



RoomQuest Mobile Navigation App

Software Requirements Specification

Version 1
January 30, 2017

Prepared by the following Team:

Jarred Fletes

Software Engineer/ Project Manager

E-mail: jwfletes@gmail.com

Phone Number: (909)708-9184

Pilar Morales

Software Engineer/ Assistant Manager

E-mail: morales.pilar18@yahoo.com

Phone Number: (323)747-6868

Steven Tang

Software Engineer

E-mail: stevenchhaytang@gmail.com

Phone Number: (909) 684-6753

Eduardo Aguilera

Software Engineer

E-mail: eduardo94aguilera@gmail.com

Phone Number: (951)289-1563

Robert Estrella

Software Engineer

E-mail: rjestrella89@gmail.com

Phone Number: (909)560-6255

Jesse Oesterblad

Server Team

E-mail: jesse618@live.com

Phone Number: (909)725-2609

Table of Contents

1. Introduction

- 1.1 Purpose
- 1.2 Scope
- 1.3 Definitions, Acronyms, and Abbreviations
- 1.4 References
- 1.5 Overview

2. Overall Description

- 2.1 Product Perspectives
 - 2.1.1 System interfaces (deployment diagram)
 - 2.1.2 User interfaces
 - 2.1.3 Software interfaces
 - 2.1.4 Communication interfaces
 - 2.1.5 Memory
 - 2.1.6 Operation
 - 2.1.7 Site adaptation requirements
- 2.2 Product Functions (use case diagram)
- 2.3 User Characteristics
- 2.4 Constraints
- 2.5 Assumptions and Dependencies

3. Specific Requirements

- 3.1 External interface requirements
 - 3.1.1 User interfaces
 - 3.1.2 Hardware interfaces
 - 3.1.3 Software interfaces
 - 3.1.4 Communication interfaces
- 3.2 Functional requirements
 - 3.2.1 Mode 1
 - 3.2.1.1 Functional requirement 1.1
 - .
 - .
 - .
 - 3.2.1.n Functional requirement 1.n

3.2.2 Mode 2

.
. .
.

3.2.m Mode m

3.2.m.1 Functional requirement m.

.
. .
.

3.2.m.w Functional requirement m.w

3.3 Performance requirements

3.4 Design constraints

3.5 Software system attributes

3.6 Other requirements

1.1 Purpose

Every once in awhile, students of the California State University, San Bernardino Main and Palm Desert Campuses become lost and directionally challenged and can sometimes even spend endless minutes trying to find a destination while roaming the on-growing Campuses. Because of this, an idea arose that if implemented would give iOS users a way to navigate to a destination while at the California State University of San Bernardino and Palm Desert Campus.

To clarify, the idea that was thought about involved creating a mobile app for Apple devices that would serve as a map and location finder for students who are in need of direction while inside the buildings of the California State University of San Bernardino Main Campus.

After the idea was validated, it became a software project which was commenced in the winter of 2015 and continues to this very day. Dr. Gerard Au and Dr. Samuel Sudhakar requested the development of the software. Their ideas were the ones that were implemented in the the app during the first stages of development, and they continue to be the ideas that are being implemented into the app today, the development and progress of the application will be overseen by Dr. Concepcion, and will be done by CSE 575 intern students at the California State University of San Bernardino during the Spring of 2016. The following is a continuation of the project that adds the iOS version of the app, and will be carried out by CSE 455 students at the California State University of San Bernardino during the Winter 2017 quarter.

The application that will be developed will be information based, and it will use the geographic information system ArcGIS to display the floor maps of the buildings in both the Main and eventually the Palm Desert campus. In this version of the app, the app will include a navigation feature that will be created on top of the apps ArcGis maps.

This document gives an overview of the functionality, specifications, and requirements of the application being developed.

Features

In summary, the application will include an internal building map of the CSUSB Main campus and eventually the Palm Desert campus. It will have a search bar where a user can search or find a destination on the Main campus by typing either a room number or a faculty member's first or last name. This version of the app will be created by using the ArcMaps for desktop application which will create the maps for the app. The app will also include a navigation system that will locate users and route their destination.

The app will also use a geodatabase to hold the information of rooms and faculty.

1.2 Scope of the Project

The following documents the boundaries of the project and will serve as a summary of the functions the application is expected to perform according to the client and the project advisor, Dr. Concepcion.

The software that is to be developed will be an iOS application which will aid students, who are unfamiliar with the CSUSB Campuses locate their destination on campus.

Two prototypes will be delivered this quarter.

The following documents what will be delivered by the first prototype:

First, the app will be strictly developed for iOS. The app will contain a home screen of a map zoomed in on the CSUSB campus. The app will be modeled after the maps application that comes with the iPhone. The reason for this is to have a familiar user interface to the regular iPhone user. Located on the home page will be a button to take the user to their current location, and buttons to switch through the building's levels.

Also, the development team will map out ten buildings using the ArcGIS software.

The first prototype will be delivered the week of February 20, 2017.

The following chart shows the buildings we plan will be delivered by the first prototype:

| week1 | week1 | week2 | week3 | week4 | week4 |
|--------------------|-----------------|----------------------|---------------------|---------------|-------------------|
| 1 Floor | 2 Floors | 3 Floors | 4 Floors | 5 Floors | 6 Floors |
| Physical Education | Student Union | Health & PE | Physical Sciences | Univerty Hall | Social Behavioral |
| University Police | Commons | College of Education | Chemical Sciences | | Library |
| Health Center | Faculty Offices | Preforming Arts | Biological Sciences | | |
| | | Visual Arts | | | |

The following documents what will be delivered by the second prototype:

For the second prototype, the development team will map out a total of nineteen buildings using ArcGis software.

The app will have an user friendly layout. It will contain buttons to display specific locations on campus such as bike racks, emergency evacuation centers, and so forth. The app will access the

server to locate locations on campus with buttons. It will display the early stages of a search option, for future groups to work off of.

The Second prototype will be delivered by finals week in March, 2017.

The focus of this quarter's development will be creating maps of Cal State San Bernardino using ArcGis software.

In summary, the RoomQuest app will now be on iOS and contain a clean user interface with maps created using ArcGis software. All this will be delivered by the end of the Winter 2017 quarter for at least the majority of buildings on the Main Campus.

1.3 Definitions, Acronyms, and Abbreviations

ArcGIS

ArcGIS is a geographic information system used to develop maps; compiling geographic data; analyzing mapped information; sharing and discovering geographic information; using maps and geographic information in a range of applications; and managing geographic information in a database.

Arcmap

A map document that is a file containing one or more maps; one page layout; and the associated layers, tables, charts, and reports. These types of files have an .mxd extension.

Wi-Fi

is a technology that allows electronic devices to connect to a [wireless LAN](#) (WLAN) network, mainly using the 2.4 gigahertz (12 cm) [UHF](#) and 5 gigahertz (6 cm) [SHF](#) ISM radio bands.

Geodatabase

A **geodatabase** is an alternate way to store GIS information in one large file, which can contain multiple point, polygon, and/or polyline layers.

API (Application Programming Interface)

Refers to a set of routines, protocols, and tools that is used in the building of software applications.

CSV

Stands for 'Comma Separated Values.' Microsoft Excel can export files in this format. A CSV file contains a single spreadsheet, which can hold information like professor name and room number.

Disk space

A very common form of long-term data storage for computing devices. It is where saved files such as documents, movies, and music, as well as system files are stored.

GPS

Stands for 'Global Positioning System'. It is a navigation system that uses satellites to locate a device in geophysical space.

HTTPS

Stands for 'Hyper Text Transfer Protocol Secure'. It is an encrypted data transfer protocol for use in Internet communications that prevents eavesdropping.

IEEE

Stands for 'Institute of Electrical and Electronics Engineers.' It is an organization that is responsible for setting technology standards, among many other things.

iOS

An operating system that is used on many mobile devices such as phones and tablets that is used on Apple's mobile devices.

MB/MiB

The megabyte (MB) and mebibyte (MiB) are two measures of data storage space that are multiples of a byte (or 8 bits) of data. These two measures are frequently used interchangeably. A megabyte is calculated in base-10 (or decimal) and is 1,000,000 bytes and a mebibyte is calculated in base-2 (or binary) and is 1,048,576 bytes.

Pixel Density

A measure of the screen resolution of a device measured in pixels-per-inch (ppi).

RAM (Random Access Memory)

RAM is the solid-state memory in a device that it stores its current state in. It is very fast compared to physical disk storage.

Server

A computer that stores data and programs that other computers connected to it can download. It is usually located remotely from the computers accessing its stored data.

UI

Stands for User Interface. This includes all the buttons, combo-boxes, sliders, menus, and windows etc. that the user uses to interact with the program.

WiFi

A wireless data transfer protocol that allows varied devices such as laptops, desktops, phones, tablets, and routers to communicate with each-other over a local area network.

1.4 References

- Esri Developing Website: <https://developers.arcgis.com/>
- Esri Software Engineer: Erwin Soekianto, esoekianto@esri.com
- CSUSB Geography Department: Bo Xu, bxu@csusb.edu
- IEEE Std 830-1998 Software Requirements Specification
- Apple Developing Website: <https://developer.apple.com/swift/>
- CSUSB School Color Policies Document: <http://policies.csusb.edu/schoolcolors.htm>
- SRS RoomQuest Winter 2016 (Version 3.0) by Thomas Saldana, Christopher Koenig, Randy Luong, Jose Banuelos, Rogelio Giron, Gerardo Aguilera, Suner Mauerhan (not yet published)
- Main Campus Floor Plans:
<http://cpdc.csusb.edu/campushistoryinfo/requestPDCfloorplans.htm>

1.5 Overview

The remainder of this document is comprised of two sections. Section 2 presents an overview of the entire application. It describes the application's interface and functions. It also describes the application's constraints, and dependencies. Section 3 presents a detailed set of requirements that pertain to the implementation of the application. These include interface requirements as well as functional requirements that the application must meet.

2. Overall Description

2.1 Product Perspectives

The application will contain the following attributes:

- iOS phone/tablet compatibility.
- Access to building layouts with labeled room numbers and doors.
- Using a room number to locate a room within a Campus building.
- Using a faculty/staff member's name to locate his/her office.
- Navigation capabilities using WiFi triangulation
- User-Friendly Interface

2.1.1 System interfaces (deployment diagram)

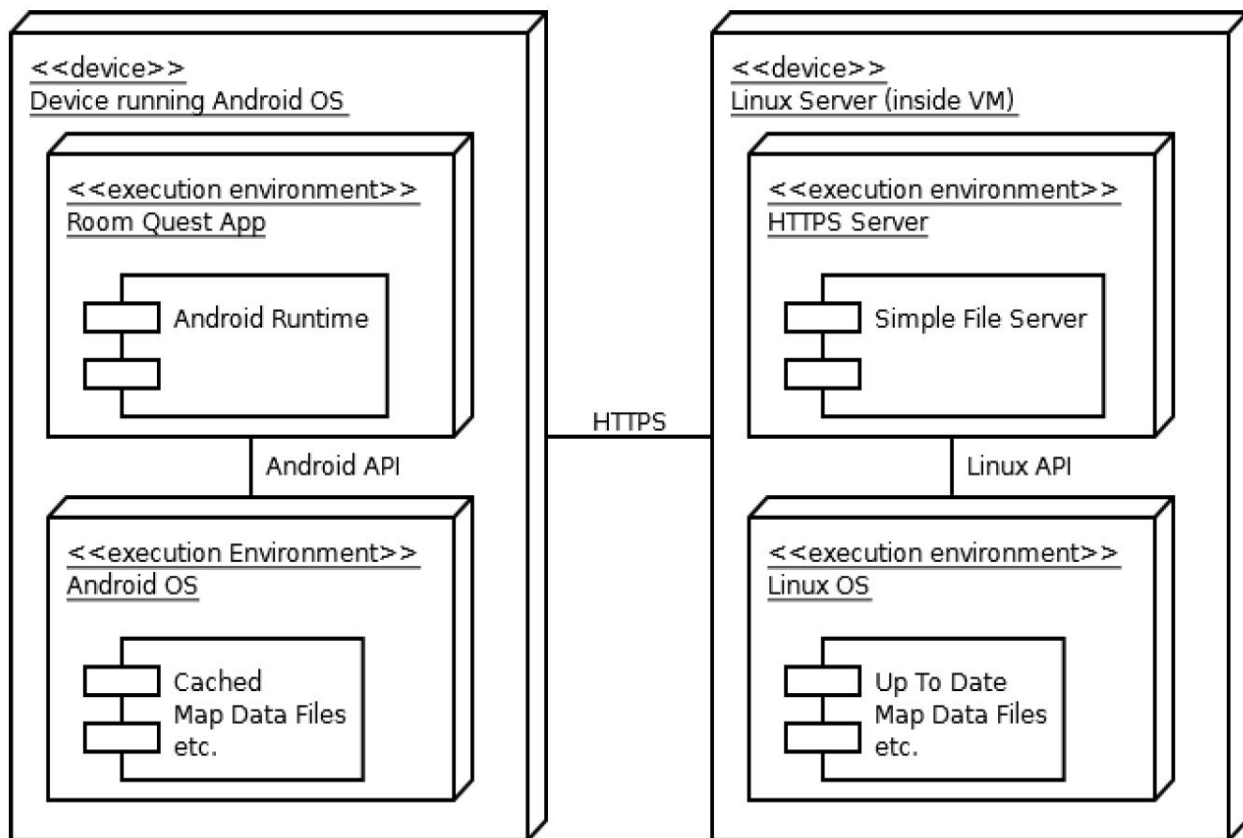


Figure 1: RoomQuest Deployment Diagram

This map shows how data will flow through the RoomQuest client-server system for an Android app. Data will flow in the same fashion for the iOS application to the RoomQuest client-server system. The data represented by this map will change quite frequently during the development phase of the application, but the overall bases is the same. This necessitates storing it on a server that all on the development team have access to.

2.1.2 User interfaces

The user interface will provide the user with a map of the building that they search or are looking for. It will also provide the user the ability to search and find the exact location of a room inside

a building. The app will not navigate the user to their destination for this prototype, but a navigation feature will be included in the app in further prototypes

The following are the screen pages that will be developed:

- Welcome Page with RoomQuest logo
- Display of a map zoomed in on the CSUSB campus with buttons and search bar.

The following summarizes how the user will interact with the app:

1. The user downloads the app from the Apple App store over ☐ WiFi or a cellular data connection.
2. The user opens the app.
3. The user inputs either a faculty/staff member's name or room ☐ number.
4. The user is shown their location with a red pin.
5. The location of the user's destination is presented to the user.
6. The user is navigated to his or her destination.
7. The user finds his or her destination.
8. The user closes the app.

2.1.3 Software interfaces

RoomQuest will be programed in the Swift 3 programming language and under the iOS operating system. The maps within the app will be created using ArcGis software. The server side will be programed in a programming language that is preferred by the server-service provider, which in this case will be Esri. The navigation feature will be provided by Esri technologies.

2.1.4 Communication interfaces

The application will download Arcmaps from Esri servers or ArcGis online on request. The information regarding rooms and faculty will be stored in an Esri geodatabase. As a result, the apps information will be updated/modified as needed. If time permits and approval is given, the RoomQuest app will be modified to retrieve faculty room data from the CSUSB Directory database.

2.1.5 Memory

The amount of RAM the application uses will vary based on factors such as iOS version and pixel density. Devices with high pixel density screens usually use more RAM at any given time. This is because there are simply more pixels to represent in memory for any given screen dimensions. However, they are usually designed with more RAM to accommodate the extra usage. Bearing this and the graphics-intensive nature of the application in mind, the RAM usage should not exceed 100MiB. Furthermore, the application should never be allowed to exceed 20MiB of disk space when all of the maps are downloaded.

2.1.6 Operation

The application is expected to be used all year round by students. However because the information, regarding faculty and buildings, is always changing, quarterly maintenance will be required. Quarterly maintenance of the app's content will ensure that the app's information stays up-to-date without errors. If approval is given to RoomQuest's use of the CSUSB Directory these quarterly updates will not need to be performed.

The information contained in the app will be held in an Esri geodatabase. This will allow maintenance personnel to quickly update the apps information without having to revise the app in the google play store.

2.1.7 Site adaptation requirements

- No site adaptation required

2.2 Product Functions (use case diagram)

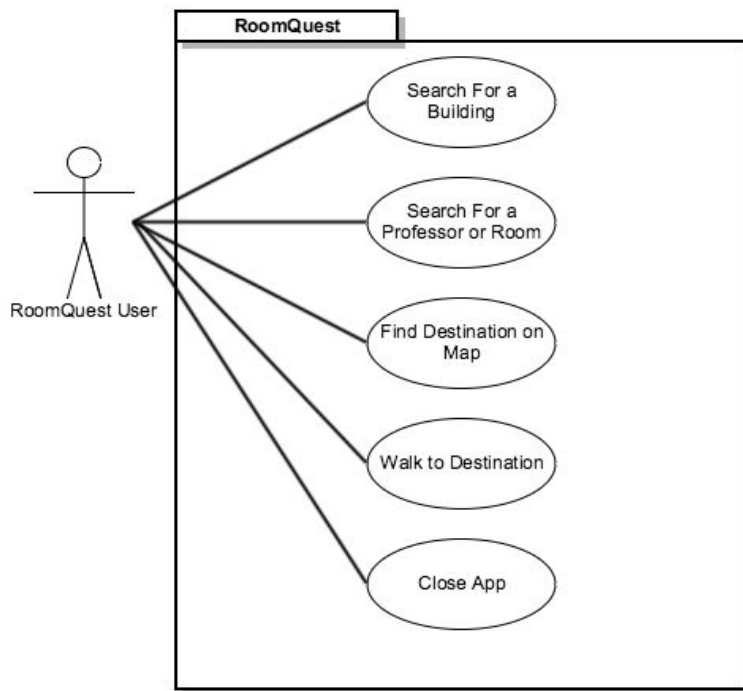


Figure 2: RoomQuest Use Case Diagram

2.3 User Characteristics

The intended user base of the application consists of CSUSB faculty, students, and visitors of both the San Bernardino Campus, and eventually Palm Desert Campus. Any user of the application should be able to access the same information for the location of any room in any building. Currently the application is being developed for the iOS operating system. As such, it will be released on the Apple App Store.

2.4 Constraints

Software Constraints

The RoomQuest app has a lot of potential for growth. It has the ability to provide a number of useful services to the students of the California State University. This includes but is not limited to displaying bike racks, emergency-exit routes, parking ticket-vending machines, dorm buildings, study areas, campus club meeting locations, department offices, colleges that reside within given buildings, history of buildings, facilities and programs offered by CSUSB (e.g. the Veterans Center, Women's resource center, etc). It also has the potential of navigating users to their destination using 3D Esri technologies. All this could be accomplished. However, the allotted time, which is roughly 7 weeks, is not enough to include all of these services. The

application's software allows the development team to implement these services, but there are not enough man-hours to implement them.

In the future, upon the completion of this app, this app will be integrated with an app that will include all of Cal State San Bernardino's apps.

Some general software constraints include the following:

- Files of buildings should be stored independently of each other.
- App should display red dot on floor maps to indicate to the user where he or she is at
- Additional floor maps of buildings added to the RoomQuest app should match in design with the floor maps that are already in the app.
- App files should be backed up.
- Every building should have its files grouped in the server.
- Experts and previous developers of the RoomQuest app should be consulted in the case that the software needs to be modified.
- Software should be secured by the server team.
- RoomQuest will run on devices with iOS 10 or greater and will be limited to these devices.
- Accessing a new map may require an Internet connection.

2.5 Assumptions and Dependencies

The technology currently used in this app will change. The app will include ArcGIS technology to improve the quality of the app and the user experience with it. The app will also include a building positioning system to locate users while they use the app.

The following improvements will also be include: high-quality image, inclusion, and general graphical changes to make the app more appealing and user friendly.

3.1.1 User Interfaces

All Icons and the overall theme will adhere to CSUSB policies regarding school colors. The policies can be found here: [The general theme will be blue, white, black, and grey. Main shades of blue and grey will be Pantone® 300 and 60% Grey.](#)



Figure 3: Color Theme

The following graphics demonstrates some of the older visuals of the user interface:



Fig 1.



Fig. 2

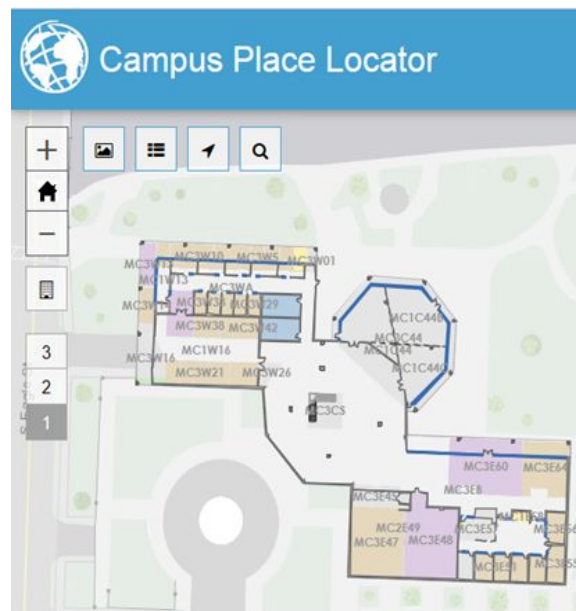


Fig. 3

Figure 2: Concept graphic using Esri's software

Figure 3: Concept graphic using Esri's software created floor map

The following are screenshots of the Android user interface we are basing our iOS app off of

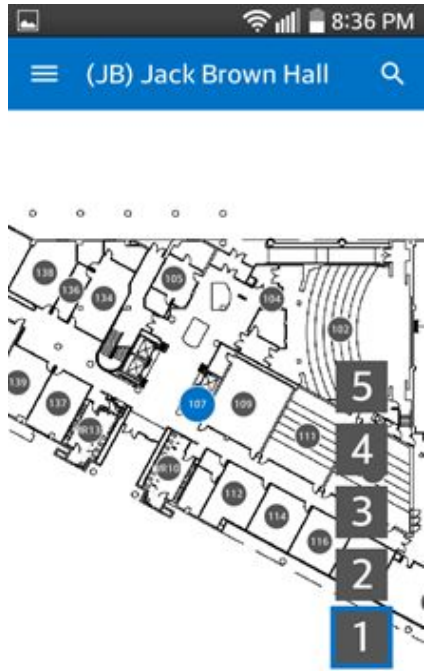


Fig 4: Image of a map with a selected floor



Fig 5: Current app homescreen

The following images are screenshots of a conceptual app with navigation implementation.

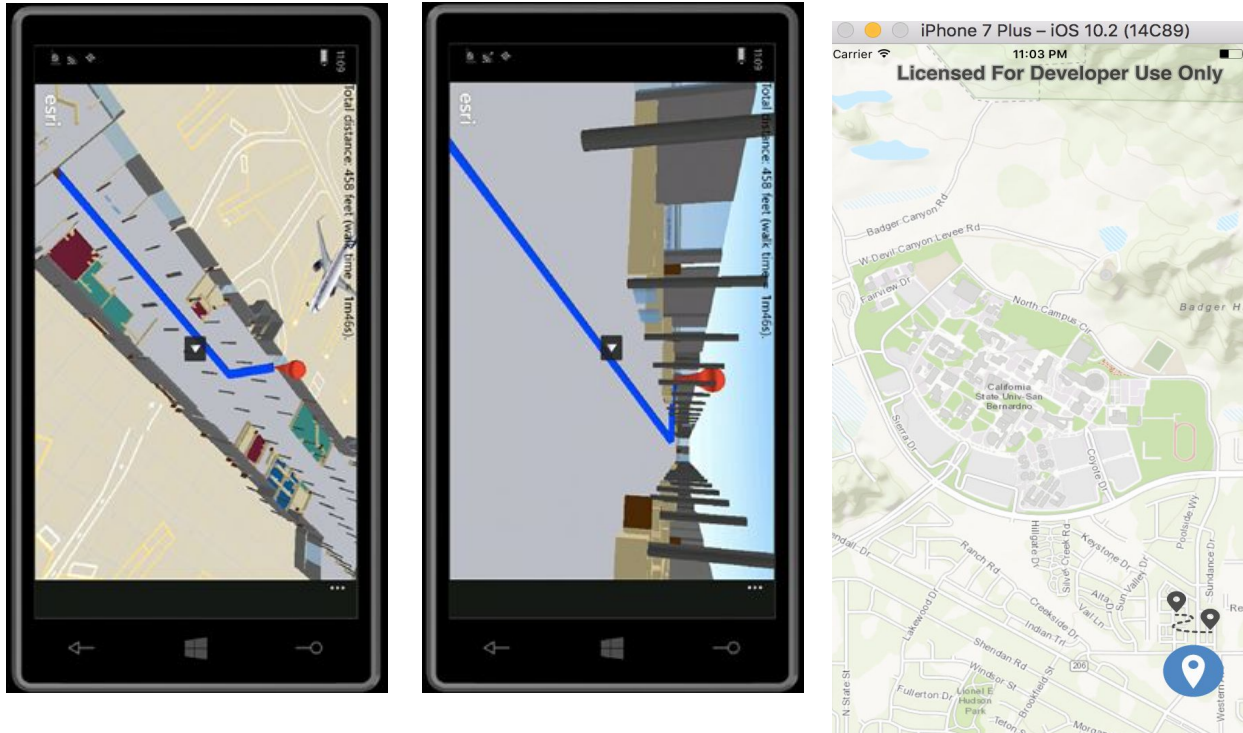


Fig. 6 and Fig.7 are conceptual graphics of the app with navigation
 Fig. 8 is an early graphic of the app over the Main Campus

When opening the app, the user will see the home screen of the app, which will contain an image of the CSUSB campus. Once opened, the user will see the campus map of the school, with a menu containing the building names. By selecting a building, the user will see a floor plan of a floor with labeled room numbers. The user will be able to toggle through floors with the floor buttons, and the user can also search for a room by clicking on the search icon on the top right of the app, and typing their preferred room or professor name.

There is also a menu for student services and deans' services in the home screen. Selecting the deans' services will allow the user to find the offices of the school's deans. Selecting the student services allows the user to find important services offered to the students like the Pride Center, and other services.

3.1.2 Hardware Interfaces

The application will use WiFi to provide the user with maps and locations of rooms and buildings. Wifi will also be used for the navigation in the app.

3.1.3 Software Interfaces

The software interface will be created using a database containing all floor plans and details pertaining to what the room is used for. It will display the necessary data pertaining to the room.

3.14 Communication Interfaces

The RoomQuest app will communicate with its server in a non-real-time mode. If successful, the WiFi and GPS function will be implemented into the application

3.2.1 Searching

- User can search for a professor and be provided with the location of his or her office.
- User can search for a building and have it displayed.
- User can search for major offices including offices of all deans and student services.
- User can choose which campus they would like to search for a building in.

3.2.2 Display Map

- The floor plan image will include the room locations to demonstrate each building's room location.
- The user will be able to see their location on the map.
- The user will be able to view the floor plan for buildings in the CSUSB Campus.
- The location of restrooms will also be available on the image.

3.3 Performance Requirements

The user interface should appeal to the user and should give the user the ability to interact with the app in a feasible manner. The user should never have troubles finding the apps services. The user should be able to navigate through the app with ease. Moreover, the app must respond reasonably quickly to user input. That is, the app must not take longer than 2 seconds to download immediately relevant data from the server.

Further, the app should always contain up-to-date information. In other words, the users of the app should have the best experience possible interacting with the user interface and the contents of the app.

Even more, the app should always navigate user accurately to their destinations.

3.4 Design Constraints

- The user will need to be connected to wifi in order to view the maps included in the app.
- A constant wifi connection is also needed for the navigation in the app.

3.5 Software System Attributes

The application will run on iOS 10 and newer. The system must also have WiFi access.

3.6 Security Requirements

The app is intended to be information based. The information in the app is general information available to the public by more than one means which means that it does not need a strong secure system. However, the app will have security features. These secure features will be decided upon the completion of the app.

All information from the application will be delivered over HTTPS due to the knowledge of the user's personal location. This will be done in effort to ensure the user's trust in using the app without potentially being exposed to personal information violations.

3.7 Document Approval

This document must be approved by the clients, Jose Banuelos, Christopher Koenig, Thomas Saldana , and the project advisor, Dr Concepcion.