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

SYSTEM REQUIREMENTS SPECIFICATION
CSE 4317: SENIOR DESIGN II
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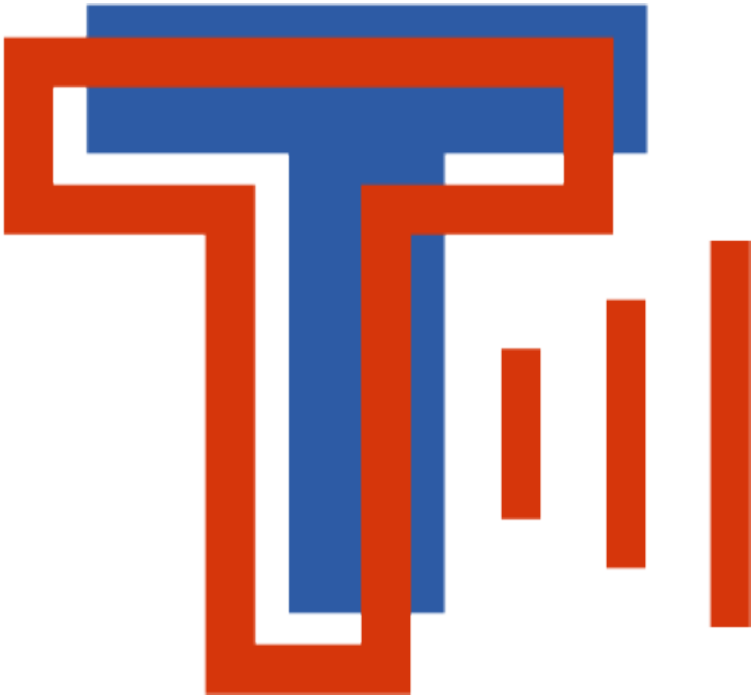

TEAM NAME: TRANSACT
PRODUCT NAME: TRANSLOCATE

NOLAN BOWDEN

Pranav Bhandari
Jian Ma
An Nguyen
Kopawid Sarawichitr

Revision History

Revision	Date	Author(s)	Description
0.1	10.04.2019	NB	document creation
0.2	10.21.2019	KS, NB, AN, PB, JM	complete draft
1.0	05.15.2020	KS, NB, AN, PB, JM	official release

CONTENTS

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1 Product Concept

This section describes the purpose, use and intended user audience for the location based messaging engine product. The location based messaging engine is a system that performs location detection of a user both indoors and outdoor and then provides that information to subscribers so that they may send messages to that user. Users of the location based messaging engine will be able to gain knowledge about particular events, deals, etc. at various businesses and institutions.

1.1 Purpose and Use

The Location Based Messaging Engine that we will develop shall determine the users location within a particular hotzone using various location detection technologies, and then send the users identity information along with their location to a cloud infrastructure where subscribers will be able to see and then subsequently notify the user with information regarding that location.

1.2 Intended Audience

We are designing this product with the idea that its intended use will be by a general population. General users can use our engine to gain information about the places they are visiting, and advertisers. educational facilities, etc. can use this product to get information about user activity that will assist them in their daily activities.

2 Product Description

This section provides the reader with an overview of the location based messaging engine. The primary operational aspects of the product, from the perspective of end users, maintainers and administrators, are defined here. The key features and functions found in the product, as well as critical user interactions and user interfaces are described in detail.

2.1 Features & Functions

The product is a back-end cloud infrastructure that uses a publisher/subscriber pattern to handle user identity information as well as their location data, and gives that information to subscribers where they can then send messages using SMS to the user giving them information related to that location. There will be multiple components to this product, a cloud infrastructure, BLE beacons to determine location, a mobile app to display proof that the cloud functions properly, and a web page that will be used by administrators to manage the many locations the product will monitor.

2.2 External Inputs & Outputs

There are three critical flows of data that will be used in this product. First, there will be flow of user location data from the BLE beacons and GPS signal to the cloud. This information will be used to publish the user identity to a queue to be consumed by subscribers. Secondly, there will be an output of user information from the cloud to specific subscribers where they can then use that information to send a message to the user. Finally, the subscriber will then send a specific message to the publisher via text message.

3 Customer Requirements

This section contains customer requirements for specific features and functions of the location base messaging application. This is specified for and by the intended audience for this product. All requirement listed in this section have been discussed and consented between customer and the development team. These requirement must not be changed without specific agreement of the customer.

3.1 Identify and Upload Information of Users

3.1.1 Description

The location-based messaging engine will identify an individual when one entered a designated location (hot zone). A message including that individual identity, location and other relevant information shall be push into a consumable queue.

3.1.2 Source

This requirement was specified by the customer.

3.1.3 Constraints

Keeping users identity and information private and secure. Tracking accuracy locations.

3.1.4 Standards

The location-based messaging app must able to identity the individual within a short amount of time after that person entered the hot zone. The location must be accurate on the scale of specific rooms, areas.

3.1.5 Priority

The priority of this requirement is moderate

3.2 Personalize and Distribute Related Messages

3.2.1 Description

The application will store messages and distribute the messages to the intended users who signed up for the specific location when they entered the zone.

3.2.2 Source

This requirement was specified by the customer.

3.2.3 Constraints

Queuing algorithm to distribute the correct messages to the intended users.

3.2.4 Standards

The application must be able to save all messages that are published to the server and keep them organized/categorized. All the messages must be delivered only to intended users.

3.2.5 Priority

This requirement is critical.

3.3 Administrative Requirements

3.3.1 Description

The administrative application will include configuration for priorities of app messages as well as the max number of messages that can be sent for a location for a time period

3.3.2 Source

This requirement was specified by the customer.

3.3.3 Constraints

Queuing algorithm to distribute the correct messages to the intended users must be efficient.

3.3.4 Standards

3.3.5 Priority

This requirement is moderate.

3.4 Supporting both Indoor and Outdoor

3.4.1 Description

The system shall detect the userâs location both indoors and outdoors. The system shall switch to the appropriate technology to detect the userâs location out of the combination of technologies used.

3.4.2 Source

This requirement was specified by the customer.

3.4.3 Constraints

The application should not require any additional information from users.

3.4.4 Standards

3.4.5 Priority

This requirement priority is high.

3.5 Accuracy

3.5.1 Description

The system shall calculate the accuracy of the detected location.

3.5.2 Source

This requirement was specified by the customer.

3.5.3 Constraints

Users location should be detected within a specific rooms.

3.5.4 Standards

3.5.5 Priority

This requirement priority is high.

3.6 Receiving messages

3.6.1 Description

The system shall send messages to the userâs device via text messages.

3.6.2 Source

This requirement was specified by the team.

3.6.3 Constraints

User should not be charged a fee when receiving messages.

3.6.4 Standards

The messages sending out should meet the standard of all carriers

3.6.5 Priority

This requirement priority is moderate.

3.7 Cloud Storage

3.7.1 Description

The location detecting technology should connect to the cloud directly. The cloud shall compute the location of the user based on the data received from the location detecting technology.

3.7.2 Source

This requirement was specified by the team.

3.7.3 Priority

This requirement priority is high.

3.8 Event-based messaging

3.8.1 Description

The system shall use event-based messaging

3.8.2 Source

This requirement was specified by the team.

3.8.3 Priority

This requirement priority is moderate.

4 Packaging Requirements

This section describes the packaging requirements that identify how the delivered product will be packaged for delivery to the end-user. Since the project is software so the team will create simple application to demonstrate the project. The end user will need to download our application to be able check and test the project. Team also will provide a back-end website, so the end user only need to login to see the back-end part.

4.1 Sample Application

4.1.1 Description

A Proof Of Concept sample application will also be created to demonstrate consuming messages and taking action

4.1.2 Source

Sponsor

4.1.3 Constraints

Time is tense for group to develop application

4.1.4 Standards

The application must able to all the function correctly.

4.1.5 Priority

This requirement priority is low

4.2 Administrative Application – User Interface

4.2.1 Description

The administrative application will have a web browser user interface and be natively deployed as a cloud application

4.2.2 Source

Sponsor (Kent Pawlak)

4.2.3 Constraints

Team may not be able to finished all design for the web browser

4.2.4 Standards

The purpose of the website is try to show and managed the back-end of the project

4.2.5 Priority

This requirement priority is high

4.3 Administrative Application – Location Information

4.3.1 Description

An administrative application will be created to configure location information -where it is, type of location, name, description, etc.

4.3.2 Source

Sponsor (Kent Pawlak)

4.3.3 Constraints

Location detection tool may not set up correctly

4.3.4 Standards

This application shall be able to show the back-end information for administrator

4.3.5 Priority

This requirement priority is high

4.4 Hardware Requirement

4.4.1 Description

The hardware required to detect location should be installed in the designated hot zone.

4.4.2 Source

Team Members

4.4.3 Constraints

The hardware may not set up correctly

4.4.4 Standards

The hardware will collect all user location information and require to be set up hot zone

4.4.5 Priority

This requirement priority is critical

4.5 Cloud Infrastructure

4.5.1 Description

The cloud infrastructure will be developed to handle the Location data

4.5.2 Source

Nolan Bowden

4.5.3 Constraints

The team may not connection to the cloud infrastructure correctly

4.5.4 Standards

The cloud will collect and store all location data

4.5.5 Priority

This requirement priority is critical

5 Performance Requirements

When the BLE device connects the user's phone to the system, it should take no more than a second or two. Once connected, it should take the system no more then 5 second to response to the user. The massage should not stay longer then 24 hours in the queue. The battery must last at least one year after installation. When installing the location-based device, it should not take longer then a three hours.

5.1 Subscriber Limit

5.1.1 Description

The BLE shall have a limit to the number of subscribers it have at a location.

5.1.2 Source

Team members

5.1.3 Constraints

BLE device constraints

5.1.4 Priority

Moderate

5.2 Queue

5.2.1 Description

The message shall remain in the queue for a limited time.

5.2.2 Source

Team members

5.2.3 Priority

High

5.3 User Connection

5.3.1 Description

The BLE beacons shall be able to connect to at least 20 users simultaneously.

5.3.2 Source

Kopawid Sarawichitr, Nolan Bowden

5.3.3 Constraints

BLE device constraint

5.3.4 Standards

BLE device Standards

5.3.5 Priority

High

5.4 Small Packets

5.4.1 Description

The BLE shall only handle small packets of data.

5.4.2 Source

Kopawid Sarawichitr

5.4.3 Constraints

BLE device constraint

5.4.4 Standards

BLE device Standards

5.4.5 Priority

Moderate

5.5 System Dependability

5.5.1 Description

System dependability - if the user is disconnected from the system, the user shall be notified.

5.5.2 Source

An Nguyen

5.5.3 Priority

Moderate

5.6 Response Time

5.6.1 Description

The system shall not take more than five seconds to respond to a user after their device is detected.

5.6.2 Source

Team members

5.6.3 Priority

High

5.7 Location Switching

5.7.1 Description

The system shall be capable to switch between location-based technology efficiently and automatically.

5.7.2 Source

Team members

5.7.3 Constraints

BLE/GPS device constraints

5.7.4 Standards

BLE/GPS device Standards

5.7.5 Priority

High

6 Safety Requirements

The safety requirements of the location based messaging engine, with exception to a few physical safety concerns are centered around the users safety with regards to their security and anonymity. We hope to create and maintain a standard in our product that ensures that security of a users sensitive data.

6.1 Laboratory equipment lockout/tagout (LOTO) procedures

6.1.1 Description

Any fabrication equipment provided used in the development of the project shall be used in accordance with OSHA standard LOTO procedures. Locks and tags are installed on all equipment items that present use hazards, and ONLY the course instructor or designated teaching assistants may remove a lock. All locks will be immediately replaced once the equipment is no longer in use.

6.1.2 Source

CSE Senior Design laboratory policy

6.1.3 Constraints

Equipment usage, due to lock removal policies, will be limited to availability of the course instructor and designed teaching assistants.

6.1.4 Standards

Occupational Safety and Health Standards 1910.147 - The control of hazardous energy (lockout/tagout).

6.1.5 Priority

Critical

6.2 Proper Packaging for Electric Shock Safety

6.2.1 Description

Any physical hardware needed for location detection shall be packaged in a manner as well as grounded such that there is no risk when electric shock.

6.2.2 Source

Team Members

6.2.3 Priority

High

6.3 Location Data Confidentiality

6.3.1 Description

The location data of all users shall be handled with care and will be confidential at all times.

6.3.2 Source

Kopawid Sarawichitr

6.3.3 Priority

High

6.4 Encryption of User Information

6.4.1 Description

All user information and location data shall be encrypted at all times.

6.4.2 Source

Jian Ma

6.4.3 Priority

High

6.5 User Privacy

6.5.1 Description

No location data shall be gathered unless the users has explicitly enabled the technology to do so.

6.5.2 Source

Pranav Bhandari

6.5.3 Priority

Critical

6.6 Subscriber Authentication

6.6.1 Description

Any users wishing to subscribe toa particular location shall have to prove their identity.

6.6.2 Source

Nolan Bowden

6.6.3 Priority

Moderate

6.7 User Privacy from Administrators

6.7.1 Description

The administrators of the application shall not be able to determine the identity of users within a location.

6.7.2 Source

Nolan Bowden, Jian Ma, Pranav Bhandari

6.7.3 Priority

High

7 Maintenance & Support Requirements

Once, the BLE device is set up, A support manual will be given to the individual who is in charge of the tech in that building/ businesses. The manual shall includes how to maintain the product to correct errors, hardware failures, required support/troubleshooting manuals/guides, availability/documentation of source code, related technical documentation that must be available for maintainers, specific/unique tools required for maintenance, specific software/environment required for maintenance; etc. Anyone with a computer science degree shall be able to understand and maintain the code. For maintaining and installing the BLE device, the individual should have a degree/experience in the related field.

7.1 Battery Replacement

7.1.1 Description

The beacons battery shall be replaces regularly.

7.1.2 Source

Team members

7.1.3 Constraints

The rate of battery replacement shall be based on the lifetime of the battery that is being use.

7.1.4 Priority

Future

7.2 Changed in hot-zone

7.2.1 Description

The hot zone can change it's current area of coverage or it can expand it's area. The back-send system shall adapt to the changes being made to the hot zone.

7.2.2 Source

Team members

7.2.3 Constraints

The physical change of the hot zone area will be manage by the development team. Similarly, back-end will also be manage by a developer.

7.2.4 Priority

Future

7.3 Troubleshooting

7.3.1 Description

User manual and technical documentation will be provided for troubleshooting.

7.3.2 Source

An Nguyen

7.3.3 Standards

ICS 01.110

7.3.4 Priority

High

7.4 Feedback

7.4.1 Description

A Feedback Forum will be created for users to share their feedback

7.4.2 Source

Pranav Bhandari

7.4.3 Priority

Future

7.5 BLE Testing

7.5.1 Description

Each additional BLE beacon unit will be tested before deploying.

7.5.2 Source

Pranav Bhandari

7.5.3 Priority

Critical

7.6 Defect Testing

7.6.1 Description

Beacons will be tested on a regular basis to detect defects.

7.6.2 Source

Nolan Bowden

7.6.3 Priority

Future

7.7 Updates

7.7.1 Description

The system shall be regularly updated to be compatible with new versions of IOS.

7.7.2 Source

Team members

7.7.3 Standards

IOS Standards

7.7.4 Priority

Future

8 Future Items

In this last section, you will reiterate all requirements that are listed as priority 5. This is repetitive, but necessary as a concise statement of features/functions that were considered/discussed and documented herein, but will NOT be addressed in the prototype version of the product due to constraints of budget, time, skills, technology, feasibility analysis, etc. Use the following format for this section.

8.1 Server Scalability

8.1.1 Description

The capability of the server to handle requests shall be increased

8.1.2 Source

Team

8.1.3 Priority

This requirement will not be addressed in the prototype version.

8.2 Improve Location Accuracy

8.2.1 Description

The accuracy of the location detected by the system shall be increased.

8.2.2 Source

Team

8.2.3 Priority

This requirement will not be addressed in the prototype version.

8.3 Detect more users

8.3.1 Description

The system shall detect more users in one particular area.

8.3.2 Source

Team

8.3.3 Priority

This requirement will not be addressed in the prototype version.

8.4 Improve Privacy

8.4.1 Description

The security of the system shall be improved to improve the privacy of the users

8.4.2 Source

An Nyugen

8.4.3 Priority

This requirement will not be addressed in the prototype version.

8.5 Block Subscribers

8.5.1 Description

The system shall allow users to block particular subscribers.

8.5.2 Source

Team

8.5.3 Priority

This requirement will not be addressed in the prototype version.

8.6 Indoor Directions

8.6.1 Description

The system shall provide directions from the user's location to their desired location indoors.

8.6.2 Source

Jian Ma

8.6.3 Priority

This requirement will not be addressed in the prototype version.

8.7 Calculate Distance Travelled by the user

8.7.1 Description

The system shall calculate the distance travelled by the user.

8.7.2 Source

An Nguyen

8.7.3 Priority

This requirement will not be addressed in the prototype version.

8.8 Advertisements

8.8.1 Description

The system shall show the user advertisements depending on their location and their preferences.

8.8.2 Source

Kopawid Sarawichitr

8.8.3 Priority

This requirement will not be addressed in the prototype version.

8.9 Parking Location

8.9.1 Description

The system shall remember the parking location of the user.

8.9.2 Source

Jian Ma

8.9.3 Priority

This requirement will not be addressed in the prototype version.

8.10 Population Density

8.10.1 Description

The system shall show the population density in certain buildings to all users.

8.10.2 Source

Nolan Bowden

8.10.3 Priority

This requirement will not be addressed in the prototype version.

8.11 Location based Chatting System

8.11.1 Description

The system shall allow the users to chat with other users nearby.

8.11.2 Source

Pranav Bhandari

8.11.3 Priority

This requirement will not be addressed in the prototype version.

REFERENCES