STUDY OF TECHNIQUES OF CLASS SCHEDULE/TIMETABLE RETRIEVAL VIA SMS FOR STUDENTS CONVENIENCE

(KAJIAN TEKNIK-TEKNIK PENCAPAIAN JADUAL WAKTU KULIAH MELALUI SMS BAGI KEMUDAHAN PELAJAR)

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(Keywords: Short Messaging Services, SMS via Cellular modem, SMS via Gateway, SMS Class Schedule.)

Short Messaging Services (SMS) is a service for transmitting text messages between mobile phones and also external systems such as electronic mail, paging and voice mail systems. In today's digital age, this service has becomes a valuable and effective tool for the students and lecturers in education environment. Some universities have used the SMS technology to improve the effectiveness of their services such as exam result notification, class cancellation, class changes, appointment reminders, class schedules and so forth. With SMS, students and lecturers can be reached in anywhere and anytime with ensuring that message is delivered.

The SMS class schedule is a way to provide a service for students to retrieve their class schedule or timetable faster and cost effective. This service also can increase convenience for the students because the information comes to them immediately and effectively rather than having to seek them on paper. This paper begins by studying two common techniques of class schedule through SMS, which are addressed on SMS via cellular modem and SMS via gateway. It will describe the system architecture of these techniques include how they were implemented, it's strengths and weaknesses in main aspects such as network interoperability and messaging cost. From these two techniques, the studies will come out with an appropriate technique solution for the class schedule via SMS for the student convenience, which considered the cost-effective and practical factors.

Finally, the paper reports on the finding of a new prototype of SMS class schedule technique that will benefit students and lectures in terms of fast delivery of class schedule, reliable and effective cost communication for concise information.

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KAJIAN TEKNIK-TEKNIK PENCAPAIAN JADUAL WAKTU KULIAH MELALUI SMS BAGI KEMUDAHAN PELAJAR

(Kata kunci:Perkhidmatan Pesanan Ringkas, SMS melalui Modem Celular, SMS melalui Get laluan, Jadual Waktu Kuliah SMS)

Perkhidmatan Pesanan Ringkas (SMS) merupakan satu perkhidmatan untuk perpindahan mesej teks di antara telefon mudah alih dan juga sistem luaran seperti mel elektronik, halaman dan sistem mail suara. Dalam zaman digital masa kini, perkhidmatan ini menjadi satu alatan yang bernilai dan berkesan bagi pelajar dan pensyarah dalam persekitaran pendidikan. Setengah universiti telah menggunakan teknologi SMS untuk memperbaiki keberkesanan perkhidmatan mereka seperti pemberitahuan keputusan peperiksaan, pembatalan kelas, pertukaran kelas, peringatan temujanji, jadual waktu kuliah dan sebagainya. Dengan menggunakan SMS, pelajar dan pensyarah boleh dihubungi setiap masa dan di mana jua mereka berada dengan jaminan bahawa mesej telah disampaikan.

Jadual waktu kuliah SMS adalah satu cara untuk menyediakan perkhidmatan bagi pelajar untuk mencapai jadual waktu kuliah dengan cepat dan keberkesanan kos. Perkhidmatan ini juga boleh meningkatkan kemudahan untuk pelajar kerana maklumat yang diperolehi adalah cepat dan berkesan sekiranya dibandingkan dengan mendapatkan maklumat tersebut melalui kertas. Kertas kerja ini bermula dengan mengkaji dua teknik pencapaian jadual waktu kuliah melalui SMS iaitu SMS melalui modem celular dan SMS melalui get laluan. Ianya akan menerangkan senibina sistem teknik-teknik ini termasuklah bagaimana ianya dilaksanakan, kelemahan dan kekuatannya dalam aspek kebolehan pengendalian dalaman rangkaian dan kos mesej. Dari dua teknik ini, penyelidik akan menghasilkan satu penyelesaian teknik yang sesuai bagi pencapaian jadual waktu kuliah melalui SMS untuk kemudahan pelajar dengan menimbangkan faktor-faktor seperti keberkesanan kos dan praktikal.

Akhir sekali, kertas kerja ini melaporkan penemuan satu prototaip baru bagi teknik pencapaian jadual waktu kuliah melalui SMS di mana ianya akan memberi kebaikan kepada pelajar dan pensyarah dari segi penghantaran jadual kelas yang cepat, boleh dipercayai dan komunikasi kos berkesan untuk maklumat yang tepat.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In the era of improved mobile communication technologies, vast amount of changes are generated in facilitating communication and the transfer of information namely from business to business, business to customers, employers to employees, etc. and in providing more and more added value services [1]. In order to get fast information communication via mobile phone units or PDAs has just made life a little bit easier.

Technology provides one means of meeting the challenge of providing for frequent and meaningful interaction amongst students and staff, which underpins students' feelings of being valued, leading to deeper and more meaningful engagement university studies. The challenge lies in providing for interaction in an environment where students and casual academic staff are spending less time on campus as a result of busy and complex lives.

The use of mobile technologies is increasingly widespread especially among the Asian countries such as Malaysia. Users of mobile phone grew from 9.7 percent in 1995 to 55.9 percent in 2004 (http://www.cmc.gov.my). Various applications can be observed among the users, which ranged from telephone conversation and simple text messages (SMS), to multimedia messaging services (MMS) and Internet access, depending on the capability of each mobile phone technology and services rendered.

Short Message Service (SMS) is the beginning of a change in education. Wireless is a particularly attractive option for blended learning. As a matter of fact, Mayer [2] has introduced several steps through which institutions may follow in providing SMS services. The steps involved collection of mobile phone numbers, setting up a centralized SMS service centre, and sending group SMS via a network. According to him, the information that can be applied in a centralized SMS is, such as:

- Lectures, meeting schedule,exam dates;
- Academic information about the students;
- Crucial homework reminders;
- Web link;
- changes in schedules;
- urgent messaging;and
- announcements- throught/facts of the week, information about new activities.

Retrieving class schedule via SMS is one of the most important agenda that we should have in our university culture. Due to the student's and lecturer's busy life, it is not impossible that they may forget about their class schedule; where it suppose to be held or when is the lecture. This incident always occurs especially during the early semester. By means, we should incorporate our technologies to provide a helpful learning environment so that all the classes will run smoothly.

Several techniques were studied in order to provide a valid communication between student's and lecturers so that information can be reached to them immediately. Two studies were taken as a benchmark and in order to perform a better result a new techniques were provided to overcome the problem. But first, let us take a look at the problem statement.

1.2 General Problem Statement

There are some problems that occur during retrieving Class schedule/Timetable using manual ways. Students and lecturers intend to forget their timetable or class schedule. Most of the time students or lecturers did not bring along their timetable and it is quite a hassle especially they have forgotten where they have put their timetable. Therefore, in order for them to obtain accurate information on timetable scheduling, they need something effective, fast, convenience and can be retrieve anytime and anywhere.

1.3 Objective or Scope of Study

The main objective of this research is to provide an appropriate technique solution o overcome the problems on obtaining class schedule/timetable. The study focuses on two techniques of Timetable retrieval via sms.

1.4 Structure of the Report

The report has been organized as follows:
- Chapter 2 presents a literature review of SMS, GSM Modem, SMS Gateway and SMS application exam result via sms.
- Chapter 3 provides an overview of methodology of the research concentrate on SMS via cellular modem, sms via sms gateway.
- Chapter 4 concentrates on class schedule sms structure and prototype techniques to retrieve class schedule via sms.
- Chapter 5 will discussed the conclusion of this report.

CHAPTER 2

LITERATURE REVIEW

2.1   SMS Overview

The Short Message Service (SMS) allows text-based messages to be sent to and from mobile telephones on a GSM network [3]. Each message has a maximum length of 160 characters. SMS messages are divided into two categories; Mobile Terminate (MT – where the SMS message originates from the network provider) and Mobile Originate (MO- where the consumer can send messages to other consumers)[4]. In the context of MO and MT messages, the consumer refers to the end-user, the person with the cell phone. This is opposed to the network provider, who provides the consumer with such services. In this section, we are only concerned with MO SMS messages.

Typically, SMS are sent and received by cellular consumers using cellular telephone handsets. Cell phone is not the only devices that have the capability though. Anything that is capable of talking to GSM network, in theory, has the ability to send and receive SMS messages. This device is called GSM modem.

2.2   Benefits of SMS

In today's competitive world, differentiation is a significant factor in the success of the service provider. Once the basic services, such as voice telephony, are deployed, SMS provides a powerful vehicle for service differentiation. If the market allows for it, SMS can also represent an additional source of revenue for the service provider.

The benefits of SMS to subscribers center around convenience, flexibility, and seamless integration of messaging services and data access. From this perspective, the primary benefit is the ability to use the handset as an extension of the computer. SMS also eliminates the need for separate devices for messaging because services can be integrated into a single wireless device—the mobile terminal. These benefits normally depend on the applications that the service provider offers. At a minimum, SMS benefits include the following:

- Delivery of notifications and alerts
- Guaranteed message delivery
- Reliable, low-cost communication mechanism for concise information
- Ability to screen messages and return calls in a selective way
- Increased subscriber productivity

More sophisticated functionality provides the following enhanced subscriber benefits:

- Delivery of messages to multiple subscribers at a time
- Ability to receive diverse information
- E-mail generation
- Creation of user groups
- Integration with other data and Internet-based applications

The benefits of SMS to the service provider are as follows:

- Ability to increment average revenue per user (due to increased number of calls on wireless and wire line networks by leveraging the notification capabilities of SMS)
- An alternative to alphanumeric paging services, which may replace or complement an existing paging offer
- Ability to enable wireless data access for corporate users
- New revenue streams resulting from addition of value-added services such as e-mail, voice mail, fax, and Web-based application integration, reminder service, stock and currency quotes, and airline schedules
- Provision of key administrative services such as advice of charge, over-the-air downloading, and over-the-air service provisioning
- Protection of important network resources (such as voice channels), due to SMS' sparing use of the control and traffic channels

All of these benefits are attainable quickly, with modest incremental cost and short payback periods, which make SMS an attractive investment for service providers.[5]

2.3 GSM Modem

Connectivity to the mobile networks is achieved using a GSM modem. The system supports multiple GSM modems and is configured so that there is one message queue for each modem physically attached to the server. Each modem contains a valid SIM card. Each modem can be configured to process messages for a certain network operator e.g: If you have a modem with a 086 SIM card, you could specify that messages for delivery to the 086 network are sent using that modem. This provides greater reliability and performance in the actual delivery of messages. It is also possible to specify the default modem for phone numbers on other networks.

The GSM modems are capable of bandwidth of 9600 bps. Negotiation with the mobile operator and transmission of message takes about 4 second per message. This means there is an upper threshold or 900 messages per hour per modem. The increase in volume may be increased in proportion to the number of modems added.[6]

Almost all GSM modems (and this includes many cell phone handset) use RS-232 as a transport protocol. On top of this, they use a protocol call the AT command set to communicate with their controlling devices. AT was defined by the European Telecommunication Standards Institute [7], and was defined to be a backward compatible set of extensions to the Hayes AT Command set [8]. Device manufacturers are free to add their own extensions to this command set, and such extensions usually have an identifying prefix.

In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

The number of SMS messages that can be processed by a GSM modem per minute is very low -- only about six to ten SMS messages per minute.

2.4 SMS Gateway

SMS Gateway is a just a piece of software that enables you to easily send and receive text "Short Messages" over GSM cellular telephone networks from your local PC or through the network. i.e. You can connect an external Short Messaging Entities (SME) to the Short Message Service Center (SMSC) through the SMS Gateway . SME is an entity that may receive or send short messages. The SME may be located in the fixed network, a mobile station, or another service center. So in other words a SMS gateway only bridges the connection between an external SME and SMSC. SMS Gateway works simply by connecting server to the client database.

In an SMS message gateway, one end of the gateway is connected to a mobile telephone network, over which SMS messages are sent. The other end of the gateway can be connected to different systems or services. These most commonly include mail systems and IP networks.

The client supplies the destination GSM number, message content (text or binary), and an optional identification number for tracking purposes. The sms gateway software then converts the data into SMS format and sends the message to any number of mobile phones.

The SMS Gateway is designed specifically for parties who wish to regularly conduct interactive SMS application such as ringtone/logo downloads, games , contest and voting either in live basis or certain period of time. As the name suggest, the main function of the gateway is to route and facilitate communications between an SMSC and application servers. Depending on the mobile-originated short message received from the SMSC, the gateway will forward it to the appropriate application server for processing. It will then reply to the SMSC with the appropriate response given by the application server.

One problem of SMS messaging is that SMSCs developed by different companies use their own communication protocol and most of these protocols are proprietary. For example, Nokia has an SMSC protocol called CIMD whereas another SMSC vendor, CMG, has an SMSC protocol called EMI. We cannot connect two SMSCs if they do not support a common SMSC protocol. To deal with this problem, an SMS gateway is placed between two SMSCs. This is illustrated in the Figure 1. The SMS gateway acts as a relay between the two SMSCs. It translates one SMSC protocol to another one. This way can be used by two different wireless carriers to interconnect their SMSCs for purposes such as enabling the exchange of inter-operator SMS messages.
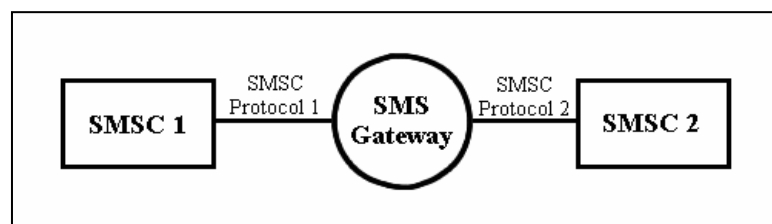

Figure 1: An SMS gateway acts as a relay between two SMS centers.

Besides wireless carriers, content providers and SMS application developers may also find an SMS gateway useful. Let's consider the following situation. Suppose you are the developer of an SMS text messaging application. To send and receive SMS text messages on your server, one way is to connect to the SMSCs of the wireless carriers. Different wireless carriers may use SMSCs from different vendors, which mean your SMS text messaging application may need to support multiple SMSC-specific protocols. This is illustrated in Figure 2. As a result, the SMS text messaging application's complexity and development time increases.
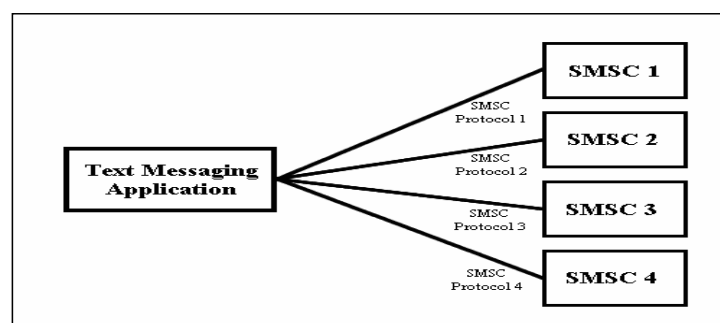

Figure 2: An SMS text messaging application connects to SMSCs without an SMS gateway

To deal with the above problem, an SMS gateway can be set up to handle the connections to the SMSCs. Now the SMS text messaging application only needs to know how to connect to the SMS gateway. To support more SMSCs, you just need to modify the settings of the SMS gateway. No change to the source code of the SMS text messaging application is required. The use of an SMS gateway can greatly shorten the SMS text messaging application's development time.

To connect to an SMS gateway, you can use an SMSC protocol such as SMPP and CIMD. Some SMS gateways support an HTTP / HTTPS interface. HTTP / HTTPS is easier to use than SMSC protocols. The drawback is that there may be fewer SMS features to use. For example, an SMS gateway may not support the sending of picture messages through the HTTP / HTTPS interface. [9]
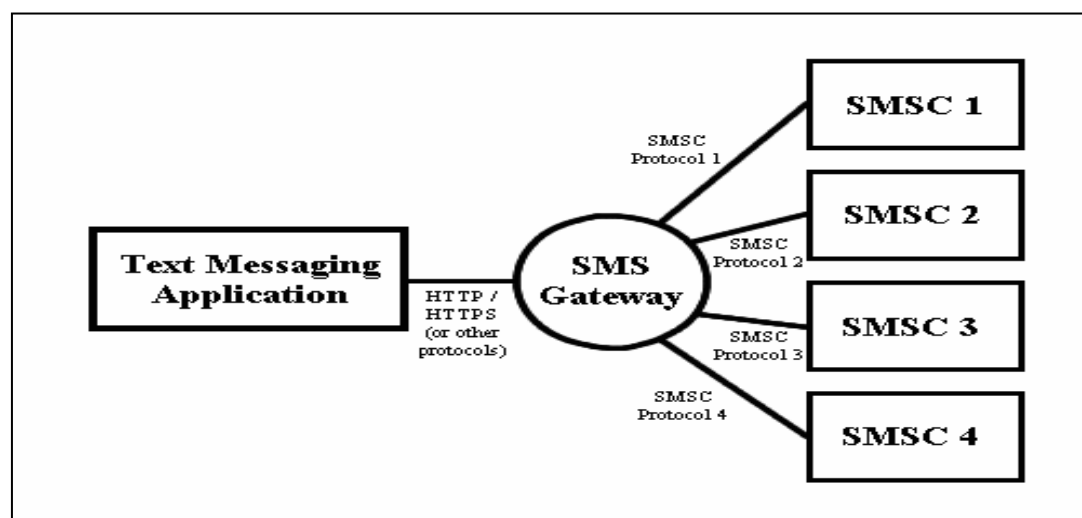

Figure 3: An SMS text messaging application connects to SMSCs through an SMS gateway

2.5   Short Message Service Center (SMSC)

SMSC is a combination of hardware and software responsible for the relaying and storing and forwarding of a short message between an SME and mobile device. Main functions of the SMSC are is the relaying if short messages between SME's and the storing and forwarding of messages if the recipient SME is not available The SMSC may be integrated as a part of the mobile network (e.g. integrated to the MSC) or as a independent network identity .

The SMSC must have high reliability, subscriber capacity, and message throughput. In addition, the system should be easily scalable to accommodate growing demand for SMS in the network. In theory one single SMSC can manage SMS for several network operators; however this is rarely implemented in real life [10]

CHAPTER 3

METHODOLOGY

3.1 Class Schedule/Timetable Via SMS: An Overview

The methodology of this research has been divided into three areas. A conceptual model is discussed and we have chosen two SMS techniques: SMS via cellular modem and SMS via SMS gateway. This two architecture or techniques how to send and retrieve SMS are discussed detail. In Chapter 4, we will discuss the prototype that will bring the best result between these two techniques and also the Class Schedule SMS structure (the application).

Several intrinsic characteristic of the Short Message Service make it a viable platform to for timetable retrieval or urgent announcement on class suspension.

3.1.1   Performance

SMS messaging is almost prompt, within limits of the cellular infrastructure provider's Quality of Service (QoS) undertaking. Significantly, SMS is a store-and-forward service, meaning that when you send a text message to a friend, the message does not go directly to your friend's cell phone. The advantage of this method is that your friend's cell phone doesn't have to be active or in range for you to send a message. The message is stored in the Short Message Service Centre (SMSC) for days if necessary until your friend turns his cell phone on or moves into range, at which point the message is delivered. The SMSC in the cellular network can notify senders of delivery status either success or fail via a delivery report. These notices can be used by class schedule/Timetable application as a communications countercheck.

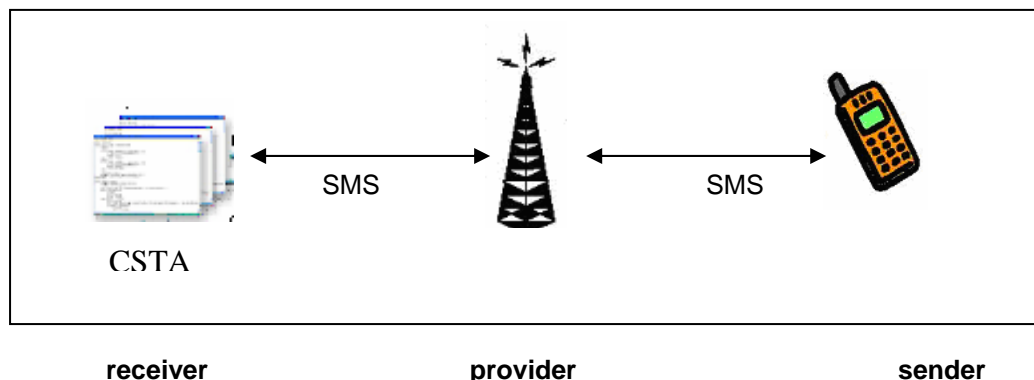**3.1.2   Conceptual Model**

CSTA

| receiver | provider | sender |

Figure 4 : Conceptual Model

The conceptual model of SMS class schedule retrieval is illustrated in Figure 4.The system comprises a class schedule application where user request a timetable based on the parameter given via SMS messages. The application will then request information from the database and gives feedback to user via cellular phone network SMSC.

3.2   SMS Class Schedule/Timetable Retrieval System Techniques (Architecture).

In this research, we have focused two techniques of sending data via SMS. The techniques are SMS via cellular modem and SMS via SMS gateway.

3.2.1   SMS via Cellular Modem

SMS techniques via cellular modem can be seen in Figure 5. This figure shows that the Class Schedule/Timetable application (CSTA) sends and receives messages via cellular modem, which in effects impersonate the capabilities of a cellular phone. A bank of several such modems maybe set up to increase message throughput. Cellular modems are available in a variety of computer interface options like PC card, RS-232 serial connection and PCI. The CSTA interface maybe via the ETSI AT command set extended for SMS or proprietary telephony software toolkits accompanying the cellular modem hardware.
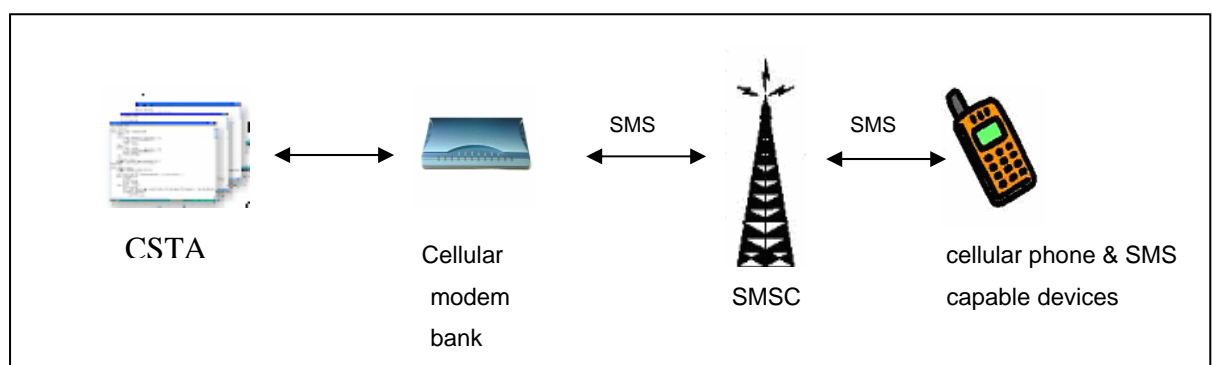

Figure 5: CSTA via Cellular Modem

We will discuss the inherit features SMS messaging via cellular modem from the SMS through cellular phone: network interoperability and messaging cost.

3.2.1.1 Network Interoperability

Where there is no SMS interoperability across cellular networks, the modem bank must have at least one modem activated for use on each non-interoperating network. The CSTA can then be directed to activate the right modem when attempting to message field staff connected to a particular network. Reply from the application can also be received on the same modem.

3.2.1.2 Messaging Cost

The cost of messages sent via cellular modem is charged the same retail price as those instigate on cellular phones. While the price of a SMS message costs less than a cellular voice call, total messaging cost for the application can rise quickly with transacted volume, even with a volume discount. There is little opportunity under this setup to benefit from wholesale message pricing.

3.2.1.3 Using a Computer to Receive SMS Messages through a Mobile Phone or GSM/GPRS Modem

Receiving SMS messages through a mobile phone or GSM/GPRS modem has a major advantage over the other two ways -- wireless carriers usually do not charge any fee for receiving incoming SMS messages with their SIM cards. The disadvantage of receiving SMS messages this way is that a mobile phone or GSM/GPRS modem cannot handle a large amount of SMS traffic. One way to overcome this is to load balance the SMS traffic with a pool of mobile phones or GSM/GPRS modems. Each mobile phone or GSM/GPRS modem will have its own SIM card and mobile phone number.

In terms of programming, sending and receiving SMS messages through a mobile phone or GSM/GPRS modem are similar. What you need to do is to send instructions (in the form of AT commands) to the mobile phone or GSM/GPRS modem.

In Table 1, we have listed the AT commands that are related to the receiving and reading of SMS messages:

AT command	Meaning
+CNMI	New message indications
+CMGL	List messages
+CMGR	Read messages
+CNMA	New message acknowledgement

Table 1: AT Commands for Sending and Receiving SMS Messages

To enable an application to receive SMS messages, you have to write the source code for connecting to and sending AT commands to the mobile phone or GSM/GPRS modem, just like what a terminal program does. You can write the source code in C, C++, Java, Visual Basic, Delphi or other programming languages you like.

3.2.2 SMS via SMS Gateway

SMS techniques via SMS Gateway can be seen in Figure 6. This figure shows that the Class Schedule/Timetable application sends and receives messages via a SMS message gateway. The gateway is a essentially a software service that connects users transparently to the SMSC of a mobile telephone network. In this case, the CSTA can transmit and receive SMS messages as though it had a cellular bank connected, or as if it were directly connected to the SMSC.
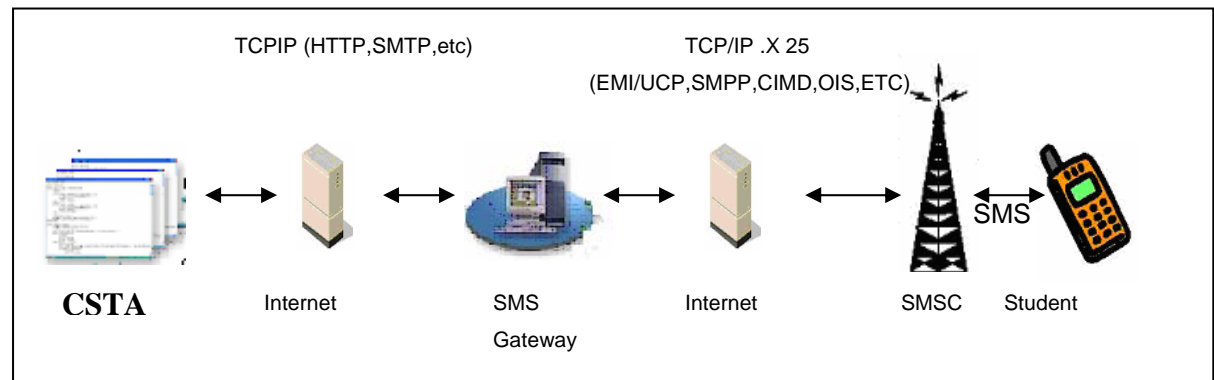

Figure 6: CSTA via SMS Gateway

The SMS gateway can shield end users and applications developers from the complexities of interfacing individually with multiple SMSCs with disparate connectivity requirements. After setting up an account with an SMS service provider, the SMSC or SMS gateway will start forwarding inbound SMS messages to your SMS application using a certain a protocol / interface. To communicate with an SMSC, an SMSC protocol is required. SMSC protocols are proprietary to the company that developed the SMSC. One widely used SMSC protocol is SMPP (Short Message Peer to Peer). It was originally a proprietary SMSC protocol created by Logica (an SMSC vendor). Now SMPP is an open SMSC protocol whose development is controlled by a non-profit organization SMS Forum. In Table 2, we have listed some of the SMSC protocols and the SMSC vendors who develop the protocols:

SMSC vendor	SMSC protocol
CMG (CMG and Logica have merged into LogicaCMC.)	EMI (External Machine Interface) UCP (Universal Computer Protocol)
Logica (CMG and Logica have merged into LogicaCMC.) (Now the SMS Forum is responsible for the development of SMPP.)	SMPP (Short Message Peer to Peer)

SMSC vendor	SMSC protocol
Nokia CIMD	CIMD (Computer Interface to Message Distribution)
SEMA Group (Now known as Airwide Solution)	OIS (Open Interface Specification) SMS2000

Table 2: List of SMSC Vendors and SMSC protocols

SMS gateways of SMS service providers and wireless carriers very often support one or more of the following protocols / interfaces: HTTP, HTTPS (HTTP + SSL encryption), XML over HTTP / HTTPS, SMTP (SMS to email), FTP. Some also support the SMPP protocol, which is usually used by advanced users. SMSC protocols other than SMPP are not commonly supported.

SMS gateways services maybe operated in-house to support custom user applications but are more often outsourced to wireless application service providers (ASPs). As one of the traditional business domain of these providers, wireless ASPs maybe in a stronger position to offer more value-added services that make a compelling case for outsourcing. Some of these are examined below in light of CSTA.

3.2.2.1 Network Interoperability

Through extensive service agreements with mobile infrastructure operators both domestically and internationally, SMS gateways offered by wireless ASPs may aggregate many more SMSCs through which messages can be routed for delivery. Networks with otherwise no direct SMS interoperability may still interconnect through third party networks with reciprocal service arrangements. A CSTA using such a gateway will benefit from seamless access to more mobile networks

3.2.2.2 Messaging Cost

In the dynamic and highly competitive global telecommunications market some wireless ASPs may be able to establish commercial arrangements with local and foreign service providers that enable the ASPs to offer domestic SMS messaging at rates lower than prevailing retail. Whether this is accomplished through bulk purchase of messaging credits at wholesale or price arbitrage among different networks is immaterial so long as the savings is passed on to customers. CSTA can look to substantial SMS messaging cost savings over full retail if deployed with such an ASP.

3.2.2.3 Using a Computer to Receive SMS Messages through a Connection to the SMS Gateway of an SMS Service Provider

Another way to receive SMS messages using a computer is through a connection to the SMS gateway of an SMS service provider. SMS service providers generally support two kinds of solution:

1. **SIM hosting** -- The SMS service provider hosts a SIM card for you. All SMS messages sent to the mobile phone number of the SIM card will be forwarded to your system using a protocol / interface supported by the SMS gateway of the SMS service provider.
2. **Shared phone number** -- The SMS service provider provides you a phone number that is shared by its customers for receiving SMS messages. You have to specify one or more keywords to associate with your SMS application. If an SMS message is received and its content begins with a keyword specified by you, it will be forwarded to your system using a protocol / interface supported by the SMS gateway of the SMS service provider.

Some SMS service providers also provide SMS messaging solutions that are customized to your needs. For example, if you need to receive SMS messages from users in a few countries, an SMS service provider may help you open dedicated phone numbers in those countries and forward the received SMS messages to you in a unified way. To use such SMS messaging services, you have to contact the SMS service provider to discuss the details.

SIM Hosting

In this approach, an SMS service provider hosts a SIM card for you. The SIM card's mobile phone number will serve as a dedicated phone number of your SMS application. To use the service, you mail your SIM card to the SMS service provider. Later if you end the service, the SMS service provider will mail the SIM card back to you. The SIM card will be put into a GSM/GPRS modem, which is connected to an SMS gateway. The SMS gateway will forward all received SMS messages to your computer using a certain protocol / interface. For example, HTTP, HTTPS, XML over HTTP/HTTPS, SMTP (SMS to email), SMPP, etc.

Like receiving SMS messages using your own mobile phone or GSM/GPRS modem, SIM hosting has a major weakness -- it cannot handle a large amount of SMS traffic. The advantage of SIM hosting is that you do not need to buy, set up and manage the necessary equipment. Also, you do not need to write any code to control the receiving of SMS messages from a GSM/GPRS modem via low-level AT commands, which means you can concentrate on the business logic of your SMS application. The SMS service provider may provide you a detail log of the incoming SMS messages.

Shared Phone Number

In this approach, the SMS service provider rents dedicated phone numbers from wireless carriers. Each phone number will then be shared by a number of the SMS service provider's customers for receiving SMS messages. Since the phone number is provided by a wireless carrier directly (not through a SIM card) and the SMS service provider has a high speed connection to the SMSC or SMS gateway of the wireless carrier, the SMS service provider is capable of handling a large amount of SMS messages with the phone number. As a result, the users of such shared phone number service can enjoy a higher SMS transmission rate than using SIM hosting services or using their own wireless modem. The cost of shared phone number service is less expensive than renting your own dedicated phone number from a wireless carrier. A detail log of the received SMS messages is sometimes provided by SMS service providers.

Like using SIM hosting service, using shared phone number service has the advantage that you do not need to buy, set up and manage any equipment (e.g. GSM / GPRS modems) and write any low-level code for receiving SMS messages. Hence, an SMS application developer can concentrate on the business logic of his/her SMS messaging application.

The weakness of shared phone number service is that the bandwidth is shared, i.e. the performance drops if the number of users sharing the phone number increases, or if the amount of incoming SMS traffic required by other users increases.

Cost of SIM Hosting Service

SIM hosting service typically involves a one-time setup fee and a monthly hosting fee. Usually there is no per-message cost. Some SMS service providers do not state the cost of SIM hosting service on their website, which means you have to contact their staff directly.

If the SMS service provider is located overseas, the SIM card needs to support foreign network roaming. SMS roaming fees may be charged by the wireless carrier that provides you the SIM card.

Cost of Shared Phone Number Service

Shared phone number service typically involves a monthly subscription fee, a per-message fee and/or a per-keyword fee. A few SMS service providers also charge a one-time setup fee. Some SMS service providers do not state the cost of shared phone number service on their web site, which means you have to contact their staff directly.

CHAPTER 4

DATA AND DISCUSSION

In this chapter we will discuss on the message structure to retrieve data from the database and also the prototype techniques proposed to handle the data transaction between the application and the SMSC.

4.1   SMS Class Schedule/ Timetable Message Structure

Short message service is exactly what it sounds like it is, a text-message sent or received to or from a mobile phone. The text messages are short, up to 160 characters, and if a phone is out of coverage, in use or turned off, the service holds the message until the phone comes back into the area. Below are the structure of information exchanged between the application and the mobile workforce:

- Sender request class schedule data from database
  - UTM
  - CSTB (class schedule table)
  - Semester/Session
  - Matrix number
  - Subject Code

  Example Structure
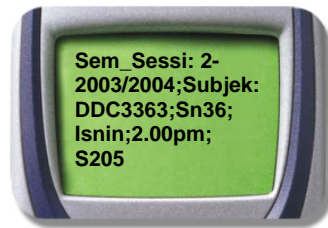- UTM<space>CSTB<space>Semester_Session<space>Matrix_no<space>subject_code

e.g: UTM CSTB 2-2003/2004 AD10004 DDC3363
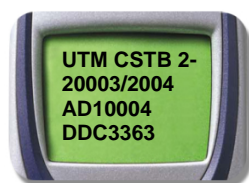
- Send to number(eg: 0133048393)

- Sender will receive a reply message from the system.

  e.g: Sem_Sessi: 2-2005/2006;Subjek: DDC3363;Sn36;Isnin;2.00pm;S205

4.2   Prototype System Design

Figure 6 depicts the system design of a prototype CSTA. The prototype demonstration system is designed around Pentium 3 laptop which has hardware equipped to support the variety of communication links required for the system's operation.
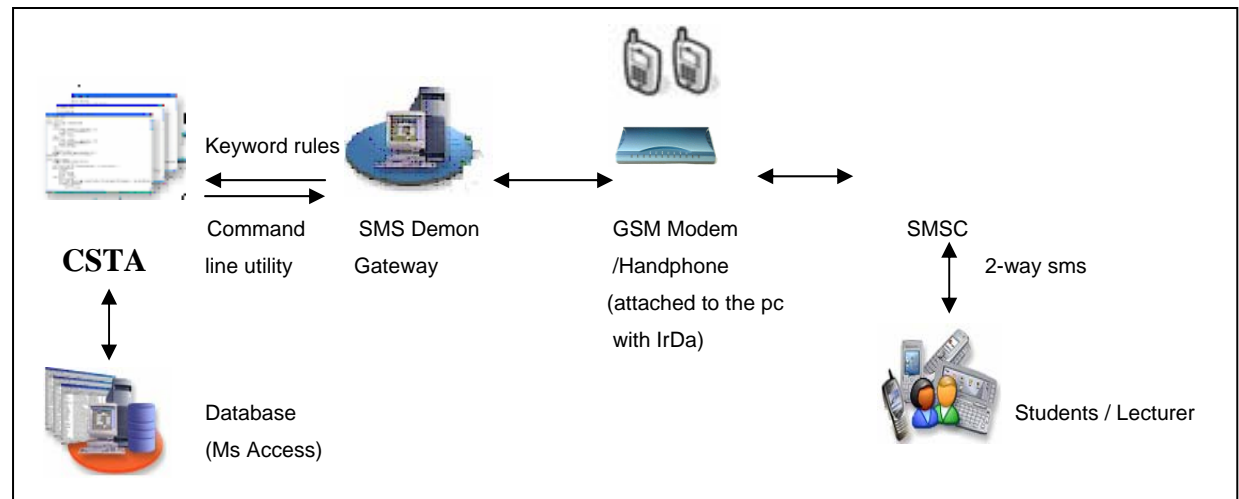

Figure 7: Solution Prototype Platform Hardware/Software

The solution to this prototype is to place an SMS gateway between the CSTA and the mobile phone or GSM modem. The CSTA can then use simple protocols such as HTTP / HTTPS for receiving SMS messages. If an SMSC protocol (e.g. SMPP, CIMD, etc) is used for communicating with the SMS gateway instead of HTTP / HTTPS, an SMS messaging API / SDK / library can be very helpful since it encapsulates the SMSC protocol's details.

For the SMS gateway we have chosen the SMSDemon Gateway as the platform to transfer the data. SMSDemon is the most complete wireless messaging platform with the reliability and performance required to operate critical business applications and web sites with wireless messaging capabilities. SMSDemon allows user to develop multiple interactive messaging services, such as information on demand e.g: class schedule data, alerting systems and promotions in the most cost efficient way. SMSDemon is capable of independently managing unlimited GSM Modems (including standard mobile phones) connected to a standard PC or

server simultaneously. It is a completely scalable solution that will allow you to start with a small number of services and quickly expand with your business.

As SMSDemon has intelligent control capabilities and runs as a service and no worries about problems with hardware and operating software that might affect the operation of SMSDemon. Once the host computer is back up and running, SMSDemon will intelligently resume where it left off. Although it is powerful, it has been re-architecture to consume minimal resources so that it can run on a very small amount of processing power and RAM. Please refer Appendix B for a complete reference on how to operate SMSDemon.[11]

For main application module, we were trying to code it in Microsoft Visual Basic 6. However, the prototype for the application was not fully developed. We were facing problems while trying to retrieve data from the database. Somehow, we have not allocated budget for GSM modem. As for the modem, we have been using a mobile phone (built in GSM modem) with an IrDA connection. This GSM mobile phone is connected to the laptop, which takes care of sending and receiving SMS messages over the GSM network. We have succeeded in connecting the mobile phone with SMSDemon. A message with parameter such as section 4.1 was sent from the user mobile. User then will send the SMS to number 013 3048393. The SMS Gateway, which connects to the GSM modem, will retrieve the data and store the data to the database. Please refer to Appendix A for a screenshot of incomplete prototype CSTA.

For the purpose of the prototype, Microsoft Access 2000 was used as the database management system to maintain the CSTA transaction. Please refer to Appendix A for the incomplete prototype of CSTA database.

4.3   Prototype Functionalities

Below are the functionalities of prototype on hardware platform that were achieved and the deficiency of the prototype on software platform:

- A graphical user interface to operate the prototype was built.
- The SMS gateway were successfully connected to mobile phone number, 013 3048393 via SMS.
- The prototype software succeeds in retrieve the SMS from sender.
- The prototype failed to send the requested data to the sender.

4.4   Limitation of Future Study and Future Research

This research focuses on the techniques to retrieve class schedule via sms. No actual or live application was developed. Therefore, for future research live platform software should be developed in order to prove that this prototype technique is capable to send and receive a real class schedule data. Future research also can be made on analysing the messaging cost, which is more practical and cheap but with a less limitation features and a good service. Apart from that, class suspension feature should be put into consideration.

CHAPTER 5

CONCLUSION

Besides using a direct connection to the SMSC of a wireless carrier, another way to send and receive SMS text messages on a computer is to use a mobile phone or GSM/GPRS modem. To do this, your SMS text messaging application has to know how to communicate with the mobile phone or GSM/GPRS modem using AT commands. However, to learn AT command takes time and need some professional understanding. In order to overcome the problem, SMS gateway was proposed to interact intelligently with the AT command.

Some SMS gateways are capable of handling the connections to mobile phones and GSM/GPRS modems. To send and receive SMS text messages with a mobile phone or GSM/GPRS modem, the SMS text-messaging application only needs to know how to talk to the SMS gateway and does not need to know anything about AT commands. We have made comparison between retrieving SMS via standalone GSM modem and via SMS gateway. Both need some improvement and our prototype has solved the problem. Unfortunately, we were only able to test the prototype platform hardware and as for the prototype platform software, an incomplete version of CSTA was not able to cater some features.

However, having a live system on retrieving class schedule via sms will prove that this prototype platform able to make the whole system design useful. Running this application live will bring benefits to students and lecturers where they can get the information no matter when and where they are.

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SMSDEMON ON DEMAND HELP

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Screenshot for incomplete prototype CSTA