SCS3016 - Third Year Group Project
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The Locator

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DECLARATION

We do hereby declare that the work reported in this report was exclusively carried out by us under the supervision of Professor N.D. Kodikara. It does not contain any material previously published or written by another person or ourselves and only it describes the results of our own independent work except where due reference has been made in the text.

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Supervisor,

Professor N.D. Kodikara.
Abstract

The aim of this project, the locator was to create an android application and a dedicated web portal to use in three different occasions.

(1) An emergency situation
Whenever a person is in an emergency situation he or she can send their location to their closest using this application. The important thing is just clicking a button on the application it can be done. Location will be sent as a text message. For that we have to prespecify mobile numbers of our closets in the provided space in the application (During the installation of the app. /Later we can edit it, if we want) Application is running as a service application to facilitate this. To get the location GPS can be used, if it is enabled in a given moment. If it is not, cell tower option will be used to approximate the location. Reciver can view the location through google map.

(2) To find a lost phone.
When someone has lost his phone, he can send his password which he uses for this app to the lost phone as a simple text message. Then the location of the phone will be received as a text message. We can view it from google map. For that lost phone’s sim should not be removed and it should have a coverage.

The location of the phone also can be viewed using the web portal. For that the user name and the password should be entered. But in this situation the phone should be connected to the internet. (Data is ON).

(3) To share the locations between friends.
This will be useful in unfamiliar places. One can maintain a friend list in this application. Friend requests can be sent and either can be accepted or rejected through this application. Location of the place can be send as either a text message or through the application. Latter one requires the users to become friends before sending the location as well as the internet connection.

This application will run on android versions 2.3 or higher. Phone battery is discharged quicker than the normal, because the application runs as a service. But more than 68% people give the priority to the importance of the application than the power saving (Online survey handled with 526 subjects through the web portal).
Acknowledgements

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Group 30.

The Locator Developers.
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1. Introduction

1.1 Introduction

Today we find number of instances where we need to find the location of someone or something, and among them some are easily achievable. But there are some instances where it is difficult to know the place exactly. With the development of modern technology we find many applications which support in finding locations. It is true that most of them are applicable to a fixed place. This is the main concept that we try to address through our project and we try to develop it from several aspects. This project is mainly based on Location Based Service (LBS) which is known as a service which can be accessed through a mobile device with a connection of network and information service. This project “The Locator” helps us to find the location of a phone. In simple we try to locate something or someone using an android mobile application. Here we give a major focus on secret communication about the location in an emergency (ex: sexual harassment, child abuse etc.), through a messaging system and the web portal “The Locator” will be helpful here.

1.2 Goals and Objectives

The main goal we tried to achieve through this project is identifying the location of another person or object using an android mobile applications. Here we have three problems that have been addressed.

(1) Share the location secretly in an emergency case.
(2) Find a lost phone.
(3) Two friends to share their locations.

When we were achieving these goals we had to consider below objectives. A clear idea can be taken after going through the user manual.

- Here to recognize the people properly as well as for the security reasons each user should be registered first to use this application. Then they have their own user name and password.
- When taking a location it can be taken using either GPS(when GPS is on) or cell tower(when GPS is off)
- To get the feedback from the users, to handle a survey, to give some popularity to the product as well as to download the application, a dedicated web portal was created. www.zkysoft.com/locator
- To maintain the user-friendliness users are able to change their details at any time.
- Sending messages in an emergency case can be done by just touching a button.
- Passwords are hashed to maintain the security.
- Location of a lost phone can be viewed through the web portal.
1.3 Scope of the project.

Using the application we can do mainly the following three things.

(1) Share the location secretly in an emergency case.
(2) Find a lost phone.
(3) Two friends to share their locations.

The application is free to download on our web portal “The Locator/www.zkysoft.com/locator” We are currently focusing to add this in to the google app store. When installing the app for the first time users will be asked to predefine five numbers that can be used to send the location link as messages in an emergency case. At the same time they will create an account which separates their own details on the web portals database. An administrator also uses the web-portal in order to administer the system and keep the information accurate. The administrator can, for instance, verify user information. Furthermore, the software needs Internet when installing first to configure the user account at the same time when any case that app needs internet. GPS connection is needed to find the place accurately, but in any case where GPS is off we can use tower signal for that which is less accurate. System information is maintained in a database which includes users information, his/her location history etc. which is located on a web-server. The overall summery is the finding the location of the phone more accurately.

If the Internet connection is not available for our lost phone, we cannot view the location of the phone using web portal. As well as if the phone sim has been changed by someone, we cannot find the locations of the phone sending our password to the phone as a text message.

1.4 Chapter summery

In this chapter we did introduce the project. First of all the basic idea behind the project was discussed. Then how the problems have been addressed was specified. Some introduction to the product functionalities as well as some introduction to the web portal was also given. What are the areas that were not covered was discussed under the scope.
2 Similar Systems

2.1 Introduction

Similar systems means systems that address the same problem. Most of the times scope is almost similar. When we are developing a software product it is very important to consider similar systems that address the same problem. It will be helpful in several ways. One of them is avoiding classical mistakes. Similar systems may have been built using weak strategies and because of those things it may be suffering. So those mistakes should be avoided. Studying similar systems will be helpful for that. Another most important usage of studying similar systems is eliminating building an existing solution. Get a competitive advantage, ability to maintain a diversity and understanding the problems easily are other advantages of studying similar systems.

2.2 Similar systems

2.2.1 Mobile Number and Phone Location

- Mobile number and phone Location enables you to know location of incoming calls or callers, mobile contacts and phone numbers.
- Support for multiple themes.
- Block calls and SMS from unwanted mobile phone numbers and callers.

2.2.2 Geoloqi

- Geoloqi allows to create triggers on addresses and find cites where apps are used.
- Send messages to prospective home buyers when their search criteria matches a home nearby.
- Notify citizens about events such as road closures or civic emergencies based on past locations.
- Uses minimal battery drain.
- Currently it supports Android phones and iPhones.
- It supports programming languages like Ruby, PHP, Python, JavaScript.

2.2.3 Navizon

- Navizon app is designed to provide accurate positioning for smart phones anywhere in the world.
- Users can navigate indoors, shopping malls, convention centers and airports.
- Navizon supports every major smart phones, including iPhone, Android, BlackBerry, Windows Mobile and Symbian.
2.3 **How ‘The Locator’ differ?**

- Most of the existing applications help finding locations of fixed places, but ‘The Locator’ helps you to detect the location wherever the person is.
- Most of the applications doesn’t concern of security aspects where in this application user is secured especially by giving chance to accept the connection between two phones, maintain separate user accounts, user names etc.
- In this application the special direction we have considered about finding location in an emergency is important. And also the messaging system that is being connected with this is a rare feature.
- And here the speed of the person also can be detected.

2.4 **Market for the product**

According to the studies done by TNS, location based mobile application users are increasingly using services to enrich their social lives. As to the statistics

- Navigation – 46%
- Finding friends nearby – 22%
- Finding restaurants – 26%
- Checking public transport – 19%
- For a deal or especial offer – 13%

2.5 **Chapter summary**

We have few similar systems to “The Locator”. But unlike “The Locator” they address only a special problem. “The Locator” addresses mainly three problems at once.

So we can clearly see that the location based services products have a good opportunities in the market. Besides that the feature of finding location of any movable object anytime which the application we have developed ‘The Locator’ has, will make it much popular. And also considering about the especial security aspects this has will make it very popular. And also for Asian countries like Sri Lanka where they highly consider about getting rid of emergency situations like sexual harassment, detecting location through the emergency messaging process will surely make it popular.

So by considering the above statistics as well as the special features we can predict that the project ‘The Locator’ will achieve the market successfully.
3 System Analysis and Design

3.1 Introduction

System analysis describes how the business requirements were collected and analyzed while the design describes the technical solution for the identified problem. First of all we had to carry out a survey. Our approach was an incremental approach. As well as to get the better idea about the product some initial prototype was needed. To get the feedbacks quickly the web portal was developed first.

3.2 System Interfaces

In our Application ‘The Locator’ we interact with several external applications such as GPS, GSM in finding the location and also with messaging systems. We use several API s to build this interaction.

3.2.1 Interfaces

This application is being used by everyone so that we need to create it in a way which anyone can easily interact with. Therefore we use an approach of GUI interface type. When building those interfaces we mainly focus on special characteristics. We always want to make the interface clear so that it will be easy to the user to understand how our application works. And also sometimes we need to focus on users who are with lack of knowledge on how to use our software. Since our application deals with web portal and messaging system this might occur frequently. So that it will be easy if small explanations can be added to the interface but we should make sure them to be concise. And also it will be highly interactive if interfaces become familiar for them. So we can use the similar patterns that other available location based applications are using. And also we must focus on responsiveness where we mainly aim the speed and the feedback for the user. Consistency, efficiency, attractiveness and also forgiveness need to be maintained in developing user interfaces. These will be described under 3.6.
3.2.2 Hardware Interfaces

Here we don’t have direct hardware interfaces as none of the mobile application and web portal have designated hardware. The GPS connection in mobile hardware is managed by the mobile phone. The communication with database server is done through Operating System of mobile phone and web server.

3.2.3 Software Interfaces

This application ‘The Locator’ is not oriented to a customer specified product. So we have all the privileges to use and software that our designers are capable of.

3.2.4 Communication Interfaces

Since we are using web services to the application there is no communication interface involved here.

3.2.5 Memory Constraints

Since this is a mobile application we need to focus on creating it in a way that it doesn’t crash the operating system of the mobile phone. So we use 1-3 megabytes capacity for the application.

3.2.6 Operations

The application can be used in various modes. Such as emergency mode, lost phone and detecting location between two people mode. In each mode the relevant operations are done accordingly. Sometimes the user may interactively operate this application and sometimes he might not. But even if the user is not interacting with the application it is running as a background service every time. So even when the user is not interacting the relevant notifications will be coming to the phone.

Some additional information will be described in Appendices A, B and C
3.3 User Characteristics

The users of this web site can be anyone. We mainly focus on emergency so that it should be easy for anyone to use. Since it uses a messaging system it will be easy for anyone. And also the people who receive the message need to have a basic idea of how to view a location through a URL. At the same time when app is using to find the location of a lost phone the user must have the capability of using a website. And also when trying to connect with a friend to know here he is they need to have basic knowledge of configuring certain things. All this things can be avoided and can make it easy for them by creating user friendly interfaces.

Following use case diagrams will describe the user involvements.

![Use case diagrams for Emergency Situation](image-url)
3.2 Find the location of a lost phone using another phone.

More details are available in Appendix B.
3.4 Constraints

The internet connection to this application is considered as a main factor. This application always interact with the database server and respond accordingly. So the connection need to be there always. 
Both the application and the web portal use the same data base. So sometimes several requests coming at the same time may lead them collide. So here by force we make the incoming requests queue. For that the time that takes to fetch data can be increased. 
The application interacts with the GPS application and view the location. We must always make sure that the interfaces use here do not be the same like other similar location based systems. For that we should make unique changes to the interfaces but at the same time they should be familiar to the user as well.

3.5 Assumptions and Dependencies

We should assume that the application is being used by the appropriate phones. For example the phones that has enough capability of the performance. Sometimes even if the phone is initially with right performance condition meantime due to other apps its performance may reduce. So there will be a doubt at such occasions whether the app will work fine or not. At the same time we assume that every phone has same quality GPS connections. And when GPS connection is not available location will be detected through GSM and we assume that it too will give somewhat accurate data.

3.6 External Interfaces

This section provides a detailed description of all inputs into and outputs from the system. It also gives a description of the following interfaces

- Software and communication interfaces
- Hardware interfaces
- Basic prototypes of the user interface.

3.6.1 User interfaces

This describes basic prototypes of user interfaces. This was helpful when handling the requirements gathering.
3.3 First interface

3.4 Create account

3.5 Prespesifying numbers

3.6 Sending friend requests
3.7 Send the location via SMS

3.8 Via Application

3.9 List the friends

3.10 Edit the things
3.7 Functions (Functional Requirements)

This section describes the required functional requirements of the product.

3.7.1 The User

Here requirements are oriented towards the user

3.7.1.1 Download the mobile app (The Locator)

The user should be able to download the mobile app from the web portal. And it should be freely available.
3.7.1.2 Register

The user should be able to register so that he/she can create an account for him/her in the system. The user must provide a unique username, password, email address, first name and last name. User should be able to do this either using the mobile app.

3.7.1.3 User Log in

Given that a user is registered in the system, user should be able to log in to the system via the app. User must provide a correct username and a password. If the password is wrong, an error message should be displayed. And when the user opens the app next time, he should be automatically logged in and if the user is using the web portal, he should be able to log in using the same user name and the password.

3.7.1.4 Change password

The users should be able to change their passwords anytime using the mobile app.

3.7.1.5 Enter emergency contacts

When the user runs the app for the first time after logging in, user should be asked to enter up to 5 emergency mobile numbers. These numbers are stored only in the phone memory and this can be done only using the mobile app. This should not be able to be done using web portal. And anytime user wants he should be able to change it.

3.7.1.6 Initiate emergency situation

The user should be able to initiate emergency situation in case he/she meets with some kind of an emergency situation (ex-kidnapping, sexual harassment). User should be able to do so by simply touching a button in the app. Once the emergency situation is initiated system should send text messages to numbers that had been saved by the user at the first run of the app. The text message should contain a link of a map with the position of the victim and the speed. And the system should also send text messages every 10 seconds and also should store the location history in the database until the emergency situation is stopped.

3.7.1.7 Stop emergency situation

The user should be able to stop the emergency situation after he/she recovered from the emergency or in case the emergency situation was initiated mistakenly. The user should be asked to enter their password to verify the identity since otherwise the kidnapper also can stop the emergency situation.
3.7.1.8 Find the lost phone using text message.

The user should be able to get the location of his/her lost phone by sending a text message containing a password, using another phone. Then the system should reply to that message with a link of a map with the location of the phone in it.

3.7.1.9 Find the lost phone using web-portal

The user should be able to track the phone using web-portal if the data connection of the phone was turned on (phone has the internet access) when the phone was lost.

3.7.1.10 add friend

The user should be able to add friends to his/her profile simply by entering their unique username. And a notification should be sent to the relevant user.

3.7.1.11 Accept/ reject friend request

The user should be able to accept or reject the friend requests he got using the mobile app. Friends info of a particular user is stored in the database. So that he won’t have to add them again in case he changes his phone.

3.7.1.12 Send location as a text message.

The users should be able to send their location to other people who do not have the app as a text message which contains a link of the map.

3.7.1.13 Remove friends

The users should be able to remove another friend using the mobile app.

3.7.1.14 Send the location to a friend.

The users should be able to send the location to the friends anytime using mobile app.

3.7.2 Performance Requirements

The requirements in this section provide a detailed specification of the user interaction with the software and measurements placed on the system performance.

3.7.2.1 Operating system support

It is sufficient to run this application only on android. But it should support all the devices that runs android 2.3(gingerbread) or higher.
3.7.2.2 Number of simultaneous users.

System should run smoothly even if 10,000 users are using it at the same time.

3.7.2.3 Logical Database Requirements.

![E-R Diagram for Locator](image)

3.12 ERD for the DB design

**User entity**

- Unique username of a user
- Hashed Password
- Email
- Status – the background process (android service) should be continuously checking for this variable. And the mobile app should respond according to the value of this. (Ex – if status==0 everything is ok. If status==1 then lost phone situation.)
- First name
- Last name
Location entity

This is a weak entity. This will be uniquely identified by the username and time stamp this stores the 10 most recent locations of each user. Location is aimed to be used in the emergency situation. It should contain the following data.

- Latitude
- Longitude
- Speed - moving speed of the user
- Accuracy - accuracy of the location details.
- Time - time stamp

Other than the above entities there will an entity called “lost phone” which can be useful in lost-phone scenario. When we map the ERD in to relations we will find few more relations other than to above entities.

3.8 Design Constraints

This section includes the design constraints on the software caused by the hardware or some other standards.

3.8.1 Initiating the emergency situation

It would be more practical if we could design the app to launch the emergency situation by holding down the volume key and shake the phone, or something like that. But the android sdk does not allow anything like that to be used in an android service (background process). Therefore we have to design a touch button to launch the emergency situation. Which involves unlocking the phone first and touching a button.

3.8.2 Turning on GPS with a text message.

Again the android SDK does not allow programmer to turn on the GPS programmatically due to security concerns. So if the GPS was turned off when the phone is lost or in the emergency situation if the GPS is off the app has to use the coarse location which is less accurate.

3.8.3 Acquiring the GPS signal

Mobile phone manufactures recommend a clear view of sky to acquire the GPS signal quickly. Thus constraining user to send accurate location details when they are indoors. And some mobile phones take long time to acquire the signal.
3.8.4 Phones with no GPS

Location GPS would be less accurate when using with the non GPS enabled phones.

3.8.5 Phones with lower version of android OS

The mobile app would not be working with the phones running a lower version of android than 2.3(gingerbread).

3.9 Software system attributes

This section includes the software system attributes (nonfunctional requirements or the quality attributes). The system must possess these characteristics and should be testable.

3.9.1 Reliability

The reliability of the system largely depends on the type of location data the system uses (FINE location (GPS) or the coarse location (cell tower signal)). When the system is using cell tower signal to get the location, the results will be less accurate thus compromises the reliability of the system.

3.9.2 Availability

The system must be available 24*7 especially because of the emergency scenario. And backups of the database should be taken every day. So in case something happens to the webserver, we can recover quickly. Testing can be done by testing the system at different times of the day. And some sort of a stress testing should also be performed to analyze how the system behaves in heavy traffics to the webserver.

3.9.3 Security

There should be a high level of security in all parts of the system since a system like this may be used as a bug (to track someone without their consent). So the following things should be used.

3.9.3.1 Passwords must be hashed

Passwords should never be kept in the database as it is. They should be hashed before storing in the database. So in case someone hacked into the database, they won’t be able to do any serious damage.
3.9.3.2 Always use strong passwords.

When registering a user, the user should not be able to register with a password less than 6 characters. This makes it hard for anyone to guess someone’s password.

3.9.3.3 Initiating the lost phone scenario

When initiating the lost phone scenario, the user must either include their password in the text message or log in to their user account in the web portal. This makes it impossible to get someone’s location without their consent.

3.9.3.4 Stop the emergency situation

After the victim recovered from the emergency situation, they should be able to stop it. When they stop the emergency situation they must enter the password. This makes it impossible for the others other than the user to turn it off.

3.9.4 Maintainability.

The system must follow standard, well established protocols in every aspects. Such as database design, communication and mobile application development. This reduces the changes that might occur later on. And a detailed documentation should be maintained thus had some modifications needed to be done, it will be easier to do so.

3.10 Change Management Process

Our development approach was incremental one and it was combined with prototyping since we did not have a client and a clear idea about the product initially. So even in the design phase we could change the requirements and do some modification.

3.11 Chapter summary

In this chapter we discovered how the system requirements were collected, analyzed and how they were designed to build the required system. From the next chapter we hope to continue the development factor.
4 System Development

4.1 Introduction.

Development of the system can be classified into two parts.

1. Web portal development.
2. Android application development.

These major parts were developed as two groups. Android app has a separate database. Web portal has its own database and it accesses the android app’s database too.

4.2 Web portal development.

Initial step of the development process is the web development. This was helpful in few ways. To get the initial feedback, to get some popularity, for beta testing are few of them. Here for the web site CMS was used. It was “Joomla 2.5” version.

4.1 Joomla back end.
“Afterburner2” template was used for the front end view. "Bluestork” was the template for administrator.

Website contain five (5) pages.

- Home: this gives some introduction about the app. It gives some introductory video also.

4.2 Introductory video.

- Download: The next page provides a link to download the application. Application was stored in the database. Once someone touch the link he will be directed to that location and download begins.

4.3 Download page

4.4 Back end of the APK file
• Find Me- This is helpful when the phone is lost and its data is one (Has the internet connection). Then we can just type our user name and password on the web page and view our location. Here what happens is if the user name and password matches (There is such user in the user table of the database) then it changes the status column to ‘1’. Application which is on the phone detects it and stores the location in the lost phone table. It will be read and displayed in the web page.

4.5 Login page.

4.6 User table in the database.
4.7 Lost phone table in the database.

4.8 php code fragment which is used in displaying the location.
- Contact: This contains the contact details of the development group.
- Feedback: This is the most important part. Once the visitors have tried the app they are kindly required to fill this forum to get the feedback. This was very useful while developing the system.

4.9 Contacts page.

4.10 Feedback forum

Once the forum has been submitted details will be sent to a specified e-mail address and through that the results can be analyzed and evaluated.

4.11 Joomla database.
4.3 Android application development

Basically the entire application development can be broken down into five (5) parts.

4.3.1 Profile unit.

User registration, user logging, unfriend friends, add friends, send friend requests, accept or reject them, and all the other user information are handled here.

```java
public class AddFriend extends Activity implements OnClickListener{
    
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_add_friend);

        Button add=(Button) findViewById(R.id.button1);
        add.setOnClickListener(this);

        // Show the Up button in the action bar.
        setupActionBar();
    }

    /**
     * Set up the {@link android.app.ActionBar}, if the API is available.
     */
    @TargetApi(Build.VERSION_CODES.HONEYCOMB)
    private void setupActionBar() {
        if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.HONEYCOMB) {
            getActionBar().setDisplayHomeAsUpEnabled(true);
        }
    }

    4.12 One of the source codes under Profile system.
```
4.3.2 SMS send and read unit

This unit is responsible for sending messages and reading them. These will be important in an emergency cases, lost phone scenario as well as sharing locations through SMS. This was tested independently and integrated with emergency, lost phone and send location parts and again tested.

```java
package zkythers.eu5.org.thelocator;

import android.os.Bundle;
import android.app.Activity;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.view.View.OnClickListener;
import android.widget.Button;
import android.support.v4.app.NavUtils;
import android.annotation.TargetApi;
import android.content.Intent;
import android.os.Build;

public class Friends extends Activity implements OnClickListener {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_friends);
        Button my_friends=(Button) findViewById(R.id.button1);
        my_friends.setOnClickListener(this);

        Button add_friends=(Button) findViewById(R.id.button2);

    }

    4.13 Source code of adding friends.
```
4.14 SMS listener source code.

4.15 Source code about the location service.

4.3.3 GPS and cell tower position taken unit

This unit is completely responsible for taking GPS location and the location with the cell tower with the accuracy and the speed. This was also integrated with emergency, send location and lost phone scenarios.
4.3.4 Interact with the database.

Android app haven’t got the direct access to the database. It has to access it through php files. When new friends are added, new location is determined, friend requires is sent the app access the database through php. As well as more importantly app checks the database for every 5 seconds (user table’s status column).

4.16 php files which are hosted in the server.

4.3.5 Background service

In order to fulfill user requirements availability of the app anytime when we open it is necessary. For that it should run as a service. We have to specifically code for this functionality.
Other than above described units “Splash Screen “unit can be taken as another important unit. This will responsible for the opening screen.

```java
public class SplashScreen extends Activity {

    // Splash screen timer
    private static int SPLASH_TIME_OUT = 3000;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_splash);

        new Handler().postDelayed(new Runnable() {

            /*
             * Showing splash screen with a timer. This will be useful when you
             * want to show case your app logo / company
             */
        }, SPLASH_TIME_OUT);
    }
}
```

4.18 Coding part of the splash screen.
4.4 Chapter summery

As described in this chapter the system (both the web portal and the android app) was developed. When developing the web site small tests, and coding done through the web host since it is very easy. Coding also was done for all the php files from the host’s code editor.

For the app coding was done on Eclipse IDE under Windows 8 OS environment. They were tested using Vodafone and Samsung mobile brands.
5 Testing and Evaluation

5.1 Introduction

The Locator went through a rigorous validation and verification process to ensure that it conforms to its specifications and to provide the users of the application with a unique experience which surpass their expectations. Validation and verification process was mainly carried out using 2 techniques.

- System Testing
- Real time Testing

This document also contains a performance analysis carried out by the development team. In this document the word “system” is used in the context in “The Locator Android” and “The Locator Web”

5.2 System Testing

System testing went through several phases. Namely,

1. Unit Testing
2. Integration Testing
3. Alpha testing
4. Beta Testing

5.2.1. Unit Testing

The Locator team expected to achieve ‘robustness’, ‘functional correctness’ and the ‘correctness in user interfaces’ in this phase.

5.2.1.1 The Locator Android

The Locator Android was developed based on following modules. And the respective unit testing was performed by the respective authors of the code.

- Profile unit
- SMS send and read unit
- GPS and cell tower based location unit.
- Database interaction unit
- Background service and splash screen unit.
5.2.1.2 The Locator Web

The Locator web was developed using Joomla and it contains some manual codes too. Find-Me page contains some manual codes. Feedback contains a forum. These two parts and rest of the joomla web site was tested separately.

“Find-Me” testing

Feedback testing

Rest of the web site Testing

5.2 Testing units in the web portal

5.2.2. Integration Testing

After the unit testing phase this phase was carried out to check the ‘integrity’ of the combined units and the ‘functional correctness’ of the overall system. Following diagrams shows how the system was integrated to be developed to the final system. Integration testing was done using the incremental method and the testing was done by the combined development team.

5.2.2.1 The Locator Android

Above all the units were integrated in order to perform required functionality. Some units were needed for all the functionalities. Ex: Location (GPS and cell tower unit). Then those integrated units were tested.

Basically three main functionalities were identified and made integrated systems based on these three.
(1) Emergency situation

Created integrating SMS send and read unit, GPS and cell tower location unit, Database interaction unit and background services unit.

(2) Sharing locations

For that profile unit is very important. Database and SMS units are important.

(3) Find the lost phone.

For this database interaction unit is very important. MS reading and send is the other important factor here.

5.2.2.2 The Locator Web

The Locator Web was integrated in the following manner.

```
“Find-Me”
```

```
Feedback
```

```
Rest of the web site
```

```
The Locator
```

5.4 Integration testing of the web site.
5.2.3. Alpha Testing

Results obtained in the above two testing phases (unit testing and integration testing) is used to identify the problems and correct the errors accordingly.

Problem 1: Sometimes the location of the phone cannot be obtained from the “Find-Me”. 
Solution 1: It is because the frequency of the reading the database of the app is not fast enough. 
The time was reduced to 5 seconds.

Problem 2: Since the app is running as a service it causes the battery to discharge quickly. 
Solution 2: If we want we can log out from the app and then it is not running as a service.

Problem 3: In an emergency situation message is sent every 10 seconds without considering anything. Sometimes it is useless. 
Solution 3: First message is sent and subsequent ones are sent only if the location has been changed.

5.2.4. Beta Testing

The Locator application is available to download in the Locator web site (http://zkysoft.com/locator/index.php/download ). The purpose is for beta testing. They test it and inform any problem through our contacts. From the current testers we have received the following feedback and the respective actions that we have taken is listed below.

5.5 The Locator is available on the web site.
Problem 1: When adding emergency contacts it would be better if we can link with the phone book.
Solution 1: Future version is focusing this.

Problem 2: It would be better if we provide a video user manual.
Solution 2: This was done.

Problem 3: It would be better if the messages that are sent have useful meanings.
Solution 3: Useful messages were added including accuracy and speed with the link saying the user’s situation.
   Ex: “I am in a trouble….”

Problem 4: We have not got meaningful error messages.
Solution 4: Meaningful error messages were added both for the app and the web site.

Here when the passwords mismatches an error message will be generated to inform that to the user.

5.6 Example of an error message.
5.3 Real Time Testing

Here main three functions were tested along with others.

(1) Emergency situation.
   Scenario: Emergency button was clicked.
   Then messages will be sent to predefined numbers.

5.7 Above message will be sent in an emergency situation
Clicking on the link above, we can view the location.

5.8 Viewing the location.
Switching off the emergency situation can be done as follows.

As described here the system was tested several times using several subjects and checked the validity of the results.

5.9 Switch off the emergency situation

(2) Find a lost phone.

Through another phone.

For that simply what you have to do is send your password to the lost phone using another phone. And lost phone will send its location to this phone. This function was tested under the given condition to check whether the system in performing well or not.

5.10 Send the password

Through web site (when data is on)
5.11 Type user name password and viewing the location on the web site

Here “Go back” link was added later for the user friendliness.

(3) Send location to friends.

This was tested as a text message as well as sending the location through the app.

5.12 Select the location sending method.

5.13 Send location interface.
As described above all the possible scenarios were tested and check whether the system responses according the requirements. Whenever error occurred it was corrected at the time it was discovered. More details of the system functions will be described in Appendix A and Appendix C.

5.4 Performance Analysis

5.4.1 Life Time Comparison

Following table indicates the average battery life (from fully charged to fully discharge) of a smart mobile phone when it is used under GPS and normal internet connections working.

<table>
<thead>
<tr>
<th>Status</th>
<th>Life time</th>
<th>Power(mW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle</td>
<td>24h 18m</td>
<td>182.7</td>
</tr>
<tr>
<td>GPS</td>
<td>5h 32m</td>
<td>617.3</td>
</tr>
<tr>
<td>Wi-Fi</td>
<td>4h 39m</td>
<td>771.8</td>
</tr>
</tbody>
</table>

5.5 Chapter summery

Under testing and evaluation above testing were done and some performance comparisons were also done. It is very important to test the system in various ways after we build it. And one of the testing that we hope to do is “Stress testing” for our web site. We hope to do that with more than 500 users.
6 Conclusion and Future Work

6.1 Introduction

As we saw in the previous chapters the system was built using the incremental approach with the prototype assistance. Initial user feedback was taken through prototypes with the help of the website. System was tested with the purpose of producing a good quality reliable product. Now it is available to the users. http://zkysoft.com/locator.

6.2 Form where to where.

Internet was invented in late 60’s in the 20th decade. After that the mobile phone (practicable cellular in 1973) was invented. WWW was invented very late 80’s. And today all the technologies are interconnected. Operating systems which ran only on huge metal boxes now available to run on small chips. Now we have Mobile OS. Android is one of them. There are several other types too. People are linked. Distance between cities are reduced. With that kind of technology, The Locator tries to increase the people’s life status by reducing the limitations of information sharing (here the location), give some opportunity to protect themselves.

Combination of all the information technologies may lead to a large number of solutions for various burning issues. Those solutions may be hiding somewhere. Now the technology is available. What you have to do is finding the combinations of technologies which enhances the people’s lives. It may be a combination of a smart phone with satellites of PC with radio waves. It up to the innovative people to discover healthy combinations.

6.3 Conclusion

What locator should do?

Only limiting to the location based service?

No.

We are hoping to spread our views, our innovative ideas to enhance the man life with the help of the current technology. There may be various areas people still need to focus and need some technology support. We are focusing those areas.
With the name “The Locator”? 

Yes.

We are not going to change our name. We may be focusing a new problem. But this name will show where we begin. It is very important to keep the memories of the beginning always.

Then what about the slogan “Never lose anyone”? 

This will not be changed either.

With our products you will never lose anyone. Our products are focusing for the goods of the mankind. With that kind of intention you will never lose anyone.
References


[8] Eric Freeman, Kathy Sierra, Bert Bates, Elisabeth Robson, Head First Design Patterns, O'Reilly Media publishing, 2004


[12] https://geoloqi.com/faq

Appendix A-User manual

User functions can be characterized into three basic types.

(1) Emergency situation.

Let’s start from the place we go to the site and download the app. You can visit the site http://zkysoft.com/locator through your mobile phone and download this android app. If you are not sure about the requirements please refer the Appendix B.

Once download is finished you can install the app and there above (A: 2) screen may appear. You just accept and go forward.

The next screen what you see is for login or register screen (A: 3). If you have not got a previous Locator account you have to register first. (A: 4)
Once an account is created you can specify at most 5 contacts which will be used in an emergency cases to send the location. (A:5) After forwarding you will see the welcome screen of the locator. There you can go for any option. (A:6)
Once the emergency button is touched in an emergency situation the location link will be sent to all the predefined numbers and there the accuracy, speed and the method that was used to get the location is included. Received person can view the location through a browser of google map. To deactivate the emergency situation we have to again click on the emergency button and there we are required to add our password to deactivate it. If we changes our location (That means we are travelling) our location will be sent in every 10 seconds.

(2) Share location between friends.

Share location contain two options. Frist one share location through the Locator. For that we need to have friends in our account. We can simply add friends just touching the add friend button and correctly add his username in Locator. Then our friend can add us or reject us if he wants.

After adding friends we can share our location with those friends. To check whether someone has sent his location to us, we can simply check the location inbox. When sending locations we can have so many options.
A :8 GUI you see after touching Friends in welcome screen

A :9 adding friends.

A :10 The GUI what you see when touching the My friends in A: 8

A:11 Check friend requests.
A:12 GUI that you see after touching
The Send Location in the welcome
screen

A :13 Send locations via the Locator

A :14 As this we can send our location to the friends in the
Locator

Accuracy = 24.0
Latitude = 7.075463333333335
Longitude = 80.08299303333334
Other option that we can have is send the location for non-Locator user. There we can send the location as SMS. Then receiving person can view the location. We need to specify the mobile number of the receiving person for that.

Here you can see from the top we can specify the source that we use to get the location. It may be GPS whenever possible. Because it gives the maximum accuracy. But if you are in a building or any indoor place GPS is not available. Then you have to go for the cell tower signal which is less accurate.

A: 15 Send location as an SMS

(3) Lost phone scenario.

Other important factor that we focus is finding the location of the phone when the phone is lost. When we lost our phone, if our phone data was in ON mode (phone has the internet connection) then we can use the Locator web portal to find the location of the phone and it will be described in Appendix C. For any given situation if the phone has enough signals for its SIM and SIM has not been changed after we lost our phone we can simply send a messages containing our Locator password to the lost phone using any other phone and we can receive the location to that phone.
After sending the password to the lost phone it will send its location as you can see in the figure A: 16.

To view a location simply one can use their web browser or google map in the smart phone.
Apart from these things user is capable of changing his information anytime he needs. But for that he will be needed to enter his password correctly.

A :18 The GUI that you see after touching the Profile button in the welcome screen. You can go forward as you wish. But further steps you will be required to enter your password correctly for the verifications.
Appendix B-System manual

Installing the application

Get the app from our official web site “The Locator”, using below link

http://zkysoft.com/locator/

When the download is finished you can install you app. There you will be asked few things. These things exhibit the resources that the app is going to use from you smart phone. If you are OK with those things simply touch Install. Then the app will get installed and you will be directed to the login page. Refer Appendix A for usages.
Prerequisites for using The Locator applications and services

<table>
<thead>
<tr>
<th>Service</th>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Locator app</td>
<td>A smart phone with;</td>
<td>(1) Android mobile operating system</td>
</tr>
<tr>
<td></td>
<td>1. GPS</td>
<td>(2) Android version 2.3 or higher</td>
</tr>
<tr>
<td></td>
<td>2. Network access</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Sim card with credits</td>
<td></td>
</tr>
<tr>
<td>The Locator Web portal</td>
<td>Working pc with the Internet. or mobile phone with the internet</td>
<td>An HTML5, Javascript and AJAX enabled/supported web browser</td>
</tr>
</tbody>
</table>

B:1 Table of prerequisites.

SYSTEM OVERVIEW

The Locator project has been developed considering two main areas.

- Android application
- Web portal

All the files and the database of the Locator project have been deployed in Go daddy Control Panel under the server name p3plcpln0462 on Linux operating system. Website is under the main domain zkysoft.com

B:3 System overview
System architecture of the Locator can be seen as below two figures.

B :4  System structure in abstract view

Above figure tells the most common structure of the system. Below block diagram shows some generalized view.

B :5  System structure in another view.
Only the administrators have the privilege to access the Locator system by using user credentials. Those administrators have the privilege to view all the data currently in our database in tabular form.

B :6 Control panel view

B :7 Database view (Php myadmin)
To make it easy for the users to understand the system here we will provide some use case scenarios. For more details you can go through chapter 3.

B:8 Find the location of the phone.

B:9 Share the location between friends.
Appendix-C Web manual

This part will describe some guidance to the web site.

The Locator web portal contains 5 pages. Address of the web page is http://zkysoft.com/locator

Let’s take one by one.

(1) Home.

---

C :1 Home page of the web site

---

C :2 Latter part of the home page

This page contains an introductory videos about the product. It will increase the user interest. You can view it just clicking on top of that. Below that there are some description and usability of the product.
(2) Download
This page will give the users an opportunity to download the app. Simply clicking on the download button one can download it.

![The Locator](image1.png)

C :3 Download page

(3) Find-Me
This is one of the most important page. Which exhibits one of the functionalities of the product. Through that one can find their lost phones.

![The Locator](image2.png)

C :4 Find–Me web page and view the location
(4) Contact
This page will give all the contact details of the developers. Once you touch on the photos of the developers you will be directed to their LinkedIn profiles for more information. Here sometimes we use the name Zkythers (Zkythosh) because it was our identity during our university life.

C :5  Contact page
You will see the photos of the developers when you scroll down in this web page.

(5) Feedback
This one of the most important things for the developers. Through that you can add your feedbacks. Once you submit it your answers will be sent to our prespecified e-mail address and later they will be analysed. Once you go through our app you are kindly requested to fill that forum.
This web portal is compatible with mobile browsers also. Therefore you can easily go to the site using your mobile browser.