

# Location Based Services on Mobile Phones

**AUTHOR**

HRISHIKESH SALUNKHE  
VIKRAM SAVANT  
RAHUL SAYKAR  
VINIT SHAH

**DATE**

MAY 2009

COMPUTER SCIENCE DEPARTMENT,  
SINHGAD ACADEMY OF ENGINEERING,  
UNIVERSITY OF PUNE, INDIA

PERSISTENT SYSTEMS LTD. PVT.

<b>1</b>	<b>INTRODUCTION .....</b>	<b>3</b>
1.1	OVERVIEW .....	3
1.2	BACKGROUND RESEARCH .....	5
1.2.1	Motivation .....	5
1.2.2	Existing Work .....	5
1.2.3	Need For Project .....	6
1.3	WHY IS THE PROJECT MOBILE AND WEB BASED? .....	7
<b>2</b>	<b>PROBLEM DEFINITION .....</b>	<b>10</b>
<b>3</b>	<b>SYSTEM OVERVIEW .....</b>	<b>12</b>
<b>4</b>	<b>FEASIBILITY STUDY .....</b>	<b>13</b>
4.1	TECHNICAL FEASIBILITY .....	13
4.1.1	Methodology .....	13
4.1.2	Development Feasibility .....	13
4.1.3	Resource Availability .....	13
4.1.4	Technology .....	14
4.2	ECONOMIC FEASIBILITY .....	14
4.2.1	Procurement cost .....	14
4.2.2	Project related costs .....	14
<b>5</b>	<b>SYSTEM REQUIREMENT .....</b>	<b>15</b>
5.1	HARDWARE AND SOFTWARE REQUIREMENTS .....	15
5.1.1	Hardware Requirements .....	15
5.1.1.1	System Requirements .....	15
5.1.1.2	Mobile Requirement .....	15
5.1.2	Software Requirements .....	15
5.2	EXTERNAL INTERFACE REQUIREMENTS .....	16
<b>6</b>	<b>SCOPE OF WORK .....</b>	<b>17</b>
6.1	SCOPE .....	17
6.2	PURPOSE .....	17
6.3	INTENDED AUDIENCE AND READING SUGGESTIONS .....	17
6.4	CONSTRAINTS .....	17
6.5	FINANCIAL CONSTRAINTS .....	17
6.6	RESOURCES .....	18
<b>7</b>	<b>REQUIREMENT SPECIFICATION .....</b>	<b>19</b>
7.1	FUNCTIONAL REQUIREMENTS .....	19
<b>8</b>	<b>RISK MANAGERMENTS .....</b>	<b>20</b>
8.1	INTRODUCTION .....	20
8.2	PROJECT RISKS .....	21
8.2.1	Risk Identification .....	21
<b>9</b>	<b>SYSTEM DESIGN .....</b>	<b>22</b>
9.1	DATA FLOW DIAGRAMS .....	22
9.2	UML DIAGRAMS .....	24
9.2.1	Use Case Diagram .....	24
9.2.2	Class Diagram .....	26
9.2.3	Sequence Diagram .....	28
9.2.4	Activity Diagram .....	31
9.2.5	Deployment Diagram: .....	35

<b>10</b>	<b>DOMAIN DETAILS.....</b>	<b>37</b>
10.1	GPRS.....	37
10.2	GSM.....	37
10.3	WIRELESS COMMUNICATION .....	39
10.3.1	Introduction .....	39
10.3.2	Application .....	40
<b>11</b>	<b>TECHNOLOGY DETAILS.....</b>	<b>43</b>
11.1	PHP .....	43
11.2	MySQL .....	43
11.3	J2ME.....	44
11.4	SYMBIAN C++ .....	45
11.5	HTML .....	45
11.6	CSS .....	46
11.7	WAMP .....	47
11.8	JAVASCRIPT.....	47
<b>12</b>	<b>TESTING .....</b>	<b>49</b>
12.1	NEED FOR TESTING .....	49
12.2	ACCEPTANCE TESTING.....	49
12.3	BRANCH TESTING .....	50
12.4	CODE BASED TESTING .....	50
12.4.1	Flow through the code.....	50
12.4.2	Statement Coverage.....	52
12.5	COMPONENT TESTING.....	53
<b>13</b>	<b>IMPLEMENTATION &amp; CODING .....</b>	<b>54</b>
13.1	DATABASE DESIGN : .....	54
13.2	GUI DESIGN .....	56
	SCREEN SHOT 1: SPLASH SCREEN DISPLAYED AT THE START OF THE APPLICATION .....	56
	(J2ME DEVELOPMENT).....	56
13.3	CODE PROFILING .....	60
<b>14</b>	<b>ADVANTAGES AND DISADVANTAGES .....</b>	<b>62</b>
14.1	ADVANTAGES .....	62
14.2	DISADVANTAGES .....	62
<b>15</b>	<b>FUTURE ENHANCEMENTS.....</b>	<b>63</b>
<b>16</b>	<b>REFERENCES .....</b>	<b>64</b>

## 1 INTRODUCTION

The use of mobile phones has increased many folds in several countries during last few years and in some countries the mobile phone penetration is well poised to overtake conventional fixed lines. “Being mobile” is the single most important reason for this exponential growth of mobile phones.

“Location” is invariably a very strong component of “mobility”. A rapid evolution in Location Determination Technologies (LDT’s) coupled with the advances made in the field of wireless in recent years has given rise to the possibility of precisely locating a mobile phone. This has opened up a plethora of a new set of wireless applications, known as “Location Based Services” (LBS).

Location based services are gaining prime importance in our increasingly mobile and highly (Information Technology) IT enabled world. With modern legislation and interest in utilizing Geo-spatial information for providing practically useful information to users of mobile services the scope and capability of informing, alerting and involving the user is evolving.

### 1.1 Overview

Location based services are considered as applications that deliver location-based information where and when it is needed. It is the ability to find the geographical location of the mobile device and provide services based on this location information . For example a person in his car calls for the nearest hospital; he needs only paths and addresses of those hospitals which are within his reach.

Users can access these services via the desktop, Web browser, mobile phone, Personal Digital Assistant (PDA), pager, or other devices. Diverse applications include fleet tracking, emergency dispatch, roadside assistance, stolen vehicle recovery, navigation, and more. With overall view, the LBS applications can be categorized as:

- ❖ Navigation applications; Route description, Turn-by-turn navigation, Dynamic route guidance.
- ❖ Safety and emergency applications; Emergency calls, Breakdown services, Warning about unsafe areas, Nearest medic centre
- ❖ Tracking applications; Find a friend, Fleet management, Asset tracking, e.g. cargo, Tracing of stolen property/vehicles, Transportation and logistics, Person surveillance
- ❖ Information service applications; Yellow pages, Traffic information, City Guide, Parking, Maps
- ❖ Operator & Tariff applications; Traffic measurements, Network planning

All these location based services can bring huge amounts of the revenues both for the network operator and services providers. The obvious technology needed in providing LBS is getting to know the location or the position, the geographic data of that location and an application to process the position information along with the geographic data to provide Location Based Service. Messaging is required to convey the location to a control center and provide the service needed. This service is based on Geospatial Database and GIS functionality . So we could consider the ingredients needed for LBS as:

- ☐ Location or positioning (GPS or GPRS)
- ☐ Geospatial data and GIS Server
- ☐ Control Center
- ☐ Communication System

## **1.2 Background Research**

### **1.2.1 Motivation**

Recent market researches showed that consumers in Asia and Europe are ready and willing to pay for Location Based Services. Some indicative findings say that mobile subscribers would consider even changing mobile phone operator in order to gain access to location based services and pay up to 16 Euros as a monthly fee for these services. In the U.S mobile subscribers would pay as much as 50 Dollars to have GPS or other location technology built into a cellular phone, according to similar market research. Some critical success factors for the adoption of LBS, as identified by these researches, seem to be the following:

- Protection of mobile user privacy
- Ease of usage
- Non-intrusive way of LBS operation

### **1.2.2 Existing Work**

For the past several years, more and more operators all over the world have introduced location based services (LBS) in their service portfolio. In certain countries, e.g. in the US, regulatory demands on mandatory positioning of cell phones calling the emergency number 911 has accelerated the deployment of the infrastructure needed in the mobile networks. In other countries e.g. in the UK and Italy, operators like 3 have made LBS an

Integral part of their service offering when rolling out their new 3G networks. Despite the investments made so far, we have yet to see any substantial success stories based on LBS. Here we try to explain why LBS have not been able to meet the high expectations and what kind of services really have the potential to lead the way and succeed. As an example of a service with high potential we use tracking of children and

Currently the LBS market is dominated by convenience oriented, user centric services. Several operators have location based services integrated as a part of their portal offering. This is the case with DoCoMo's i-Mode services, Vodafone Live! And Hutchisons 3Gportals. Typical services offered are friend finders, directory services, points of interest, and different types of

navigation services. Some of the services offered are quite advanced. In some cell phones you can find features similar to the ones in a EUR2000 in-car GPS navigation system, but for a fraction of the cost. Several tracking services exist already today, but so far none have been able to combine sufficient technical performance in a stand-alone managed service with a low-cost dedicated tracking device.

### **1.2.3 Need For Project**

We went through lot of domains and topics before finalizing the topic. We developed interest in mobile application after studying its advantages and disadvantages. Then we finalized the topic of location based services using mobile devices.

Mobile phones and the Internet have revolutionized the communication and with it the lifestyle of people. An increasing number of mobile phones and Personal Digital Assistants (PDA) allow people to access the Internet where ever they are and when ever they want. From the Internet they can obtain on one hand information on events (cinema, concerts, parties) and on the other hand information on places (city maps, restaurants, museums, hospitals).

Let us consider the example that somebody wants to take a dinner in a restaurant and is therefore searching a restaurant in the Internet. A useful approach to prevent that one gets as search result every restaurant web-page on the world one could restrict the search by adding further search criteria. A good choice is the city where the mobile user is (position), the actual time (evening) or a special type of restaurant (Chinese or Greek).

Such kind of restaurant search with respect to position and time can be done by use of a Location Based Service (LBS). Thus, one can define that:

#### **LBS Definition:**

LBSs are information services accessible with mobile devices through the mobile network and utilizing the ability to make use of the location of the mobile device.



A Location Based Service delivering a map of the environment and the position of the hiker.

### 1.3 Why is the project Mobile and Web Based?

- Geographically separated users. It can be accessed by team across the globe with any explicit synchronization required. This is very important for organizations working in different geographies.
- Multiple concurrent users. This web-based application can indeed be utilized by multiple users at the same time. No need to screen share or send a screenshot when multiple users can see and even edit the same document together.
- Better GUI.





- Cross-platform compatibility. Web-based applications have a much easier path to successful cross-platform compatibility than downloadable software applications. Several technologies including Java, PHP, ASP and Ajax allow effective development of programs supporting all of the major operating systems.
- More manageable. Web based systems need to be installed only on the server placing minimal requirements on the end user workstation. This makes maintaining and updating the system much simpler as usually it can all be done on the server. Any client updates can be deployed via the web server with relative ease.
- Pricing. Web-based applications do not require distribution, technical support and marketing infrastructure. This makes this online application almost free and extremely manageable.
- Web based applications allow businesses to consolidate and streamline their systems and processes and reduce costs.
- The two applications namely Advertisement and Mobile tracker can only be implemented through web access
- In India today, from big businessman like Vijay Mallya to small hawker in front of our house or literate to illiterate or employed to unemployed each situation has one thing common i.e. each of them uses mobile. So we thought of developing such application for mobile device which is not available to common man and we decided of location based services using wireless communication.
- Today this facility is available to all network operators but not to common man. We found finding a friend application very interesting and challenging.

And also recent market researches showed that consumers in Asia and Europe are ready and willing to pay for Location Based Services. Some indicative findings say that mobile

subscribers would consider even changing mobile phone operator in order to gain access to location based services and pay up to 16 Euros as a monthly fee for these services.

Project will include mobile software which provides tracking application i.e. finding the location of a friend, indication on reaching destination place , Advertisements(Yellow Pages),Finding path between you and your friend ,mobile tracking , etc

We can obtain the location information from mobile device using two technologies

1. GPS tracking (3G Mobile Devices)
2. Cell based tracking (2G/2.5G Mobile Devices )

We have chosen Cell based tracking or Network based tracking because of the following reasons:

1. Easy Available
2. 3G enabled mobile devices are very expensive
3. Can be used on any smart phone

In country like India , mostly people are using 2G/2.5G Mobile Devices and designing software for such phones would be beneficial rather than using GPS tracking for 3G Mobile Devices which are very rarely used .

We studied the all the possible advantages and disadvantages we decided to go for second option i.e. Cell based tracking for 2G/2.5G Mobile Devices. There were advantages for GPS tracking (3G Mobile Devices) like the location which we would get would be exact rather than approximate but mobile of this type are rarely used in India and they are very expensive so we thought of stick to normal phone only with GPRS facility.

We have developed software for JAVA based mobile operating system which support multiple brands such as Nokia, Sony Ericsson, Motorola, Siemens etc.

## 2 PROBLEM DEFINITION

The project under discussion will involve the location based services. LBSs are information services accessible with mobile devices through the mobile network and utilizing the ability to make use of the location of the mobile device. Location based services are gaining prime importance in our increasingly mobile and highly (Information Technology) IT enabled world. With modern legislation and interest in utilizing Geo-spatial information for providing practically useful information to users of mobile services the scope and capability of informing, alerting and involving the user is evolving.

As its name suggests, Location is the epitome of the LBS services. In each and every kind of Location Based Service, Location of the user will be accessed and accordingly service will be provided. e.g. If user wants to find shops near by him, then his location will be considered as a reference and information about shops around the user will be found out and that information will be provided to the user.

We have developed the software which facilitates following services:

➤ **My Location:**

Here, user can view his location. When user will click on this option his location information will be sent to the server. In turn server will reply with the Google Map of the location, now user can view his location in the form of Google Maps.

➤ **Find a Friend:**

User can use this option to find out the location of his friend. User can find location of those friends who are registered under same group as of user. User just has to enter the mobile number of his friend which will be sent to the server. Server will reply with the Google Maps of the friend's location.



➤ **Way to Friend:**

User also can find out the path and the distance between the user and the friend. Here same constraint is applied as of the above. User has to enter the mobile number of the friend. This will be sent to the server. Server in turn will send Google Map containing paths between the user and the friend. Along with the minimum path and distance user can view different paths between user and friend.

➤ **Address finder:**

This is one this simple utility added to this software. User can find out map of any location by using this utility. User just has to enter the address or location, It turn he will get Google Map containing that address.

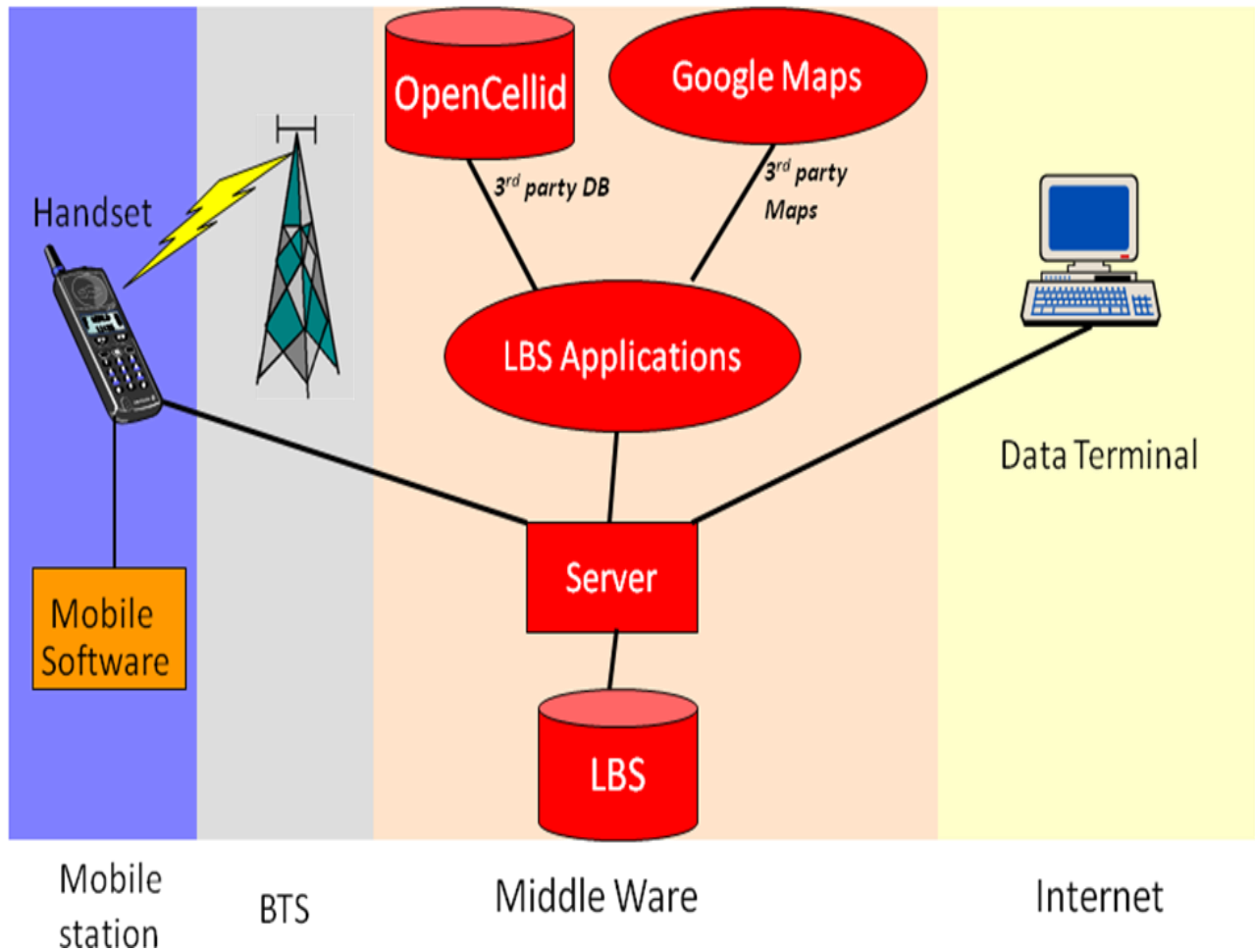
➤ **Location alarm:**

This is the innovative service which we have added to this application. This is an alarm service which is based on the location entered by the user. User will enter the destination location and tentative time period required to reach , Alarm will be raised after reaching the required destination.

➤ **Advertisement:**

User can find out different shops around him using this service. User's location will be taken and information of shops near the user location will be sent to the user.

### 3 SYSTEM OVERVIEW



Diagrammatic representation of system

## 4 FEASIBILITY STUDY

All projects are feasible-given unlimited resources and infinite time! This feasibility study report is in concern with the system analysis carried out for the project to make sure that the project being implemented is actually feasible

### 4.1 Technical Feasibility

The study of functions, performance and constraints that may affect the ability to achieve an acceptable system, lead to the following constraints:

#### 4.1.1 Methodology

- The approach should be object oriented.
- The software should be well documented.
- The software should be easily configurable.

#### 4.1.2 Development Feasibility

- The development environment for the Application Module (Mobile Application) is Netbeans and Eclipse. Mobile software has been developed in J2ME for JAVA based operating systems.
- The Database has been designed in MySQL.
- For server development PHP scripting language is used.
- The website is developed using HTML & CSS.
- We have used WAMP server, integrated package which contains apache web server, MySQL DBMS, PHP interpreter for windows XP OS.

#### 4.1.3 Resource Availability

The assistance of the project guides, the availability of relevant documentation as well as the availability of the required software and hardware, greatly contributed in making this project feasible.

#### **4.1.4 Technology**

- Operating system used: Windows XP
- Back End:  
WAMP 2.0f (Apache Web Server 2.2.8, MySQL 5.0.2, PHP 5.2.6)
- Front End:  
J2ME, Symbian C++ , Html & CSS

### **4.2 Economic Feasibility**

#### **4.2.1 Procurement cost**

- Software cost: none since all the technologies are open source
- Consulting cost: none since project is sponsored by Persistent System Ltd.
- Equipment installation cost: None, as software can be installed by downloading from our website.

#### **4.2.2 Project related costs**

- Cost of application software: All the applications are freely available on the net.
- Cost of mobile device: Depends on mobile phone used.
- Cost of static IP: None
- Cost of web space: Cannot be determined at this instant.

## **5 SYSTEM REQUIREMENT**

### **5.1 Hardware and Software Requirements**

#### **5.1.1 Hardware Requirements**

##### **5.1.1.1 System Requirements**

- 2GHz processor; x86 architecture
- 1,280 x 1,024-pixel screen or better
- 32-bit color
- 2GB of RAM
- 5GB of free disk space

##### **5.1.1.2 Mobile Requirement**

- Mobile device should of smart phone supporting JAVA / Symbian OS.
- Mobile device should be GPRS enabled and GPRS service should be active.
- Display 176 x 208 pixel, 256 color display.
- Mobile device should use a 32-bit ARM processor.

#### **5.1.2 Software Requirements**

- Operating System : Windows XP
- Back End:  
WAMP 2.0f ( Apache Web Server 2.2.8, MySQL 5.0.2 , PHP 5.2.6)
- Front End:  
J2ME , Symbian C++ , Html & CSS
- IDEs:  
Eclipse , Netbeans 6.5.1, Carbide 2.0 , Dreamviewer 8.0
- Tools:  
Ikivo Animator 2.2.1.3 , Adobe Illustrator CS3





- SDKs:

Sun JAVA SDK, Symbian S60 3<sup>rd</sup> Edition FP3 1.2 for C++  
and Symbian S60 3<sup>rd</sup> Edition FP3 1.1 J2ME.

## **5.2 External Interface Requirements**

External interfaces are required in order to access open source Cell id database and Google Maps.

User Interfaces :

Internet Mozilla Firefox 2.0 or opera Internet browser.

## **6 SCOPE OF WORK**

### **6.1 Scope**

- Project will include mobile software which provides tracking application i.e. finding the location of a friend, indication on reaching destination place , Advertisements(Yellow Pages),Address Locator ,mobile tracking , etc

### **6.2 Purpose**

- The purpose of this planning is to describe the proposed project and to identify certain aspects such as the scope, constraints and the technology used. The plan will also establish the scope of the project in terms of the major functions, performance issues and technical constraints.

### **6.3 Intended audience and reading suggestions**

- The project is mainly for common man because in today's world mostly everyone is using mobile. As the name suggest "Location based services " it deals with location finding .

### **6.4 Constraints**

- Time Constraints  
This project work spans over 5 months (Dec 2008 - April 2009)..
- Technical Constraints  
User location is not exact as Cell based or Network based tracking technology is used.

### **6.5 Financial Constraints**

- The project has no major financial constraints.



## 6.6 Resources

- Project Team

- 1) Hrishikesh Salunkhe
- 2) Vikram Sawant
- 3) Rahul Saykar
- 4) Vinitkumar Shah

- Guidance

Internal Guide

**Prof. B. B. Gite**

(Senior Professor)

(Sinhgad Academy Of Engineering)

External Guide

Dr. Umesh Hivarkar

(Sr. Technical Head)

(Persistent Systems Ltd. )

## **7** REQUIREMENT SPECIFICATION

### **7.1** Functional Requirements

## 8 RISK MANAGERMENTS

### 8.1 Introduction

Risk analysis and management are a series of steps that help a software team to understand and manage uncertainty. Many problems can plague a software project. A risk is a potential problem-it might happen, it might not. But, regardless of the outcome, it's a really good idea to identify it, assess its probability of occurrence, estimate its impact, and establish a contingency plan should the problem actually occur.

For any project being developed, it is empirical for the team to monitor and manage risks. Risks are the unexpected delays and hindrances that are faced by the software team and need to be actively managed for rapid development. In the words of Tom Glib," If you don't actively attack risks, they will actively attack you".

The key functions of software risk management are to identify, address and eliminate sources of risk before they become threats to successful completion of a software project. An effective strategy must address three issues:

- Risk avoidance
- Risk Monitoring
- Risk Management and contingency planning

If a software team adopts a proactive approach to a risk, avoidance is the best strategy. This is achieved by developing a plan for risk mitigation. In the words of Napoleon, "If I take so many precautions, it is because I leave nothing to chance". As the project proceeds, risk monitoring activities commence and the project manager monitors factors that may provide indication if the risk is becoming more or less likely. Risk management and contingency planning assumes that mitigation efforts have failed and the risk has become a reality.

## 8.2 Project Risks

### 8.2.1 Risk Identification

- Technical Risks: Complexity / Availability / Obsolesce

The use of different APIs used by different mobile brands will limit the software compatibility. Also mobile software supports some of the versions of these mobile brands.

- Business Risks:

Legal:

The only legal hassles involved could be APIs used to access network information which may become private and may become unavailable to use.

- Financial/Market:

There are no financial or market risks.

- Project Risks:

The team members are not proficient in the technology being used.

## 9 SYSTEM DESIGN

### 9.1 Data Flow Diagrams

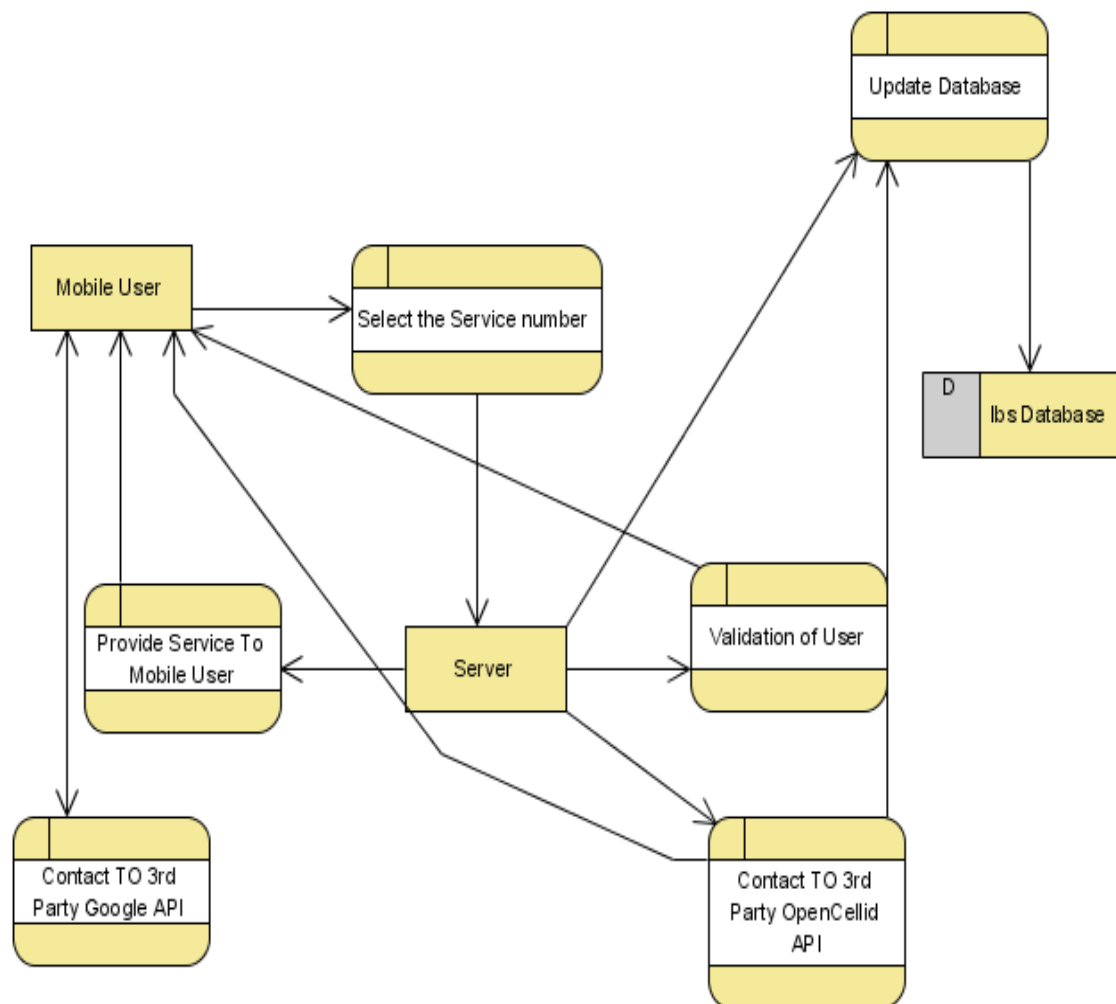


Fig: DFD –Level 0(J2ME )Development

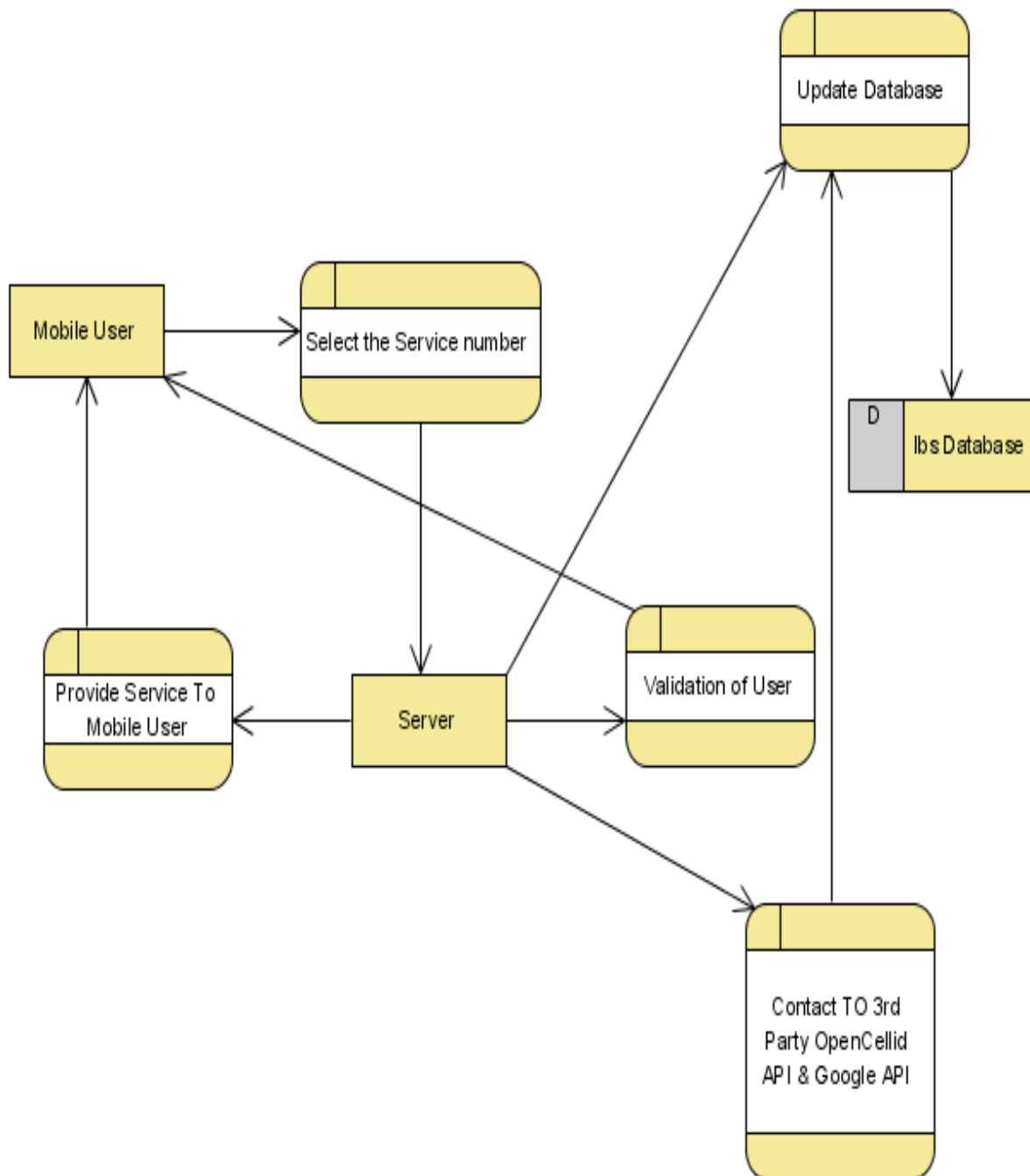


Fig: DFD –Level 0(C++ Development)



## 9.2 UML Diagrams

### 9.2.1 Use Case Diagram

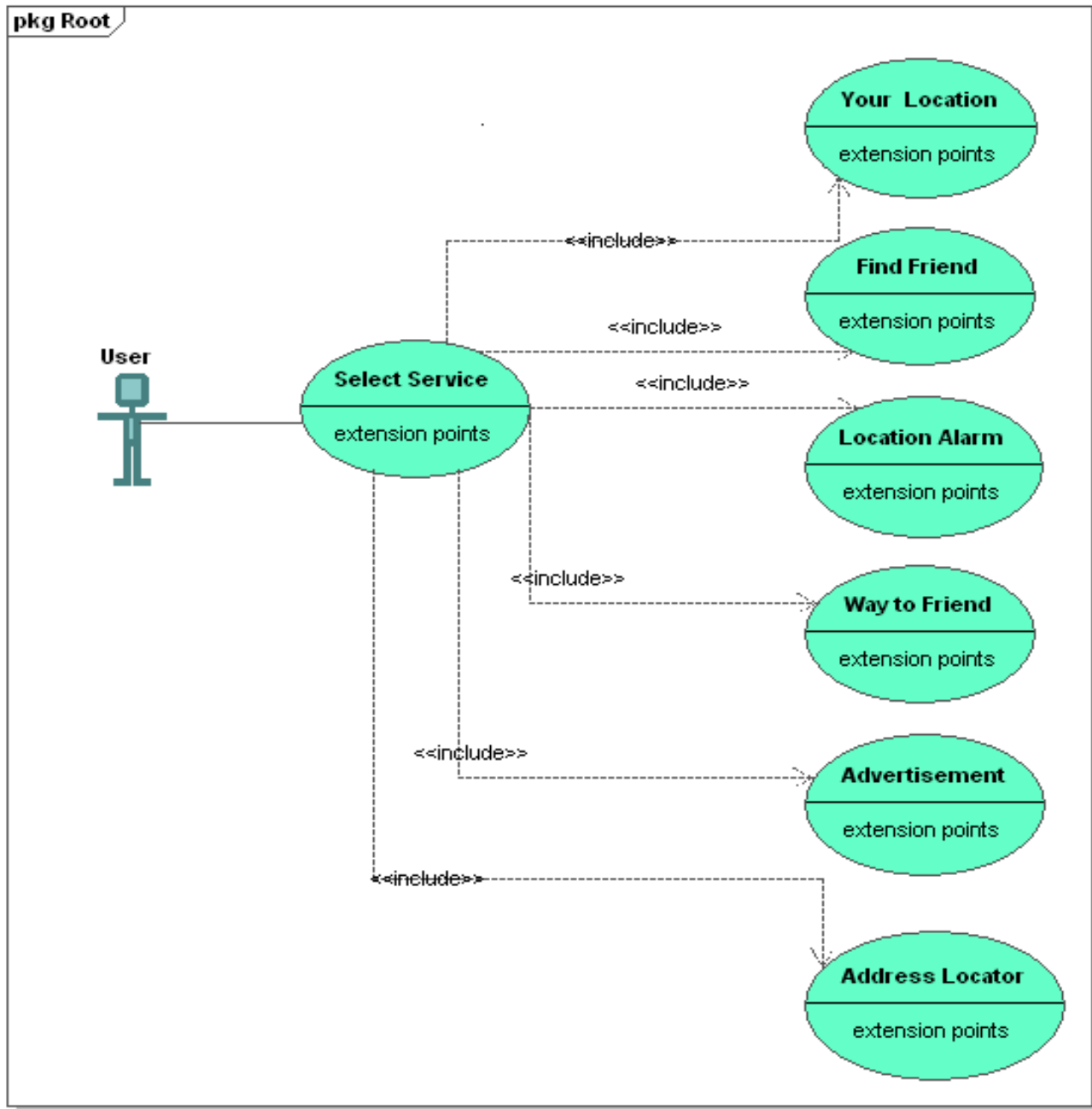


Fig 4.7: Use case diagram 1

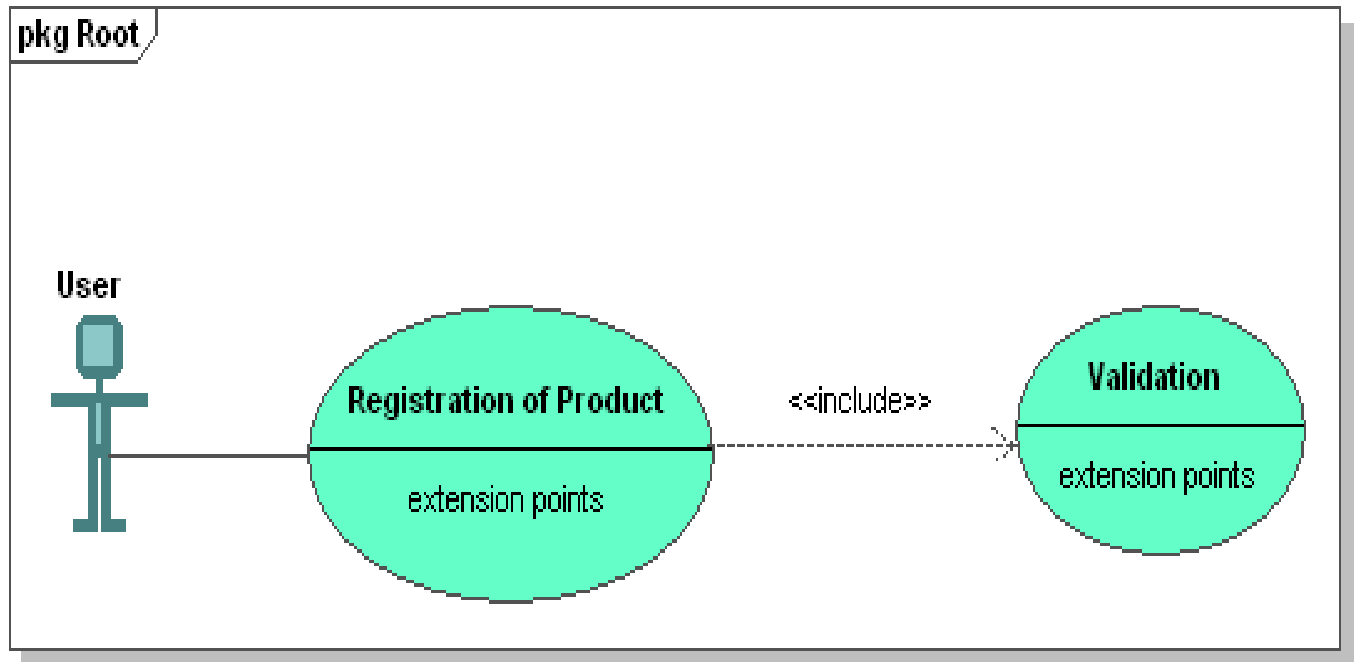


Fig 4.8: Use case diagram 2

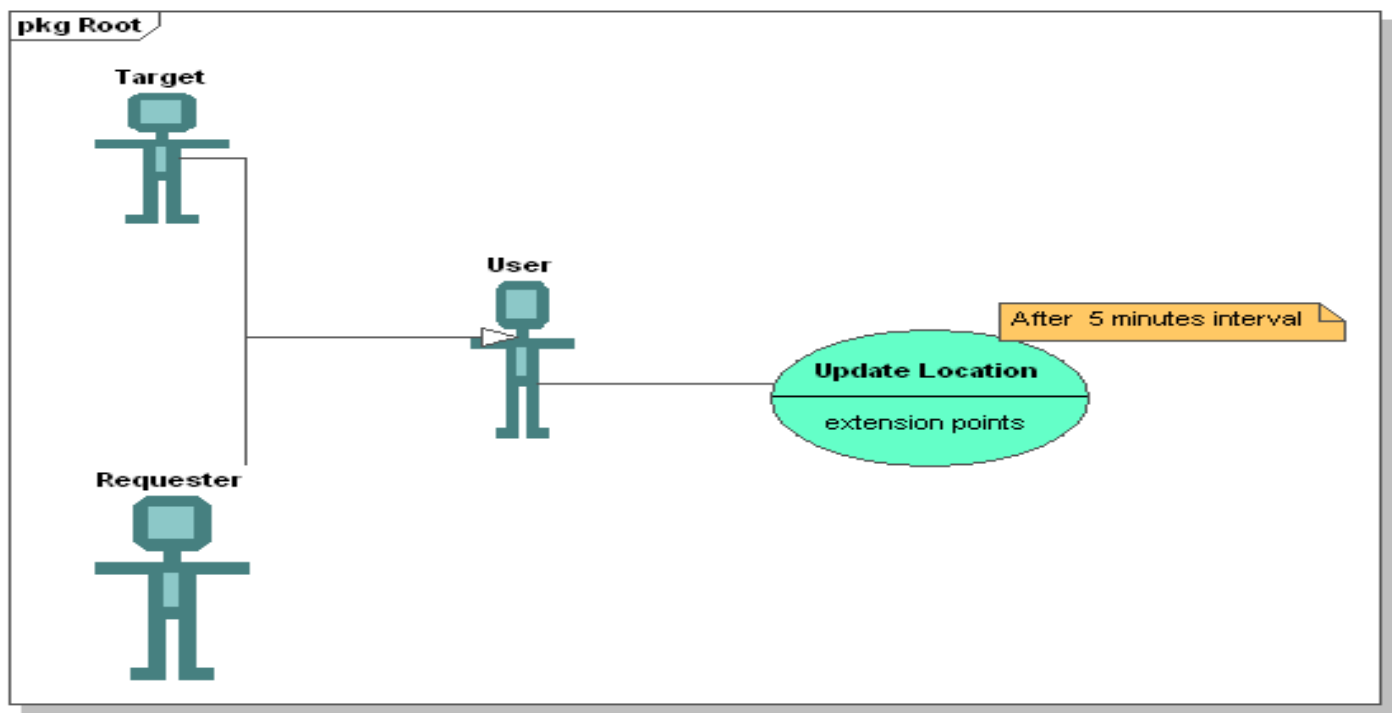


Fig 4.8: Use case diagram 2

## 9.2.2 Class Diagram

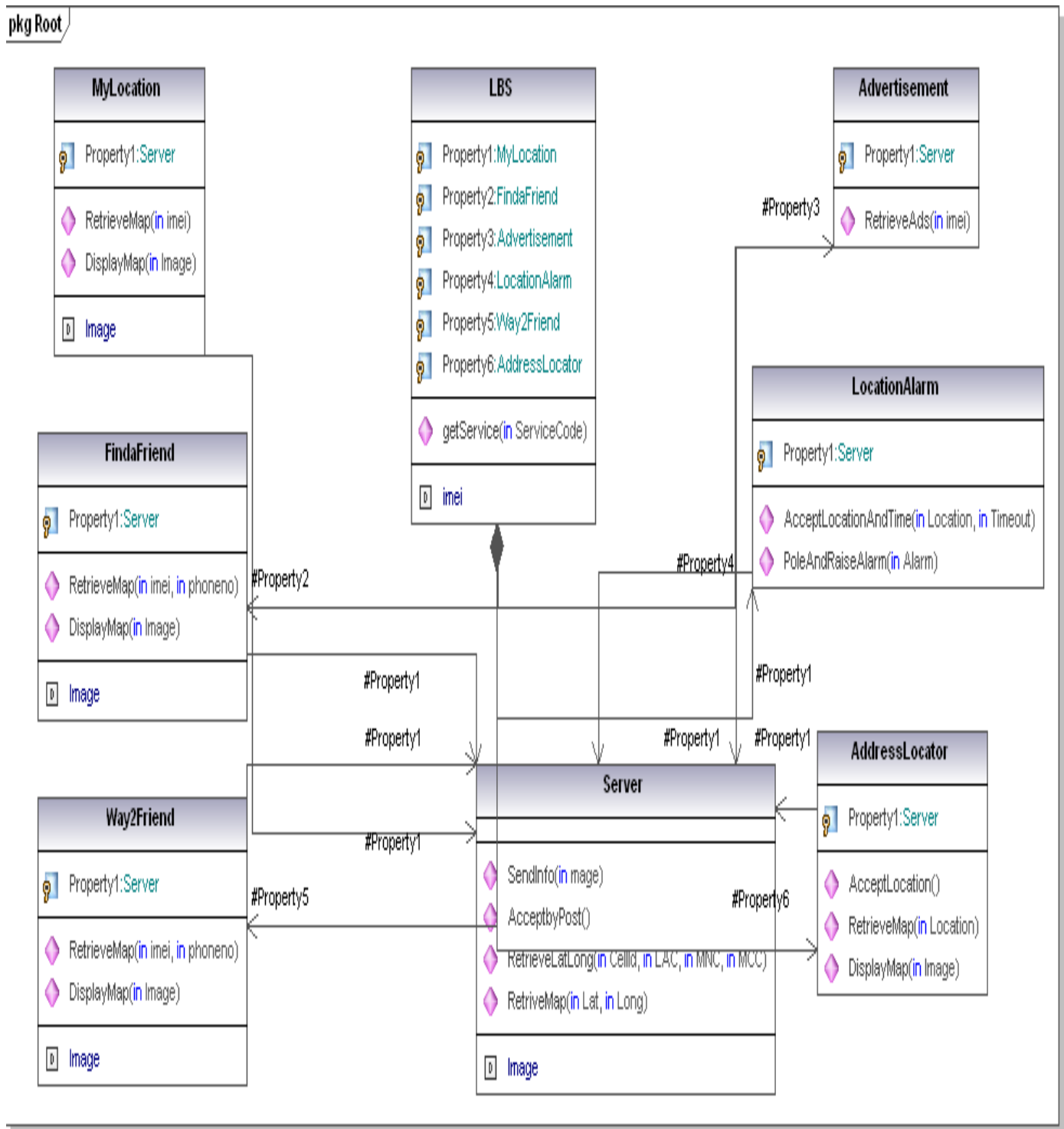
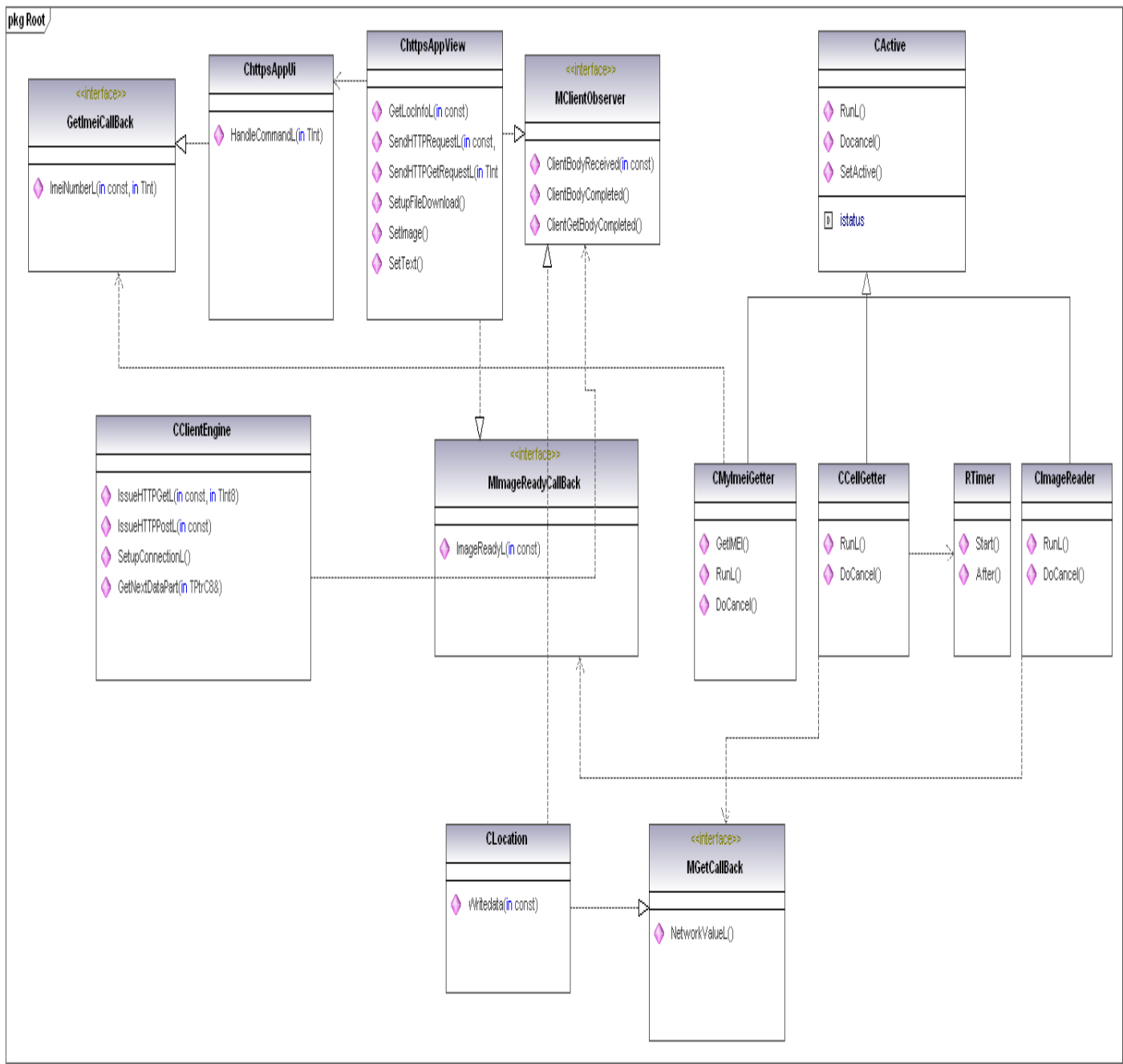


Fig 4.9: Class Diagram(J2ME)

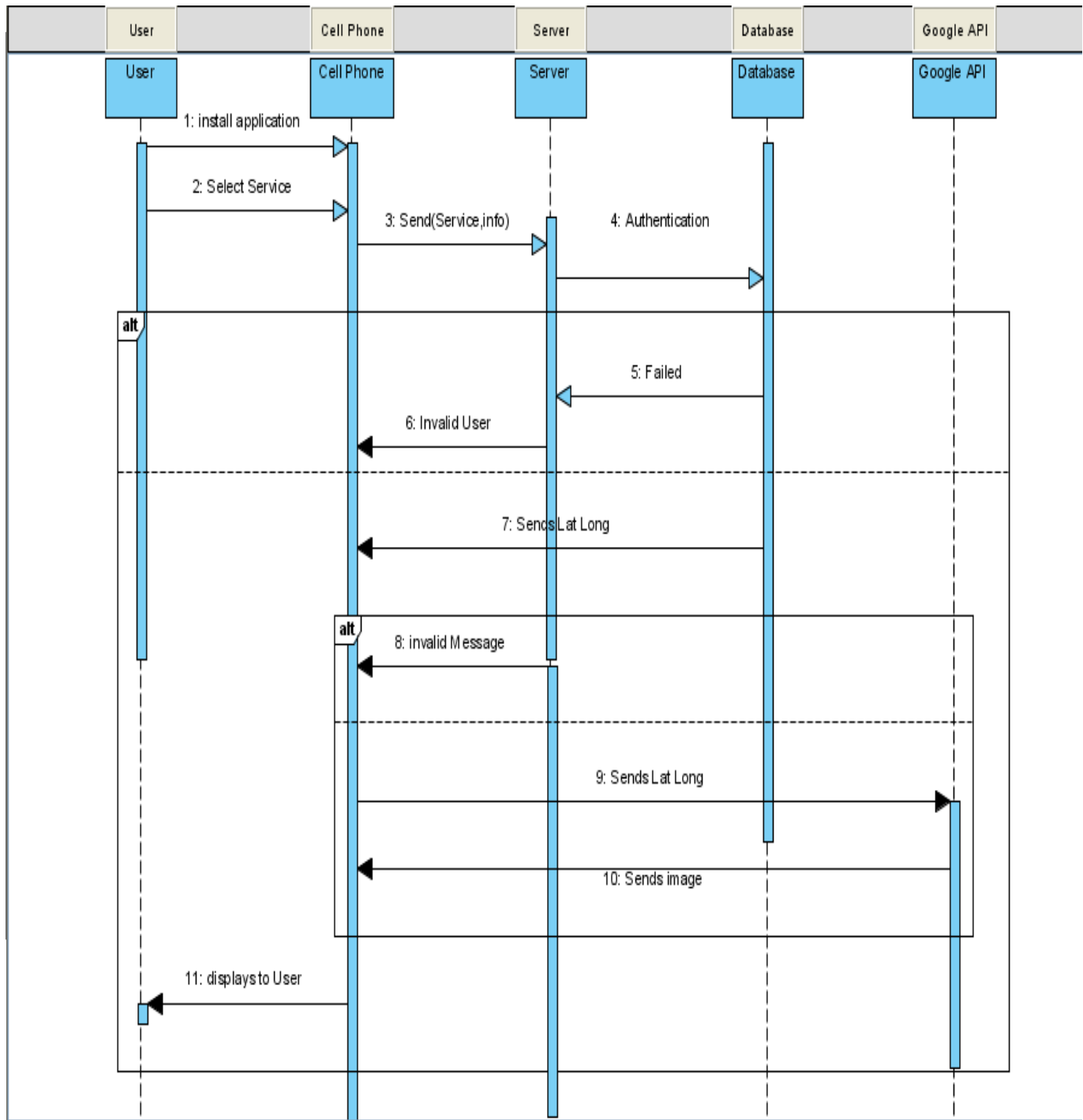


Generated by UModel

www.altova.com

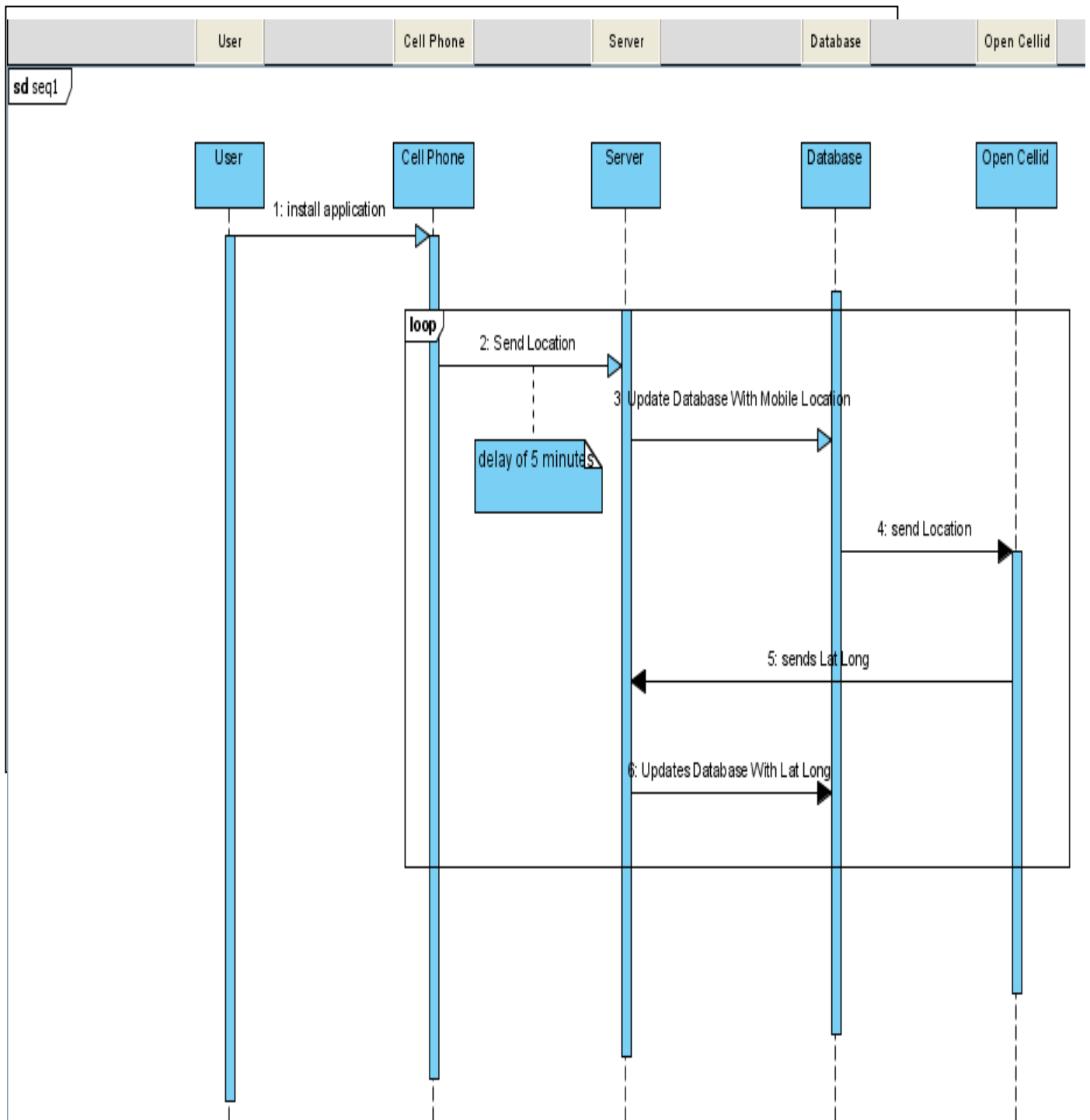
Fig 4.9: Class Diagram(C++)

### 9.2.3 Sequence Diagram



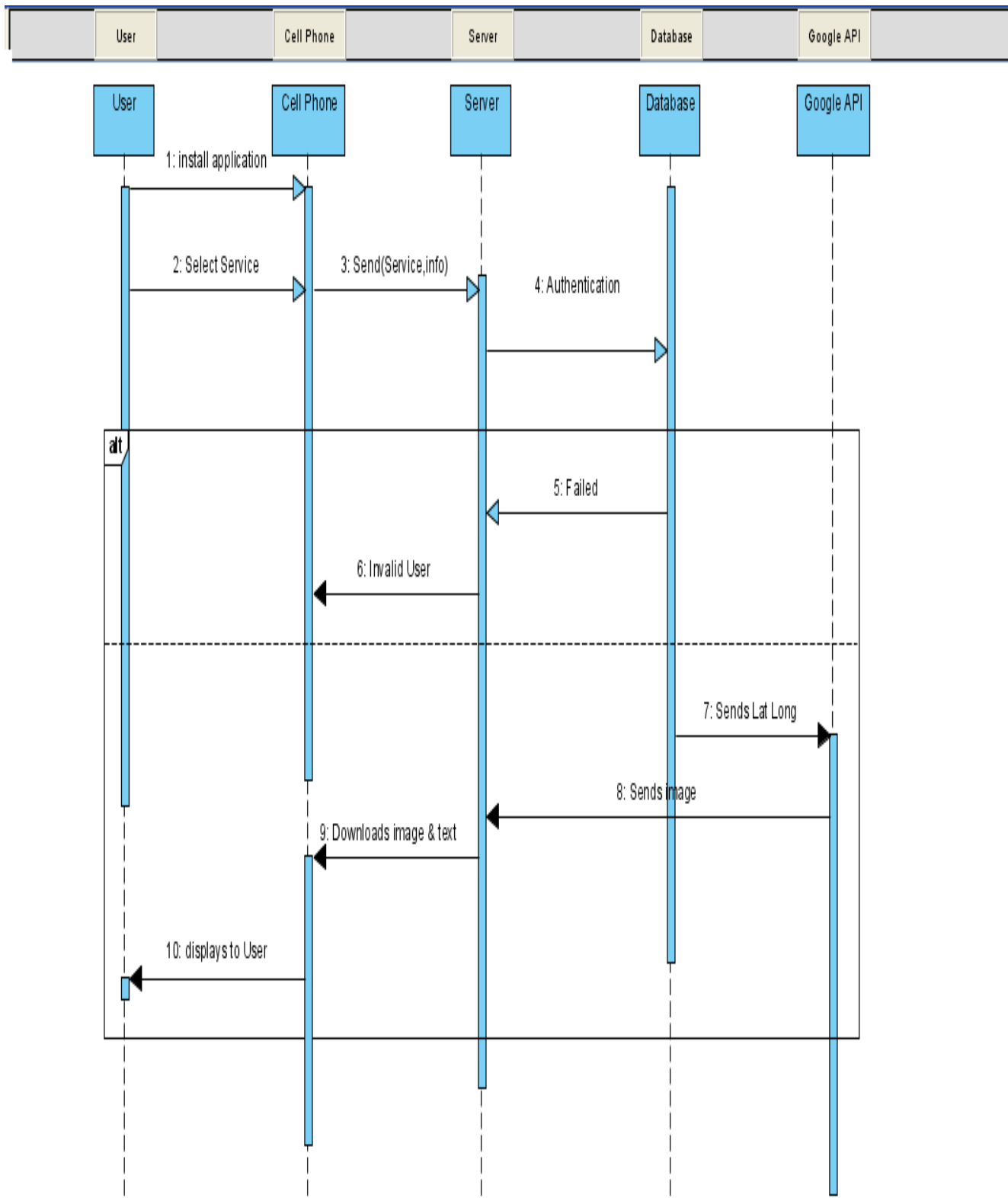
J2ME Development

Fig 4.10: Sequence Diagram

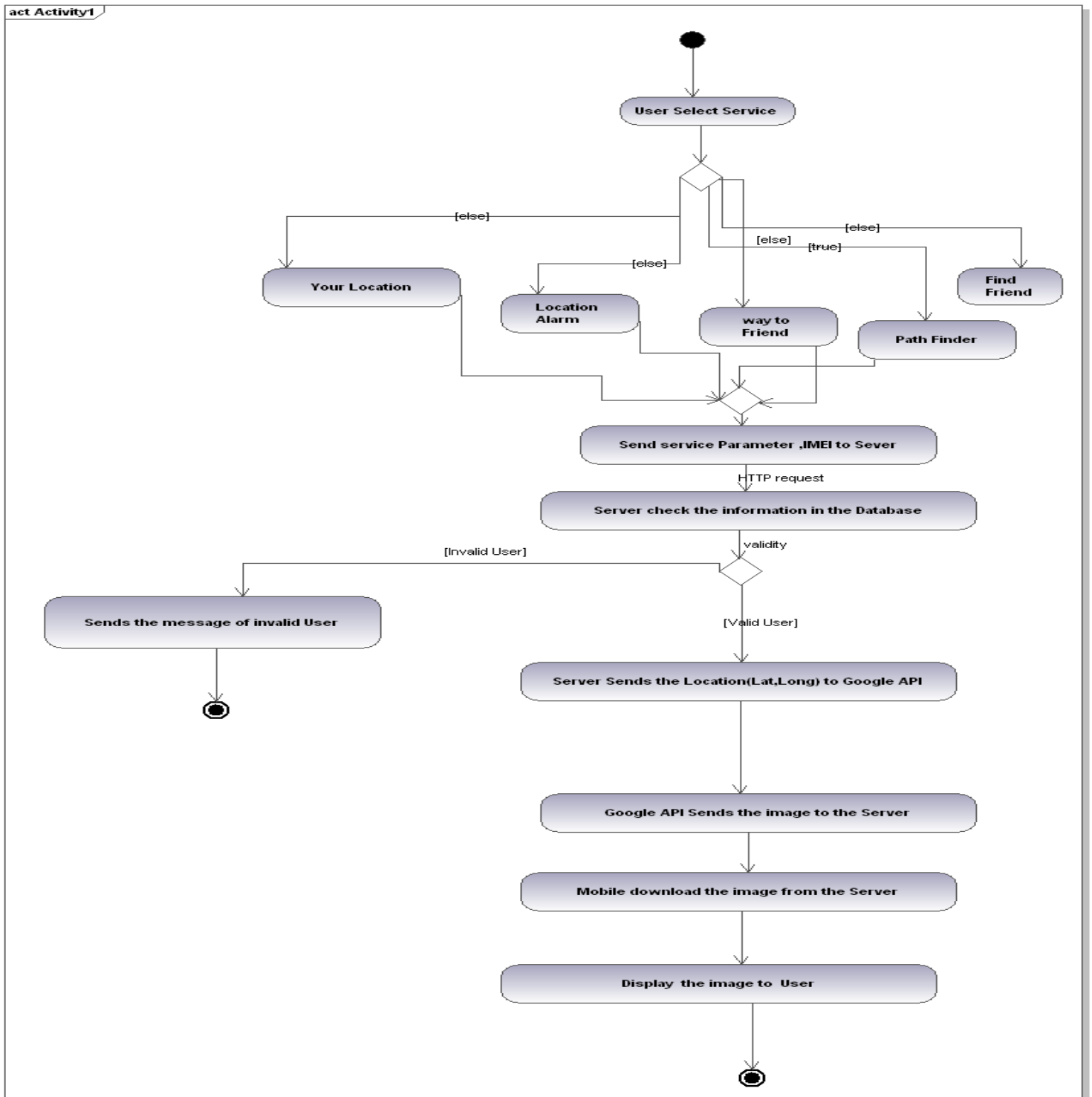


### C++ Development

Fig 4.10: Sequence Diagram

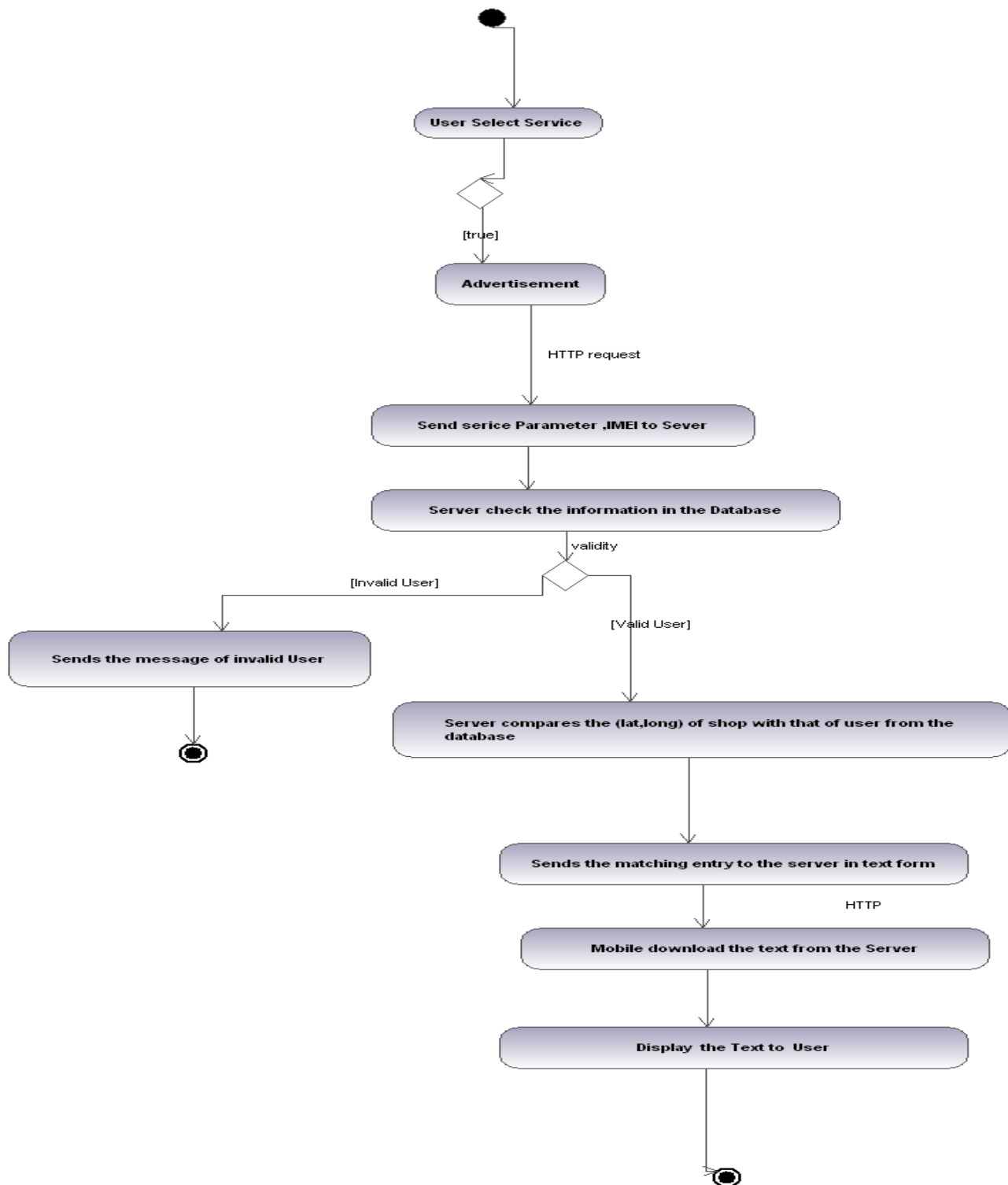


## 9.2.4 Activity Diagram

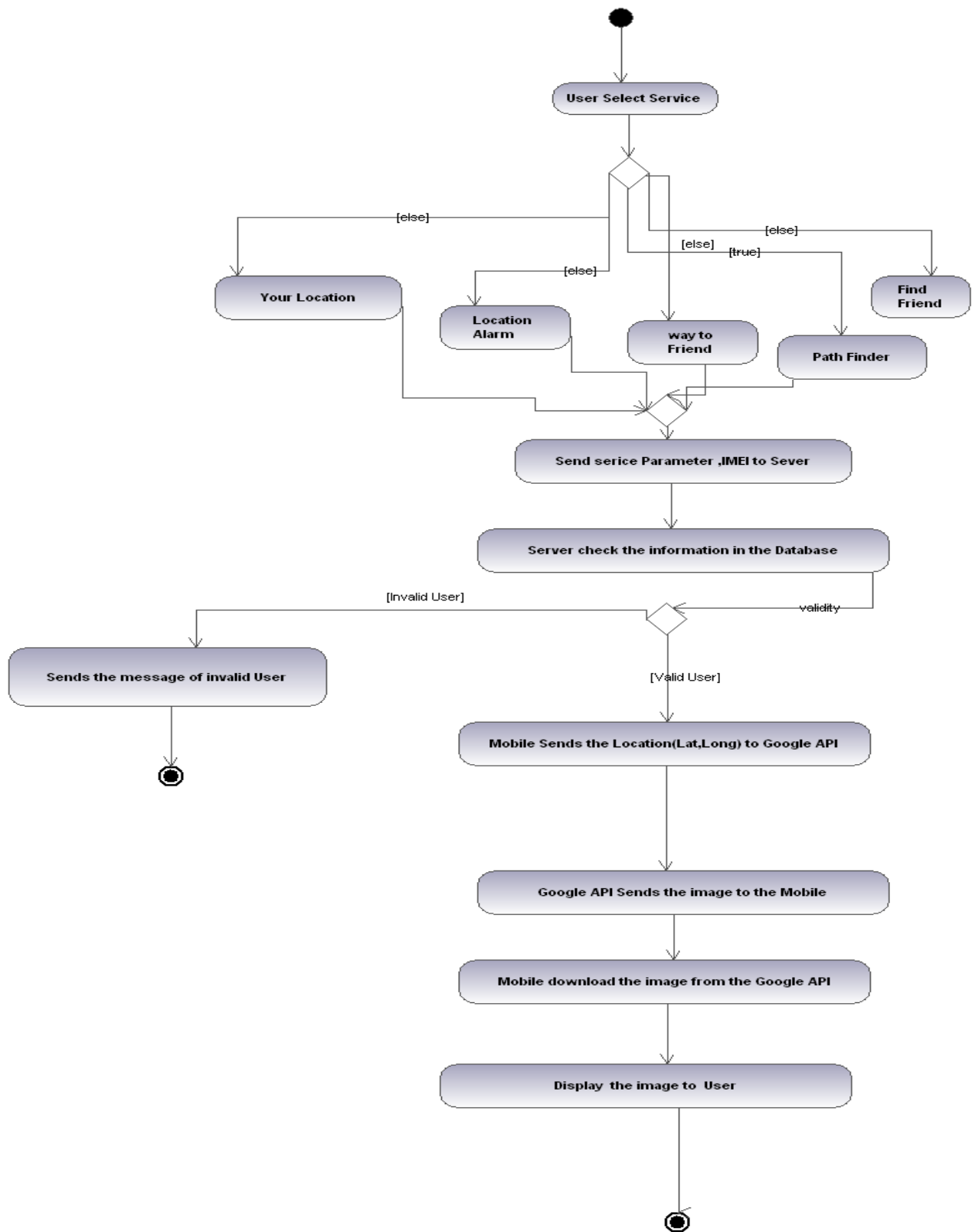




act Activity2



act Activity4



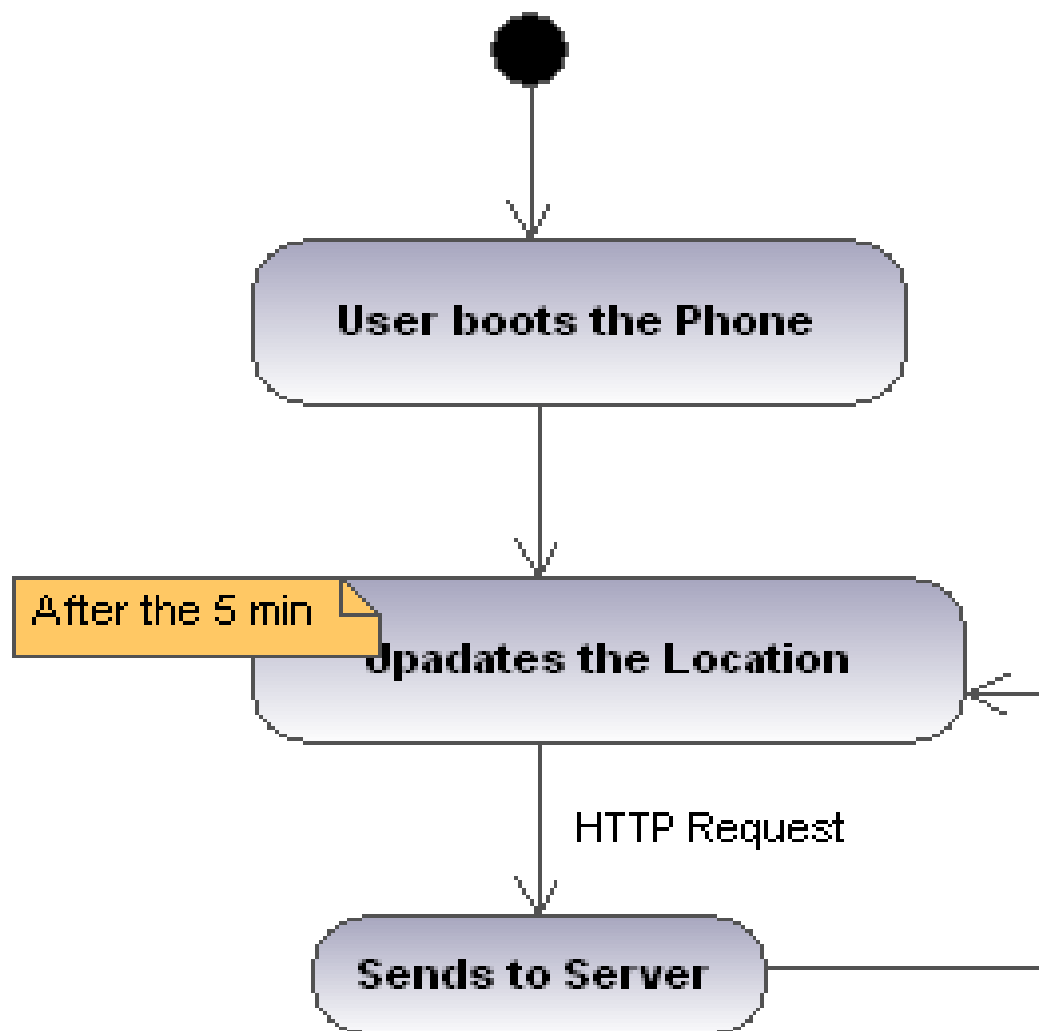
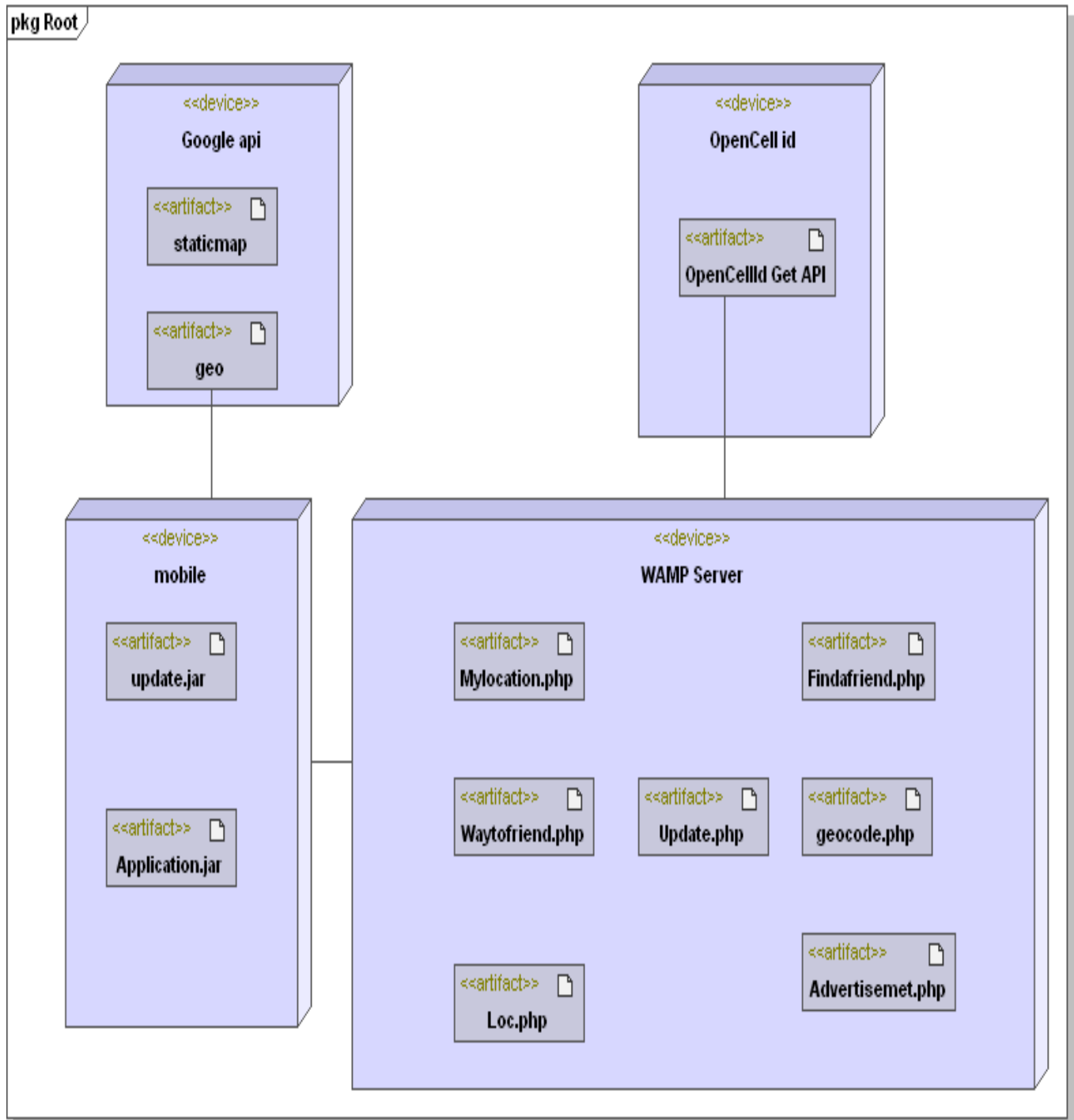
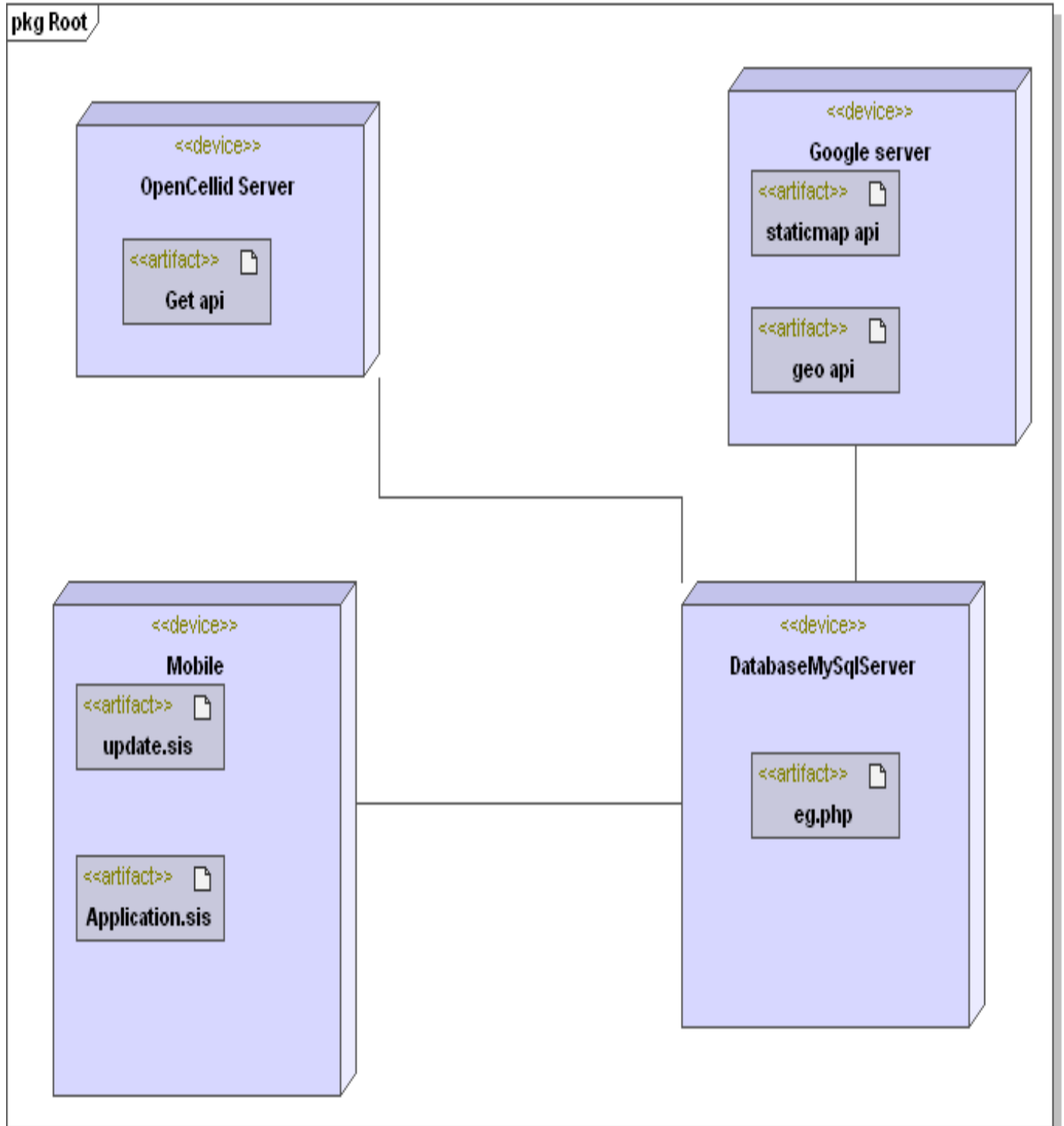
**act Activity3**

Fig 4.13: Activity Diagram

### 9.2.5 Deployment Diagram:



Deployment Diagram for J2ME Development



Deployment Diagram for C++ Development

## 10 DOMAIN DETAILS

### 10.1 GPRS

- General packet radio service (GPRS) is a packet oriented mobile data service available to users of the 2G cellular communication systems global system for mobile communications (GSM), as well as in the 3G systems. In the 2G systems, GPRS provides data rates of 56-114 kbit/s.
- GPRS data transfer is typically charged per megabyte of traffic transferred, while data communication via traditional circuit switching is billed per minute of connection time, independent of whether the user actually is using the capacity or is in an idle state. GPRS is a best-effort packet switched service, as opposed to circuit switching, where a certain quality of service (QoS) is guaranteed during the connection for non-mobile users.
- 2G cellular systems combined with GPRS are often described as 2.5G, that is, a technology between the second (2G) and third (3G) generations of mobile telephony. It provides moderate speed data transfer, by using unused time division multiple access (TDMA) channels in, for example, the GSM system. Originally there was some thought to extend GPRS to cover other standards, but instead those networks are being converted to use the GSM standard, so that GSM is the only kind of network where GPRS is in use. GPRS is integrated into GSM Release 97 and newer releases. It was originally standardized by European Telecommunications Standards Institute (ETSI), but now by the 3rd Generation Partnership Project (3GPP).
- GPRS was developed as a GSM response to the earlier CDPD and i-mode packet switched cellular technologies.

### 10.2 GSM

- GSM (Global System for Mobile communications: originally from Groupe Spécial Mobile) is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 80% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile

phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signaling and speech channels are digital, and thus is considered a second generation (2G) mobile phone system. This has also meant that data communication was easy to build into the system.

- The ubiquity of the GSM standard has been an advantage to both consumers (who benefit from the ability to roam and switch carriers without switching phones) and also to network operators (who can choose equipment from any of the many vendors implementing GSM). GSM also pioneered a low-cost (to the network carrier) alternative to voice calls, the Short message service (SMS, also called "text messaging"), which is now supported on other mobile standards as well. Another advantage is that the standard includes one worldwide Emergency telephone number, 112. This makes it easier for international travellers to connect to emergency services without knowing the local emergency number.
- Newer versions of the standard were backward-compatible with the original GSM phones. For example, Release '97 of the standard added packet data capabilities, by means of General Packet Radio Service (GPRS). Release '99 introduced higher speed data transmission using Enhanced Data Rates for GSM Evolution (EDGE).

### 10.3 Wireless Communication

Wireless communication is the transfer of information over a distance without the use of electrical conductors or "wires". The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio communications). When the context is clear, the term is often shortened to "wireless". Wireless communication is generally considered to be a branch of telecommunications.

It encompasses various types of fixed, mobile, and portable two way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of wireless technology include GPS units, garage door openers and or garage doors, wireless computer mice, keyboards and headsets, satellite television and cordless telephones.

#### 10.3.1 Introduction

"Wireless communication was developed while wired communication was being expanded. Guilermo Marconi was one of the first to experiment with other ways to communicate besides a wired system. According to the book Marconi used Einstein's theory of relativity to create a system of wireless telegraphy. The book goes on to say that the early development of wireless communications was the stepping stone for today's wireless communications networks. (Regli) In the past wireless networks were unreliable and expensive. The old system was often criticized for not being fast enough and not providing users with the benefits associated with the traditional wired systems. However, today there have been many technological advances that have allowed these networks to become more efficient."

Handheld wireless radios such as this Maritime VHF radio transceiver use electromagnetic waves to implement a form of wireless communications technology.

Wireless operations permits services, such as long range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems (e.g., radio transmitters and



receivers, remote controls, computer networks, network terminals, etc.) which use some form of energy (e.g. radio frequency (RF), infrared light, laser light, visible light, acoustic energy, etc.) to transfer information without the use of wires. Information is transferred in this manner over both short and long distances.

### 10.3.2 Application

The term "wireless" has become a generic and all-encompassing word used to describe communications in which electromagnetic waves or RF (rather than some form of wire) carry a signal over part or the entire communication path. Common examples of wireless equipment in use today include:

- Professional LMR (Land Mobile Radio) and SMR (Specialized Mobile Radio) typically used by business, industrial and Public Safety entities
- Consumer Two Way Radio including FRS (Family Radio Service), GMRS (General Mobile Radio Service) and Citizens band ("CB") radios
- The Amateur Radio Service (Ham radio)
- Consumer and professional Marine VHF radios
- Cellular telephones and pagers: provide connectivity for portable and mobile applications, both personal and business.
- Global Positioning System (GPS): allows drivers of cars and trucks, captains of boats and ships, and pilots of aircraft to ascertain their location anywhere on earth.
- Cordless computer peripherals: the cordless mouse is a common example; keyboards and printers can also be linked to a computer via wireless.
- Cordless telephone sets: these are limited-range devices, not to be confused with cell phones.
- Satellite television: allows viewers in almost any location to select from hundreds of channels.
- Wireless gaming: new gaming consoles allow players to interact and play in the same game regardless of whether they are playing on different consoles. Players can chat, send text messages as well as record sound and send it to their friends. Controllers also use

wireless technology. They do not have any cords but they can send the information from what is being pressed on the controller to the main console which then processes this information and makes it happen in the game. All of these steps are completed in milliseconds.

Wireless networking (i.e. the various types of unlicensed 2.4 GHz WiFi devices) is used to meet many needs. Perhaps the most common use is to connect laptop users who travel from location to location. Another common use is for mobile networks that connect via satellite. A wireless transmission method is a logical choice to network a LAN segment that must frequently change locations. The following situations justify the use of wireless technology:

- To span a distance beyond the capabilities of typical cabling,
- To avoid obstacles such as physical structures, EMI, or RFI,
- To provide a backup communications link in case of normal network failure,
- To link portable or temporary workstations,
- To overcome situations where normal cabling is difficult or financially impractical, or
- To remotely connect mobile users or networks.

Wireless communication can be via:

- radio frequency communication,
- microwave communication, for example long-range line-of-sight via highly directional antennas, or short-range communication, or
- infrared (IR) short-range communication, for example from remote controls or via IRDA.

Applications may involve point-to-point communication, point-to-multipoint communication, broadcasting, cellular networks and other wireless networks.

The term "wireless" should not be confused with the term "cordless", which is generally used to refer to powered electrical or electronic devices that are able to operate from a portable power source (e.g. a battery pack) without any cable or cord to limit the mobility of the cordless device through a connection to the mains power supply. Some cordless devices, such as cordless



telephones, are also wireless in the sense that information is transferred from the cordless telephone to the telephone's base unit via some type of wireless communications link. This has caused some disparity in the usage of the term "cordless", for example in Digital Enhanced Cordless Telecommunications.

In the last fifty years, wireless communications industry experienced drastic changes driven by many technology innovations.

## 11 TECHNOLOGY DETAILS

### 11.1 PHP

PHP is a widely used general-purpose scripting language that is especially suited for web development and can be embedded into HTML. It generally runs on a web server, taking PHP code as its input and creating web pages as output. It can be deployed on most web servers and on almost every operating system and platform open source platform. It is for server-side scripting but can be used from a command line interface or in standalone graphical applications.

PHP is a scripting language originally designed for producing dynamic web pages. It has evolved to include a command line interface capability and can be used in standalone graphical applications.

### 11.2 MySQL

MySQL is a relational database management system (RDBMS). The program runs as a server providing multi-user access to a number of databases. MySQL is popular for web applications and acts as the database component of the LAMP, BAMP, MAMP, and WAMP platforms (Linux/BSD/Mac/Windows-Apache-MySQL-PHP/Perl/Python). PHP is often combined with MySQL to create web applications. PHP and MySQL are essential components for running popular content management systems such as Drupal, Joomla!, WordPress etc. Wikipedia runs on MediaWiki software, which is written in PHP and uses a MySQL database.

#### ❖ PHP with MY SQL

MySQL and PHP have become the “bread and butter” of web application builders. It is the combination you are most likely to encounter today and probably for the years to come. 150 Databases can go with PHP but MYSQL is the best of all

### 11.3 J2ME

In computing, the Java Platform, Micro Edition or Java ME (still commonly referred to by its previous name: Java 2 Platform, Micro Edition or J2ME) is a specification of a subset of the Java platform aimed at providing a certified collection of Java APIs for the development of software for tiny, small and resource-constrained devices. Target devices range from industrial control and automotive devices to cell phones and set-top boxes.

Java ME was designed by Sun Microsystems and is a replacement for a similar technology, PersonalJava. Originally developed under the Java Community Process as JSR 68, the different flavors of Java ME have evolved in separate JSRs. Sun provides a reference implementation of the specification, but has tended not to provide free binary implementations of its Java ME runtime environment for mobile devices, rather relying on third parties to provide their own.

As of 22 December 2006, the Java ME source code is licensed under the GNU General Public License, and is released under the project name phoneME.

As of 2008, all Java ME platforms are currently restricted to JRE 1.3 features and uses that version of the class file format (internally known as version 47.0). Should Sun ever declare a new round of Java ME configuration versions that support the later class file formats and language features, such as those corresponding JRE 1.5 or 1.6 (notably, generics), it will entail extra work on the part of all platform vendors to update their JREs.

## 11.4 Symbian C++

Symbian C++, the native language of Symbian OS, offers developers the most flexibility in accessing the features of the S60 platform. To complement Symbian C++, Open C was recently introduced. Open C simplifies the porting of application engines to the S60 platform and aids multiplatform development by offering developers the ability to work with the familiar desktop C.

Application development with Symbian C++ offers developers the most flexibility for taking full advantage of the S60 platform. C++ is used to implement the S60 platform's UI and additional middleware APIs. Using Symbian C++, developers can access any feature of the S60 platform that has a public API. This means that third-party applications can offer the same rich features seen in the applications that are embedded in S60 devices.

Developing in Symbian C++ requires an S60 platform SDK. Each S60 SDK includes the Symbian and S60 APIs, command-line development tools, comprehensive documentation, a set of example applications, and a device emulator. The device emulator is a key component in application development, because, when used in conjunction with the WINSW compiler delivered with Carbide.c++, it allows for testing applications on PCs. The emulator allows developers to run applications in very much the same way they would on a device, providing features such as call simulation, Internet access, full emulation of UI resolution and orientation, sound, and even location simulation. Using the emulator accelerates the development cycle by allowing developers to do most of their development work on PCs.

## 11.5 HTML

HTML, an initialism of HyperText Markup Language, is the predominant markup language for Web pages. It provides a means to describe the structure of text-based information in a document—by denoting certain text as links, headings, paragraphs, lists, and so on—and to supplement that text with interactive forms, embedded images, and other objects. HTML is written in the form of tags, surrounded by angle brackets. HTML can also describe, to some degree, the appearance and semantics of a document, and can include embedded scripting

language code (such as JavaScript) which can affect the behavior of Web browsers and other HTML processors.

```
<!DOCTYPE html>
<html>
  <head>
    <title>Hello HTML</title>
  </head>
  <body>
    <p>Hello World!!</p>
  </body>
</html>
```

## 11.6 CSS

CSS is an acronym for Cascading Style Sheets, another programming specification. CSS uses rules called styles to determine visual presentation. The style rules are integrated with the content of the web page in several ways. In this book, we will deal with style rules that are embedded in the web page itself, as well as with style rules that are linked to or imported into a web page. You will learn to write the style rules and how to import, link, or embed them in the web pages you make. In HTML, styles can be written into the flow of the HTML, or inline, as well.

CSS can also be integrated into web pages in other ways. Sometimes you have no control over these rules. Browsers allow users to set up certain CSS style rules, or user styles, according to their own preferences. The user preferences can override style rules you write. Further, all browsers come with built-in style rules. Generally the built-in styles can be overridden in your CSS style rules. Built-in browser display rules are referred to as default presentation rules. Part of what you will learn is what to expect from a browser by default, in order to develop any new CSS rules to override those default display values.

## 11.7 WAMP

WAMPs are packages of independently-created programs installed on computers that use a Microsoft Windows operating system. The interaction of these programs enables dynamic web pages to be served over a computer network, such as the internet or a private network.

"WAMP" is an acronym formed from the initials of the operating system (Windows) and the package's principal components: Apache, MySQL and PHP (or Perl or Python). Apache is a web server, which allows people with web browsers like Internet Explorer or Firefox to connect to a computer and see information there as web pages. MySQL is a database manager (that is, it keeps track of data in a highly organized way). PHP is a scripting language which can manipulate information held in a database and generate web pages afresh each time an element of content is requested from a browser. Other programs may also be included in a package, such as phpMyAdmin which provides a graphical interface for the MySQL database manager, or the alternative scripting languages Python or Perl.

## 11.8 JavaScript

JavaScript is a scripting language widely used for client-side web development. It was the originating dialect of the ECMAScript standard. It is a dynamic, weakly typed, prototype-based language with first-class functions. JavaScript was influenced by many languages and was designed to look like Java, but be easier for non-programmers to work with.

Although best known for its use in websites (as client-side JavaScript), JavaScript is also used to enable scripting access to objects embedded in other applications.

JavaScript, despite the name, is essentially unrelated to the Java programming language, although both have the common C syntax, and JavaScript copies many Java names and naming conventions. The language's name is the result of a co-marketing deal between Netscape and Sun, in exchange for Netscape bundling Sun's Java runtime with their then-dominant browser. The key design principles within JavaScript are inherited from the Self and Scheme programming languages.





"JavaScript" is a trademark of Sun Microsystems. It was used under license for technology invented and implemented by Netscape Communications and current entities such as the Mozilla Foundation

## 12 TESTING

### 12.1 NEED FOR TESTING

Software testing is a critical element of software quality assurance and represents the ultimate review of specification, design, and code generation. The increasing visibility of software failure motivate for well –planned, through testing.

Instead the view of demolishing the software, the testing should be viewed as an effort to increase the software reliability. The inherited bugs in the software are the results of human imperfection and human communication problem.

Various objectives of the testing are:

- To uncover errors in functional logic or implementation of the software.
- To verify that the software meets the specific requirement
- To ensure that the software has been implemented according to the predefined conditions.
- To ensure customer satisfaction, enhance business and set reputation for the software developer

### 12.2 Acceptance Testing

It is technically impossible for a web developer to foresee how a customer will actually use the application. Instructions for use may be misinterpreted, strange combinations of data may be regularly used, and output that seemed clear to tester may be unintelligent to a user in the field.

When an application is build for a customer, a series of acceptance tests are conducted to enable the customer to end validate all the requirements. Conducted by the end user rather than the developers, an acceptance test can range from an informal drive to a systematically executed series of tests. In fact, acceptance testing can be conducted over a period of weeks or months, thereby uncovering cumulative errors that might degrade the system overnight.

### 12.3 Branch Testing

Branch testing guarantees the detection of branching errors in a condition provided that all the BOOLEAN variables in the condition occur only once and have no common variables.

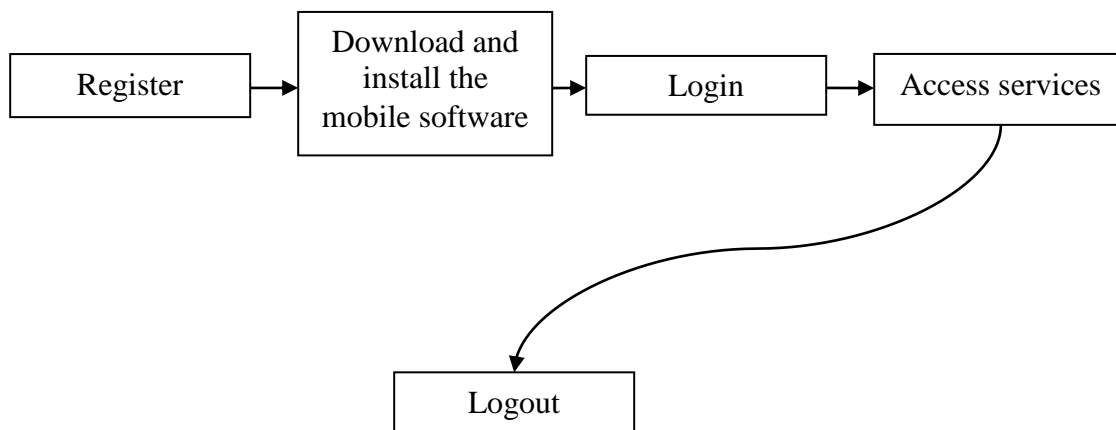
This testing uses condition constraints for a condition C. A condition constraint for C with n simple condition is defined as  $(D_1, D_2)$  where  $D_i (0 \leq i \leq n)$  is the symbol specifying a constraint on the outcome of the i-th simple condition in condition C.

### 12.4 Code Based Testing

During the coding phase, initially some ideal conditions were considered and the code was written accordingly. Validations were performed along the actual coding phase. This approach helps us to come across minimal problems when the testing was carried out after writing the final application.

#### 12.4.1 Flow through the code

One way is to consider the entire flow of system and test whether the flow is proper and test with different possible values so that all conditions, branches and loops are executed at least once. So, consider one such flow as shown below:



## 12.3.1: Flow through the code

Test cases			
	Function under test	Message Sequence	Result
1.	Validate()	send_mail()	Validate the entries filled in the register form.
2.	confirm()	create_account()	Account is created. User information stored in database.
3.	login()	my_profile()	Successful login, display user's account with all LBS application.
4.	create_map()		Map with markers,etc is created and stored in database in Xml file.
5.	view_map()	get_all_info(),	Map from database is retrieved and displayed properly.
6.	create_grp()	show_friends() , add_friends()	Select the friends, group is created.
7.	share_map()	share(), edit_rights()	Xml file is updated according to access rights given by user.
8.	logout()	save()	Save unsaved data if any and close the account.

Table 12.3.1: Test cases

Test cases (Mobile Software and Server)			
	Function under test	Message Sequence	Result
1	Getimei()	systemProperty()	Imei fetched from mobile
2	Run()	Getparam()	Fetches all parameters from mobile
3	Myloc() (C0)	Send(), recv()	Locates the user.
4	FindaFriend() (C2)	Send(), recv()	Locates friend
5	Way2Friend() (C4)	Send(), recv()	Finds dist between friends.
6	Geocode() (C8)	Send(), recv()	Locates address
7	Adv() (C12)		Finds shops nearby user
8	Localrm() (C10)	Pole()	Raises alarm after reaching destination

Table 12.3.2: Test cases

### 12.4.2 Statement Coverage

Coverage Calculation is done as follows:

$$\text{Statement Coverage} = \frac{\text{Number of executable statements executed}}{\text{Total number of executable statements}} * 100 \%$$

## 12.5 Component Testing

Component Testing means Module Testing i.e we are testing each module or component differently. After component Testing Integration Testing is done. While doing Black Box Testing or White Box Testing by Tester first of all Component Testing is done. Component Testing is done by the developers. While doing this testing the Developers runs each functions/method of the Component/Module.

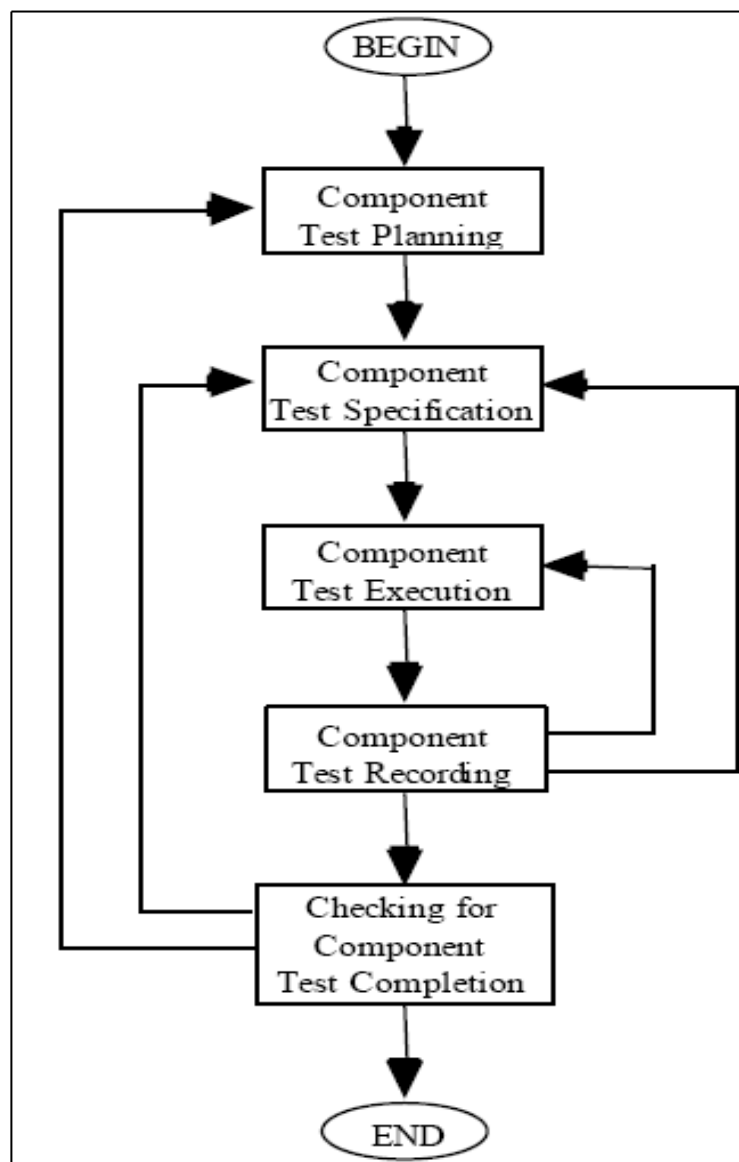


Fig: 5.4 Component Testing

## 13 IMPLEMENTATION & CODING

### 13.1 Database Design :

Server: localhost ▶ Database: pr183 ▶ Table: reg

Field	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/> Name	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> mail	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> gend	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> uid	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> imei	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> passd	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> phoneno	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> Gr_Id	int(5)			No	None		
<input type="checkbox"/> Grpass	varchar(20)	latin1_swedish_ci		No	None		

Check All / Uncheck All With selected:

Figure 1: Table details of registration 'Reg'

Server: localhost ▶ Database: pr183 ▶ Table: lbs

Field	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/> Group_Id	int(5)			No	None		
<input type="checkbox"/> uid	varchar(15)	latin1_swedish_ci		No	None		
<input type="checkbox"/> Password	varchar(20)	latin1_swedish_ci		No	None		
<input type="checkbox"/> Name	varchar(25)	latin1_swedish_ci		No	None		
<input type="checkbox"/> imsi	varchar(15)	latin1_swedish_ci		No	None		
<input type="checkbox"/> imei	varchar(15)	latin1_swedish_ci		No	None		
<input type="checkbox"/> Cell_Id	varchar(15)	latin1_swedish_ci		No	None		
<input type="checkbox"/> LAC	varchar(15)	latin1_swedish_ci		No	None		
<input type="checkbox"/> mnc	varchar(10)	latin1_swedish_ci		Yes	NULL		
<input type="checkbox"/> CC	varchar(15)	latin1_swedish_ci		No	None		
<input type="checkbox"/> lat	varchar(15)	latin1_swedish_ci		No	None		
<input type="checkbox"/> lng	varchar(15)	latin1_swedish_ci		No	None		

Check All / Uncheck All With selected:

Figure 2: Table details of mobile user 'lbs'

Server: localhost ▶ Database: pr183 ▶ Table: shop

[Browse](#)
[Structure](#)
[SQL](#)
[Search](#)
[Insert](#)
[Export](#)
[Import](#)
[Operations](#)
[Empty](#)
[Drop](#)

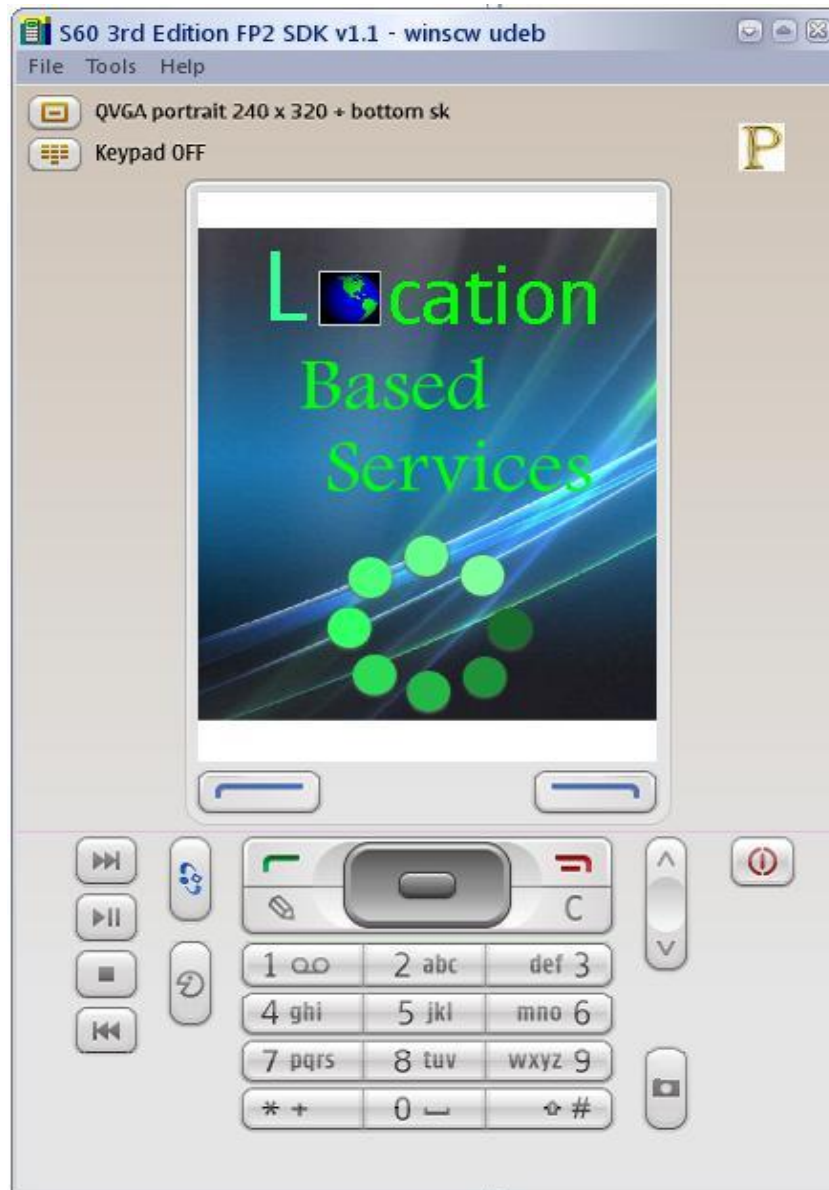
	Field	Type	Collation	Attributes	Null	Default	Extra	Action					
<input type="checkbox"/>	uid	varchar(15)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	name	varchar(20)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	shop_name	varchar(30)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	address	varchar(60)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	state	varchar(20)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	country	varchar(20)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	adt	varchar(80)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	pass	varchar(20)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	lat	varchar(15)	latin1_swedish_ci		No	None							
<input type="checkbox"/>	lng	varchar(15)	latin1_swedish_ci		No	None							

[Check All](#) / [Uncheck All](#) With selected:

Figure 3: Table details of shop owner 'shop'



## 13.2 GUI Design

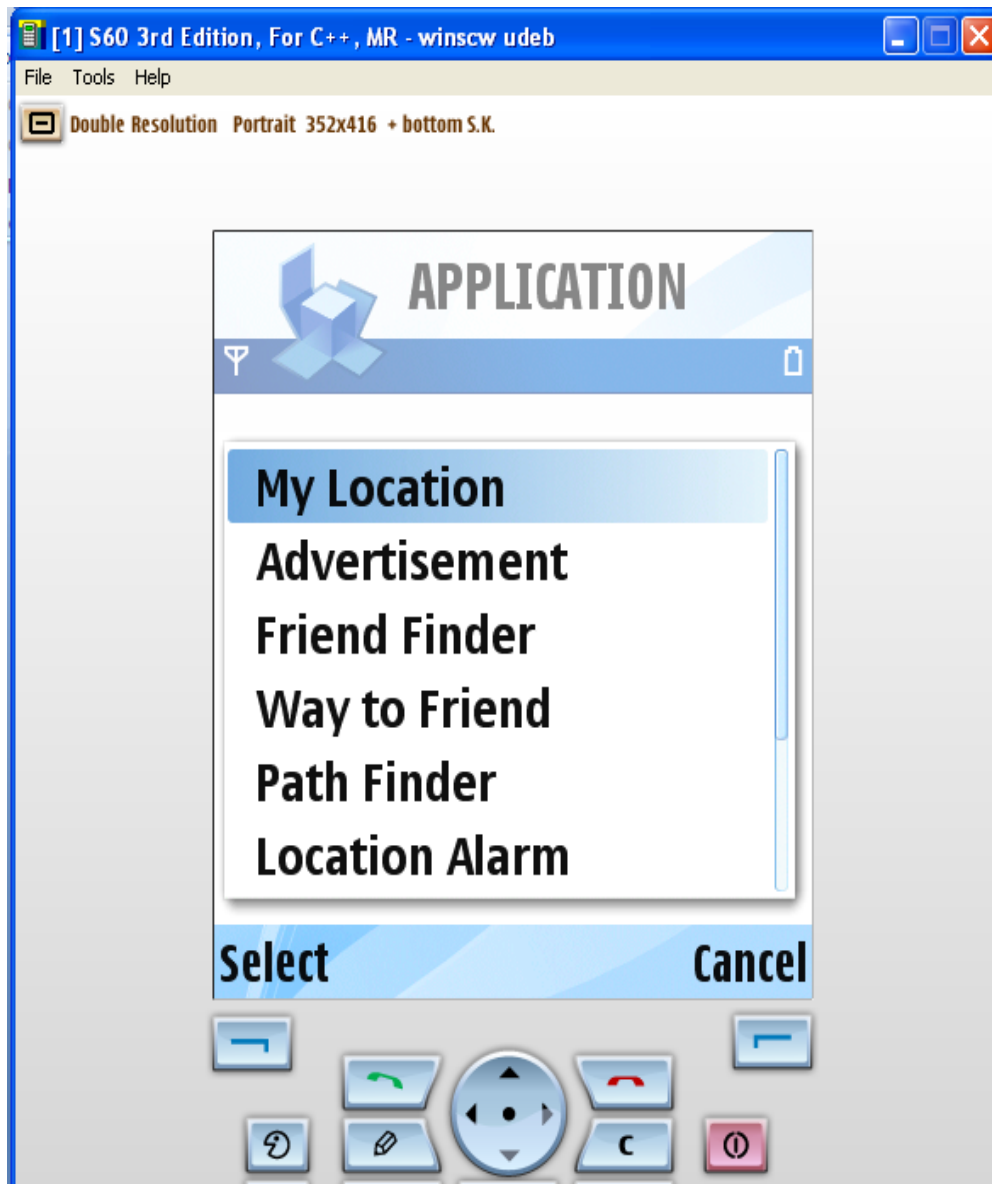


Screen Shot 1: Splash Screen Displayed at the start of the application

(J2ME Development)



Screen shot 2: Main Menu Screen  
(J2ME Development)



Screen Shot3: Men Menu (C++ Development)

# LBS

By lbs group

[Homepage](#)

[About Us](#)

[Gallery](#)

[Contact us](#)

## WELCOME TO LBS!

Mar. 8, 2007



LBSs are information services accessible with mobile devices through the mobile network utilizing the ability to make use of the location of the mobile device.

## CLIENT INFO

User ID :

Password:

[Sign In](#)

[Forgot your password?](#)

[Register Urself](#)

## SERVICES PROVIDED

Feb. 24, 2007

We are providing the location based services such as:

Services are :

1. My location
2. Find a friend

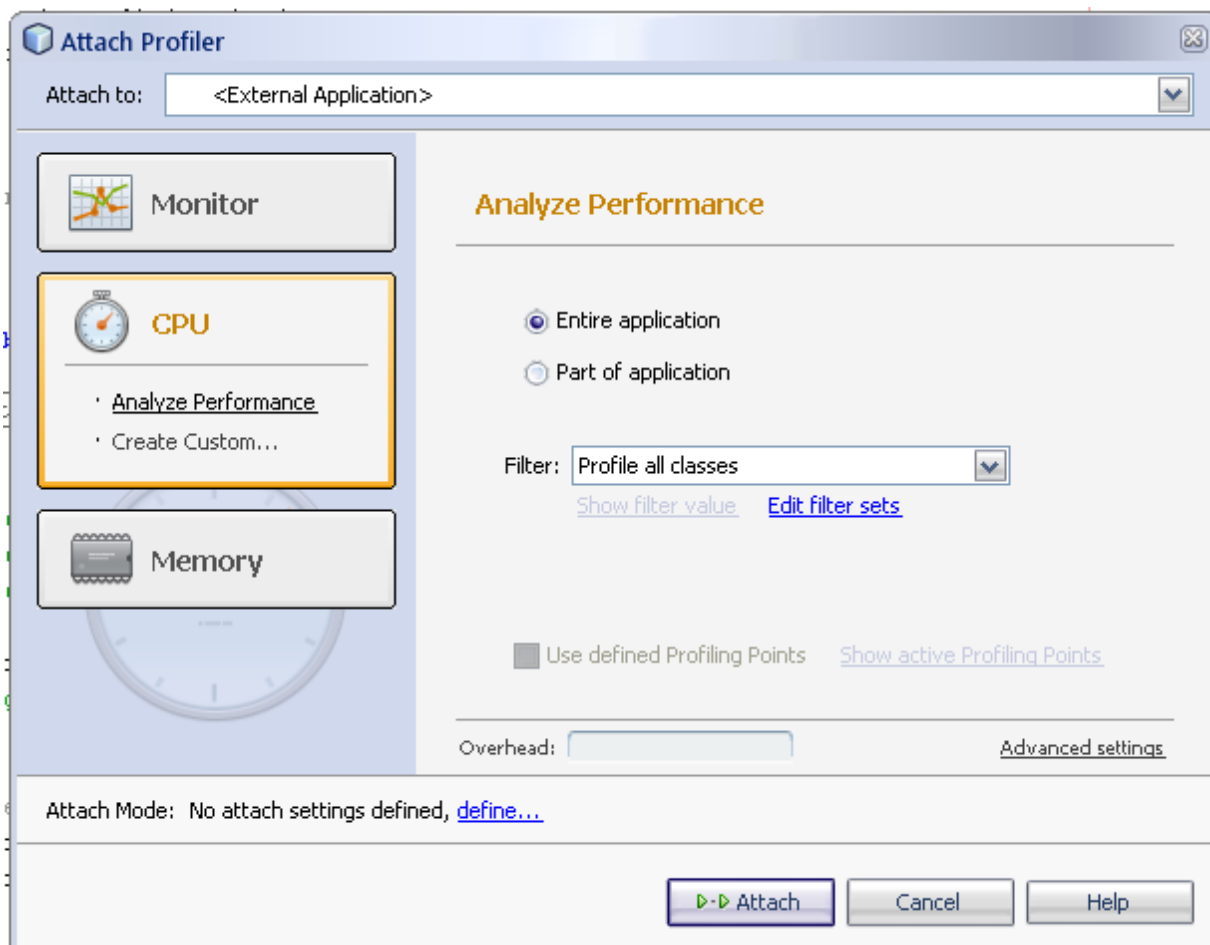
## RECENT UPDATES

Jan 5, 2009

Can access ur mobile position from the web.

### 13.3 Code Profiling

A profiler is a performance analysis tool that measures the behavior of a program as it executes, particularly the frequency and duration of function calls. (An instruction set simulator which is also — by necessity — a profiler, can measure the totality of a program's behaviour from invocation to termination.) The output may be a stream of recorded events (a trace) or a statistical summary of the events observed (a profile) or an ongoing interaction with the hypervisor. Profilers use a wide variety of techniques to collect data, including hardware interrupts, code instrumentation, instruction set simulation, operating system hooks, and performance counters. The usage of profilers is 'called out' in the performance engineering process.





We have used Netbeans code profiler. Netbeans code profiler helps to monitor the application actions, helps to analyze performance also to analyze memory allocations. We can track different object creation ,deletion. Time required by a functions and many more. Using profiler we have optimized the performance of the software.

## **14 ADVANTAGES AND DISADVANTAGES**

### **14.1 Advantages**

- **Feasibility**

Completely feasible as it is entirely open sourced and hence all the software requirements can be easily met.

- **Maintainability**

Multiple revisions of the same unit of information can be easily maintained.

- **Time Complexity**

We have used Code profilers to analyze the code performance at the run time and have optimized the software performance.

### **14.2 Disadvantages**

- User location is not exact as network based tracking is used.
- Mobile software compatibility

## **15 FUTURE ENHANCEMENTS**

Future scope of the project includes following extended applications

- Vehicle tracking system
- Billing System
- Weather forecasting
- Use of e-card through mobile no.
- Tracking the user path
- Emergency services
- Automatic Toll /Parking



## 16 REFERENCES

- Principles of Mobile Communication (2nd Edition)
- Web Database Applications with PHP & MySQL, 2nd Edition
- Beginning PHP5 by Dave Mercer, Allan Kent, Steven Nowicki, David Mercer, Dan Squier, Wankyu Choi
- Addison Wesley Developing Series 60 Applications A Guide For Symbian Os C Developers
- Developing Software for Symbian OS - An Introduction to Creating Smartphone Applications in C++
- Symbian OS Explained Effective C++ Programming for Smartphones
- Wiley.Symbian.OS.Communications.Programming.2nd.Edition.Sep.2007
- J2ME in a Nutshell (O'Reilly Java)
- Enterprise J2ME: Developing Mobile Java Applications
- J2ME complete reference
- Sams Teach Yourself Wireless Java with J2ME in 21 Days
- [www.Forum.Nokia.com](http://www.Forum.Nokia.com)
- [www.Symbianone.com](http://www.Symbianone.com)
- [www.Newlc.com](http://www.Newlc.com)
- [www.Forum.SonyEricsson.com](http://www.Forum.SonyEricsson.com)

