

Table of Contents

Abstract

1. Introduction

1.1 Backgroud

1.2 GPS

1.3 Project

1.3.1 Description

1.3.2 Function

1.4.3Environment

1.4.4 User description

2. Requirements Analysis for mobile guide

2.1 Functional Requirement

2.1.1 Identification

2.1.2 User Management

2.1.3 Teaching

2.1.4 Data Submission

2.1.5 Information

2.1.6 Location

2.1.7 Forum Requirement

2.2 Nonfunctional Requirements

2.1.1 Security

2.1.2 Performance

2.1.3 Availability

2.1.4 Reliability

2.1.5 Maintainability

2.3 Use Cases

2.3.1 Sign in

2.3.2 Sign out

3.3.2 Teaching

2.3.4 Submit Data

-
- 2.3.5 Register
 - 2.3.6 View Profile
 - 2.3.7 Post Information
 - 2.3.8 Send Position
 - 2.3.9 Forum

2.4 Dataflow model

3. Design

3.1 Architecture

- 3.1.1 Layers
- 3.1.2 Interfaces
- 3.1.3 Components

3.2 Software Modules

- 3.3.1 User Interface
- 3.3.2 Data Submission
- 3.3.3 Teaching
- 3.3.4 Information Management
- 3.3.5 Location
- 3.3.6 Communication between modules

3.3 Database Design

- 3.3.1 Entity relationship
- 3.3.2 Logical database requirements
- 3.3.3 Task distribution

4. Implementation and testing

- 4.1 Unit testing**
- 4.2 Integration Testing**
- 4.3 Class Diagram**

5. PRELIMINARY Research

- 5.1 Analysis of the existing**
- 5.2 Critical of existing**
- 5.3 Proposed solution**

6. Conclusions

7. References

Abstract

The reason to sign myself up for this bachelor program was the fact that after four years in Beijing JiaoTong University and I came to the conclusion that it will be a good idea to creating a good software product than students can user easily. This conclusion made me realize that in order to increase my skills and make students life more simple I had to increase my awareness of the aspects that together form the complete software engineering process. While I'm writing this, as the last part of my final thesis document I truly believe that my awareness of the software engineering process has increased a lot. I hope that my final thesis document proofs this awareness to you and all students in each University in Beijing or more.

For me there is no doubt this could have been a more complete document and especially when it comes to the actual research I've performed to base my conclusion on. The reason for this, is that during the available period of time that students have to work on their final thesis research I decided to change my research subject because my supervisor orient me in better direction and with flash back I believed the research topic I started out with did not have a concrete link with the software engineering . I was convinced that when I continued my original research it would result in writing a final thesis document that I could not ever be satisfied with. This meant I had to find a new research subject as well as my supervisor giving me the change to perform a new research within the limited available amount of time that was still left.

1. Introduction

1.1 Background

Over these past years, the reputation of Chinese Universities has increased causing therefore a great number of foreign students to come to study in China. However, most of them have to face an integration challenge, namely in their host Universities. There are twofold key problems the students are to face with are regularity and social life; regularity, being the first one, regards registration such as not knowing how and where to carry out smoothly their registration. This can follow the communication problem (language -related), poor assistance (not sufficient stuff to provide individual-based assistance to the students be it related to residence their application to their residence permit and inherent immigration documents. The second major problem concerns school life especially how to get real-time good information on curricula and extra-curricular-related activities though they do want to join in or participate to them. The existent patterns consisting in having the students to log on their school accounts and checking the school websites turn to be not effective as it can take time before the students get a little bit familirialized with those facilities. Thus, easy and practical as well as intelligent applications or software for mobile phones and computers designed in view of coping with the students' need would be of great utility i.e. provide information on the schedule of the semesters, updates, guide to the courses, extra-curricular activities, etc. In addition to that, a guide to the different facilities could be embedded (restaurants, canteen, laundry, coffee, printing shops, ATMs, and stationary shops...). This application will let student to student by them self , with this platform all foreigner student can improve the Chinese language.

1.2 GPS

The most important factor in GPS function, accuracy is essential to precisely the exact location in real-time. There is a need to know the GPS infrastructure layouts, limitations, and communication protocol. Research will need to be conduct in order to fully understand each individual component. We need to understand the type of methods used for the GPS technology and the problem which would affect the performance of the GPS location receiving of satellite signal.

1.3 Project

1.3.1 Introduction to Software

Before beginning to work on the project, an understanding of Software development is inevitable. By definition, Software Development is the exercise of putting in order the design and construction of software. In order to develop software, some requirements need to be done. As we mentioned above some tools will be used to develop this Application. However it is not only about developing a project, it is also about planning carefully and doing everything right in order to achieve our goal. So in this part of the project, we are going to explain what software is made of by showing what will be used and how it is going to be used so that we can reach our goal. Software is a set of directives that enable the user to interact with a computer, its hardware, or perform tasks. Without software, computers, mobile phones, or others devices would be useless. For example, without your Google chrome browser, you could not surf the Internet and without an [operatingsystem](#), the browser could not run on your computer. Hence, the tools that are going to be used are software. So the importance here is to let you know that software is created based on others software.

1.3.2 Description

One of the valuable lessons I learned all this time I was at JiaoTong University is that it is important to have a good software development environment and process. My research springs from Android studio. And build a good software application that will be very useful for international student in JiaoTong University.

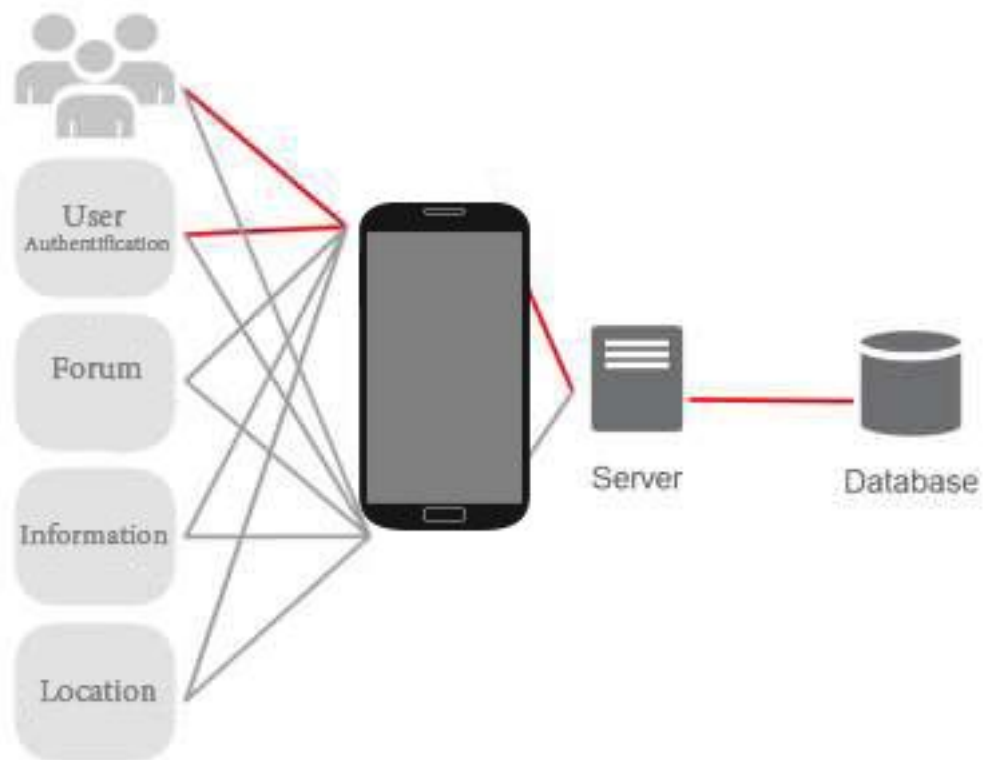


Figure 1.3.2 System Overview.

1.3.3 Function

This application should offer several functions, including:

- Student Information Management
- Identification
- Data Submission
- Teaching
- GPS (location)
- Forum
- Post information

Since this is a work on progress, some other functionality will be required as development is carried on and to make the application more useful the platform must offer support, interactivity, and flexibility to these new features and functions.

1.4.4 Environment

This application is a distributed platform; this is a requirement in order to support scalability and sustain large amount of calculations for a high number of users at a lower cost. This distributed system must be able to support the deployment the following resources:

- Adobe Illustrator

Adobe illustrator is the industry design Application. It let you capture creating visions with shapes, colors, effects and typography. Work across desktop and mobile devices and quickly create beautiful designs that can go anywhere, print, web and Apps, videos, animations and more. Digital graphics fall to two categories: vector graphic and raster graphic. Raster based graphic such as a photograph are groups of pixels align on a grid to form an image and have a fixed resolution. They cannot be scaled up and down without quickly losing quality. Vectors graphic are resolution independent. They made of objects and path that are defined mathematically which means they can be scaled up and down in size without losing quality. Illustrator is used to create logos and products that are used in all type of applications such as business cards, websites, photo realistic art work, navigation icon on websites, packaging design for general merchandise, maps both printed and digital, charts in infographic, posters, user interfaces on computer and mobile devices.

So for our project, we are going to use Adobeillustrator to design and create our user interface (UI) and icons.

- Adobe Photoshop

Adobe Photoshop is a family of desktop and mobile applications connected to each other and to your creative asset using creative sync technology. With it, you can create and edit images and design to show anything that you could have never imagined. From polishing to perfecting your photos to create something out of this world. Creating amazing images design for print, web and apps and animations.

So what not just use Photoshop or Illustrator? Both of these applications almost have the same functions. To know the difference, we need to understand how importing designs with these software into our application works. We can only import icons or others design into applications if they have a picture extension such as: PNG, JPEG etc... Adobe illustrator doesn't save design with a picture extension; Photoshop however does it well because it is used for pictures. Therefore, in order to put our design and icons into our application, we need to import them to Photoshop then we can send them to our project.

- WAMPSERVER

The system will also use a web server to offer web and mobile clients a way to interact with the platform. Wamp server will be the web server. WAMPSERVER is a Windows web development environment. It allows you to create web applications with Apache2, PHP and a MySQL database. Alongside, PhpMyAdmin allows you to manage easily your databases. So basically because we are building a Social Network application, we will need an environment where we can have a database and server.

- Apache

Apache HTTP Server is a web server developed and maintained by The Apache Software Foundation. The stated objective of Apache is to create an [opensource](#) HTTP [server](#) that will run on any modern operating system and hardware. It is a Web Server application that helps deliver content to be accessed through the internet. Thus it is an open source web server that is responsible for serving the dynamic web page content that developers build.

- PHP

PHP is used to fetch data from the database. Our application will communicate with the PHP page with necessary parameters and PHP will contact MYSQL database and will fetch the result and return the results to us. PHP is an open source scripting and programming language. It stands for Hypertext Preprocessor. It can be used to create robust applications or dynamic websites. It runs on a server. It is a server side language that interfaces with the database and others resources as necessary to build HTML responses and send these responses back to the requester or a browser. Thus it is the most popular server side programming language.

- MySQL

MySQL is a relational data base management system. MySQL will be used to store students information, also the informations about school activity and class information. MySQL is the most wildly use database management system on the world. It is a database open source engine using the SQL language to store and retrieve data from web applications. So for our Social Media, it will be used as a database to store and retrieve data such as: name, password etc...

- Android Studio

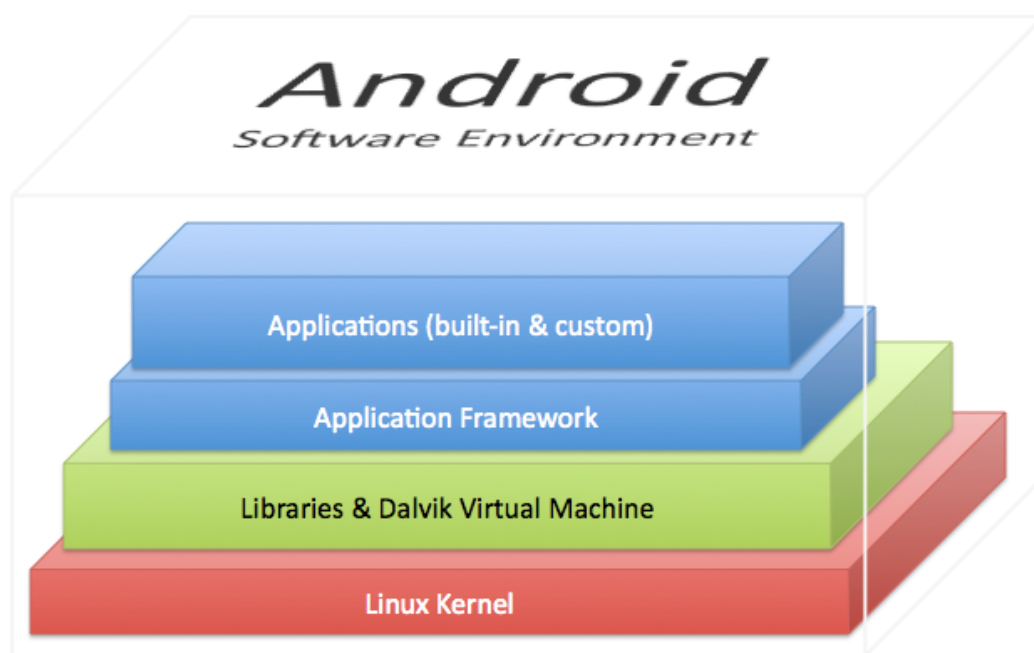


Figure 1.4.4 Android Software Environment contains a Linux Kernel, Libraries, Dalvik Virtual Machine, Application Framework and built-in and custom applications. Illustration made By Benny Skogberg.

This part will be more developed in Appendix A

1.4.4 User description

There are two kinds of users for this system:

- Administrator: this kind of user can be one school teacher, the administrator will be able to post information about school, to manage student information or delete one student from the forum. The admin is able to create courses that after the student can learn from that.
- Student: the student is the kind of user, the student is able only to read all information about school activity, about class, to receive message about his location, to check if one class is empty or not, his also able to send some message on the forum. This student is about to learn from the course input by the admin, also to do exercise about those class.

2.1 Functional Requirements

2.1.1 Identification

This project is about students so I think each student personal information that might be considered confidential. A way to identify users is required. Each user should have a username (that is the student ID) and a password. This can help prevent confidential information from being accessed by another student who is not the owner of the account.

2.1.2 User Management

This requirement is about how user personal information is handled. There are 2 kind of user and each of them has their own authorization. The Personal information is not required for most of the request user can make; only the administrator or the student can accede to his owns information; but keeping contact information of every student at hand is important to able to reach them when needed. The ability to update this information should make available to user in a simple and straightforward way. This function should include a method for adding users, for updating and for retrieving their information as they needed.

2.1.3 Teaching

This function is one of the most important; this project is about informing, guide and integration for foreigner in Chinese University so in this platform will be implement a function that students can learn about Chinese language and Chinese culture.

This function includes some functionality like choose class, do homework, list available class, show score. Students can choose the type of class they want learn and do also some homework about this class. The class is put in the system but the administrator who will be one teacher from the school, and the students don't have authorization to add or delete class.

2.1.4 Data Submission

After the student lunch the application and enter the data the php code will be use to connect the android application and the MySQL DataBase. Added in the system a more straight way to import data will be required. The data submission function should upload the raw data generated by the web server to the platform where it will be kept for further usage

Once the information has been uploaded into the system, it must be translated from binary to a format that can be used in the different calculations. To achieve this data must be cleaned up before the relevant data can be extracted.

This is one of the most important functions; it should take the data extracted during the data processing and perform some analysis and computations on it. These computations will eventually include pattern recognition and analysis.

2.1.5 Post

This is by far the most important function; in this function the students can receive all information posting by the administrator, who can be one school teaching. It depends on the school to manage it how he wants. This function is not just a checking, it s an interactive function that mean the information is changing, the student will get the information when it's posting.

2.1.7 Location

This function is a guide function; with this function the student can be oriented. When the student will be close to a shop or a class building he will receive a broadcast message that will notice him the name of the place. With the function he can get is exact position in the school that mean the latitude and the longitude. He can he position on the map.

2.1.8 Forum Requirement

With the forum function it's a room chat, this part will offer an opportunity to all student to communicate between them also to ask some question about the school life or about life out of the school.

2.2 Nonfunctional Requirements

2.2.1 Security

This system has to handle some personal information so it better to kept it private. The system should concern a strong security way and must be always sought by using encryption strong password enforcing and strict security policies system wide.

2.2.2 Performance

It is expected that the platform will be used by a large amount of users. So this will demand high performance and computational power. Performance is relevant because one of the goals of the platform it, the application should offer to student a fast way to get a service.

2.2.3 Availability

The application should be on working condition 7 days a week, 24 hours a day, and it should be an interactive system. Assuring up times of at least 99.99% .

2.2.4 Reliability

The application should be reliable ensuring that data is not corrupted or lost. Data redundancy and replication should be in place to assure reliability.

2.2.5 Maintainability

The application should be easily maintained, performing updates, upgrades or adding additional features should not have a major impact in the rest of the system. Test environments should be built for the application to allow testing of the applications different functions.

2.3 Use Cases

The different use cases for the different students (USERS). This offers a quick overview of what functionalities are available to each user. Not every user will have access to the same functionality and the administrator who will be the school, require

more information than their user (who are students) and students need to have information presented to them in an easy and very simple way. These use cases and their description will allow developers and designers to have a way to visualize what functions should be made available to each kind of user (students), making it possible to create a more secure platform.; For simplicity and better understanding the interaction is shown between the users (students) and the modules and a sample of the functions that are being implemented for the prototype are also indicated. Please keep in mind that this system is still in development and in future iterations more features will be added.

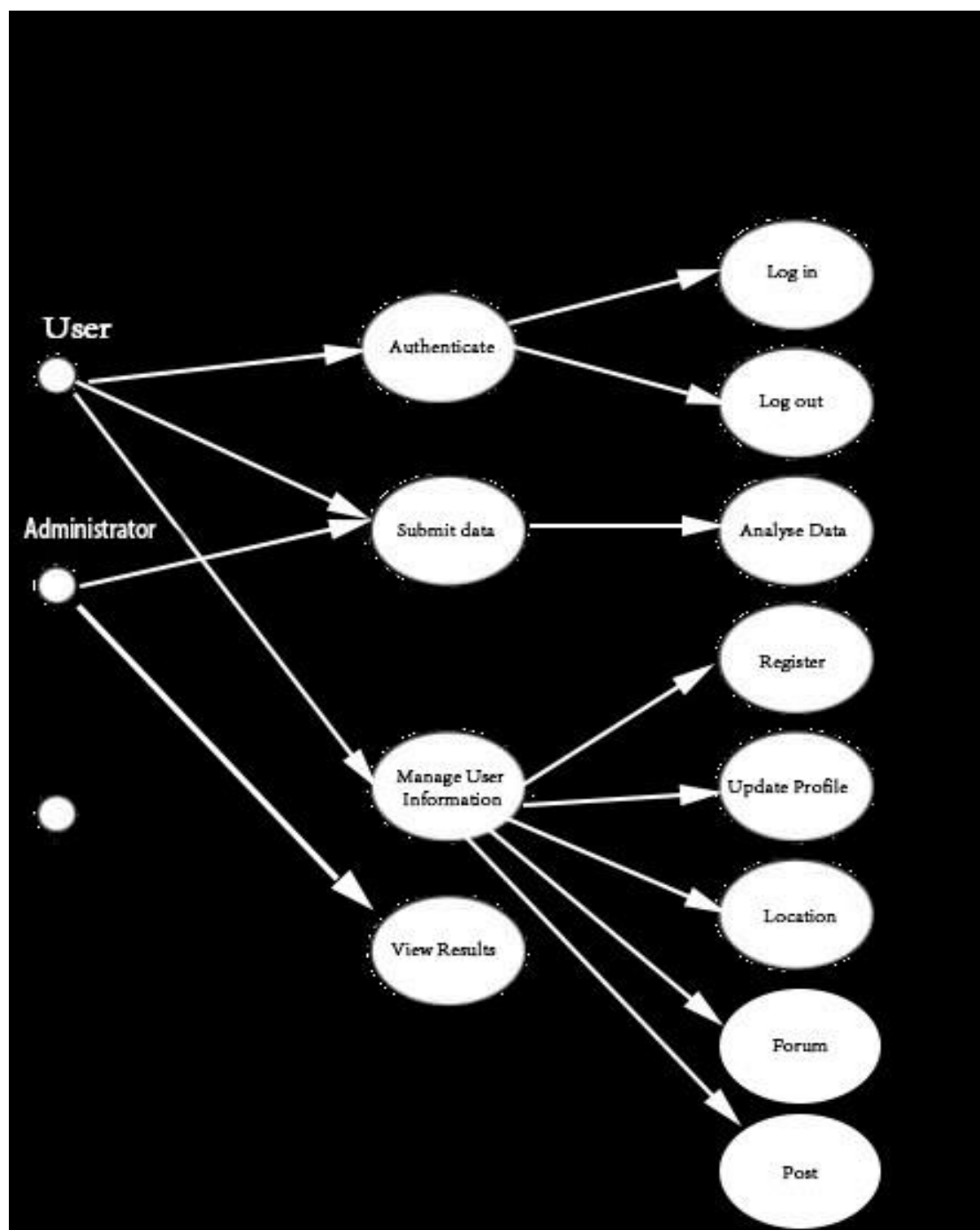


Figure 2-3 Use-Case Diagram

2.3.1 Sign in

It is the first function a user must call to access the system; this function will create a session and allows users to interact with their data. It is important to this is an important to implement because, in this way the system will be able to identify the current user and provide only the required information without exposing others sensitive data to third parties.

Table 2.3.1 Use case for Sign

User Name	Sign in	
Main Person	Students, Administrator (school)	
Person Interests	The user want to sign in of the system	
Description	This is the first step before a user can use the system	
Conditions	<ol style="list-style-type: none"> 1. The user should register in the system and has a username and password. 2. The user doesn't have an open session 	
Trigger	The user clicks on Sign in after put a username and password.	
Flow	Person	System response
	<ol style="list-style-type: none"> 1. The user want to log in 2. Enter the username 3. Enter the password 4. And then clicks on Sign in 	<ol style="list-style-type: none"> 1. The system displays the Sign in page 2. The system validates the enter information 3. If the validation fails, the system will show an error message, but if the information the user put is correct then a session will be started and the profile page will show up.

The identification information must be protected and encrypted to offer more security.

2.3.2 Sign out

This function is the last function a user will call. It will close any activity (any active session)

Table 2.3.2 user case for Sign Out

User Name	Sign out	
Main Person	Students, Administrator (school)	
Person Interest	The user want to sign out of the system	
Description	The user has completed his (or her) tasks and want to terminate the session.	
Condition	1. The user has been register in the system and has a username and a password. 2. The user has an open session	
Trigger	The user clicks on Sign out.	
Flow	Person	System response
	1. The user clicks on the log out button	1. The system Terminates and close all session. 2. The log in page will be is displayed

2.3.3 Teaching

Teaching is the function where they students can learn about the class they choose, do the exercise. One of functionality of this function is also to provide to students the correct answer after they finish doing the exercise.

Table 2.3.3 user case for Teaching

User Name	Teaching
Main Person	students, Admin
Person Interest	The student wants to learn some class and do exercise.
Description	This is how students can learn courses and then do exercise..
Condition	1. The student has been register in the system and has username and password. 2. The student already in open session. 3. The student hasn't been blocked by the system.

	4. The student hasn't answered the class that he chooses.	
Trigger	The student goes to class page and click on a course.	
Flow	Person	System response
	1. The user wants to lean class.. 2. The student doing exercise after read slash class. 3. The user answers the question on the course.	1. The system display class page. 2. The system display article and question from the course. 3. The system validates the student information and authorization. 4. If the student had answered the course before then the system shows error about detailing problems.

3.2.4 Submit Data

This function is one of the most important functions, Is with this function the user can introduce information in the system, at the current stage of development this is just a file transferring function. As the development advances, more interesting and complex functionality should be developed and implemented, like real time data Transfer that mean when the school will post something all students can read it on the wall. Also when one student sends a message in the forum they other students should receive the information.

Table 2.3.4 User case of Submit Data

Use Name	Submit Data
Main Actor	Students and administrator
Person Interests	Submit data for analysis and persistence in the system.
Description	
Conditions	1. The user that enters the information after, is registered in the system. 2. The user is authenticated and a session is active.

Trigger	The user has gathered some data and Requested to upload in the system. Either by a using a manual system or using an automated process.	
Flow	Person	System
	1. A request to Send information is Made. 2. The data is Uploaded. 3. The user receives a report of the success of The upload.	1. The system prepares to receive The information. 2. The system receives the data, Stores it in the database. 3. The system triggers the data Processing module. 4. The system Executes data analysis. 5. A report is Generated. In case of an error on any step, the user will receive a warning or error message detailing the Problems.

3.2.5 Register

This is how will be added a new user in the system, some information should be enter for register and it should be valid especially the student number, because only school student can be register.

Table 2.3.5 Use case for register

Name	Register
Person	Students, Administrator
Description	It s the first thing a user should do before to get in the system.

Conditions	1. The user does not have yet an account. 2. The user should know information about how to operate the system.	
Trigger	Students or Administrator click on register here.	
Flow	Actor	System response
	1. The user clicks on register 2. The user provides information. 3. The user can now log in	1. The system displays the registration page 2. The system validates the given information 3. If the validation fails, the system will show an error message, but if it is successful, the Sign in page will be displayed.

Table shows how this function would be used. In reality it just simple insert function.

2.3.6 View Profile

This function is how the students can be able to see a information about them self, and it should retrieve information from the system then display it.

Table 2.3.6 Use case for View

Name	View Profile	
Person	Students	
Description	This will display the information personal about student.	
Person interest	A student want to see his profile	
Condition	1. The user already has an account in the system. 2. The user has been trained information about how to operate the system. 3. The user has logged in the application and a activity is open	
Trigger	The student logs in the application.	
Flow	Person	System
	1. the student click	1. The system

	on view	analyze the required information from the server and the persistent layer 2. The system displays the view results page
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This function only take information from the database and show it on the view page, should be performed on the server side. The student should only be used to display the information about himself.

2.3.7 Post Information

The post function is very important in this application. With this function the Administrator will save information about class in the table “ class information” and after the student connect to the application all information the table will be show at the page post. For information about activity extra-curricular it will be the same way, administrator will save information in the table “ activity” and it will be show to the student after his connect to the application.

Table 2.3.7 Use case Posting Information

Name	Post	
Person	Students, administrator	
Description	This function will informed student about what happened in the school.	
Condition	1. The student should have a account in the system. 2. The student should be connected to internet. 3.first the administrator should put information in the databse	
Trigger	The student logs in the application	
Flow	Student	administrator
	Student should log	Student will receive information only after, the administrator put some information in the database

3.2.8 Send position

This function will use GPS to give to the student his position, the goal is ,when the student his near to a important place like a shop or a class building , he will receive a message that have the name of the place.

Table 2.3.8 Use case Send Location

Name	Send location
Person	Students
Description	This will use GPS to show to the student his location , when the student will be near a school building ,the application will send him the name of this building
Condition	1. The student should have an account in the system. 2. The student should be connected to internet.
Trigger	The student logs in the application
Flow	1.a message will be send to the student. 2.he can open the message and read it.

2.3.9 Forum

I build a forum to make students to communicate more between them, it will be a friendly and funny place for student to send to each other message, or to ask about some information if they need a help.

Table 2.3.9 use case for forum

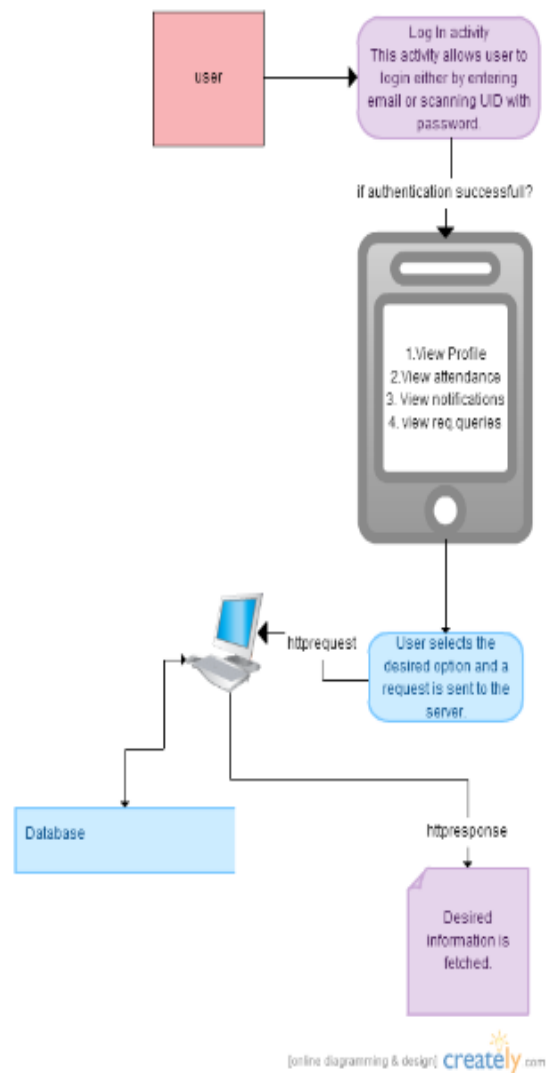
Name	forum
Person	Students
Description	It will look like a room chat between students, they can ask any questions, and they can receive the answer in real time.
Condition	1.the student should have a account in the system. 2.The student should be connected to internet.
Trigger	The student logs in the application
Flow	1. student can send a message 2. the message will be receive to all student who are online.

2.4 Dataflow model

The Dataflow programming model is designed to simplify the mechanics of large-scale data processing. When you program with a Dataflow SDK, you are essentially creating a data processing job to be executed by one of the Cloud Dataflow runner services. This model lets you concentrate on the logical composition of your data processing job, rather than the physical orchestration of parallel processing. You can focus on what you need your job to do instead of exactly how that job gets executed. The Dataflow model provides a number of useful abstractions that insulate you from low-level details of distributed processing, such as coordinating individual workers, shading data sets, and other such tasks. These low-level details are fully managed for you by Cloud Dataflow's runner services.

To understanding how the data flows with the android application will provide a general idea about how the data is processed. This application is a tool designed to process and analyze data, therefore on each step a copy of the generated or extracted information is stored in one of the different.

Figure 2-3 shows how the data will flow inside of the system. The data is introduced in the system via the Data Submission, after the module receives this data in binary form it will forward it to the Data Processing module while keeping a copy in the HDFS storage. The Data Processing module will extract all the relevant information from this data and then discard it, the information extracted is then kept in memory for the Data Analysis module and a copy will be kept in the database. The Data Analysis will perform some calculations and computations with this information and then store the results of these operations in the corresponding data storage, either MySQL. Once this process has been completed the data will be removed from memory and a report will be created from the results. This report can be stored in the data storage for later reference, in future stages this report will be dynamically generated on demand.



<http://createely.com/diagram/example/hh664ckq2/android%20app>

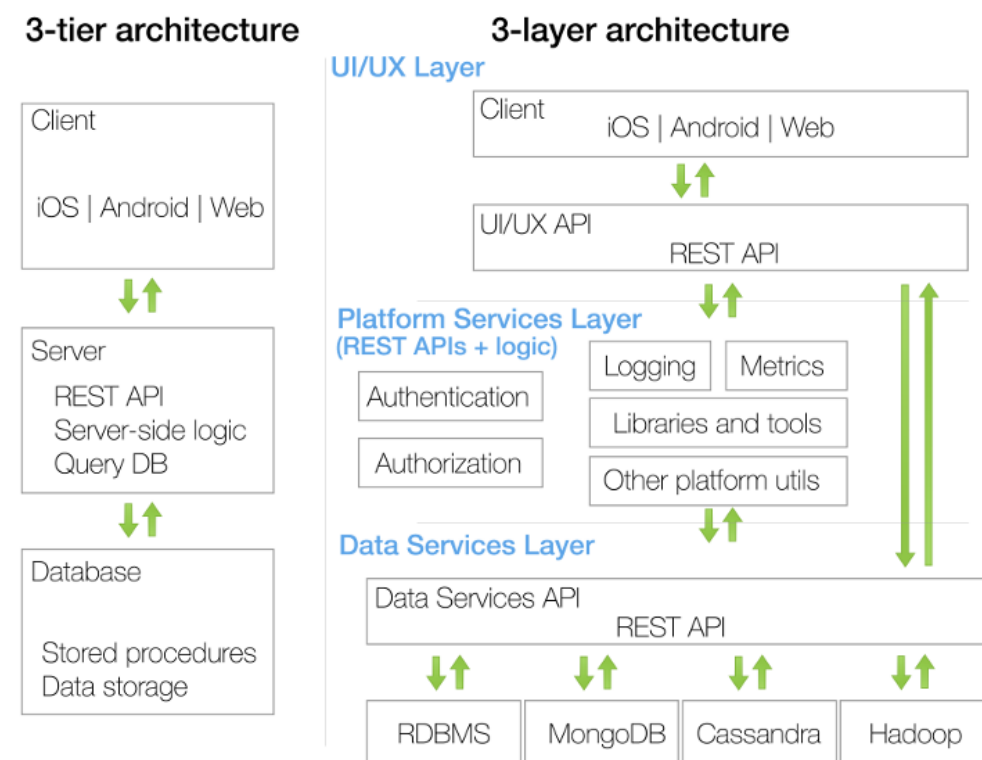
Figure 2.4 Flow of data in the system

3. Design

3.1 Architecture

The architecture technologies will use here are 3-tier

Architecture, that we can update or modify requires between the different modules.



<http://exponential.io/blog/2015/03/05/3-layer-architecture-in-detail/>

Figure 3.1 3-tier architecture

3.1.1 Layers

The system will be separated as follows:

- **The User Layer: this layer** will provide to the users an easy and simple way to interact with the application. And the entire page will be developed on android studio.
- **The Application Layer: this layer** is where the requests from the clients will be handled as well as all the computations executed. After This layer retrieve data and information from the Data Layer by including the functionality that

retrieves deletes and modifies the information stored in them.

- **The Data Layer: This layer** will stored all the data, this layer is composed of the three storage required, as mentioned in section 2.3. The biggest advantage of this separation is that any of the three components can be changed without affecting the others. So a new interface can be created without having to modify the data.

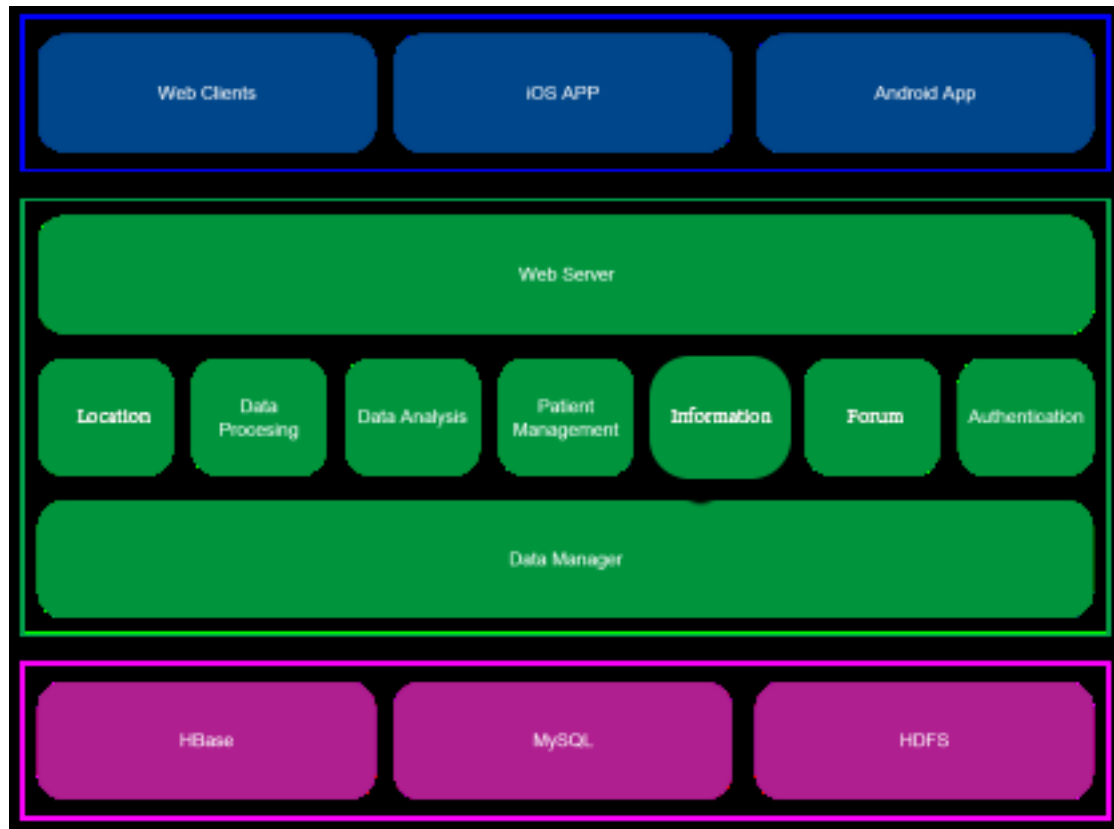


Figure 3.1.1 Architectural Overview

3.1.2 Interfaces

The different layers will communicate using the following interfaces:

Web Server: The web server will use the local host to transfer information between the User Layer (User interface) and Application Layer. All the information will be performed on the server side, only final results will be sent to the client for display. The Web Server will be hosted on Apache Tomcat.

Data Manager: This interface will connect the Application Layer with the Data Layer. The Data Manager is responsible of all the data manipulation operations in all the three databases.

3.1.3 Components

The client side which contains an android application. The application server will be wamp server will contains the php code and the MySQL database. The php code will make connection between the android application and the database.

The application will connect to some school application that already exists.

3.2 Software Modules

In accordance with the functional requirements from section 3.2, modules will be created. A detailed explanation of how these modules are composed will be given in this section. The idea with this section is to give a clear view of the structure of the application, the functions provided by these modules and also the way in which they interact with each other .

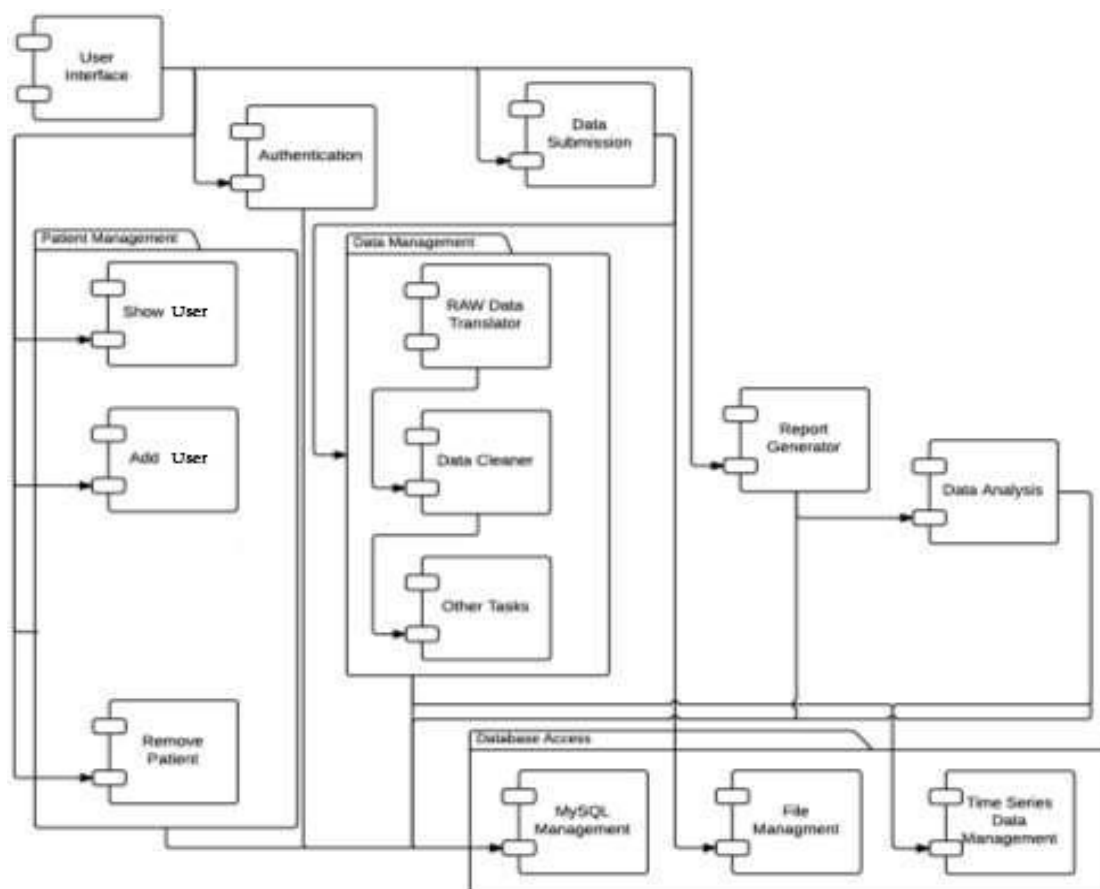
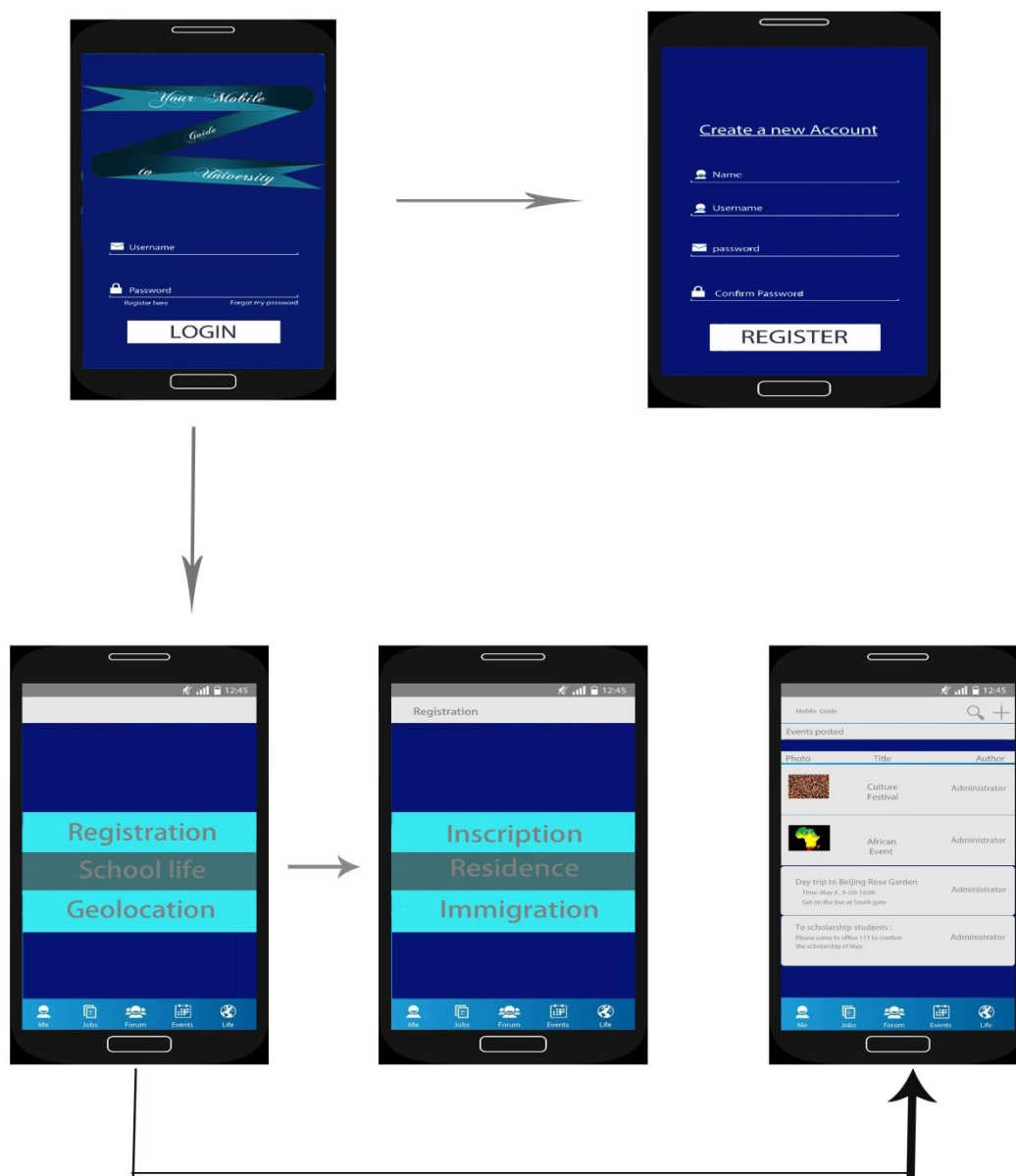


Figure3.2 Modules Relation

The user interface is the first way for the users to interact with the application, it give a way to use the other modules either directly or indirectly. each modules offer different functions ranging from importing data into the system to analyzing, retrieving and storing data or just consulting.

3.3.1 User Interface



3.3.1 User interface

The user interface using a android application page. Currently this is a simple application but as more functionality and requirements are added to the project it will grow in size and complexity.

- Log In

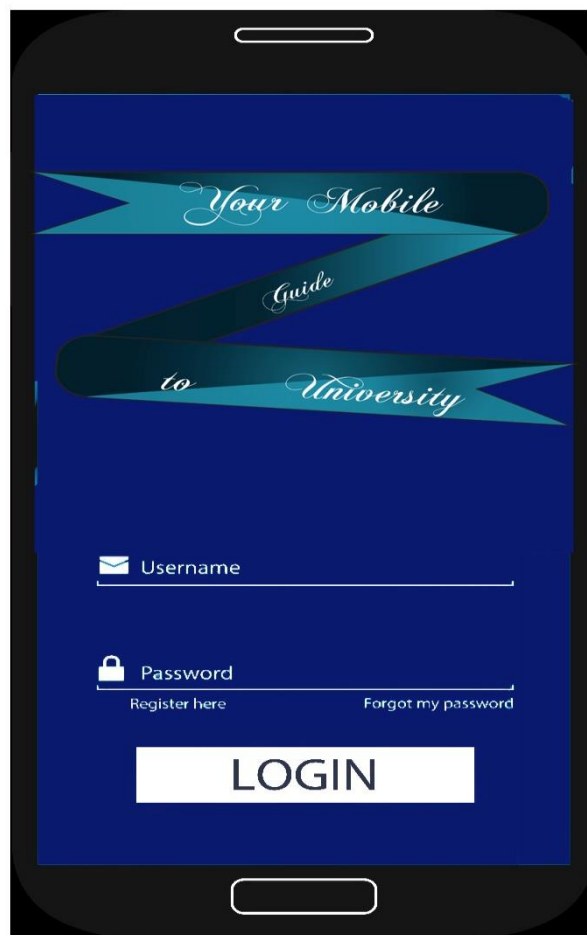


Figure 3.3.1-2 Log in screen design

This page is the first page the user can see, if the user already have a account , he just need to put his username and password and the click on logging ,but if is the first time and he doesn't have yet a account the user should click on register here then the register page will be show to him.

Click on:

- Register here will display the Create New Account page
- Sign in will verify the log in information and log the user in if the information is correct.

➤ Identification Activity Diagram

The identification activity diagram will show the flow of the students use the application. In this figure we can see how the student interacts with the application. They should register first if the username already exists, the system will redirect student to re-enter a new username.

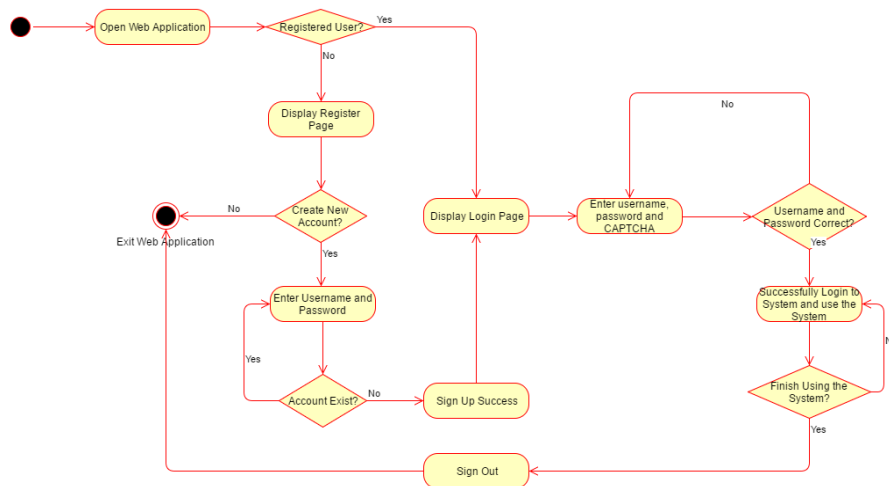


Figure 3.3.1-3 Identification Activity Diagram

➤ Identification Sequence Diagram

This part will show us the sequence between the user and the identification module. It will also show the interaction of student and register, sign in and also sign out.

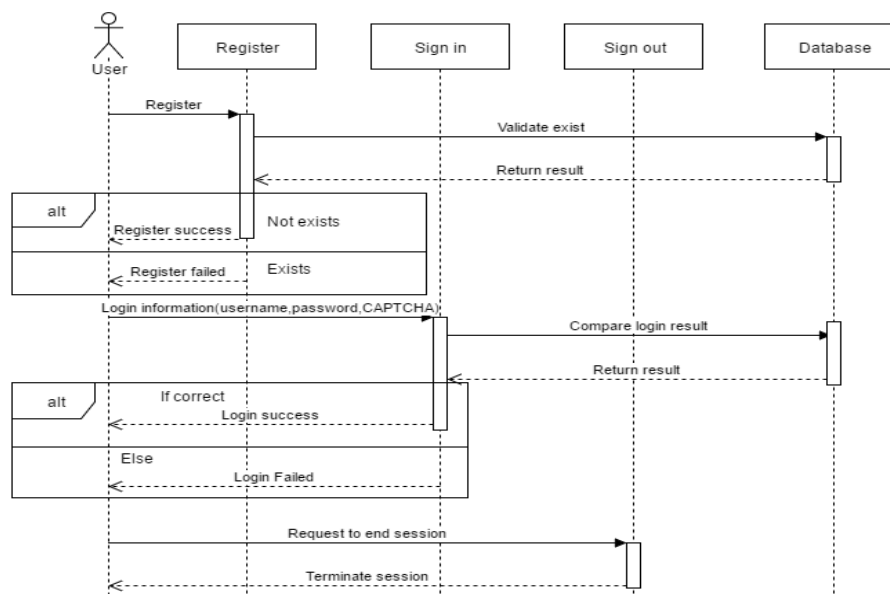


Figure 3.3.1-4 identification Sequence diagram

- Create New Account

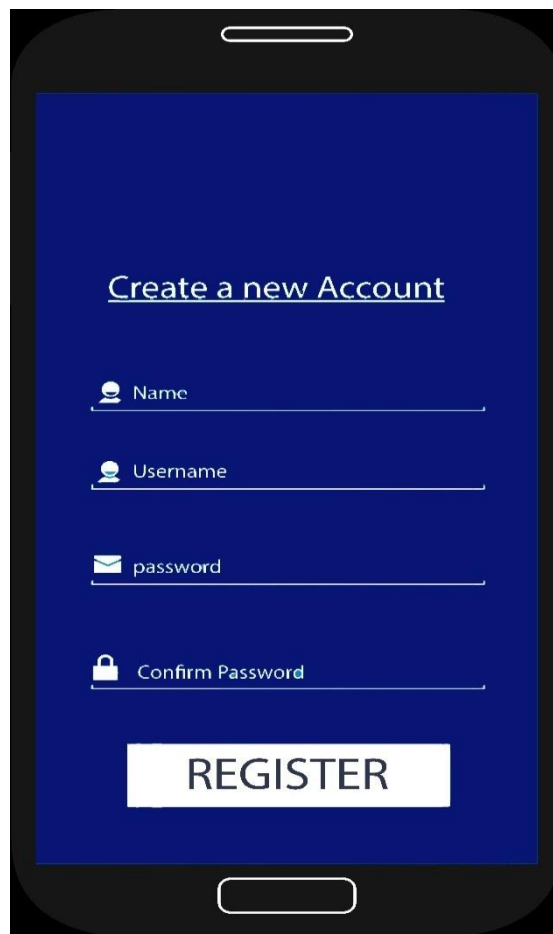


Figure 3.3.1-5 Create New Account

This page will show when a user is being registering in the system, wither by a third-party of the user by itself.

Click on:

- logging will discard the information and return to the Log in page
- Register here will validate the information and update the database.

The extra room on the left of the page next to the form can be used to display useful information like instructions about how to register, list features and benefits of the system or health tips for patients and visitors. Data validation is required in this form as it contains important information that must be verified and correct.

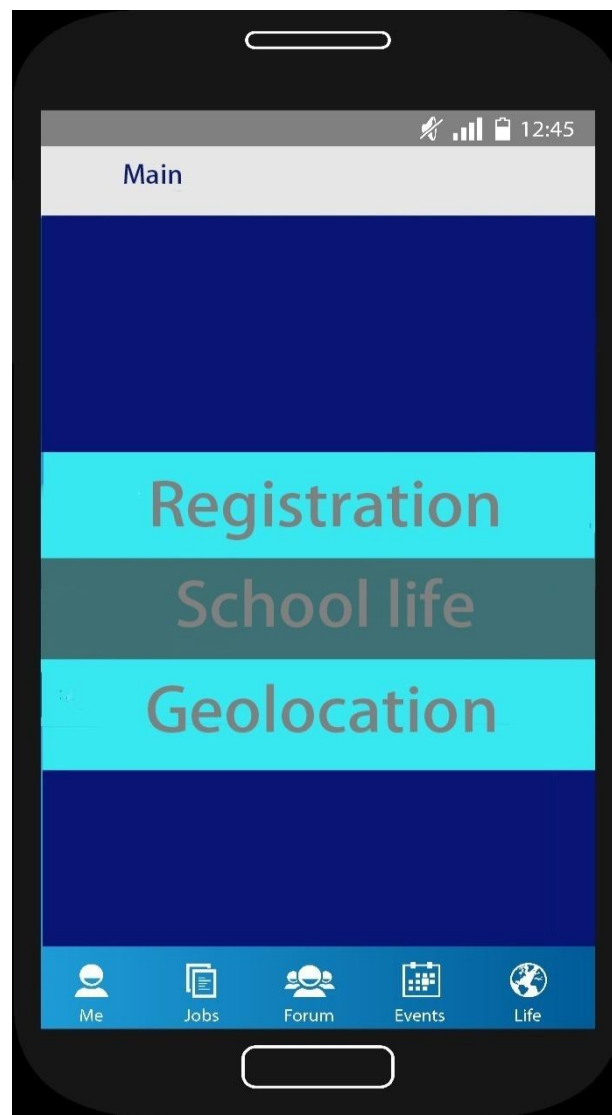


Figure 3.3.1-6 Main

3.3.2 Data Submission

All the information give by user must be introduced in to the database and also information about posting that give by the administrator. This should be done in different ways, for example uploading a binary file with all the information or just a fraction of it. In later stages support for information to be introduced in real time must be implemented. This module should include the following function:

InsertData: the data that will be inserted in the system to be in the appropriate format. When this function is called the data should be stored in original binary form in the HDFS file system on the cluster. If there is an error during validation or when introducing the information in the database an appropriate error message should be displayed.

3.3.3 Teaching

This part will give activity for class, from learning, exercise and score. This list it depends on which class the administrator put in the application

The figure 3.3.3 shows us the general interface for choose class, doing exercise and also get the score.

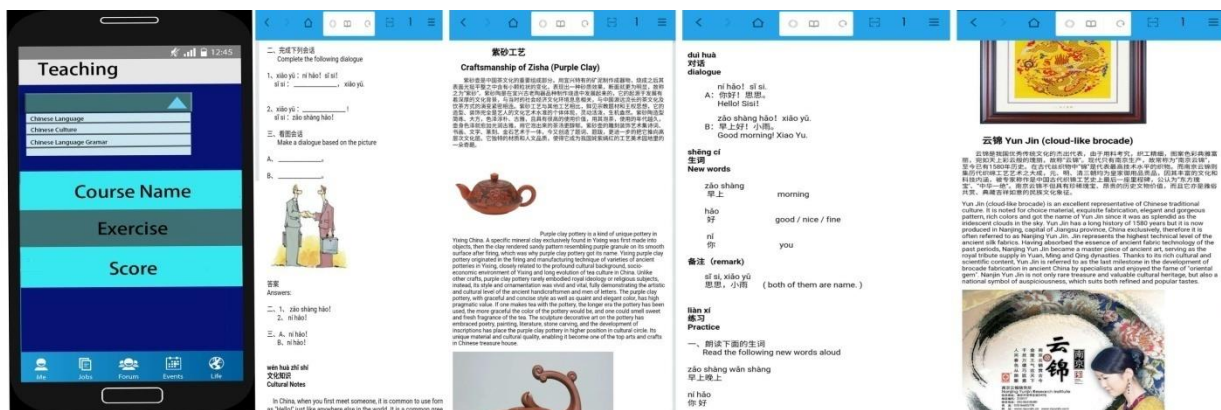
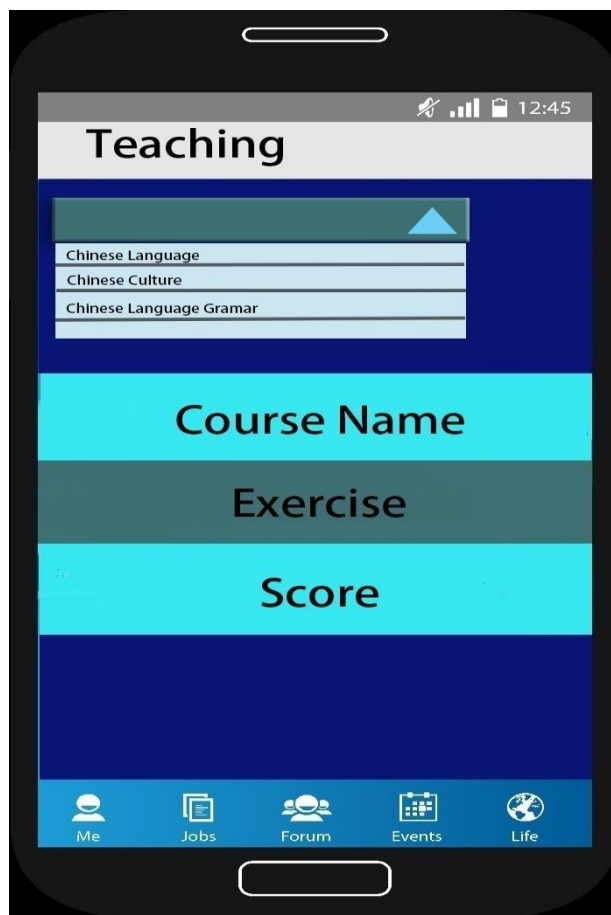


Figure 3.3.3 Teaching Interface

➤ Teaching Activity Diagram

Teaching function will include all activity that corresponding to teaching. From choose class, do homework, get scorer and also view result.

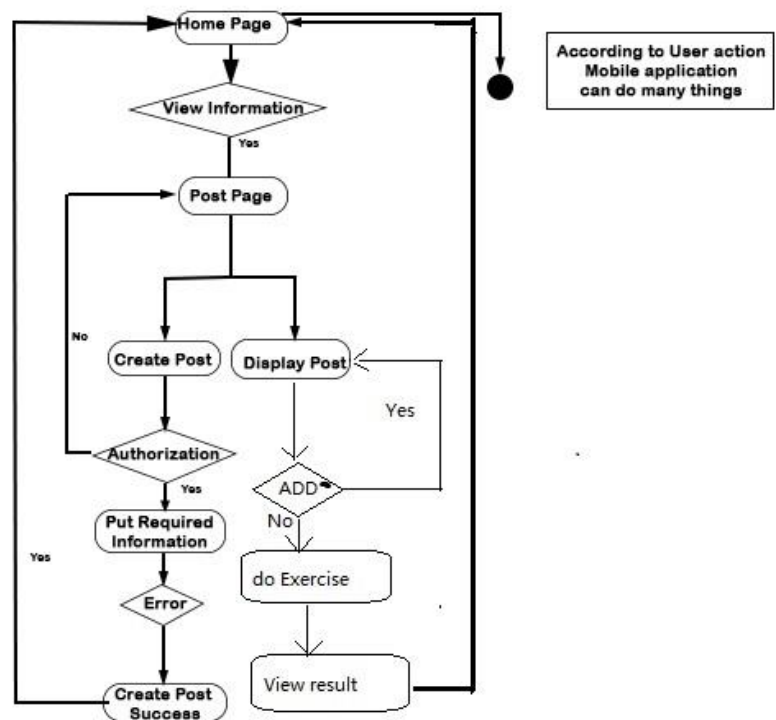


Figure 3.3.3-1 Teaching Activity Diagram

➤ Teaching Sequence Diagram

In the figure 3.3.3-2 we can see each part of Teaching function. The process will be about choose class, doing homework (exercise), get the score.

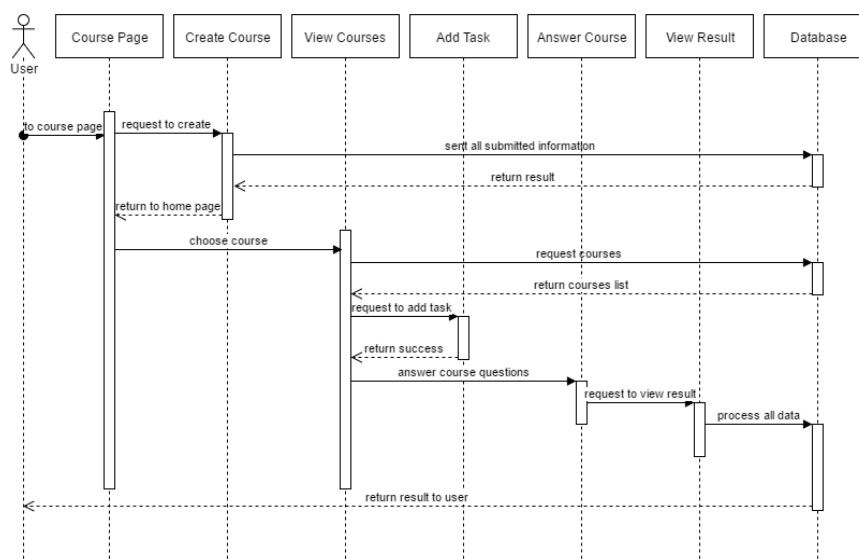


Figure 3.3.3-2 Teaching Sequence Diagram

3.3.4 Information Management

This Information module has many parts, the interactive part and no interactive part. This part is a guide for student that can let them to save time, to be informed, to be oriented.

➤ No Interactive

Here we have all modules that the user will just check; those pages give simple but important information to the students.

- **Registration:** this page show to student who came for the first time at JiaoTong University, how and where to go to register. For example each international student should go to building 14 AND room 119 for registration, the student should present to the teacher his certificate notice and then after than the teacher can put his personal information in the school system, and from this he became a BEIJING JIAOTONG University student. After the registration the next step is the registration for the visa.
- **Immigration:** because each foreigner in china should have a visa, this part is very important to foreigner, so after registration the student should go to room 111 to get a school paper to prove he/her student in Beijing jiaotong university and after get the paper he/her should to the immigration office at guoloudajie on line 2 to get his visa. The student can also let the school bring his passport at the immigration office but in this case, supplementary money will be given by the student to the school.



Figure 3.3.4-1Registration

➤ Interactive

This part is one of the most important part of the application, this part make the application more useful and more interesting, here the information is not static that mean the student can receive the information on real time and also get the information he need when he want , in this part we have:

- **Residence:** this page will show to student the empty dormitory , so after his inscription he can check the application and chose the room he want, if someone already took the room it show him that too (who take it and where his from). Many international student face room problem, sometime because of the different culture, different language between him and his roommate. So to avoid that kind of problem this application can be used by every student to know with who he will live.
- **Class availability :** The function have the same role than residence , but now it's about class, if they want the empty class to go to work he can just check on the application which class is empty The school already have this kind of software ,so this application will just connect to the school website . I will create an HTTP request that will connect to the school website.
- **Forum:** this part will give to student opportunity to communicate between them,

the school build an application on WECHAT that the student can communicate but this application is all in Chinese and many foreigners don't speak Chinese or even if they can speak, their Chinese level is not high enough to communicate on the forum.

- **School Activity:** In school activity the student will receive the information about school activity. The administrator who is the school will put this information about activity in the table activity and when the student connects to the application all the information in the table activity will be show in at the school activity page.

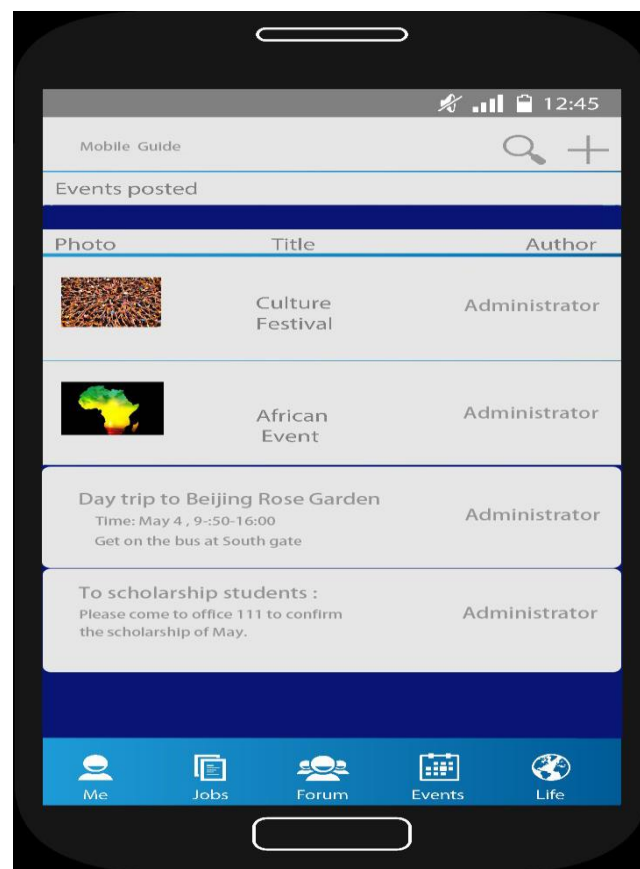


Figure 3.3.4-2 Post

- **Geolocation:** In this page the school map will be show, so when a student is near to one building, he will receive a message that will tell him the building name or show him a shop is near. This function will more develop in the part 3.3.5

➤ Post Activity Diagram

Information management will include any kind of activity about posting

information. In figure 3.3.4-3 we can see the activity that user will get in Information management. Only the admin can post information in the system, the student are not allow to post information.

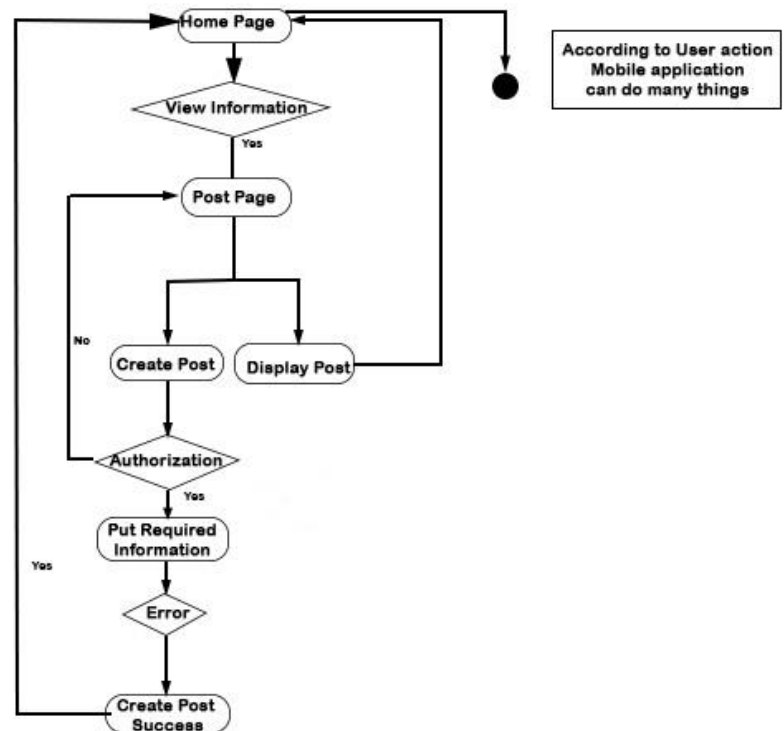


Figure 3.3.4-3 Post Activity Diagram

3.3.5 Location

➤ Sending GPS Coordinates to a Server Using Mobile Data Communication

On the application the students can get the coordinates (position) from its GPS page. The position must contain:

1. User Id
2. Time
3. Longitude coordinates
4. Latitude coordinate
5. Place name.

Then the GPS records the position under the current user id. If no position record is created or the user Id does not exists; the system gives an error message, and do not record the position.

➤ Following Users in Real Time

Any student who login in the application can be located and the localization will be in real time, so the student can see his position and the name of the place in the page location.

3.3.5 Communication between modules

- The client makes a request using a HTTP POST to a server
- The PHP script queries the MYSQL server
- The PHP script gets the SQL data
- The PHP script puts the data into an array and assigns keys for the values. The script then outputs the data as a JSON array. [JSON \(JavaScript Object Notation\)](#) is a standard for data exchange, and formats the data in a way both humans and computers can easily read.
- The app parses the JSON and displays the data.
- And for the localization part the application will use GPRS/GSM, vMy idea is to implement a SMS communication in the future within the communication nodes

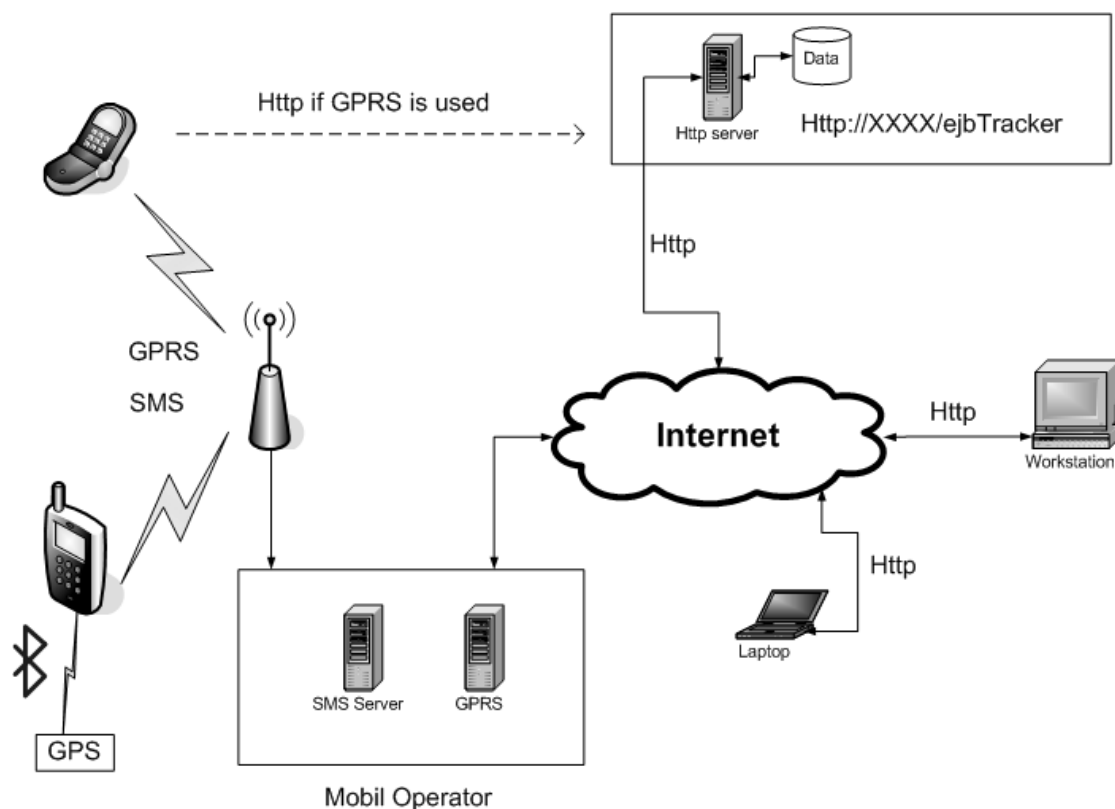


Figure 3.5 Communication between modules.

3.3 Database Design

3.3.1 Entity relationship

At that stage of the development of the application, we have a limited number of entities in consideration. This is reflected in Figure 3.4 Entity relationship, which shows the relation between some of the entities on the platform. The student can post many message in the forum. The administrator will post information from activity class and activity school, all this data will then be introduced in the system in binary form, for now this is a file that is uploaded into the system, in later stages as development increases a different approach might be needed. This file is processed using different methodologies and techniques to extract the relevant data and information. Once this data is available a set of operations will be performed so that results can be obtained.

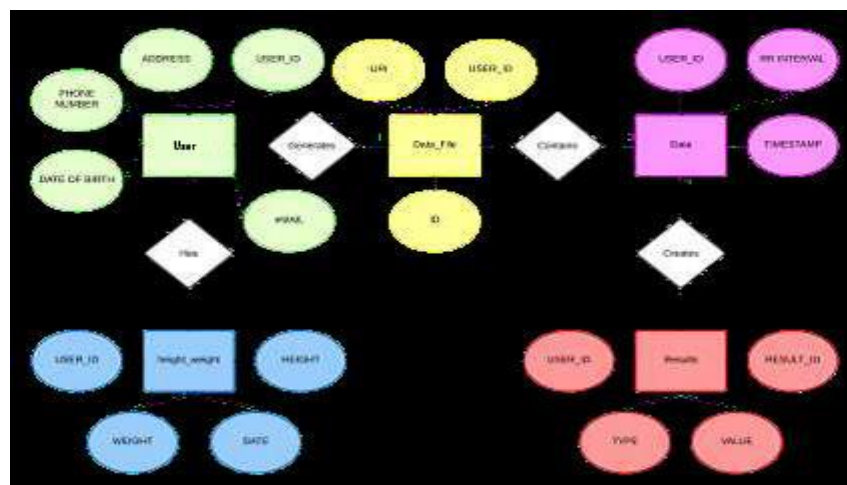


Figure 3.3.1-1 Entity relationship

The student can also generate other data that can be manually introduced in the system by administrator or themselves HBase is a non-relational database, the previous diagram is only meant to help the reader create a mind image of how the different entities are related to each other.

3.3.2 Logical database requirements

The DataBase will be deployed on MySQL who is an open sours relational database management system (RDBMS). MySQL is one of the most popular software of

database for use in mobile applications is alsoio9 a central component of the widely used LAMP open-source web application software stack (and other "AMP" stacks).

The interface I'm using is PhpMyAdmin who is a free and open source tool written in PHP intended to handle the administration of MySQL with the use of a web browser. It can perform various tasks such as creating, modifying or deleting databases, tables, fields or rows; executing SQL statements; or managing users and permissions. The software which is available in 78 languages is maintained by *the phpMyAdmin Project*. It can import data from CSV and SQL, and transform stored data into any format using a set of predefined functions, like displaying BLOB-data as images or download-links.

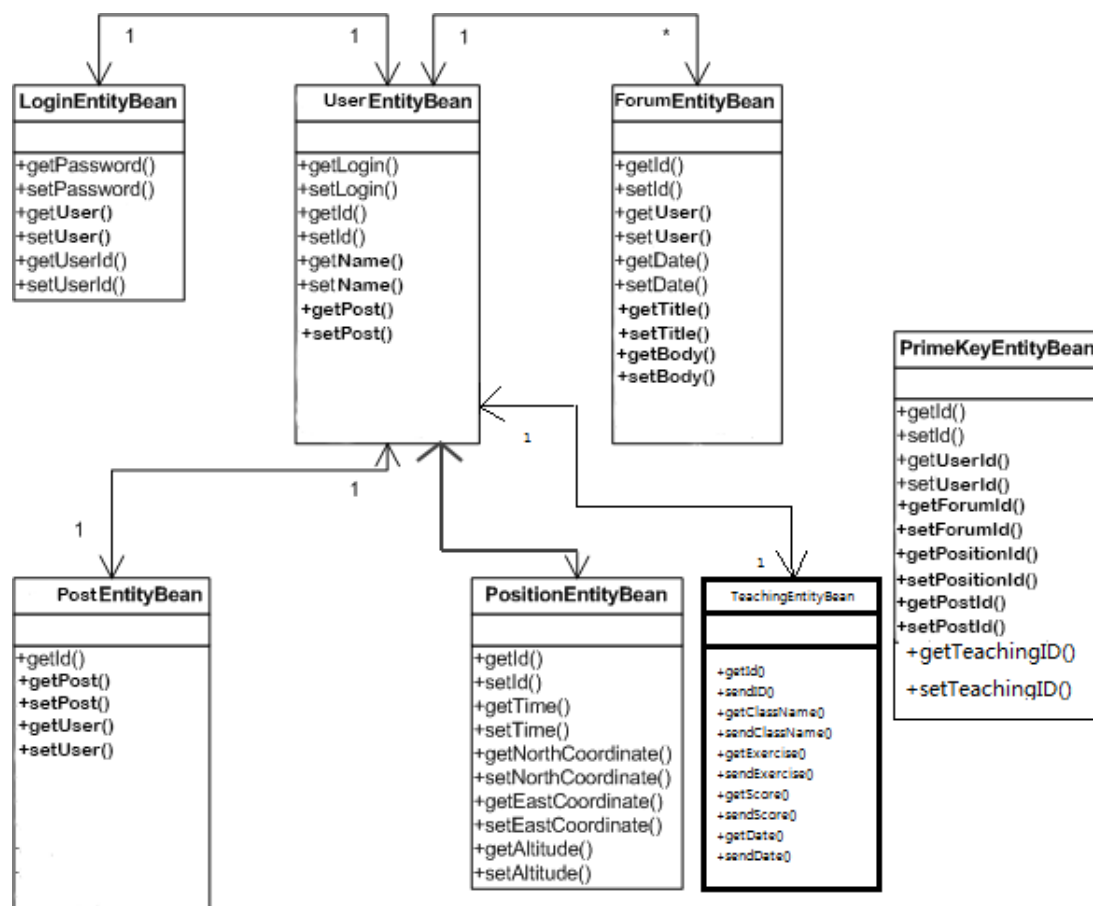


Figure 3.3.2 Logical ERD

3.3.3 Task distribution

The flow of data and the processes on this project are completely linear. That's means something comes in and something else comes out at the end, with some other things coming out in the middle, in a very linear way. This carries the inconvenience that if several different sets of data must be processed a queue must be in place. but if for example if there are one thousand sets of data it will take around two hours to be processed, making it unsustainable for a single computer to run all these tasks. Remember that this platform is aimed at a massive amount of information.

To solve it, more activity should be running simultaneously. Using multiple threads is the more simple way to solve this issue, but it makes code more complicated and hard to maintain and expand, also the number of simultaneous threads is limited by the hardware. Using a super computer with several dozen or more CPUs can help overcome the issue of the hardware limitation, but it is a very expensive solution and the code would still be hard to maintain and expand. This is where spark comes into play. Apache Spark is an in memory; open-source cluster computing framework. By using the memory of the cluster Spark allows the applications to query data faster and repeatedly, allowing better performance. Spark also offers support for machine learning making it a useful tool for the future implementation and integration of future algorithms. Spark will allow several processes to be executed at the same time in the cluster taking advantage of the large number of CPUs and the capability to execute multiple threads in every one of them.

Spark is an efficient way to process and analyze several datasets concurrently. This approach comes with some issues of its own; for example the data replication feature might induce computation of the same dataset twice or more times but also comes with great benefits like lower cost than a supercomputer because of the ability to use Commodity hardware to build a cluster or use a cloud based platform like AWS to deploy the system and the use of map reduce methodologies to better distribute tasks while providing redundancy and fault tolerance. In the first stage of development, only map is used to execute the same operations on the different datasets simultaneously regardless of the data size. This approach might be more effective for small datasets or real-time data processing and in later stages both map and reduce should be apply to larger datasets.

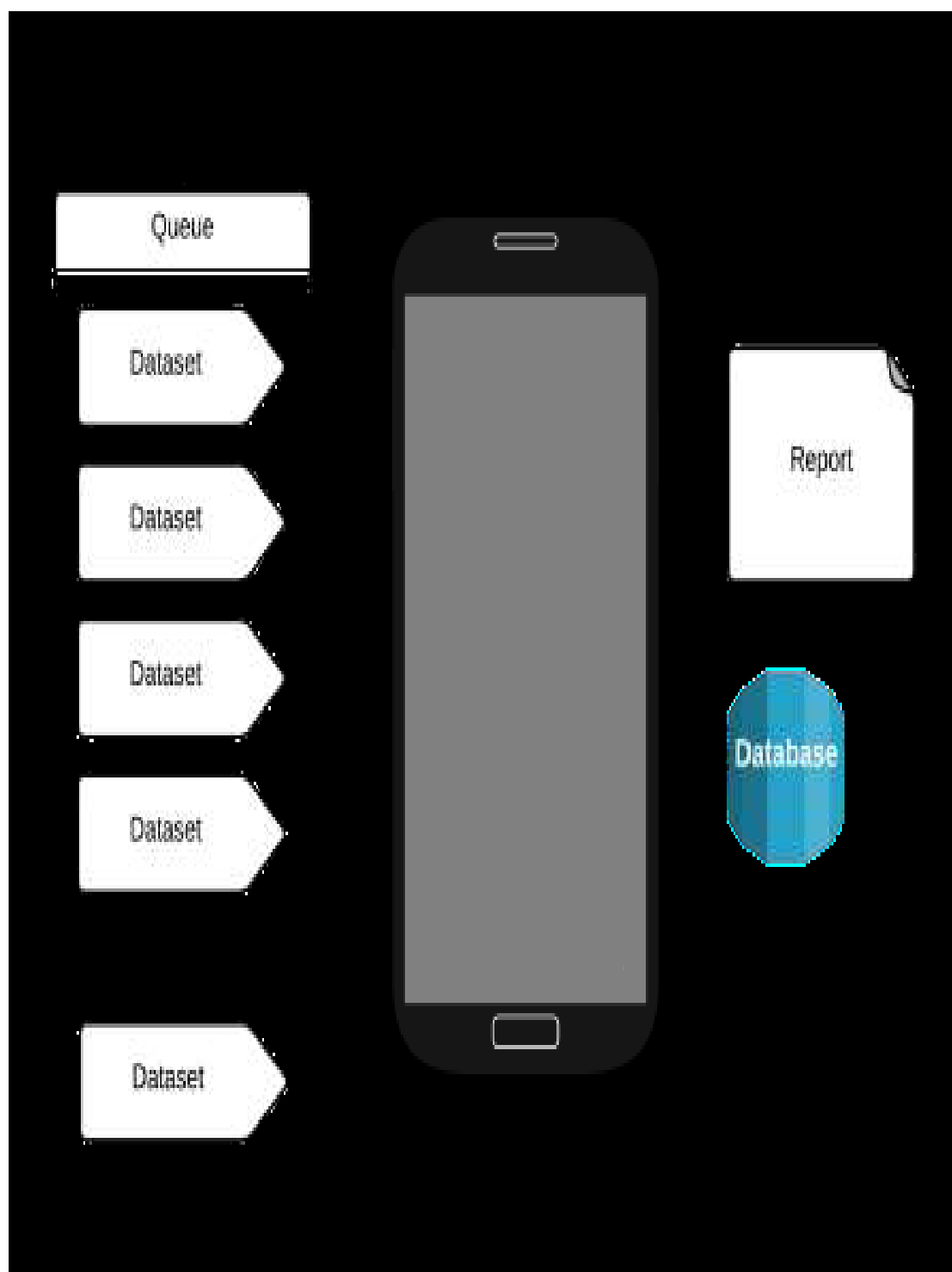


Figure 3.3.3.1 Task distribution one user

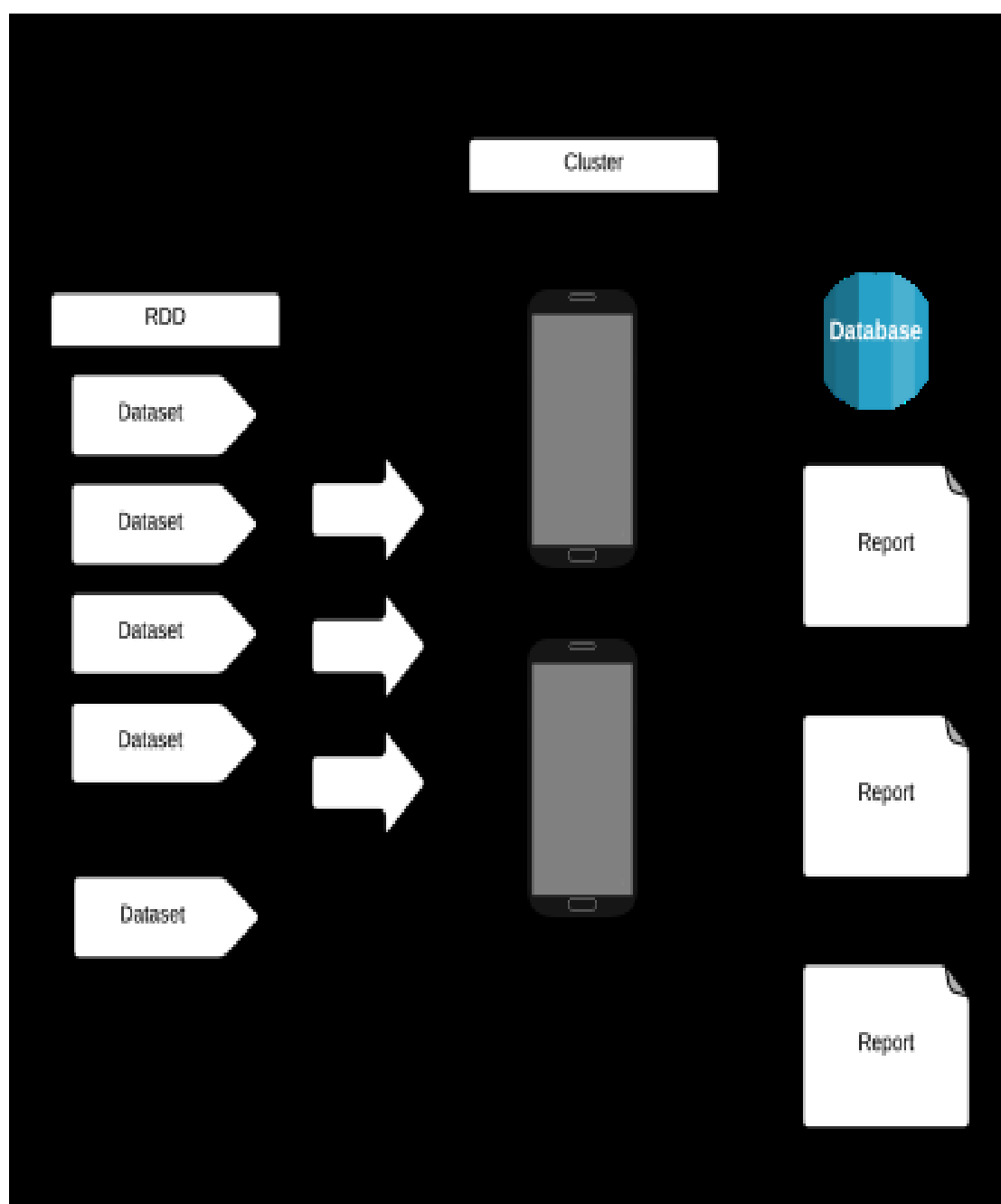


Figure 3.3.3.2 Task distribution multi users

4. Implementation and Testing

Software testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. The application mobile will be subjected to a series of field trials and functional testing where various test cases will be performed to validate the different features of the platform. The methodology used in the testing process is described in **Figure 4** below.

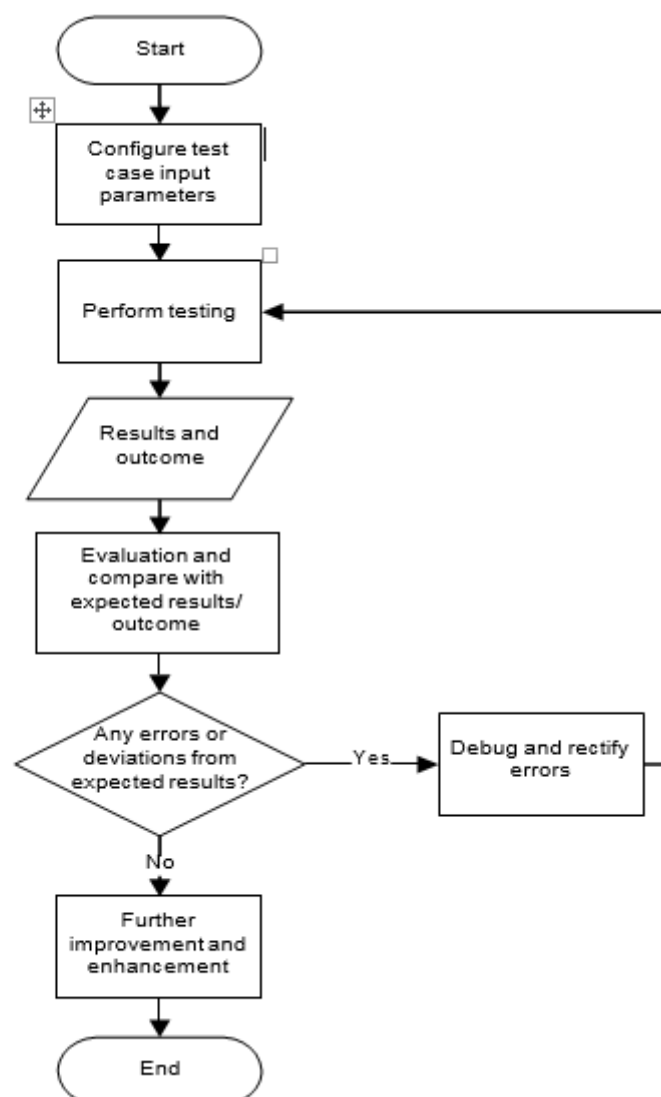


Figure 4 Functional Testing Methodologies

A few test cases and those test cases have the same logic than the use case in part “**2.2 use Cases**” it will be defined and tested where the collated results will be verified and

compared with the expected results. If there are any errors or deviations from the expected results, the program will be analyzed to rectify. This testing cycle will be repeated until all the problems have been resolved. Thereafter evaluation will be performed to further enhance and improve the system to deliver the best mobile application.

4.1 Unit Testing

Unit testing is the method by which individual units of source code and sets of one or more computer program modules together with associated control data. Usage procedures, operating procedures are tested to determine if they are fit for use.

4.1.1 Test Strategies

Features to be tested:

1. Module which register student
2. Module which posting information
3. Module which send positions
4. Module which Teaching

4.1.2 Test Case

No of test case:	1
Name Of test:	Register student
Feature being tested:	Whether system is able to create student account
Sample input:	Allowing student to Register on providing specified constraints
Expected output:	User account should created
Actual output:	User created successfully
Remark:	Module is working properly.

No of test case:	2
Name Of test:	Post information
Feature being tested:	The administrator is able to post information
Sample input:	The module get the information that the administrator put.

Expected output:	The student can see the information that the administrator put.
Actual output:	post successfully
Remark:	Module is working properly.

No of test case:	3
Name Of test:	Sending location
Feature being tested:	Whether the system is able to send GPS coordinates and the name place
Sample input:	Module get position and sent it to the server
Expected output:	Module send location to server
Actual output:	Position was sent properly
Remark:	Module is working properly.

No of test case:	4
Name Of test:	Teaching
Feature being tested:	Able to create class by administrator and save it in the database.
Sample input:	The admin will put class topic.
Expected output:	The students can choose class and also exercise
Actual output:	class was show properly
Remark:	Module is working properly.

4.2 Integration Testing

Integration testing is the part in software testing that each individual software modules are combine and test as a group.

4.2.1 Test Strategies

Features to be tested:

1. Login

4.2.2 Test Case:

No of test case:	1
Name Of test:	login
Feature being tested:	Whether the system login properly with user id
Sample input:	User put username and password for login
Expected output:	User should be logged in
Actual output:	User can use all the application functionality.
Remark:	Module is working properly.

To make the mobile application structure better, the system will also get those module:

- The <connection> class; it content the module and protocol to connect to the web server.
- <ActionBar>, that content the user parameter (for example login)
- <Post>, content the module that the administrator can add or delete some post. It also can give to the student his position using GPS.
- <ServerRequests> content the service that can send data to the server.

4.3 Class Diagram

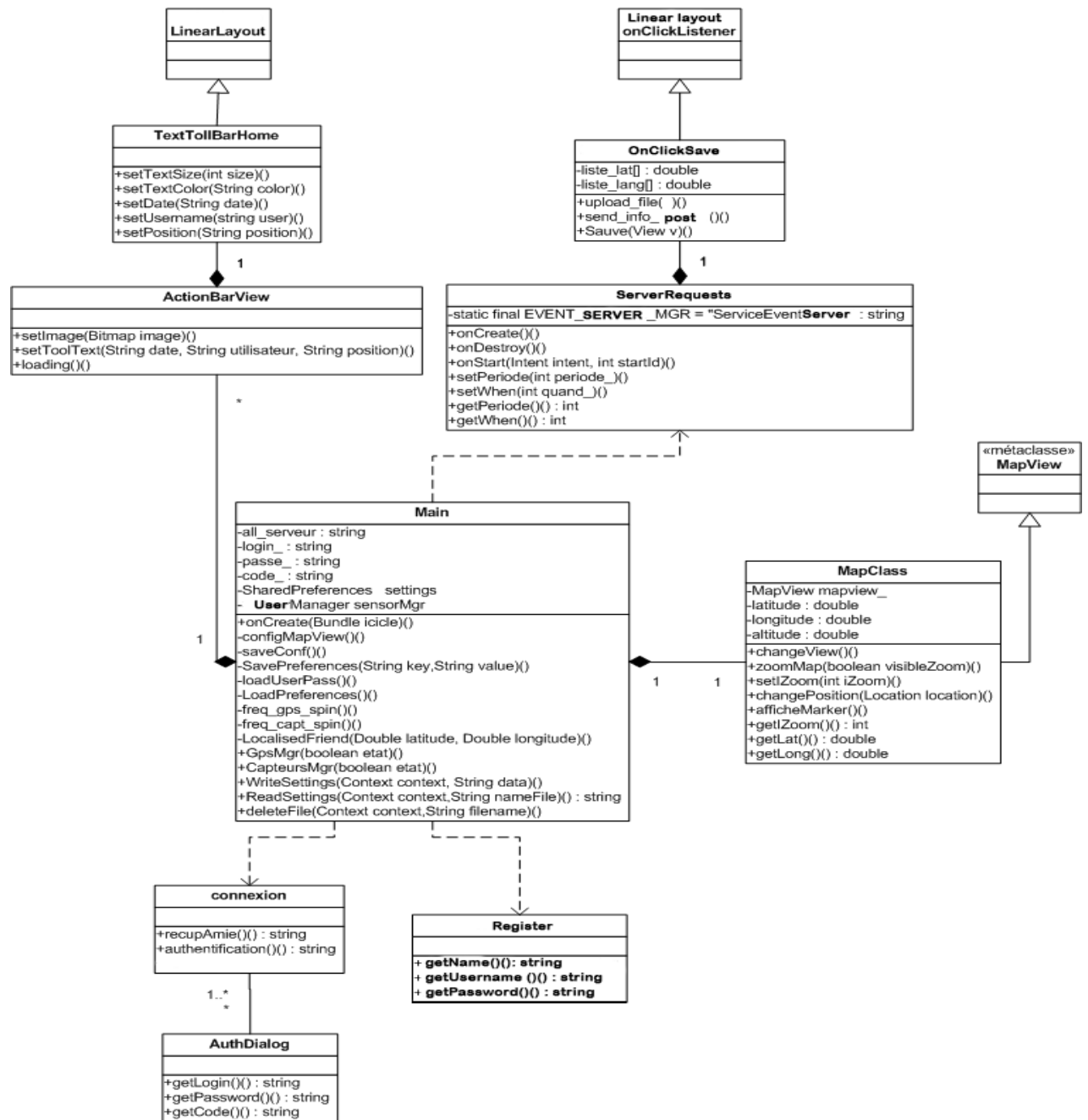


Figure 4-1 class Diagram

Known Problems

Here is a list of the most severe problems I meet:

- I had one serious database corruption due to external access and manual unlock of tables.
- My first idea is to make my database on SqlServer but I face a lot of problem to connect the data base and the android app, now I'm using Mysql who is more convenient.

- I had problem to update the android SDK, because android SDK connect to Google and sometime my VPN wasn't it took some days to make it.

5. PRELIMINARY Research

5.1 Analysis of the existing

Like many Universities in china Beijing JIAOTONG University have some platform to inform, to guide student, like the school web site, the school email, the school Wechat account.

5.2 Critical of existing

The platform using by the school is good but I think is not enough and someone have some limit. Many students even don't know some platform existed, and the one they know sometime I don't know how to use it or is not convenient for them to use it. For example:

- The school wechat is all in Chinese, it kind of difficult to many foreigners to use it, and even for some foreigners who can speak Chinese, they can use it a little bit, but most of them don't that platform existed.





我校代表团应邀访问非洲三国

来源：学校办、国际处 作者：学校办、国际处

2016年4月10日至19日，校长宁滨应邀率我校代表团赴肯尼亚、埃及和阿尔及利亚三国访问。代表团此行与三国的有关高校、政府机构和有关企业及中资企业进行了会谈，并签署了合作协议。此次出访提升了我校与非洲高校合作的层次与水平，探索了国际产学合作人才培养的模式。出访达到了预期目的，取得了一系列成果。



Figure 4.2-1 School officials WECHAT Account.

This is Beijing JiaoTong University international office account on wechat, We can see all the page is on Chinese, for new students study Chinese or even those who can speak is complicate to understand all the information.

- The another problem is not everyday everyone open his email so some kind of important information can maybe not read at the right moment.
- Not all students who are living in the school, for those student is more complicate to use school web site or school email because of the school parameter security.
- Many new students get lose in the school because they don't have I guide platform. And also because almost everything is write in Chinese
- This platform has a forum account, but the forum is in Chinese that mean not all foreigner students can dare to go there.

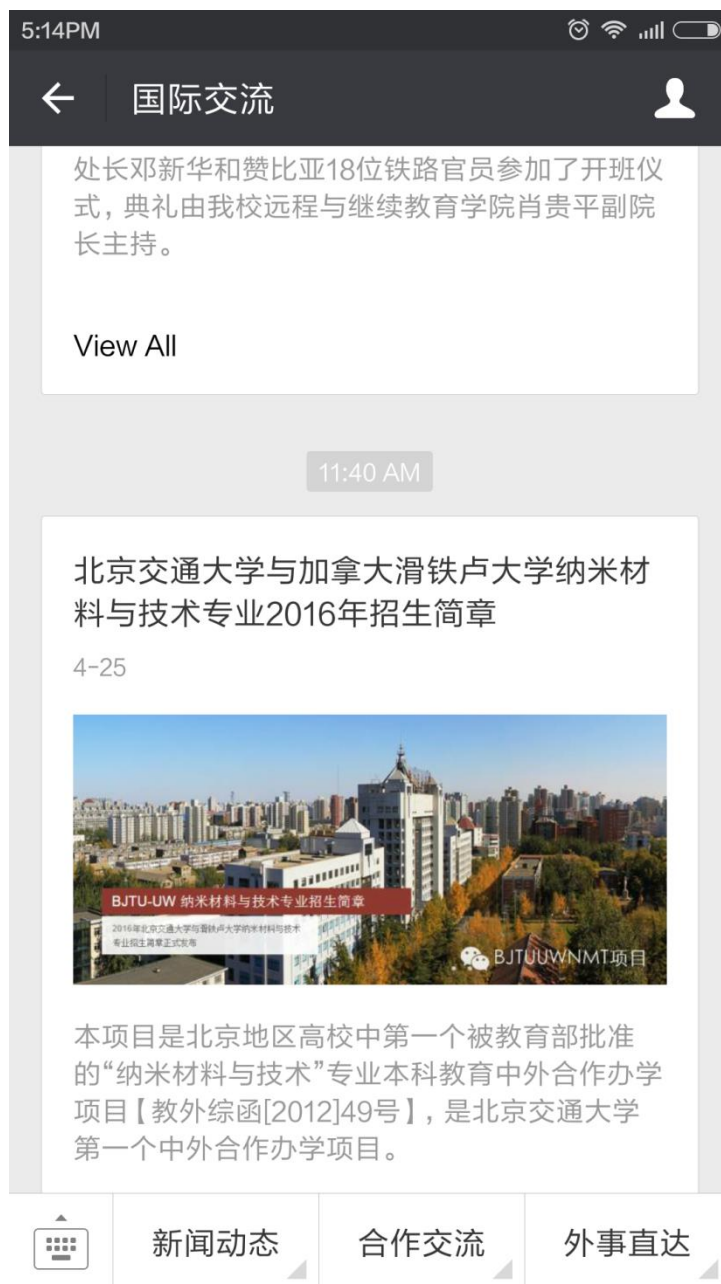


Figure 4.2-2 International office WECHAT Account.

5.3 Proposed solution

A platform for student should concern all students, new students or not new one. And now in Beijing JIAOTONG University students from foreign country are more and more munch, so to make them more integrated in there University It s important to make a intelligent and useful software that everybody can use at any time.

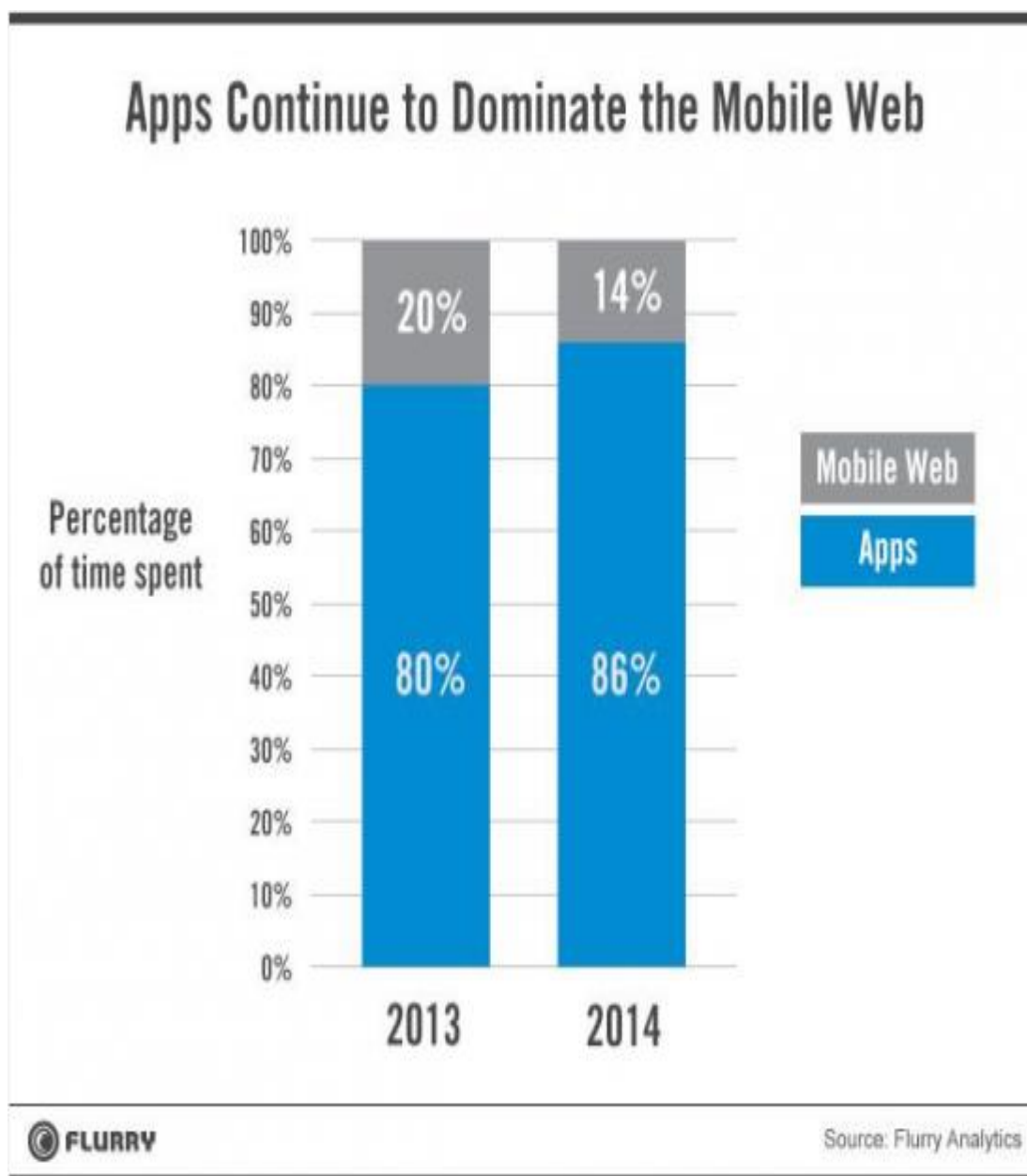
Envisioned benefits are the application is faster and more practical especially in the provision of the needed information. For example last

semester the school organized an extra-curricular activity to visit the Great Wall. Many students who wanted to participate in it failed to do so since the latter did not read their emails on time. With the project mobile application the students are expected to be informed on time as it is comprehensive useful software they will have on their mobile devices. This application will be:

- Will not just be an android platform to inform students, it will also be a mobile guide that can offer service to students.
- More easy to use for all students
- It will be very useful, because of many some interactive function like, get his position and also the near shop or class building, also every student who want go to student in a empty class room can from his dormitory check which class room is free. The students will also receive information about school activity or class in real time, that mean when the school posts the information the students will receive a message that he can read...
- The application will be all in English so it will not be that to complicate to user for foreigner.
- This application will provide English forum, where the students can change and discusses about everything.

One of the raison why I choice to make an android application is people use more mobile phone that web site. With Smartphone users currently accounting for around a quarter of the four billion mobile users around the world it is already a priority to optimize content and experiences for mobile consumption. Mobile apps offer a fast and convenient way for people to access information and as such it is more important than ever to understand how they are used and to keep up with the habits of their users. In this post we have compiled the latest stats from the best sources on mobile app downloads and usage to give a summary of statistics on consumer mobile app adoption to help members develop their mobile strategies. This part will be more developed in appendix A.

The application will be a school property and as it intends to improve the students' education and campus live the University can make it a free mobile application for every student. Regardless that this thesis does not claim to offer the solution to the problems of international students are facing with, it will strive to reduce some key constraints they have by offering a real-time time information and time saving tool.



Source: [Flurry: Apps Solidify Leadership Six Years into the Mobile Revolution](#)

6. Conclusions

Usually creating tools for students in some University restricted to large corporation and research centers and with at least a minimum budgets and also large piles of resources. This thesis was motivated by my observation of need support for many students, since I'm at JIAOTONG University every new academic year I'm helping international office to register new students, and I saw by myself how lost many students are, this assistance is very not enough.

The desired platform is large, simple to use and ambitious, but a proper design is required to guide designers and developers in their tasks. Even if the project is being developed using AGILE methodologies a clear overview of the whole project must always be present, and this technology could be useful in many ways. The school has authority to make it bigger than tools that already exists.

After spending some time on this project it has been made clear that by using open source tools and distributed systems improvements can be made to the way the school can evaluate student's activity in the school. Taking advantage of parallelism and efficient algorithms the development of these tools becomes easier.

As the analysis of information the platform can give the student will gain on time, the school will be homier and more students will participle to school activity. But the most significant advantage of this is that on one tools the student have many useful functions that can inform and guide him in all his school life.

As this project advances more functions can be introduced in the system. This together with more and better algorithms will create an better tools for student and teachers.

As a general recommendation, other than applying machine inform and guide students, looking for ways to better optimize the algorithms and how the process is executed and distributed in spark to achieve better performance and a more efficient resource use.

This application has been running and the expected goal still hasn't been reached. Even most of the function still being developed and some functions that already available still have some little bug. This project can be soon be accessed to all BEIJINGJIAOTONG foreigner students.

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Table of Figures

Figure 1.3.2: System Overview	6
Figure 2-3: Use-Case Diagram.....	13
Figure 2.4.2: Flow of data in the system	22
Figure 3.1: 3-tie architecture.....	23
Figure 3.1.1: Architecture Overview	24
Figure 3.2: Modules Relation	25
Figure 3.3.1: User interface	26
Figure 3.3.1-2: Login Screen	Error! Bookmark not defined.
Figure 3.3.1-3: identification Activity Diagram.....	Error! Bookmark not defined.
Figure 3.3.1-4: Identification Sequence Diagram	28
Figure 3.3.1-5: Create New Account	Error! Bookmark not defined.
Figure 3.3.1-6: Main.....	30
Figure 3.3.3: Teaching Interface	31
Figure 3.3.3-1: Teaching Activity Diagram.....	32
Figure 3.3.3-2: teaching Sequence Diagram.....	33
Figure 3.3.4-1: Registration	34
Figure 3.3.4-2: Post.....	35
Figure 3.3.4-3: Post Activity Diagram	36
Figure 3.5: Communication between modules.....	37
Figure 3.3.1-1: Entity relationship	38
Figure 3.3.2: Logical ERD	39
Figure 3.3.3-1: distribution one user	41
Figure 3.3.3-2: distribution multi users	42
Figure 4: Funtional Testing Methodologies	43
Figure 4-1: Class Diagram.....	47
Figure 4.2-1: School officials wecahat Account.....	50
Figure 4.2-2: International office wechat Account.....	51