A Generic Architecture for Mobile Commerce M-CUSP

NC Tayyaba Hayat

NC Sarwat Jabeen

PC Zafar Iftikhar

ABSTRACT

Mobile network operators are continuously introducing new products and services, to meet the ever growing demand for mobility in today's fast moving world, while simultaneously attempting to make such services increasingly relevant to, and affordable by low income members of the society. Voice has become a basic commodity so product differentiation is achieved by value added services. These services are now the determining factor for the market ratings and revenue shares of mobile operators.

Mobile Commerce is the ability to carry out transaction anywhere at any time. Mobile commerce is not only a promising revenue generator but also achieves the pinnacle of

customer ease. The only obstruction in the way of m-commerce is the lack of a common standard.

This project, developed in collaboration with Turno-Tech Solutions, aims to design a system that provides air time transfer facility over the existing GSM network provided by Mobile Network Operators, user authentication being the prime focus. As part of the project, a sample m-commerce application, a bus reservation system has been built upon the architecture.

The system designed is generic and also serves as the building foundation for advanced applications from the m-Commerce field. It can be used by the travel industry to update customers on flight status, notify them when this information changes and will offer to make new arrangements based on preset user preferences requiring no input from the user. In the entertainment industry, m-commerce could be used for the reservation and purchasing of movie tickets. In short any merchant can provide the customer with the facility to pay by their mobile by uploading their service upon this architecture.

DECLARATION

No portion of the work presented in this dissertation has been submitted in support of any other award or qualification either at this institution or elsewhere.

ACKNOWLEDGMENTS

We are eternally grateful to Almighty Allah for bestowing us with the strength and resolve to undertake and complete the project.

We gratefully recognize the continuous supervision and motivation provided to us by our Project Supervisor, Assistant Professor Tauseef Ahmed Rana.

We highly acknowledge with gratitude Mr Shoaib Alam (CEO) Turnotech Solutions for his direction specifications and ever helping attitude towards our project. He himself is part of the NUST incubator program. We deeply treasure the unparallel support and tolerance that we received from our friends for their useful suggestions that helped us in completion of this project. We are also deeply obliged to our families for their never ending patience and support for our mental peace and to our parents for the strength that they gave us through their prayers.

A word of thanks to the MILITARY COLLEGE OF SIGNALS (MCS) as it had been our foundation and has made us capable to undertake the project.

DEDICATION

In the name of Allah, the Most Merciful, the Most Beneficent

To our parents, who have always been there for us when we needed them. Without their unflinching support and unstinting cooperation, a work of this magnitude would not have been possible

&

To our teachers, it is because of their efforts and dedication to the profession that we stand where we are today.

Preface

Driven by cheap and easy availability of the World Wide Web, widespread understanding of the internet's capabilities, the power and success of electronic commerce, and rapid advancements in wireless technologies and devices, mobile commerce is rapidly approaching the business forefront.

Nowadays it seems that our society is experimenting fast changes towards a new revolution, a revolution that many people have called Information Society: the ability to contact each other and access information independently of time and place has a major impact in our lives. Along side the growth of computing power, recent times have seen large advances in the area of networking and communications, mainly fuelled by the explosion of the Internet and mobile phone technologies.

Mobile phones are more common than bank accounts within Pakistan. For most of the world, turning the dream of mobile payments into reality has long met with frustration. M-payment — shorthand for using a cell phone to pay for goods and services — has morphed over the years. In its early form, it involved using a voice connection to initiate and settle a transaction; lately it has evolved into a far more convenient process that turns cell phones into one-step instant payment devices. For consumers, mobile payments mean no more fishing for credit cards or cash, and, with prepaid services, no more monthly bills to worry about.

The viability of these m-commerce applications basically depends on their attractiveness for consumers. Customers from Asia have demonstrated that they're eager to take advantage of the m-payment function and moved a step forward towards using their phones as lifestyle tools rather than just as communications devices.

Table of Contents

List Of Tables

List of Figures

Chapter 1

1. Introduction

This chapter outlines the main concepts of the mobile payment domain. The principle attributes of mobile payment describe actors, characterization of payment, possible scenarios and operations involved.

1.1.Mobile Commerce

Mobile Commerce is the ability to conduct commerce using a mobile device thus being able to make purchases anytime, anyplace. The essence of m-commerce is to break free of the traditional static commerce model, in which customers are constrained by time and location. The pervasiveness of wireless networks is creating new opportunities to offer innovative mobile services. This conversion from physical to virtual payment has already brought significant benefits to consumers and merchants alike. Mobile commerce is currently used for the sale of mobile phone ring tones and games. It is increasingly being used to enable C2B and C2C micro-payments

1.2.m-Commerce Applications

M-commerce applications primarily fall into three main categories:

- Transaction management
- Digital content delivery
- Telemetry services.

Table1 m-commerce application framework

Category	Applications	
	Passive (self activated)	Active(user-activated)
Transaction Management	Tolls, Payment, Automatic updates	Shopping
Digital content Delivery	E-mail, short messages	Information Browsing Directory Services,video
Telemetry Services	Status monitoring, Interactive Marketing, Smart Messaging	Stock Quotations , Appliance Management

1.2.1. Transaction management

Transaction management is basically the payments of services and goods in real time using a mobile phone. The amount usually being small it is known as micro-transaction. When individuals reach for their e-cash-equipped mobile phones or PDAs instead of coins to settle transactions such as subway fees, the dream of digital economy will come one step closer to reality.

1.2.2. Content delivery services

These m-commerce activities include information browsing, status information and directory services.

1.2.3. Telemetry services

The transmission and receipt of status, sensing, and measurement information—

Telemetry services—form the basis for a wide range of new applications involving mobile devices. These types of applications enable communication to remote devices via a mobile phone. Similarly, users will transmit messages to activate remote recording devices or service systems.

1.3. Challenges

The opportunity and challenge for business community is to develop applications that make the most of the advantages of mobile commerce. The greatest challenge to structuring such a strategy may be creating the advancements and improvements that will satisfy the requirements and meet the expectations of consumers as well as commercial sector participants.

1.4. Actors within an m-payment system

The various actors within a mobile payment system are listed below..

1.4.1. Mobile Network Operators

The most significant participant after the customer in the m-Commerce value network is the network operator (or network carrier), because they are responsible for a wide range of activities including investing in network infrastructure and educating customers about the availability and uses of new wireless services. Mobile Operators must consider new mobile payment systems in the context of new ways to open up revenue streams, especially from monthly m-payment subscription charges or per transaction fees. Operators must also take full advantage of the positive side effect of embedding the mobile phone even deeper into the life of the subscribers.

1.4.2. Handset suppliers

Handset suppliers must embrace new approaches and start to consider active integration of mobile payment capabilities into product road maps and line-ups. Mobile payment capabilities are seen by some as the next big thing to drive handset replacement, making standardization and compatibility across operators and platforms critical to preserve user attractiveness and scale benefits.

1.4.3. Merchants

Merchants are someone or some organization who sell products to the consumer. They must use their vast experience with cashless payments to drive further cost decreases that accrue from giving up cash, and to offset technology upgrade costs. Finally, it needs to be demonstrated to mobile phone users that mobile payment is much more attractive than other more familiar payment schemes. The bundle of convenience aspects (safe, secure, available, fast, transparent, etc.) needs to be packaged and sold to target groups individually. Although meeting these critical success factors is a balance not easy to achieve, it is worth the effort. An ecosystem play, tailored to the geography to be served, will succeed and change today's payment landscape.

1.4.4. Consumer

The consumer is the person owning the mobile device and is willing to use it to pay for a service. In this report the consumer is referred to as the mobile user. Customers are placed as the central value network member in B2C m-commerce, because they are at the

end of the value chain and they are responsible for any growth in this sector by purchasing available wireless products and/or services.

1.4.5. Payment service Providers

The payment service providers are the party responsible for the payment process. They control the payment between the mobile user and the merchant. This actor may be the Mobile Network Operator and in some cases a trusted third party. The trusted third party is a company used to perform the authentication of transaction parties and the authorization of the payment settlement. This actor could be a network operator, a financial institution or a credit card company. Therefore, their main role is authentication and authorization of payment requests.

1.5.An Industry Consortium Approach

The single most important step in building a successful m-payment system is to set the incentives for all stakeholders. Without this, there will be no progress. Each of the participants, furthermore, must accept certain fundamentals and step up as needed for the good of the entire enterprise.

Chapter 2

2. The Project

This chapter summarizes what the project is all about. The motivation behind the undertaking of the project, its scope, planning of work, goals and how it was planned to be achieved are part of the discussion in this chapter.

2.1.Motivation

Mobile commerce though being considered as the future method of payment within executive enclaves yet lacked a common acceptable platform for the stakeholders. To develop a framework for this purpose has been selected as our final degree project as it is a state-of-the-art application and will benefit the masses.

2.2.Problem Statement

Developing send and receive SMS functionality

Device authentication procedures

Develop a methodology for connectivity with MNO

2.3.Work break down Structure

The whole project was divided into sub portions and tasks that were accomplished so forth are listed below.

2.3.1. Requirements Engineering

1. Requirements Elicitation
    i. Interaction with Domain Expert
    ii. Determining Stake holders of the system
    iii. Study existing infrastructure of MNOs.
    iv. Carrying out research and market study.
2. Developing Problem Statement
    i. SRS Preparation
    ii. List constraints for interface-ability with existing infrastructure
3. Solutions Evaluations
    i. Analyze various options Available (i.e. Platform Compatibility, Language)
    ii. Propose the best Approach to Problem Solution
4. Analysis
    i. Feasibility Study
    ii. Determine the stakeholders' preferences
5. Assignment and Planning
    i. Assignment of Tasks to the syndicate members
    ii. Preparation of TimeLine Chart

2.4.Literature Review

1. Payment methodologies Research Work
2. Existing m-commerce systems analysis

3. Review telecom industry setup
4. Conduct research to determine appropriate security algorithms

2.5. Architecture Design

1. List required functionality
2. Design the Components
3. Develop and deploy components
4. Integrate Components

2.6. Testing

1. Prepare test Cases
2. Black Box Testing
3. White Box Testing
4. Validation
5. Verification

2.7. Documentation

1. Preparation of System Manual
2. Preparation of Data Dictionary
3. Detailed Thesis
4. Research Papers and Publications
5. User Manuals

2.8.Refinement

To list the future work and further refinements for the architecture

2.9.Research Objectives

Determine the most feasible and generic m-commerce setup for a third party developer.

2.10. Project Goals and Objectives

The objectives of the project were:

(a) Design and implement a sms-based credit transfer facility.

(b) Extend the system as a generic design for other m-commerce applications

(c) Develop sample application upon this architecture

2.11. Subsequent Future Objectives

Deployment of security model on mobile phone

Deployment of system in industry

2.12. End-Product description

The project develops a product which is capable of providing the facility to use the credit of your mobile as actual cash. It focuses on transactional m-commerce. Interaction with the customer is done via SMS. The core functionality transfer of credit is to be developed with appropriate methodology for user authentication. A sample application is to be built upon this architecture to demonstrate the working as proof of reference.

2.13. Market Worth

The major benefit of this architecture is that to introduce new Value added services pertaining to m-commerce no changes in the intelligent network of the operator is required. Since the base line functionality is already developed the cost, time and efforts required to change add or remove new services has been reduced substantially, thus increasing profit margins.

2.14. Project beneficiaries

Military College of Signals

Turno tech Solutions

Chapter 3

3. Design and Implementation

This chapter elaborates upon the design of the framework developed. Design constraints are discussed as well. Each component is explained in detail and appropriate diagrammatic are displayed accordingly.

3.1.Design Constraints

The design framework developed must comply with the following constraints (as put forward by Turno tech Solutions)

- The framework must have the capability of being placed within the MNO infrastructure.
- It must also be capable of being monitored and controlled by a third party application developer external to the MNO.
- The system must be flexible to allow new patches as per change in market environment.
- The system must be generic enough to allow easy addition and removal of m-services.

3.2.Design Components

The system has the following main components

- SMS Gateway
- (virtual) SMSC

- Application Server
    - Web server (Apache2)
    - Service defining Scripts (PHP)
- An Intelligent Network (IN) from mobile Network Operator (mysql realization of the standard IN SDP Layer for the demonstration)

The architecture developed works with daemon threads. The main threads in the application are

- Apache2(httpd)
- Mysql(mysqld)
- smsGateway threads (bearer-box and sms-box)

Other than this an application layer is developed which communicates with the architecture and provides the processing functionality for transactions

The flow of a request put forward by the customer is depicted in the following diagram

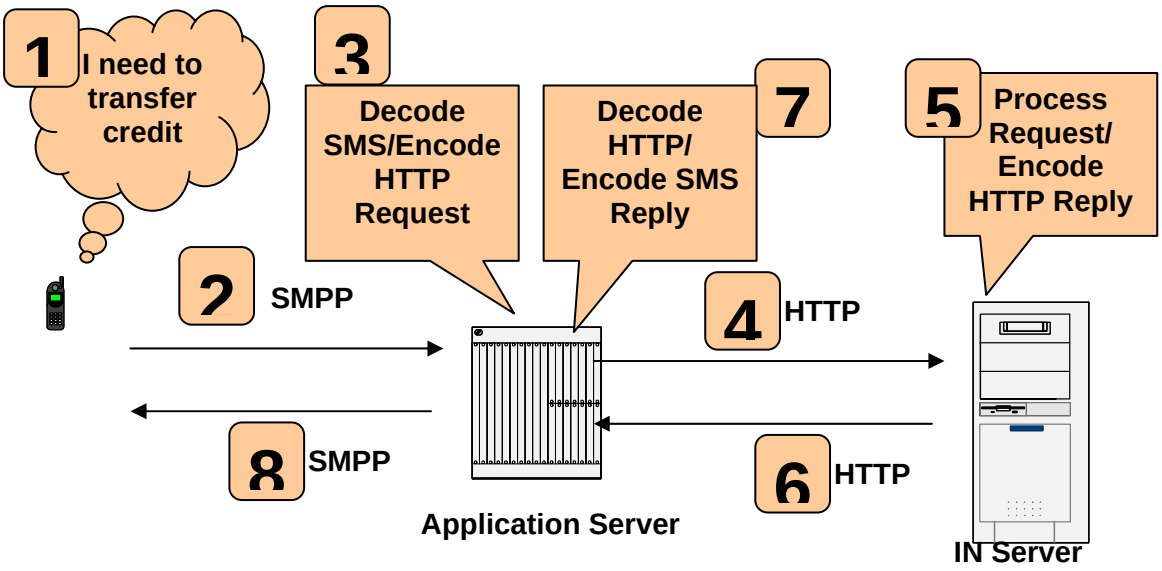

Figure # 1 System flow diagram

3.3.SMS Gateway

To provide send and receive sms functionality an sms Gateway is used. The reasons behind choosing the option of the open source sms gateway Kannel are as follows

- It provides high load handling capability
- The state of the messages within the system are saved persistently
- Better security than commercial gateways. If there is a security hazard it can be patched in a day or two, sometimes it could only take a few hours until the problem is fixed.
- Since the code is open source there are no hidden security hazards or other inconveniences.

3.4.Kannel

Kannel an open source product of Wapit ltd (Finland) was developed primarily for WAP services. Its first version was released in fall 2000 and over the years improvements and refinements have been induced by the open source developers' community.

Kannel divides its various duties into three different kinds of processes, called boxes, mostly based on what kinds of external agents it needs to interact with.

The bearerbox is the central hub of the gateway. It connects to the SMS centers The smsbox implements the rest of the SMS gateway functionality. It receives textual SMS messages from the bearerbox, and interprets them as service requests, and responds to them in the appropriate way. The wapbox implements WAP protocol stack and WAP Push (an application level protocol). If wapbox is used for pushing, it is called Push Proxy Gateway or PPG

3.4.1. Bearerbox

The Bearer Box works with messages, message queues, thread structure, heartbeats inside the box, and communication between internal and external modules. It is the central hub of the gateway. The bearerbox receives UDP messages from the phones, sends them to smsboxes, receives reply messages from the smsboxes, and sends the corresponding UDP messages to the phones. The bearerbox uses several internal threads and message queues. The bearerbox tries to balance the load between different SMS boxes. This is implemented using heartbeat messages sent by the smsboxes to the bearerbox. Each smsbox computes its own load factor. Periodically, the smsboxes send a heartbeat message containing their load factor to the bearerbox.

To make sure things are working a methodology of heartbeats is utilized. In addition to shuffling packets between the phones (directly or via SMS centers) and the other boxes, also keeps track of the *heartbeat* of each box. Each box sends a heartbeat message, essentially saying 'I am still alive', and the bearerbox will keep track of when each box has sent it last. If a box stops sending heartbeat messages for too long a time, the bearerbox will close the connection to it. A parameter to the heartbeat message is the *load factor* of the box. The bearerbox uses this to decide which box it should send each package to.

3.4.2. SMS box

The sms box receives the message from the bearer box and forwards it to the http server. It runs as a daemon thread. Each SMSC is attached to one SMS box. The sms box is responsible for translating the sms to html format and forwarding it to the required server side script.

3.5.SMSC

The Point-to-Point Short Message Service (SMS) provides a means of sending messages of limited size to and from GSM mobiles. The provision of SMS makes use of a Service Centre, which acts as a store and forward centre for short messages. Thus a Global System for Mobile Communication Public Land Mobile Network (GSM PLMN) needs to support the transfer of short messages between Service Centers and mobiles. Two different point-to-point services have been defined: mobile originated and mobile terminated. Mobile originated messages will be transported from an MS to a Service Centre. These may be destined for other mobile users, or for subscribers on a fixed

network. Mobile terminated messages will be transported from a Service Centre to an MS.

For this project a replacement for SMSC is utilized. A cell phone is used and it is called the virtual SMSC. I t was observed that the smsgateway works with serially input data stream. Therefore a phones with serial data streaming were shortlisted. Among which after testing and verification a Nokia 6070 phone set is used as the virtual SMSC. Connectivity with kannel is provided via a USB Cable.

3.6.Application server

A web server Apache 2 is being used to upload the services. The SMS gateway connects to this service also.

3.7.Php scripts

Various php scripts have been developed to define each service deployed upon the server. The general algorithm for these scripts is that they work with the

- parse information
- perform user-defined checks
- perform transaction
- return text for message

3.8.SMS Grammar

SMS being sent by the user should follow the predefined manner. The SMS formats for the currently implemented system are given below:

3.8.1. Credit transfer between end-users

Transfer *password*destination number*amount*

Password : known by the owner only (4 characters)

Destination number : the number to which the credit is to be transferred (13 digits)

Amount : the amount the sender wishes to transfer

3.8.2. Getting bus information

binfo *date*time*departure*destination*

date : the date for the bus departure (10 characters)

time : the time for the bus departure (8 characters)

departure : the city for the bus departure (3 characters)

destination : the city for the bus arrival (3 characters)

3.8.3. Making a reservation on a particular bus

breserve *bus id*the seats to be reserved*

bus id : the bus in which the sender wishes to make reservations

the seats to be reserved : give seat numbers any number of seats can be given separated by * .If they are not already booked and enough balance is available the transaction will be carried out

3.9. Intelligent Network

After detailed study of the MNO infrastructure the following observations have been made.

An intelligent Network (IN) is a service-independent telecommunications network. That is intelligence is taken out of the switch and placed in computer nodes that are distributed throughout the network. This provides the network operator with the means to develop and control services more efficiently. This service creation procedure is accessible only from within the MNO and not by the third party developers. Also it has the drawback of accidental deletion of core modules.

The component of the IN that we require to communicate with is the SDP Service Data Point keeps record of all the customers and their call and service records. It is observed from market survey that most telcos use a mysql realization of the SDP Layer. Therefore, we have developed a bare minimum replacement of the IN in the form of a dummy mysql database. Its job would be to communicate with the developed architecture as the IN.

3.10. Security model

There are basically two aspects to providing secure transaction. One is to provide user authentication i.e. the person requesting the transaction is the actual owner of the mobile .Second is to provide security while the message is being transmitted so that no interception is possible .

3.10.1.User Authentication:

The SIM of the mobile operator comes with a 4 digit pin. Whenever the user wants to make a transaction it is a requirement to provide this number. This ensures that the person performing the transaction is the actual owner of the mobile.

3.10.2.OTA Security:

An encryption module has been designed to be developed in J2ME. The application runs on the mobile set and before sending any message encrypts it. The decryption is performed at the mobile operators end as the decryption string is known by the mobile operator only.

Several third-party packages are currently available to supply the lack of encryption libraries in the MIDP specification. One of the best known is Bouncy Castle .The Legion of Bouncy Castle is a Web community that produces an open-source Java implementation of cryptographic algorithms. Bouncy Castle includes a clean-room implementation of the Java Cryptography Extension (JCE) and, more significantly, a version targeted to the Java 2 Platform, Micro Edition.

Bouncy Castle for J2ME has a lightweight API that includes a simple cryptographic framework and a large number of algorithms such as block ciphers, public-key ciphers, message digests, etc. It also contains generalized interfaces like BlockCipher, Digest, etc., making it easy to switch algorithms and find the right balance between strength and speed.

The MIDlet's user interface has two screens, one for sending a message and one for receiving. The sending message form contains fields for the destination number, text. Destination number is fixed. It also has a Send command to do the encryption and send the message.

On the receiving end, the application listens for incoming messages and upon their arrival it prompts for the password to be used in the decryption process.

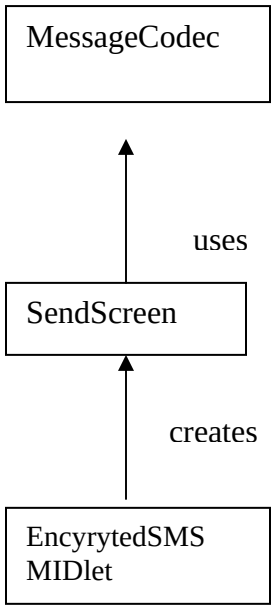

Figure # 2 Encryption model for Send

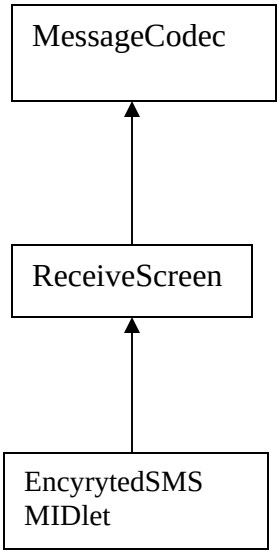

Figure # 3 Encryption model for Receive

External Interfaces to the system

The system developed has two external components that it must communicate. Firstly, the Intelligent Network of the Mobile Network Operator and secondly the electronic database of the merchant who wishes to provide m-commerce service to the customer is the most important external interface to the system. Each unique merchant would havbe a unique electronic database connected to the system. If a merchant wishes to upload more than one service the instance of database connections would depend upon the nature of the service.

3.11. How to use this architecture

To use this architecture in the industry some sort of business deal between the network operator and vendors who want to sell via m-commerce must be done. Then their service is registered on this platform by defining a keyword and the list of information they require to process the transaction. The customers / mobile users are required to send the SMS in the pre-defined format to the SMSC deployed by m-CUSP. The message is routed within the system to the server where appropriate scripts are run to perform validation and authentication checks and subsequently a script for the specified service is executed to perform the transaction. The baseline modules common to all services are provided and allow easy reuse for swift design and development of new services.

3.12. Transaction flow diagram

The credit transfer lifecycle is diagrammatically elaborated below

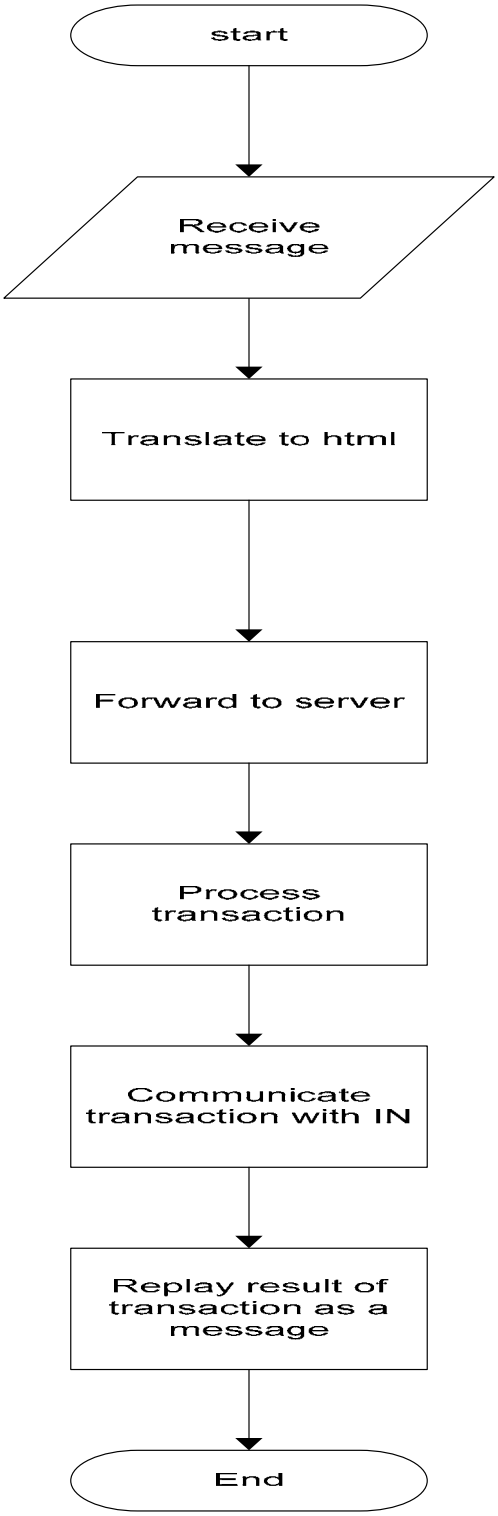

Figure # 4 Message life cycle

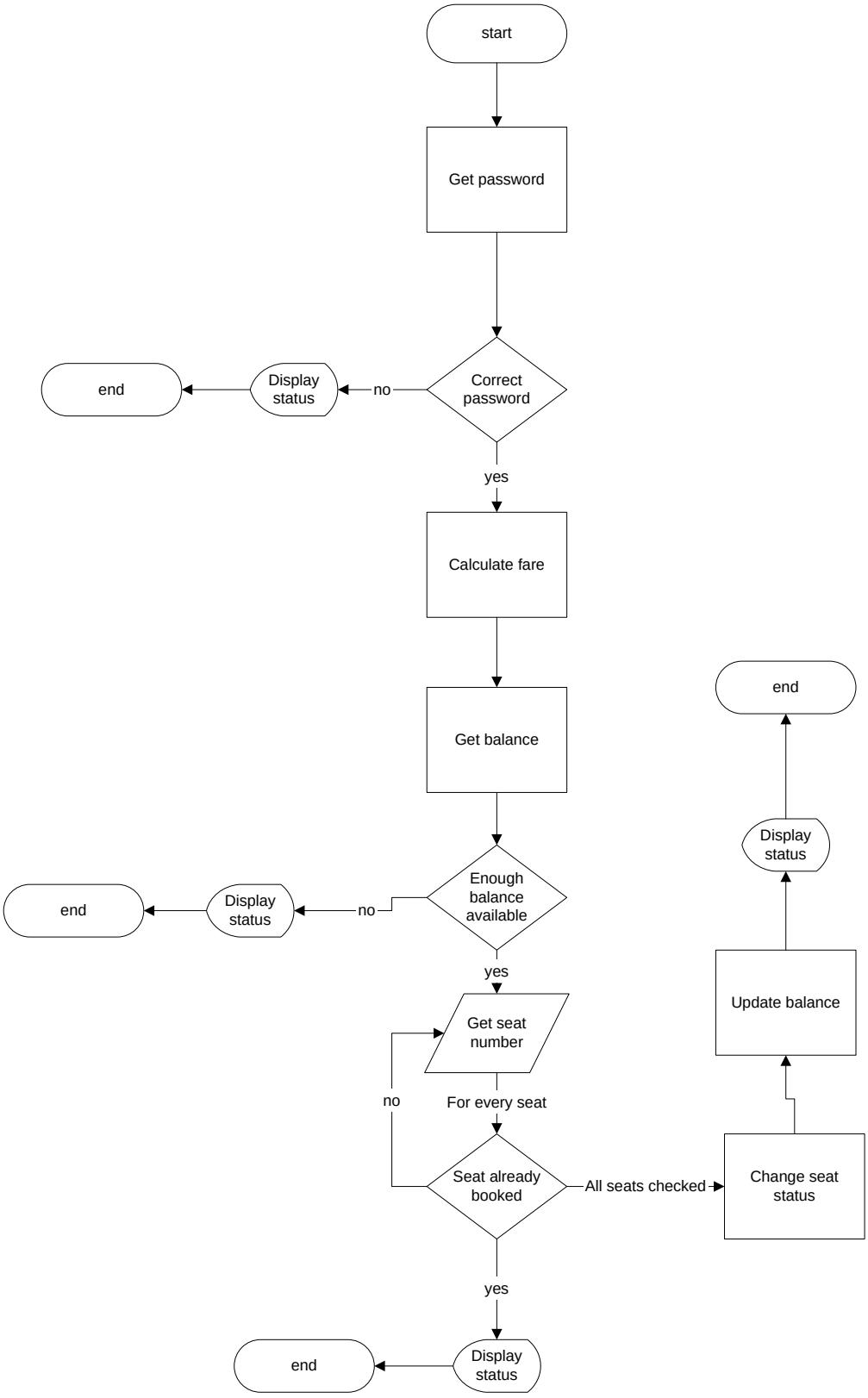

Figure # 5 Flowchart Bus Reservation

Chapter 4

4. Analysis Conclusion and Future Work

This chapter makes an analysis of the system developed. It presents a conclusive report about the project and all that is gained from it. Directions for future enhancements and refinements are specified.

4.1.Analysis of the idea

According to Jupiter Research the global m-Commerce revenue in 2009 will be 88 billion US dollars whereas it was only 22.2 million us dollars in 2005.This shows that m-commerce is on its way to be a dominant force in business as well as in society. The technology required to make m-commerce successful is within reach

4.2.Analysis by Turnotech SQA team

The end-product developed for Turnotech Solutions has been approved by the Software Quality Assurance team. Their comments about the end-product are as follows :

"The designed system is perfect for a third party application. The components of this system are easily available but the generalized configurations settings developed by the students are very rare and exactly what the industry needs. Mobile industry leaders like Mobilink have failed to implement what has been achieved in this undergrad project. Project m- CUSP not only meets the software Quality metric standards followed by Turnotech Solutions but also is flexible enough for additional patches like that of encryption module, etc. The bottom-line evaluation criteria for an m-payment system

are security, convenience and efficiency. All three m-commerce applications quality metrics are met by m-CUSP."

4.3. Conclusion

Since mobile phones are more common in Pakistan than bank accounts the concept of your mobile phone being your wallet is going to be ground breaking and a rationale to adopt a for a new lifestyle. It would have the benefit the masses in handling their money efficiently. Among many one obvious advantage is in case of theft nobody would loose their money. Their money would be password protected and the sim may be retrieved from the Mobile Network Operator.

4.4. Future Work

We have recommended a refinement in this project; it follows as a standard GUI interface at the mobile user end should be developed for enhancing customer ease. It would involve development of standard login screen for customer on cell phone and list directory of available m-payment services there. The challenge in this task would be to find a common workable solution for the variety of phone handsets available in the market. Deployment of the encryption module as a java applet is also a future task to be done.

This task is currently being assessed by Software Quality Assurance officers at Turnotech Solutions. Once a feasibility report has been formally approved the project would be given to students who have proved their merit for this laborious task.

5. Annexure A

Mobile Credit Transfer Facility

Software Development Plan

Version (1.0)

Preface

In this document the detailed development and management plan for mCUSP is described. This plan will be strictly followed over a course of six months. Any modifications applied to this plan will be incorporated in the next versions of this document.

The document includes the details of the software to be delivered; major activities, major deliverables, major milestones, required resources, and top-level schedule and budget will be followed in the sections to come.

Introduction

This section contains the details of the project and the software product being to be built. In this section we give a brief overview of the project.

Project Overview

mCUSP is a nonspecific application that aims towards providing a platform for mCommerce applications. Currently, as an initial implementation of the system it provides credit transfer facility between end-users. If support from the business sector is made available, this can be used to provide transaction between business and consumer sector .The main aim of the application is to provide for rapid creation of third party mCommerce applications with out changes in the way mobile service providers operate.

Minimum Requirements

The minimum requirement for the software to be operational requires

Hardware Requirements:

GHz Processor or More

256 MB of RAM or More

Software Requirements:

PHP

Apache Web Server

MySQL Server

Kannel SMS and WAP gateway

Operating System:

Ubuntu Linux (Debian Core)

Major milestones

The major milestones of the project are

- Completion of Project Plan
- Completion of Requirement Analysis and Project Specifications phase.
- Completion of Design phase
- Implementation and Integration of components.
- Product testing, installation and approval

The details of the software to be delivered, major activities, major deliverables, major milestones, required resources, and top-level schedule and budget will be followed in the sections to come.

Project Deliverables

This section outlines the major items to be delivered to either the external customer or the in-house user. Following are the details:

List of Project Deliverables

List of project deliverable is as follows:

Deliverable Name	Due Date
Project Definition and List of team Members	22nd May 2006
Project Plan	19th June 2006
Requirements Description	28th September 2006
Project Specifications	13th October 2005
Detail Design Document	29th January 2006
Testing Plan	12th February 2007
Fully Functional Product Model with Project Report and Review	4th April 2007

Further deliverables will be provided upon request.

Details of the Deliverables

Following are brief details of the project deliverables

Project Definition and List of team Members

This includes definition of project and list of team members

Project Plan

This document describes how the team is to be structured and managed for the duration of the project.

Requirements Description

This document outlines the requirements of the proposed software system, upon which design and coding is based.

Project Specifications

This document will describe detailed specification for mCUSP defining parameters and interface.

Detail Design Document

This document builds on the high-level design, and further details the specifics of Coding Product implementation and key algorithms as required.

Testing Plan

A complete testing plan describing how and when the testing will be carried out. This document describes the methodologies used in testing the system.

Fully Functional Product Model with Project Report and Review

A fully functional product model will be demonstrated. A full source code will also be given if requested.This will include complete project journal explaining what was achieved during the project. Also further improvements possible will also be described.

Project Organization

This section describes the development structure of the project which includes the process model (e.g., lifecycle model) and responsibilities of individuals on the project.

Process Model

Project Life Cycle Model

mCUSP will be developed using spiral life-cycle model. The model is as follows:

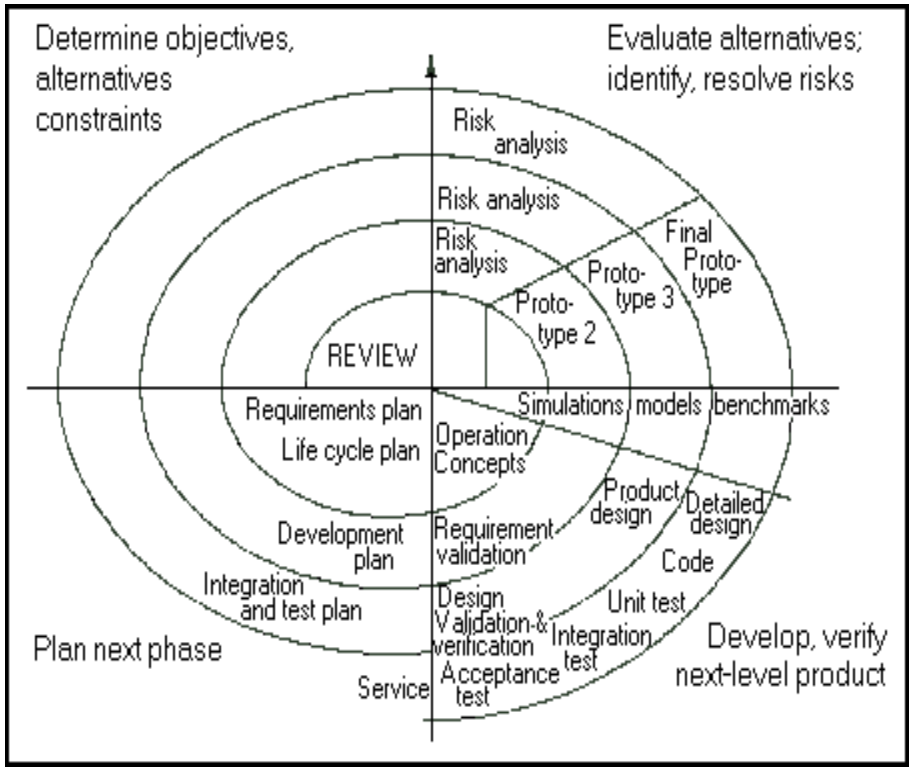

Fig. 1 Spiral Model

Significance

The Spiral model is better from waterfall as it allows for risk management where the Waterfall places too much emphasis on project management.

The duration of the development period is 8-12 months for which this model is best suited.

There are only three team members. So each and every member will have to participate in all the phases and deliverables

Good for large and complex projects

Customer Evaluation allows for any changes deemed necessary, or would allow for new technological advances to be used

Allows customer and developer to determine and to react to risks at each evolutionary level

Direct consideration of risks at all levels greatly reduces problems

Organizational Boundaries and Interfaces

Regular meetings with client will be held. The project progress will have to be approved by the client at least once a week. Explanation of different requirements will be acquired from the client.

Any member of the team will not reveal the project documentation to any party other than the client.

Also every member will have to attend team meetings unless he/she has a valid reason. Team members will meet at least twice a week and a detailed meeting will be held before submission of each deliverable.

Informal Communication will also be used extensively in this project due to its quick and efficient information transferal properties. Other than all the meetings, email being cheap and easily available to all is the basic mode of communication between team members.

Project Manager will be responsible for communicating with the upper management.

Direct communication is being held and will be held with the Customer organization externally.

Again the Project manager will be responsible for communication with the customer organization.

There are no subcontracting organization(s) associated with project.

There are no other organizations that the project interacts with. Any future interactions or relationship will be delineated in the future revised versions of the document if the need arises.

Project Responsibilities

The following chart illustrates the persons and their respective responsibilities concerning this project. Any changes in the given structure will be incorporated in the future versions of the document.

Responsibility	*Persons Responsible*
Overall Project Manager	Tayyaba Hayat
Engineering Manager	Sarwat Jabeen
Quality Assurance Manager	Sarwat Jabeen
End-User Documentation Manager	Tayyaba Hayat
Requirements Engineer	Zafar Iftikhar
System Design	Sarwat Jabeen ,Tayyaba Hayat, Zafar Iftikhar
Technical Self-Reviews	Zafar Iftikhar

Managerial Process

In this section we describe policies that will be adopted to manage mCUSP**.** This includes management objectives, priorities, project assumptions, dependencies, constraints, risk management techniques, monitoring and controlling mechanisms, and the staffing plan.

Management Objectives and Priorities

The main objective is to ensure that time constraints are strictly followed. Also the priority will be given to the quality of work.

During the earlier stages of the project more priority will be given to schedule.

Cost will not be as much a major factor in this project. Though this is a commercial project but it does not fall into the category of high budget projects, so cost management

is not the primary goal. Due to work load main concern will be, to meet time constraints and to make sure work is completed on schedule.

More priority will be given to functionality as well. The main aim of the project will be to achieve the maximum possible efficient functions of the project in the minimum possible time. The project team will attempt to strike maximum possible balance between time and functional priority.

Risk Management

This area describes the major risks to the project, which the project plan has been designed to address. It also describes how risks will be tracked and monitored.

Major Risks

The major risks that can impinge on the project are

Work overload.

Shortage of time

Availability of hardware

Risk Tracking and Monitoring

To avoid work overload the tasks will be distributed among team members in such a way that every personnel is able to give enough time. Every phase will have an informal sub schedule. Main schedule is made flexible enough to accommodate mishaps and undesirable circumstances

Hardware procurement being a very important phase in the project it will be made sure before integration phase or during the test plan definition phase that desired hardware and software is acquired.

This being a new field for the team, every team member will be given time to get familiar to the domain of the project. Help materials will be acquired for this purpose. Also necessary in time help will be requested from our supervisor.

Any risk factor, suggested by a team member or client will be included in this section for next versions. The possibility of risks emerging during the project is very high so a risk list along with the avoidance mechanism will be kept and updated accordingly.

Progress Monitoring and Controlling Mechanism

Monitoring and Controlling Mechanisms

Project cost, schedule, quality, and functionality will be tracked throughout the project. Problems encountered by any team member will be discussed and resolved accordingly. Regular and open interaction between the team members is really important in this regard

Report contents

Separate reports shall be prepared for monitoring the technical, functional, quality and cost monitoring of the project. Progress reports will also be maintained in due course of time. The status reports of the Managing committee will contain the following details:

Status of the current phase activities

Milestone deliverables at current phase

Schedule for the next phase activities

User Actions

Staffing Plan

The number of personnel is fixed in the current project, considering the different approach of the project at hand. The minimum skill levels are not defined at this stage. The entire duration of the project will be headed and dealt with the same time, each individual acquiring different role during different phases.

There will be no extra personnel acquired during the course of the project besides those that are currently involved in the project.

Technical Process

This section describes the top-level technical processes used on the project including the technical methods, tools, and techniques; major software documents; and supporting activities such as configuration management and quality assurance.

Methods, Tools and Techniques

Operating Environment

The operating environment will be that of Ubuntu Linux Debian core. Installation of Kannel SMS and WAP GAteway and C++ IDE is mandatory.

Hardware

SMSC

Standalone System

Software tools

Compiler or IDE	:	C++,PHP
Programming language/tools	:	PHP, Apache Web Server, MySQL Server
Coding standards	:	IEEE
Documentation standards	:	IEEE

Remarks

Documentation will be clear and explanatory. Detailed user guide and installation manual will be accompanied.

Software Documentation

The listed documents will be developed for the project, including are milestones, reviews, and signoffs for each document.

Documentation will consist of

Project Plan

Requirements Document

Requirement Analysis

Requirement Specifications

Testing Plan

Detailed Design

Product Review

System configuration and installation manual

End - user documentation (USER MANUAL)

Work Packages, Schedule, and Budget

Work Packages

The work packages defined for the software development lifecycle are as below. These including the sub-packages and tasks must be completed in order to complete the software.

Software Project Initiation

Software Concept Development

Software Requirements Development

Software Architectural Design

Software Development

Software Implementation and Integration

Software Testing and Configuration Management

Dependencies

Dependencies among work packages

All the work packages discussed above are extensively interdependent. Every package is dependent upon all the packages illustrated before it. And all the tasks within each work-package follow the same schematic.

Dependencies on external events

Various work products will be dependent on the external approvals etc.

Resource Requirements

The following resources will be needed.

Hardware Tools: Stand alone PCs,SMSC.

Software Tools PHP, C++, MySql, Appache Web Server

Operating System Ubuntu Linux

Additional resources will be identified in the later versions of this document.

Budget and Resource Allocation

Budget Allocation

Following is the amount of Budget allocated to the Software processes.

Software Requirements Management	:	15 %
Software Design	:	15 %
Software Construction	:	10 %
Software Implementation	:	7 %
Software Testing and Integration	:	18 %
Documentation	:	10 %
Software Project Management	:	25 %

Project Schedule

The following schedule will be followed during the development process. The schedule is based on project deliverables. The schedule given below is subject to change as the project development progresses.

Based on Project Deliverables, following Chart illustrates the Project Schedule.

Deliverable Name	Due Date
Project Definition and List of team Members	**22nd May 2006**
Project Plan	**19th June 2006**
Requirements Description	**28th September 2006**
Project Specifications	**13th October 2005**
Detail Design Document	**29th January 2006**
Testing Plan	**12th February 2007**
Fully Functional Product Model with Project Report and Review	**4th April 2007**

Additional Components

This section defines the additional components needed to manage this project.

Training plans

Facilities plans

Installation plans

Software Maintenance plans

Details of these areas will be provided in separate documents in due time.

6. Annexure B

Mobile Credit Transfer Facility

User Manual

Version (1.0)

A GENERIC ARCHITECTURE FOR mCOMMERCE APPLICATIONS

Tayyaba Hayat, Sarwat Jabeen, Zafar Iftikhar

USER GUIDE

This user guide comes with the m-CUSP application. Here we give, in detail, steps involved to use this application. There are two possible cases:

- Using existing services.
- Creating new services.

USING EXISTING SERVICES

SMS Based Credit Transfer

Start all 3 boxes

It is important that the predefined keywords and format of the message is highly publicized among the users.

Open the start.php file in Mozilla Browser for a user friendly interface to monitor the system.

The links on the left side of the page are explained in detail.

Add Customer

This link is given for fast and easy addition of a user account. Usually this functionality is used during the creation of new……

Search Customer

This link is used to easily find a customer account from the database making use of first name, last name and NIC of the customer.

Customer Details

View the complete customer database. A sample output is given below:

Account Details

View the complete accounts database. One customer can have multiple accounts but one account has only one owner. A sample output is given below:

Transaction Details

View the complete transaction database.

SMS based bus reservation System

Get electronic database of the bus service providing the booking via SMS service. There should be arrangement to keep the database uptodate. Most suitable case scenario would be to manually add details of available buses e.g. their departure, destination, date and time. Whenever a new bus is available all of its sets are empty. The status of seats is automatically updated whenever a new request for booking is received via SMS.
It is important that the predefined keywords and format of the message is highly publicized among the users.
Open the start.php file in Mozilla Browser for a user friendly interface to monitor the system.
The links on the left side of the page are explained in detail.

Bus Details

View the complete information of the available buses.

Booking Details

View the complete information of the bookings made on each bus.

CREATING NEW SERVICES

Requirements Gathering

Carry out a detailed requirements gathering for the system which is to provide SMS facility.

Using these requirements make a list of specific checks to be performed and priorities these checks as well. One primary requirement is that password check and balance amount check is mandatory for every transfer transaction.

For information messages no password and balance checks are performed.

Once the checks are defined write MySQL queries for them which use

7. Annexure C

Mobile Credit Transfer Facility

System Requirements and Installation Guide

Version (1.0)

A GENERIC ARCHITECTURE FOR mCOMMERCE APPLICATIONS

Tayyaba Hayat, Sarwat Jabeen, Zafar Iftikhar

SYSTEM REQUIREMENTS AND INSTALLATION GUIDE

Hardware Requirements:

- GHz Processor or More
- 256 MB of RAM or More

Software Requirements:

- PHP
- Apache Web Server
- MySQL Server
- Kannel SMS and WAP gateway
- Operating System:
  - Ubuntu Linux (Debian Core)

Installation Guide:

Steps to install and execute.

- Get the installation cd for Ubuntu Linux from *https://shipit.ubuntu.com/*
  You have the option to buy, download or order a free cd of the older version.choose which ever suits you the best
- Install Ubuntu Linux on the available system. (get detailed installation guide at https://help.ubuntu.com/6.10/ubuntu/installation-guide/i386/index.html)
- Install Kannel SMS and WAP gateway. (get detailed installation guide at http://www.kannel.org/userguide.shtml)
- Install PHP
- Install Apache Web Server
  - Default port setting is 80.If it is not free set the port setting to any free port available on the system.e.g.8080, 8081.
- Install MySQL.
  - Give a free port number to install the service.

Execution Guide

- Setting up the Service:
  - Start MySQL service.
  - Start Apache Web Server.
    - Enable PHP (if not already enable)
  - Run the Bearer box.
  - Run the SMS box.

To start the boxes go to destop\kannel\sbin

Execute the following commands
.\bearerbox smskannel
.\smsbox smskannel

- Now the system is ready to receive and respond to SMS messages.
- To start system monitoring:
  - Click on the start.php page to start the monitoring system.

Now the system is up and running. Web browser will be used for the sake of monitoring the system. The SMS and Bearer Boxes are also running as daemon threads and can be used to monitor status of the gateway.

NOTE: The web browser is just for monitoring purposes. If the browser window is closed it will have no effect on the functionality of the system.

8. Annexure D

Research Paper accepted at e-Asia m-Serve Conference,

Putrajaya, Malaysia

titled

“Customizing Database capabilities of Open Sources SMS Gateway for VAS (Value Added Services) Providers”