionalities, how the system works and communicate among different components.

Purpose: This document will contain all the details of the software's design. For example, the details of how the design of the software came to be and what are the advancements that we produced. The details of the entities will also be included, such as how many entities are there and how they all communicate with each other.

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

Intended audience

This document is intended for customers who are interested in the design of the software. This document will contain the specifications of the design. For example, the design of the web application such as the user interface, how many entities are in the software, how the entities communicate together and what are the test cases used. This document will also include the stages of design and all the versions as well.

References

<https://www.dimensionengineering.com/info/accelerometers>

<https://crypto.stanford.edu/powerspy/files/powerspy.pdf>

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=IwAR3u6VbMQOgnysWC8rNAze8GZHbsZHfRbt2PtHYoqRrRTick1MZ1e8am4Wl>

Glossary

SDD = Software Design Documentation

Components Design

Component Decomposition Description

We will break the components into two-part, components in the front end and back end. The front end will contain the HTML resources, such as the home page. The back end will contain the database and also a node.js server that will serve the request of the user by calling javascript functions, running applications and also make API calls to a web application called OpenCellID to access location data of cell locations.

Back end

User Database (To store the most recently updated cell locations of a phone number)

Firebase Database (Stores the cell information that the phone sends, accessed by our server through API)

Cell ID Database (Stores the information of cell id and location area code, such as signal strength, longitude, latitude, last updated, etc.)

Server (To contain functionalities for users)

1. Obtain cell data from the phone with the Android application in the firebase database
2. Obtain MCC and MNC from the phone number field and carrier company, respectively
3. Make API calls to OpenCellID open database
4. Make calls to database to update most recently updated cell data of phone number.
5. Display location of mobile phone on google map

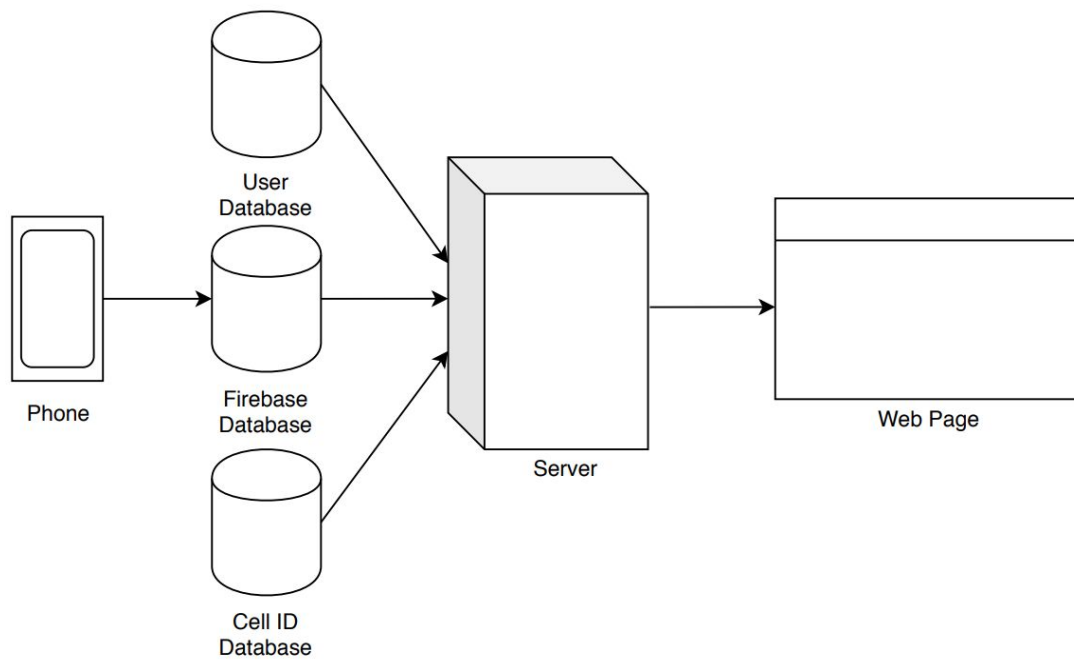


Figure 1. The overview of component design

Front end

Web page

1. Home page
 - a. Refresh button
 - b. Google Map (to demonstrate the location of phone)

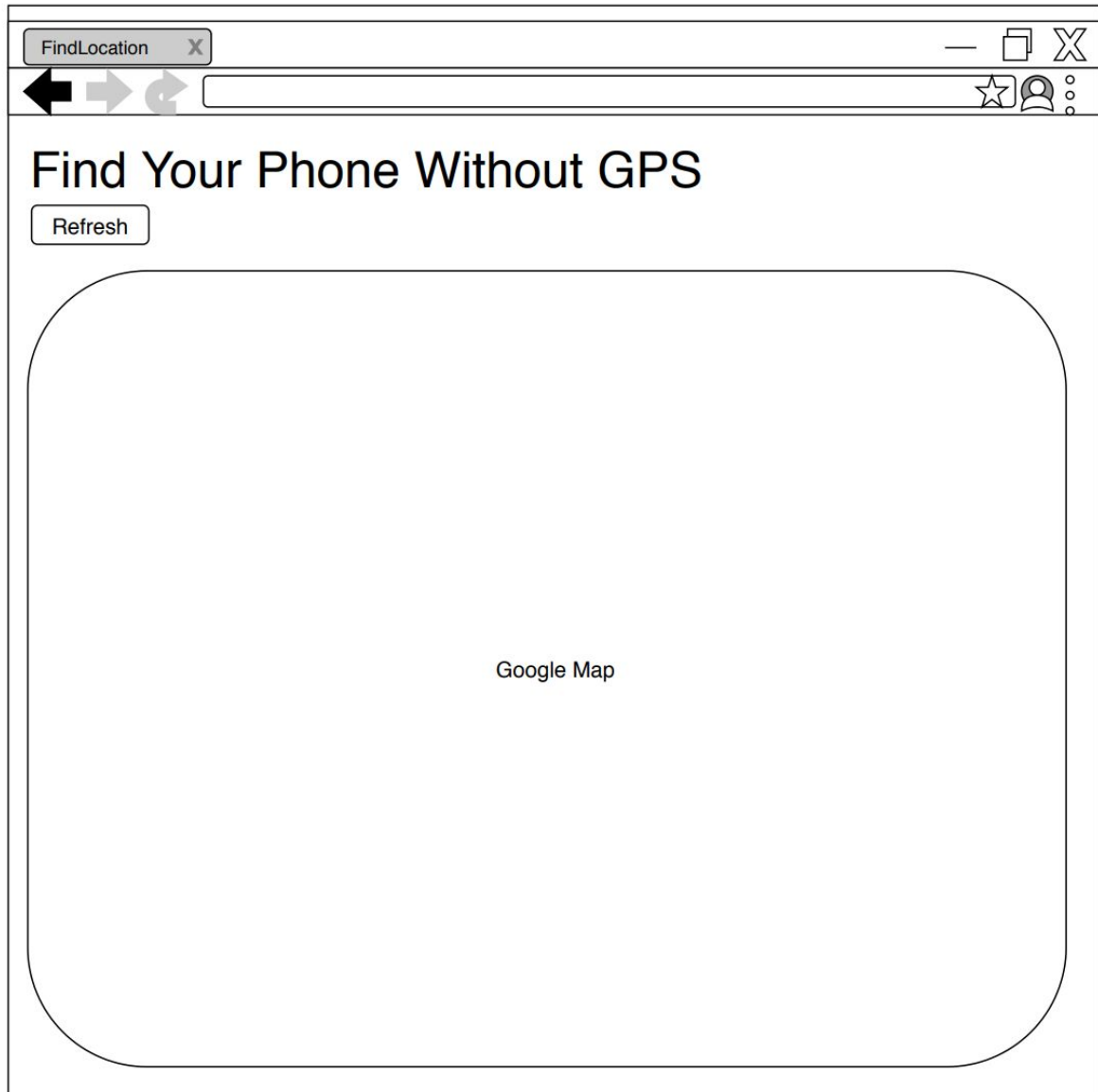
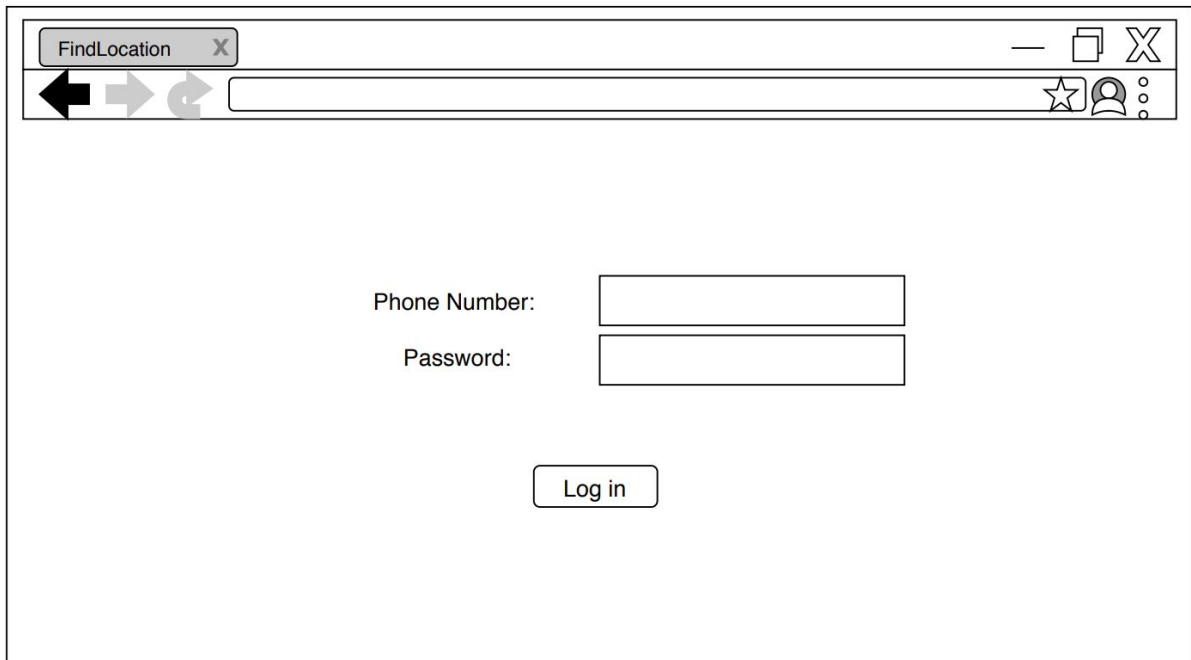


Figure 2. Homepage design

- 2. Login page
 - a. Phone number field
 - b. Password field
 - c. Login button

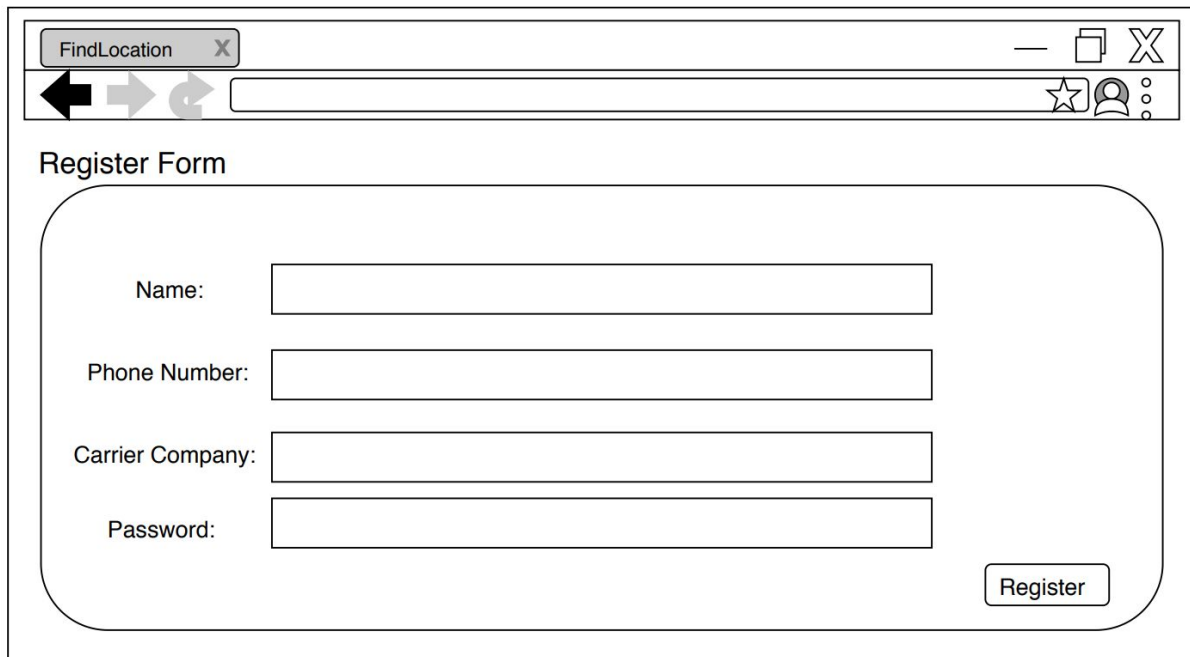


The image shows a web browser window with a single tab titled "FindLocation". The address bar is empty. The main content area contains a login form with the following elements:

- A label "Phone Number:" followed by a text input field.
- A label "Password:" followed by a text input field.
- A "Log in" button centered below the input fields.

Figure 3. Login page design

3. Register Page
 - a. Name field
 - b. Phone number field
 - c. Carrier company field
 - d. Password field



The image shows a web browser window with a tab titled 'FindLocation'. The address bar is empty. Below the browser window is a 'Register Form' containing four input fields: 'Name:', 'Phone Number:', 'Carrier Company:', and 'Password:'. A 'Register' button is located at the bottom right of the form.

Figure 4. Register page design

Detailed description of communication between entities

Server will obtain the MCC and MNC from the input. It will then look into the **user database** for the most recently updated cell location of that corresponding phone number. The cell location (CID and LAC) is obtained from the Android application in the phone where the application will capture the CID and LAC of that phone number and send it to our **server**. **Server** will then make API calls to the **OpenCellID database** to extract the location of the phone number using MCC, MNC, CID and LAC as the **OpenCellID database** stores the longitude and latitude of corresponding MCC, MNC, CID, LAC. After the server gets the location of that phone number, it will then display it on the google map.

Human Interface Design

Overview of the User Interface

Our user interface consists of two separate parts. One is our web page and the other is our mobile application.

For web page, it has a button to locate the phone. When the user clicks on it, our web page will use our unique algorithm to locate the user's mobile phone information stored in the database. For each mobile phone stored on the database, we have a special number to indicate whose phone is this. After a quick calculation, Google Maps on the web will show the location of the phone as a pinned location. For each pin, when user moves their mice on that, it will display the special number I mentioned before.

For mobile application, its main function is to transfer data to our servers. Therefore its user interface is the information of the base station on the current mobile phone connection.

Detailed Design of the User Interface

Screen Images, Objects and Actions:

1) Web page

Screen Images: illustration, Figure 2

Screen Objects and Actions: For the web side, it consists of a navigation button and a Google map. The location button connects to our back-end database, above which is our core positioning algorithm based on the information stored on the database. Google Maps is used to show the location of the phone after positioning.

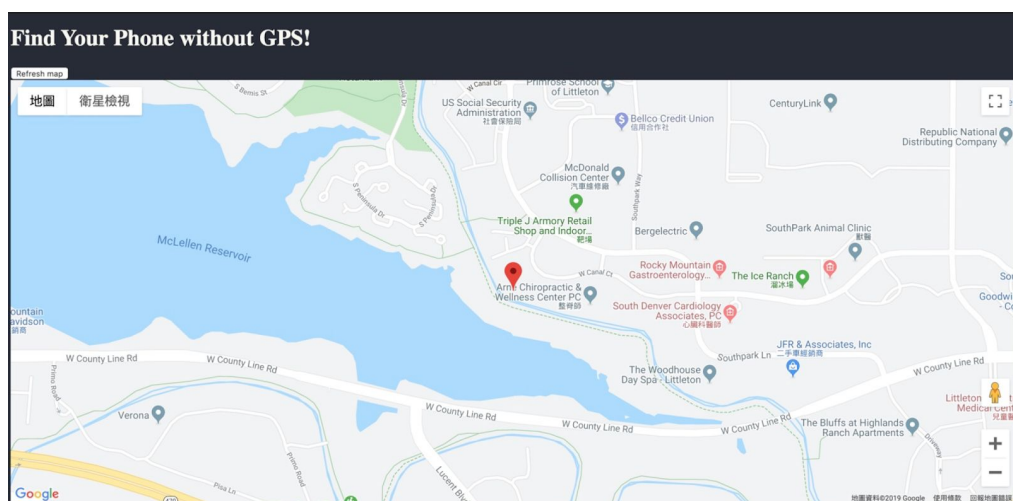


Figure 2. Web page

2) Android application page

Screen Images: illustration, Figure 3

Screen Objects and Actions: For mobile apps, its main function is to transfer data to our servers. So we didn't initially want to design a user interface for it, but then we decided to let the user see some information they should know. This is also a convenient way for us to test our features in development. The final result is very straightforward, and our program prints the information about the currently connected base station in the center of the phone screen.



Figure 3. Android Application UI

Report Forms Draft: Our system consists of these three pages: 1)Web page (Main page) 2) Android application page. Two different pages contain some major and help functionalities mentioned in our SRS draft, User Requirements and Use Cases part.