Mobile University Notification System Using Jabber Protocol

by

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Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Technology (Hons)
(Business Information System)

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CERTIFICATION OF APPROVAL

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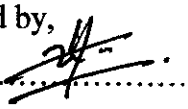
Approved by,



(MOHD HILMI HASAN)
UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
January 2008

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

HALIF RIZUAN BIN BAHARUDDIN

ABSTRACT

This progress report consists of sections, Introduction, Literature Review, Methodology, Results & Discussion and Conclusion.

For the Introduction section includes the project's background, problem statement, objectives and scope of work.

In the Literature Review section consist of results from literature gathering from various sources like articles, journals or the Internet. The section is divided to Introduction, Problem Statement, Current Implementation/Related Works and Support.

For the Methodology section consist of the project's proposed methodology or how the project will be conducted. The project is using the Waterfall Methodology.

For the Results & Discussion section consist of the previous activities conducted for the project and their end results.

Finally the Conclusion section will include the final conclusion for this interim.

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CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

Communication between lecturers and students is a common activity in universities. It may occur verbal or written. Sometimes lectures may require posting immediate announcements to their students such as postponement of classes, change of class's venues etc.

Popular and common methods used for notifying students are posting through the e-learning, lecturer's doors or short message service (SMS). The most often used for notifying students immediately is through SMS but this method is quite costly especially when required to be sent to a large number of students. Communication with different mobile operators may also influence higher SMS charges.

Hence my Final Year Project is to be an alternative form of communication between lecturers and students. The advantages of the project it is cheaper than SMS and faster notification compared to postings on e-learning, lecturer's door and lecture room's entrance.

1.2 PROBLEM STATEMENT

1.2.1 Immediate notification to students:

Lecturers faced difficulties when in need to notify their students immediately on several matters especially postponement of classes. Currently, lecturers may post announcements at their office's door or post by e-learning. This method is unable to notify students immediately as students might not visit their lecturer's offices or login their e-learning. Another method would be by sending SMS to their students.

1.2.2 SMS Costly:

As stated in 1.2.1, lecturers may choose to notify their students on several matters by sending (SMS). Though, this method is quite costly especially when in need to notify a large number of students.

1.3 OBJECTIVES

1.3.1 To develop a mobile university notification system using the Jabber Protocol that enables the lecturer or student to send to many recipients.

1.3.2 To ensure the mobile university notification system is cheaper compared to SMS.

1.4 SCOPE OF WORK

1.4.1 Communication inside universities

- Communication within a university for example between lectures and students.

CHAPTER 2
LITERATURE OF REVIEW

2.1 INTRODUCTION

Nowadays, everyone would go mobile on some daily activities. As stated by [1] by the end of 2003, there will be 623 million mobile users.

Jabber (XMPP) is a protocol that is based on Instant Messaging networks that use real-time messaging between applications. This platform is fully FIPA compliant and provides a simple interface to create agents using this new communication concept. [2]

J2ME is Java's platform for embedded and small consumer electronic devices. The J2ME technology has been developed specifically to work within constrained resources (for instance, within a limited memory range of 128K–512K. It should, however, be noted that J2ME is not restricted to lower-end devices only. It can also be used on higher-end devices, such as set-top boxes, with as much computing power as a PC. Since J2ME is upwardly scalable to work with J2SE and J2EE, it enables these small consumer devices to be networked with servers or PCs. [10]

2.2 PROBLEM STATEMENT

With the inclusion of the Jabber protocol, Sun opens its Java Communications Suite to other XMPP-based systems looking to interoperate their features on the IM platform. Officials say XMPP support offers cost savings for their customers by expanding IM and presence functionality through open source and third-party software applications. **[3]**

Jabber is an open, XML-based protocol for instant messaging and presence. One of the more visible applications of this protocol is the creation of an instant-messaging network, though the protocol itself allows the development of and use with many other applications. Apart from the philosophical benefits of Jabber, one great advantage is the absolute openness of both the Jabber protocol itself and a variety of open source software projects (some also conform to the FSF's description of free software) that implement the protocol. Without this, few companies would have the resources to accomplish the solutions described in this article. **[5]**

Celcom SMS Rates

	Peak (RM)	Off-Peak (RM)
Celcom to Celcom	0.10	0.01
Celcom to Others	0.20	0.20

Celcom GPRS Rates is 10cents per one kilobyte. **[12]**

2.3 CURRENT IMPLEMENTATION/RELATED WORKS

In this section, I will categorize the related works into two categories which are: a) Web-based instant messaging, b) Mobile instant messaging.

Web-based instant messaging

meebo.com is a website for instant messaging from absolutely anywhere. Whether the end user is at home, on campus, at work, or travelling foreign lands, the user is only required to visit meebo.com on any computer to access all of instant messenger's friends (on AIM, Yahoo!, MSN, Google Talk, ICQ and Jabber) and chat with them. No downloads or installs required and the usage is free of charge. meebo was launched in September 2005 and received funding from Sequoia Capital in December 2005 and Draper Fisher Jurvetson in January 2007. Today, meebo users exchange over one hundred million instant messages daily. **[6]**

Mobile instant messaging

First mobile instant messaging that will be mentioned is mundu IM v4. mundu allows several functions for example, chat, conference, share photos, transfer files. mundu runs on Windows Smart phone devices supporting Windows Mobile 5.0 & above.**[7]**

Another mobile instant messaging is Hubbub which is an instant messenger that runs on a wireless Palm and a PC, enabling people to maintain background awareness of others and send them quick messages. It uses a novel concept of "sound instant messages," i.e., ear cons that have meaning, such "Hi" or "Thanks". Each user has a sound ID that announces their sound messages and their changes in availability. Users can protect their privacy and control sound overload. **[8]**

2.4 SUPPORT

With the rapid progress in wireless network technologies and the increasing demand on efficient mobile commerce solutions, wireless information services and mobile commerce applications are becoming the focal point of emerging wireless technology community. **[1]**

Today wireless technologies such as GRPS, new 3G networks and different WLAN technologies are rapidly being developed and deployed providing wireless access to the Internet in a much larger scale than before. Nowadays, new mobile platforms like PDAs, advanced mobile phones and wearable computers are becoming more and more common. Together it will mean that the Internet will be accessible from anywhere, on a wide variety of different platforms and connection technologies. A user should be able to expect to access the same applications and services that are available on a fixed, connected PC from a mobile connected unit. **[9]**

CHAPTER 3
METHODOLOGY

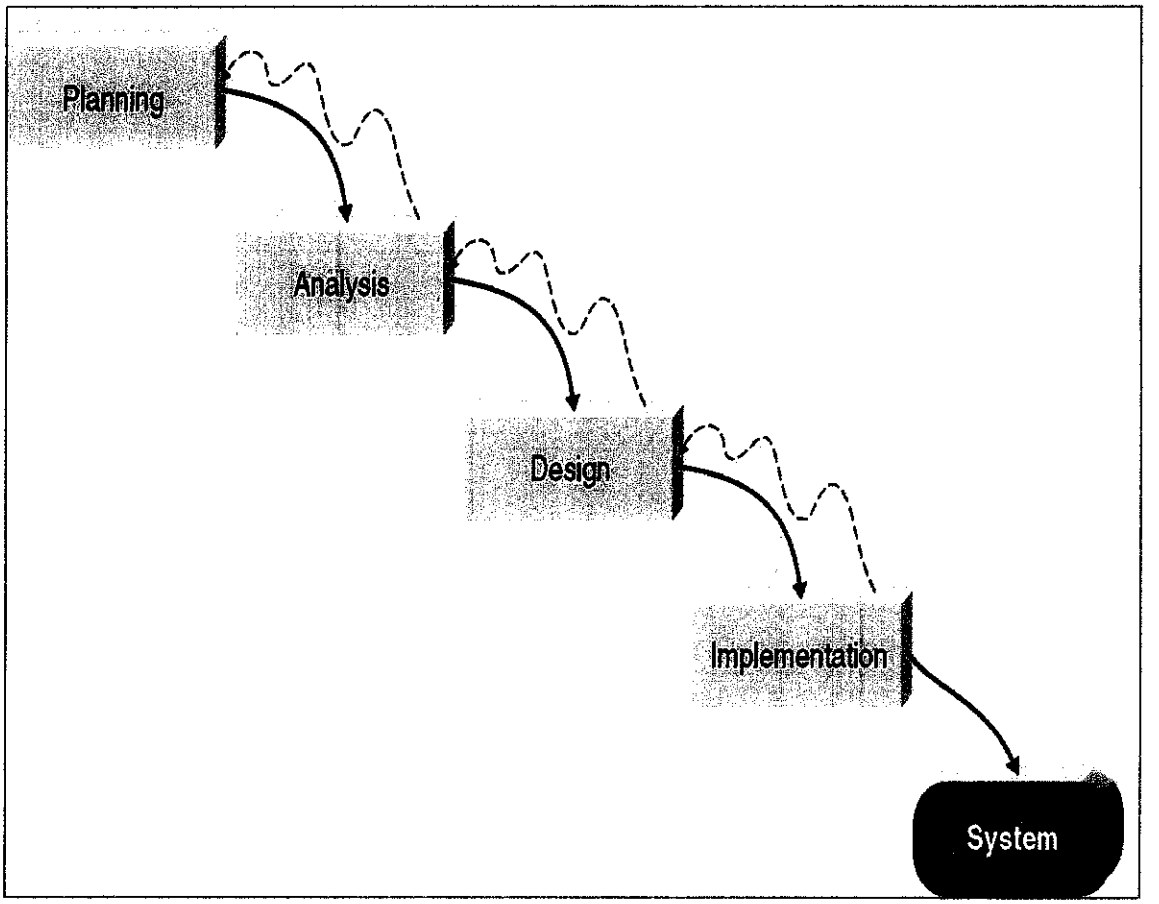

Figure 3.1 - Waterfall System Development Methodology

As shown in Figure 1, I will implement the Waterfall as my system development methodology. I chose this methodology as it identifies system requirements before the programming activity begins and it minimizes requirement changes as the project proceed.

3.1 PLANNING PHASE

In this phase, I had to ensure the tasks to be carried out for the second part of Final Year Project. Hence I had developed a project milestone or can also be known as a project plan.

PROJECT MILESTONE

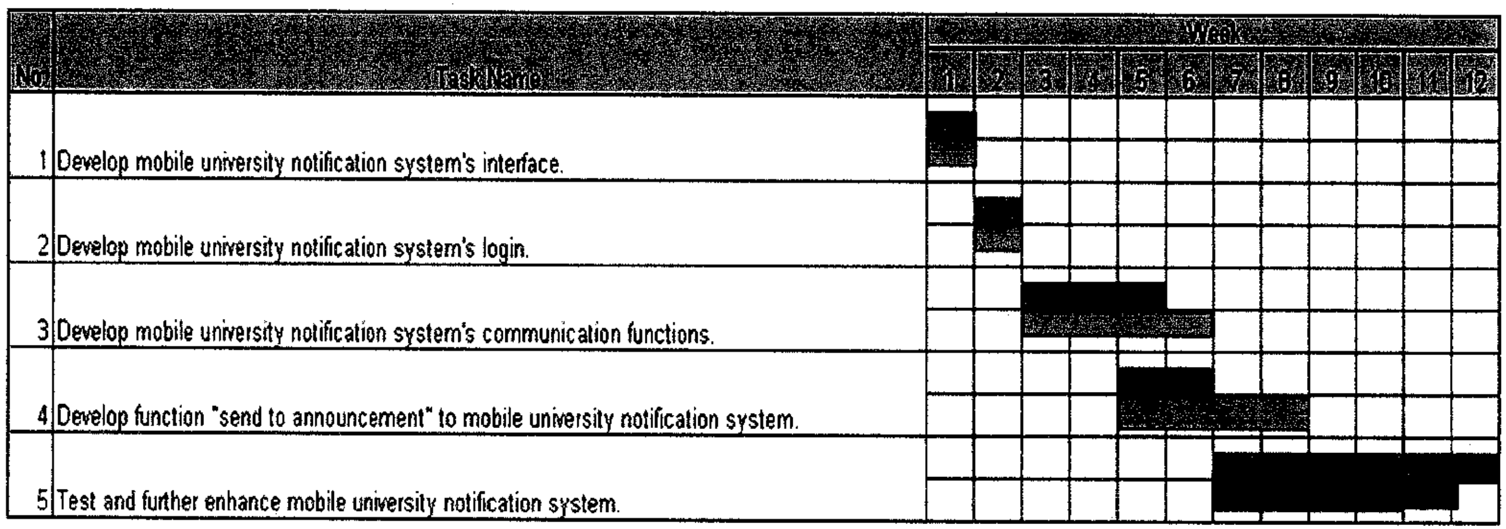

Figure 3.2 – Project Milestone

According to Figure 3.2, firstly I will develop the Mobile University Notification System's interface. Next, I will develop the Mobile University Notification System's login. Thirdly, I will develop the Mobile University Notification System's communication functions. Next, I will develop the function "send announcement" to Mobile University Notification System. Finally is to test and further enhance Mobile University Notification System.

3.2 ANALYSIS PHASE

In this phase I had analysed the technology that will be used in developing the Mobile University Notification System using Jabber Protocol.

3.2.1 Java 2 Micro Edition (J2ME)

These devices are conceptually designed to be handy and compact; hence, they are small, lightweight, and portable. They have limited computing power, limited memory, a small display area, and limited input power (being battery operated). Besides, most of these handheld devices work on proprietary software, with little or no compatibility with other brands or other devices. Hence, what is required is a platform on which a memory efficient, device-independent or platform-independent application can be built. An application designed in J2SE, for example, cannot run in a limited memory space of 16K–512K, which happens to be the typical range of memory for handheld devices. The solution lies in J2ME, the third platform (after J2EE and J2SE) offered by Sun Microsystems.

J2ME is Java's platform for embedded and small consumer electronic devices. The J2ME technology has been developed specifically to work within constrained resources (for instance, within a limited memory range of 128K–512K. It should, however, be noted that J2ME is not restricted to lower-end devices only. It can also be used on higher-end devices, such as set-top boxes, with as much computing power as a PC. Since J2ME is upwardly scalable to work with J2SE and J2EE, it enables these small consumer devices to be networked with servers or PCs.

The J2ME platform consists of a J2ME Virtual Machine and a set of APIs that are suitable for consumer and embedded devices. The J2ME technology can be divided into two primary components — configurations and profiles. These components can be understood if we think of J2ME in terms of a layered technology, with one layer working upon the other. The base layer is formed by a configuration, upon which operates the second layer, formed by a profile. Figure 2 illustrates this concept. A configuration is composed of the low-level APIs and the J2ME Virtual Machine; both of these provide an interface with a device's operating system. A profile built on top of a configuration is composed of APIs that provide functionality to build the user interface and develop the classes required to build an application.

Think of a configuration as an abstract entity that provides basic J2ME functionality to a device, whereas a profile is what utilizes this configuration to allow the actual implementation of that functionality. For example, a configuration may support J2ME input/output functions on a family of devices, but the implementation of the input/output streams and their associated methods, properties, and so on depends upon the profile being used. Configurations and profiles are complementary to each other; both are required to develop and run a J2ME application. [10]

3.2.2 Jabber

Jabber is best known as "the Linux of instant messaging" -- an open, secure, ad-free alternative to consumer *IM* services like AIM, ICQ and MSN. Under the hood, Jabber is a set of streaming XML protocols and technologies that enable any two entities on the Internet to exchange messages, *presence*, and other structured information in close to real time. Jabber technologies offer several key advantages:

- Open -- the Jabber protocols are free, open, public, and easily understandable; in addition, multiple implementations exist for clients, servers, components, and code libraries.

- Standard -- the Internet Engineering Task Force (IETF) has formalized the core XML streaming protocols as an approved *Instant Messaging* and *presence* technology under the name of XMPP, and the XMPP specifications have been published as RFC 3920 and RFC 3921.
- Proven -- the first Jabber technologies were developed by Jeremie Miller in 1998 [Jabber.org, 2006] and are now quite stable; hundreds of developers are working on Jabber technologies, there are tens of thousands of Jabber servers running on the Internet today, and millions of people use Jabber for *IM.*
- Decentralized -- the architecture of the Jabber network is similar to email; as a result, anyone can run their own Jabber server, enabling individuals and organizations to take control of their *IM* experience.
- Secure -- any Jabber server may be isolated from the public Jabber network (e.g., on a company intranet), and robust security using SASL and TLS has been built into the core XMPP specifications.
- Extensible -- using the power of XML namespaces, anyone can build custom functionality on top of the core protocols.
- Flexible -- Jabber applications beyond *IM* include network management, content syndication, collaboration tools, file sharing, gaming, and remote systems monitoring.
- Diverse -- a wide range of companies and open-source projects use the Jabber protocols to build and deploy real-time applications and services; you will never get "locked in" when you use Jabber technologies.

The Jabber server is far more complex than those of the conventional Client/Server architecture, whose simplicity may be attributed to the fact that they often overlook the client priorities. With the Jabber server, making Jabber clients for different platforms is far simpler and involves fewer headaches than with the conventional servers. In order to start creating a Jabber client, we need at first understand Jabber's architecture. [10]

3.2.3 Short Message Service (SMS)

Short Message Service (SMS) refers to sending and receiving text messages to and from mobile telephones. The text may be composed of words or numbers or may be an alphanumeric combination. SMS was created as part of the GSM Phase 1 standard. The first short message was sent in December 1992 from a PC to a mobile phone on the Vodafone GSM network in the U.K. Each short message ranges between 70–160 characters. SMS has a store-forward capability; this means sending messages is possible even when the recipient is not available. The user is notified when a message is waiting, as with voicemail. [10]

3.2.5 General Packet Radio Service (GPRS)

General Packet Radio Service (GPRS) is a Mobile Data Service available to users of Global System for Mobile Communications (GSM) and IS-136 mobile phones. GPRS data transfer is typically charged per megabyte of transferred data, while data communication via traditional circuit switching is billed per minute of connection time, independent of whether the user has actually transferred data or has been in an idle state. GPRS can be used for services such as Wireless Application Protocol (WAP) access, Short Message Service (SMS), Multimedia Messaging Service (MMS), and for Internet communication services such as email and World Wide Web access.

2G cellular systems combined with GPRS is 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). [11]

3.3 DESIGN PHASE

3.3.1 System Architecture

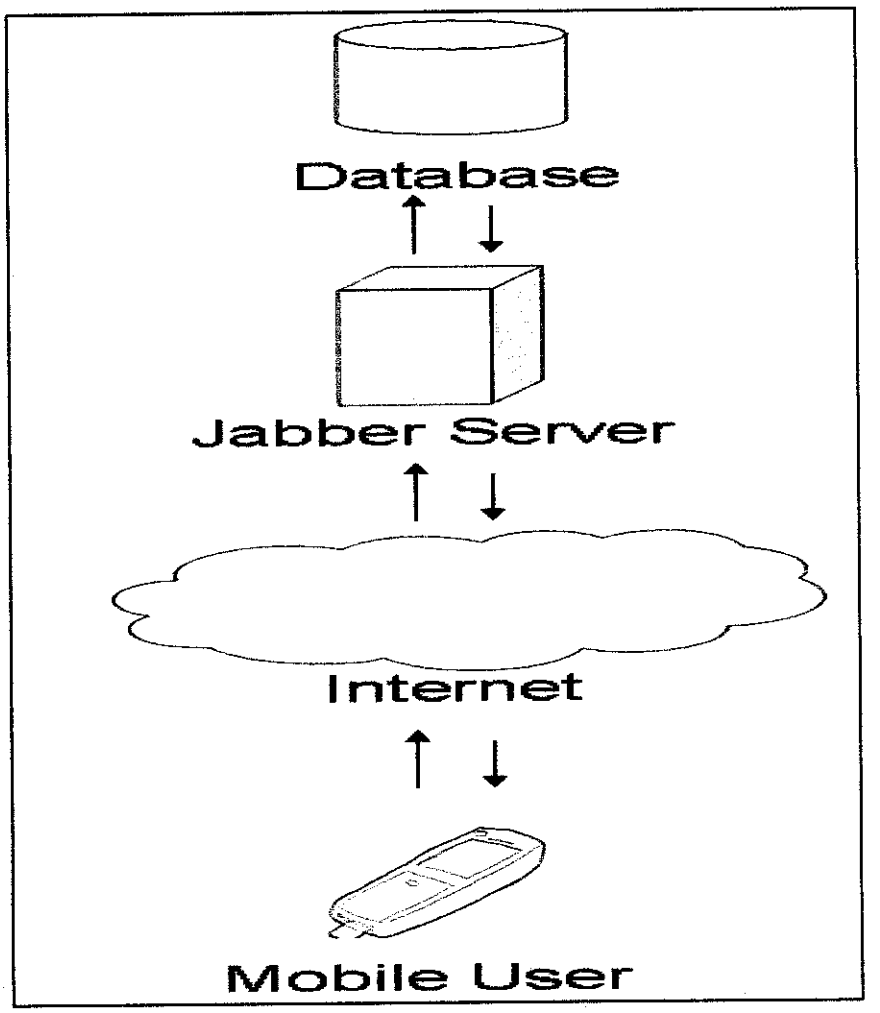

Figure 3.3 - System Architecture

As for the design phase, I had developed the system architecture before designing its programming codes. Figure 3.3 shows the Mobile University Notification System as a 4-tier client-server architecture which consists of four layers. These layers include the presentation layer, middleware, application layer and the data storage layer.

1. Presentation Layer
   - Includes GPRS mobile phones which support J2ME with MIDP 2.0 and CLDC 1.1 and a client as its receiver or sender of notification messages. The supported mobile phone will be installed the Mobile University Notification System.

2. Middleware
   - The Internet will be the middleware for the Mobile University Notification System to allow notification messages transaction between users.

3. Application Layer
   - Includes the Jabber Server. The server is for supporting text chat sessions and notification messages among users.

4. Data Store Layer
   - This layer is to store and manages all notification messages from users.

3.3.2 Programming the Mobile University Notification System

As stated earlier in this report, the Mobile University Notification System will be developed using J2ME. The Mobile University Notification System is built from different Java packages which each have their own classes to handle specific tasks. The packages:

1. muns

Contains the GUI Midlet (main program) and the Jabber stanzas reader

2. muns.connection

Contains the connection tools

3. jabber.roster

Contains classes concerning Jabber ID and roster management

4. jabber.conversation

Contains classes to manage chats

5. jabber.presence

Contains classes for jabber presence management

6. jabber.subscription

Contains classes for registration to jabber servers and Jabber IDs subscriptions

7. org.bouncycastle.crypto.digests

Contains classes for password encryption

8. util

Contains utility classes

9. xmlstreamparser

Contains classes for XML parsing

The Mobile University Notification System's main program is muns.StartMidlet. Here is where the Mobile University Notification System interacts with end users and also the other classes involved.

3.3 IMPLEMENTATION PHASE

Implementation phase is the final phase for the Mobile University Notification System. During this phase, the Mobile University Notification System is executed and tested. Any errors or bugs could be detected during these activities and be corrected as soon as detected.

The following are screenshots of the some of the completed Mobile University Notification System:

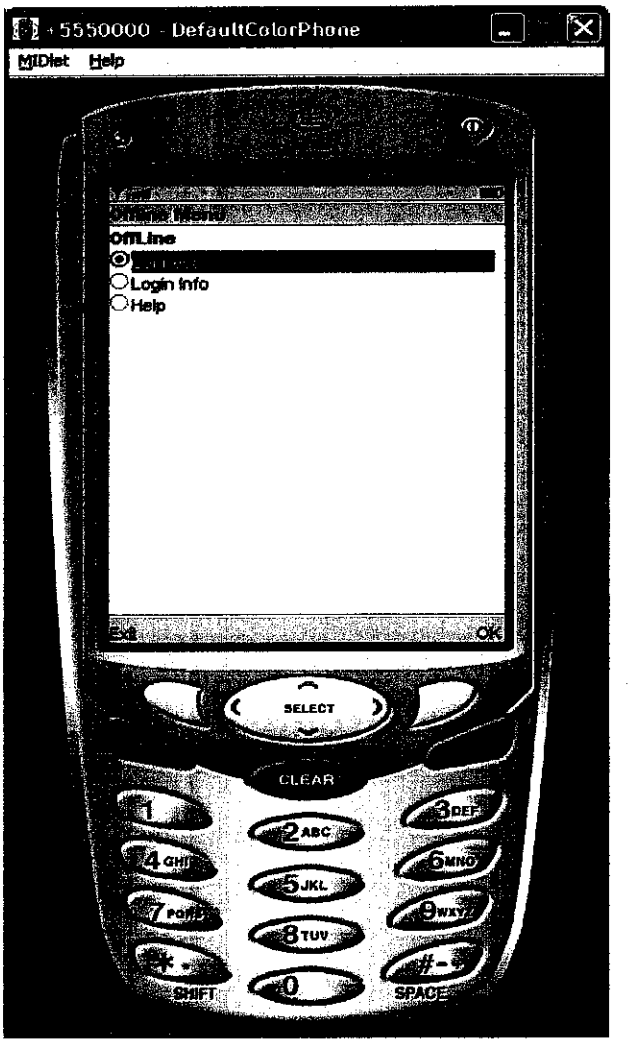

Figure 3.4 – "Offline Menu". Users are able to choose from 3 different options which are "Connect", "Login Info" or "Help".

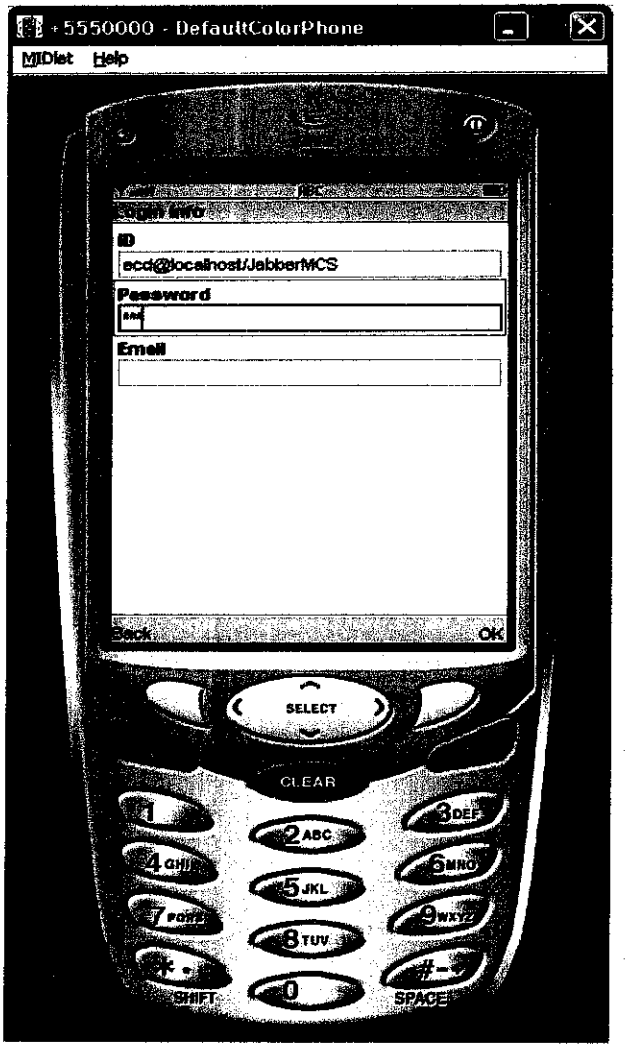

Figure 3.5 – "Login Info". Users upon connecting to the system are required to enter their respective ID and password. Entering email is optional.

Figure 3.6 – "Online Menu with Offline ID Hidden". Upon successful login, automatically, all offline contacts are hidden.

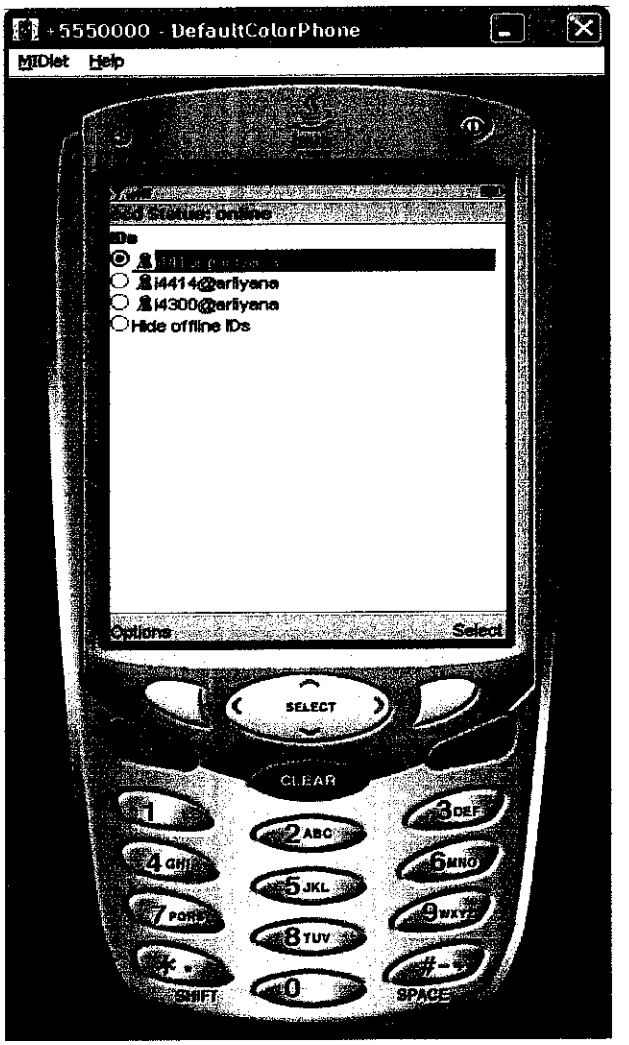

Figure 3.7 – "Online Menu with All ID". All ID are shown including online and offline ID.

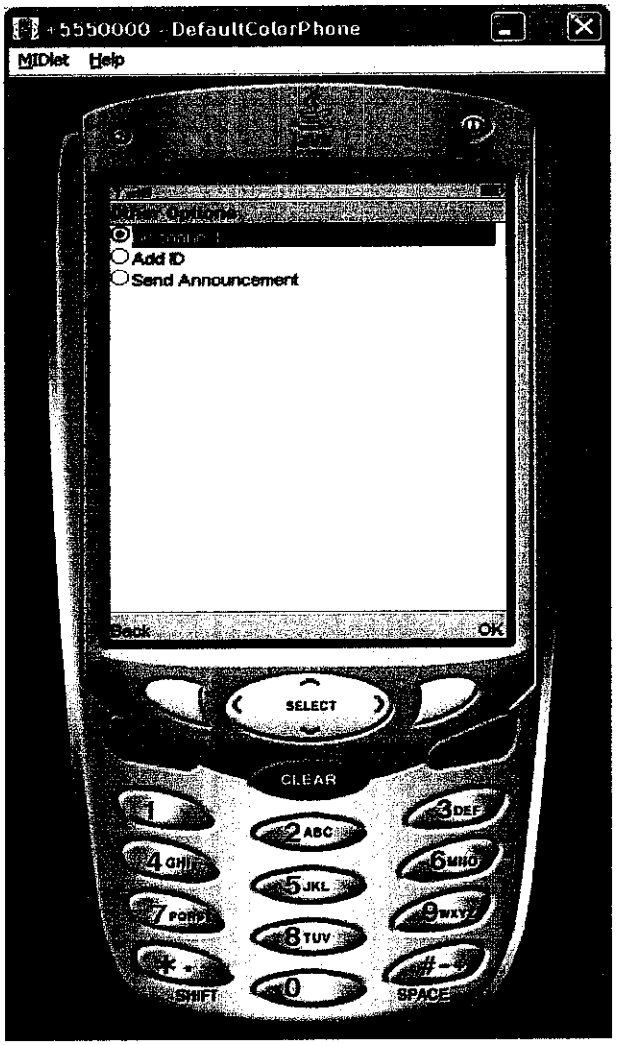

Figure 3.8 – "Other Options". Screen where user may choose 3 options which are "Disconnect", "Add ID" or "Send Announcement".

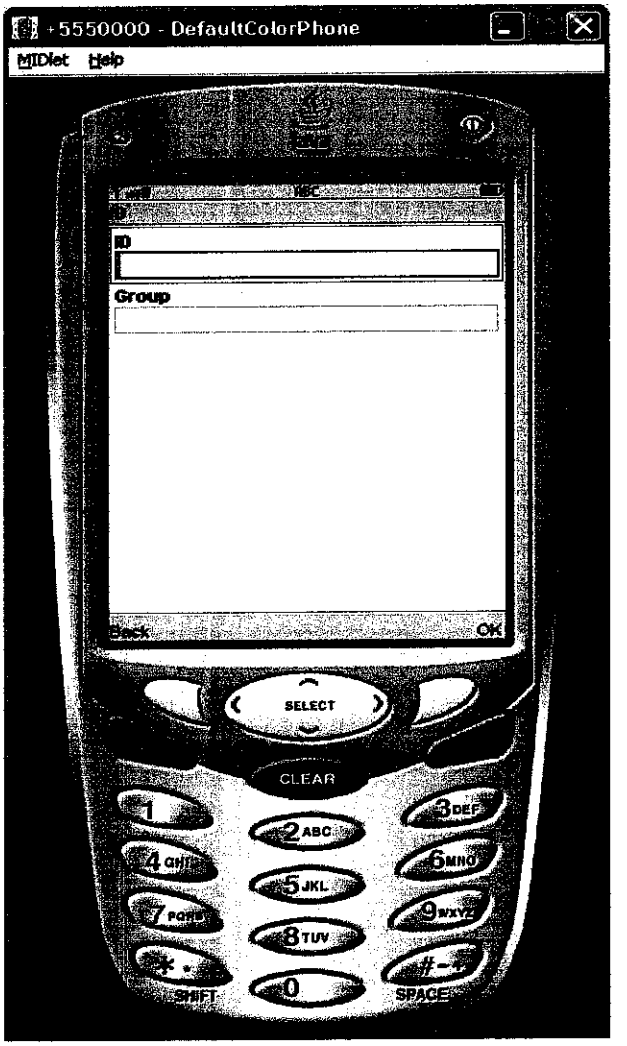

Figure 3.9 – "Add ID". Screen where user is required to enter ID of the person to be added. Entering "Group" is optional.

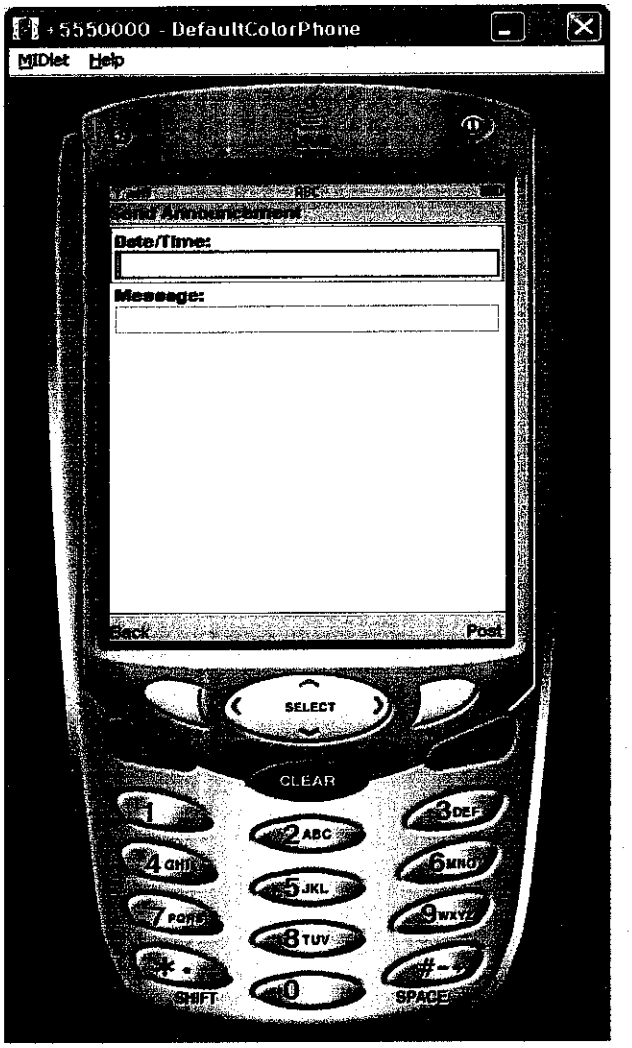

Figure 3.10 – "Send Announcement". Screen where user is able to send to all contacts with one single button.

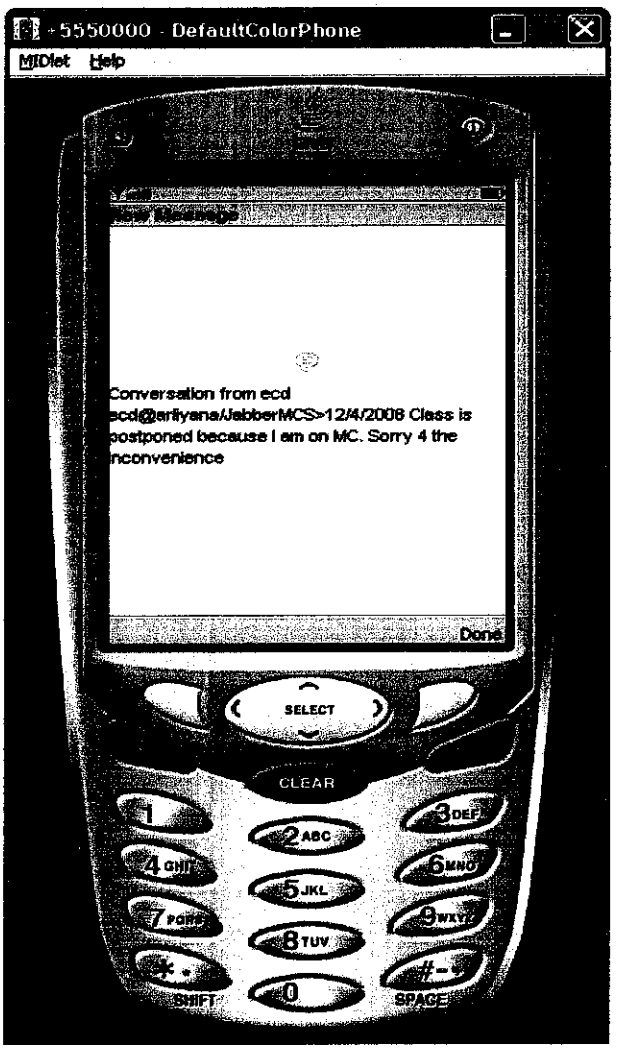

Figure 3.11 – "New Message". Screen where user receives notification. The notification will close once the user presses the "Done" button.

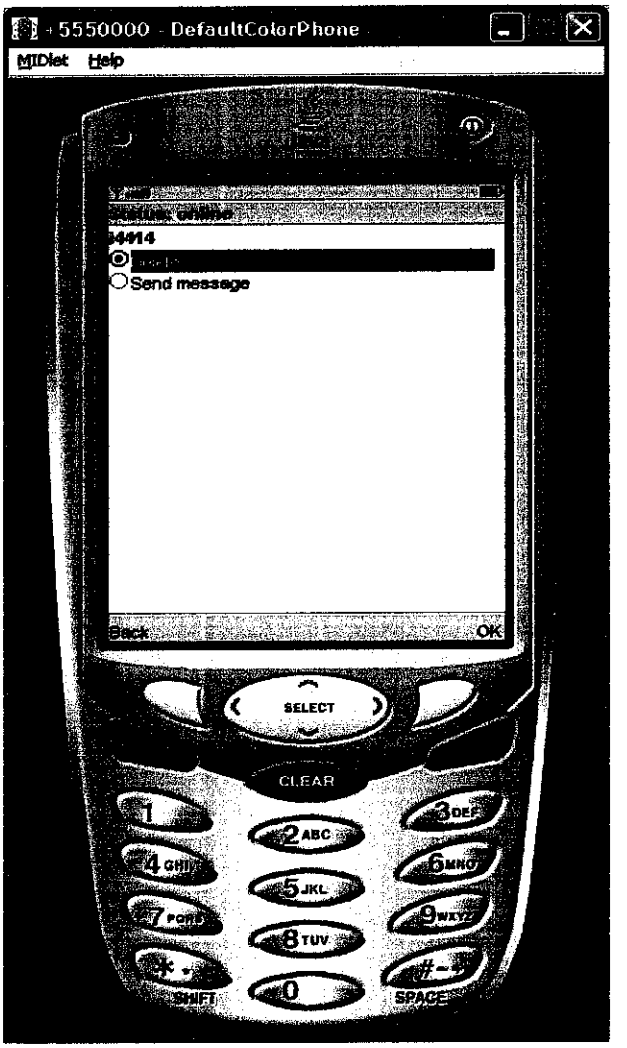

Figure 3.12 – "Contacts Options". Screen where user may choose to either delete the contact or send a message.

Figure 3.13 – "Single ID". Screen where user may exchange messages with each other.

CHAPTER 4
RESULTS & DISCUSSION

4.1 Compare SMS Charges and GPRS Charges

	Peak (RM)	Off-Peak (RM)
Celcom to Celcom	0.10	0.01
Celcom to Others	0.20	0.20

Figure 4.1: SMS Charges (Standard Celcom rates)

GPRS Charges (Standard Celcom rates) = 0.10 per kilobyte.

Establishing a connection to the Jabber server:		
No. of characters in XML streams	=	2431 characters
Encode using UTF-8 (one byte for one character)	=	2431 bytes
Convert to kilobytes	=	2.431 kilobytes
Usage charges of GPRS	=	2.421/10 X RM 0.10
	=	RM 0.02

Figure 4.2: Mobile University Notification System Charges

As a conclusion to the above information, assuming notification is required during peak hours, SMS: Mobile University Notification System = 0.02<0.20@0.10. This shows that the Mobile University Notification System is cheaper than SMS.

4.2 Mobile University Notification System Sends Notifications Immediately

The Mobile University Notification System requires GPRS in order to connect to any Jabber servers. Hence with GPRS availability, communication between lecturers and students will occur same time similar with SMS which requires network coverage.

Comparing to posting the E-Learning, students are required to login via desktop with network availability. Hence, the student is only able to accept the notification if logged into the E-Learning.

Posting notification on doors requires the students to go to the targeted places in order to obtain the notification. The notification may not reach students if students do not visit the targeted places.

Hence, the Mobile University Notification System sends notifications faster than methods like posting in the e-learning, on lecturer's doors or lecture room's entrance.

4.3 Different Mobile Phones Compatibility

The Mobile University Notification System had been installed properly on different mobile phones which were Nokia, Samsung, Motorola and Sony Ericsson. This is to ensure that the notification is indeed compatible with different types of mobile phones.

4.4 Tab Technology for Certain Mobile Phones

Certain mobile phones have the tab technology which is useful where the notification system may run in background. For certain mobile phones which do not have this technology, the notification system must be the active window in order to receive or transmit messages.

CHAPTER 5
CONCLUSION

In conclusion to this progress report, it would be very useful especially to university lecturers to notify students immediately on any particular matter using the Mobile University Notification System using Jabber Protocol.

Studies also shows that the mobile notification system is much cheaper compared to SMS.

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APPENDIX A

Mobile University Notification System User Manual

Introduction

Mobile University Notification System implements Jabber protocol as its transport protocol and applicable for any GPRS supported mobile phones. It is based on J2ME (MIDP 2.0) and the MicroJabber library.

The Mobile University Notification System is to ease the communication between lecturers and students for any important announcements or notifications. It is also to reduce the cost of sending SMS.

System Requirements

Mobile University Notification System runs on all GPRS mobile phones which supports J2ME with MIDP 2.0 and CLDC 1.1. Mobile University Notification System is very easy to install by deploying the .jar file in your device following the specific guidelines provided by the device manufacturer. Mobile phones manufactured by Nokia, Sony and Samsung had been tested and applicable.

Offline menu

The first menu you will encounter upon system startup is the Offline Menu. There are 3 options available here as shown in **Figure 1**:

- Connect
- Login Info
- Help

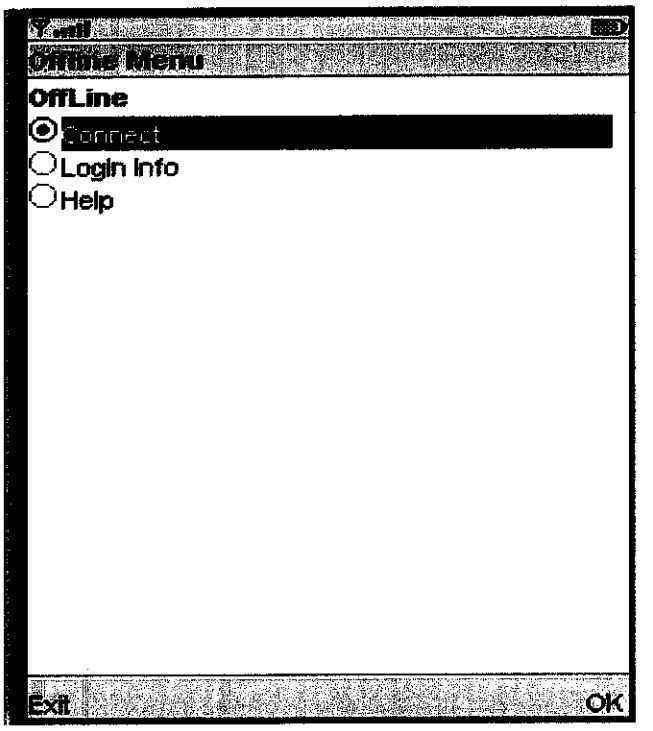

Figure 1: Offline Menu

For first time users, you will need to enter required information in the "Login Info" as shown in **Figure 2**. You are required to enter an ID and password. Entering an e-mail address is optional. If the ID is not registered to the server, the Mobile University Notification System will automatically create the ID at the respected server.

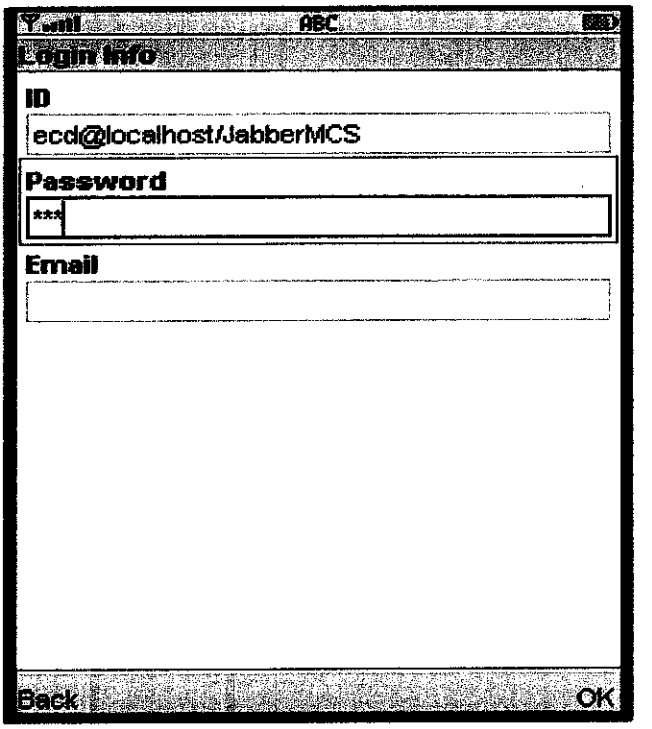

Figure 2: Login Info

"Help" contains information to assist users in the "Offline Menu".

Online Menu

Upon a successful login the Online Menu will popup as shown in **Figure 3**. Here is where all contacts shown whether offline or online at the current moment. Options available to choose from here are whether to go to Other Options or opening single contact.

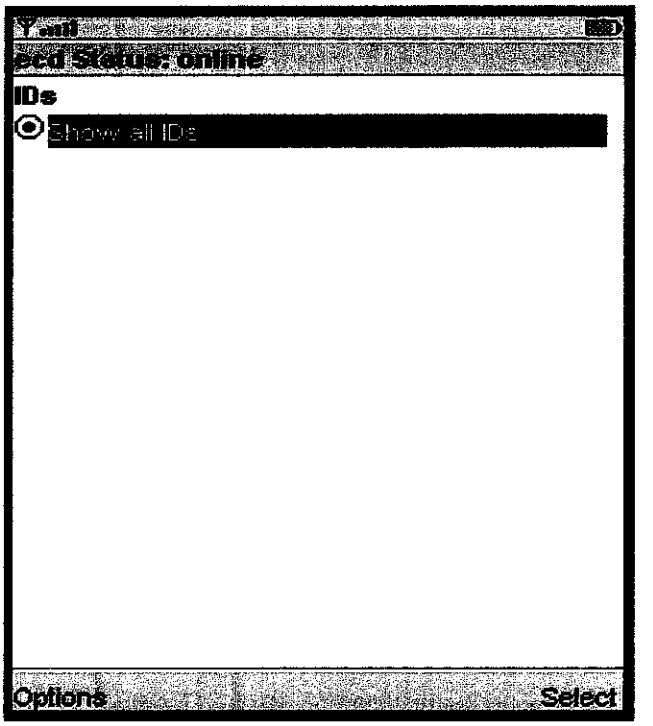

Figure 3: Online Menu

Below is the option available for a single contact. You may wish to delete the contact or send a message as shown in **Figure 5**.

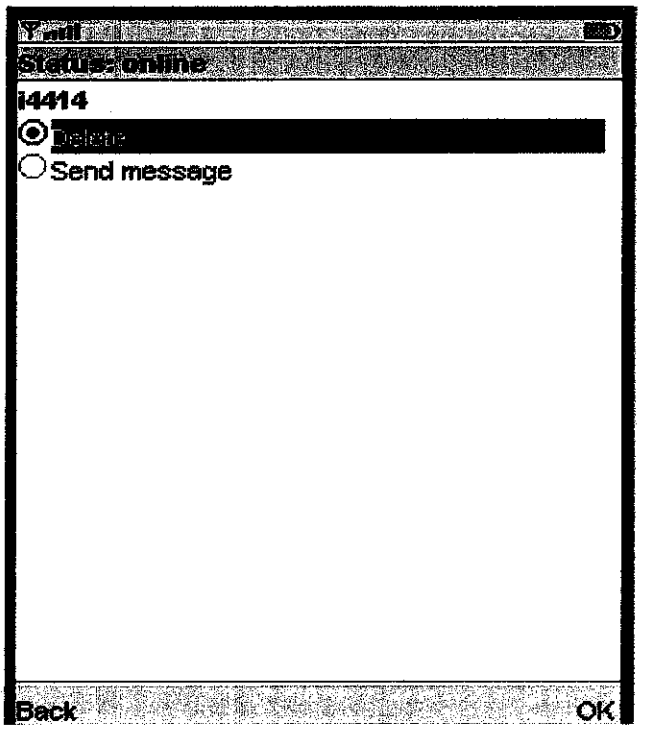

Figure 5: Single Contact Menu

Other Options Menu

You can choose to disconnect from the system, add an id or send an announcement to all contacts from this menu as shown in **Figure 5**.

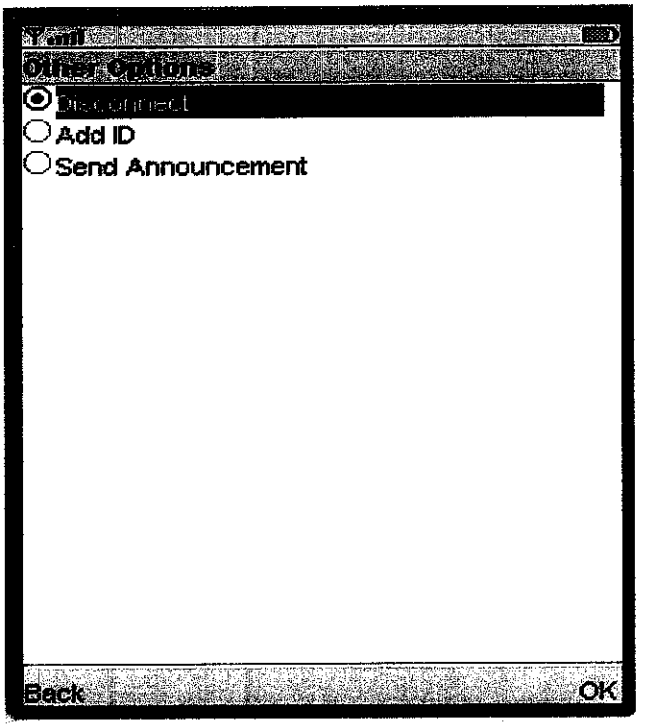

Figure 5: Other Options

If you choose to add a new ID, the information required is his or her ID with server address. Entering Group is optional. This is shown in **Figure 6.**

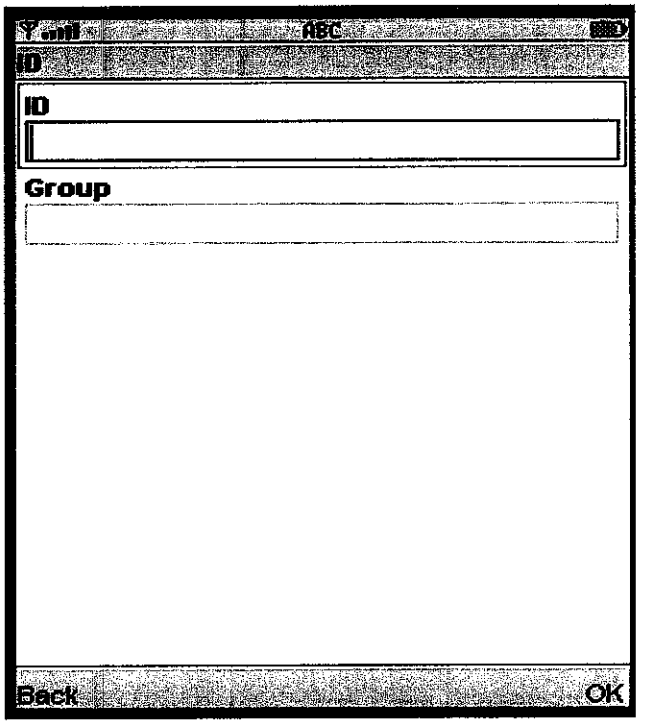

Figure 6: Add New ID

You can also choose to send an announcement to all contacts whether currently online or offline at the moment. You may choose to enter date and time but the message textbox must be filled. Once all information is entered, you must press Post to send to all contacts. This is shown in **Figure 7.**

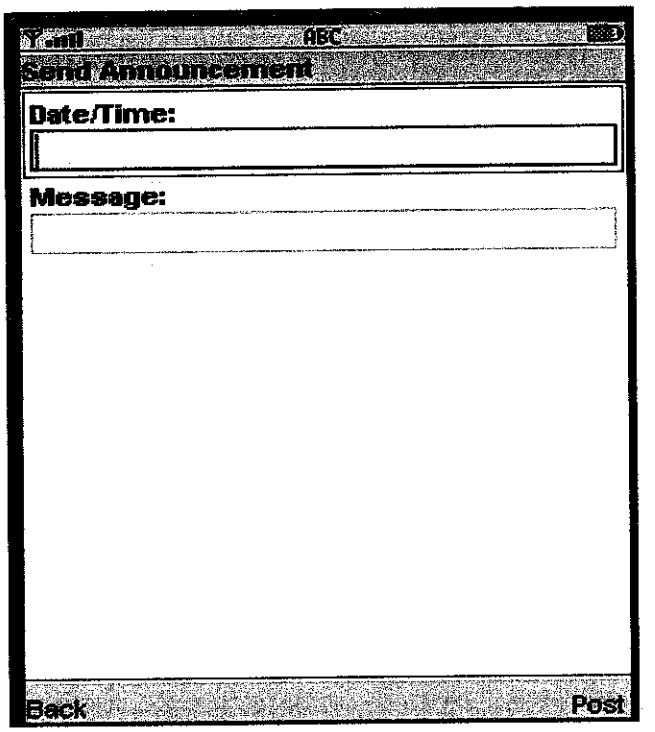

Figure 7: Send Announcement

A notification display will popup at the recipient's interface once announcement is sent. The popup will only close once the recipient presses the Done button. This is shown in **Figure 8.**

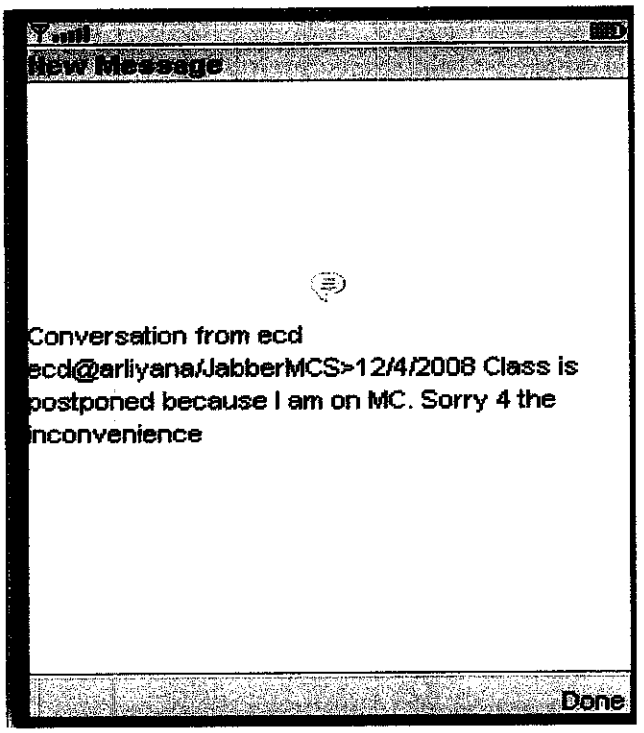

Figure 8: New Message

Thank you for spending the time to go through the Mobile University Notification System User Manual. For any further enquiries on the system, do not hesitate to contact me at halif_baharuddin@yahoo.com.