

Development of Integrated E-Parcel Management System with GSM Network

Mohd Helmy Abd Wahab, Danial Md. Nor, Afizah Abdoll Mutalib,
Ayob Johari and Rahmat Sanudin

Abstract – As the trend of information dissemination has become more important, the use of mobile communication medium has gained more popularity. Since the number of mobile applications developed had increased tremendously, the technology offers an option to end user with information at their fingertips. Thus the notification methods also change drastically from notice board to Short Messaging System (SMS) based notification system. This paper intends to discuss the development process of e-parcel management system which is integrated with Global System for Mobile (GSM) networks. The whole system utilizes the barcode system, Microsoft Visual Basic 6.0 and Active Server Pages 3.0 as the interface, and mobile network to realize the intended purpose. The implementation shows that the prototype developed has successfully executed and it is concluded this on-going research requires further improvement on the current prototypes.

Keywords : *Databases, GSM Network, System Development, E-Parcel.*

INTRODUCTION

The rapid growth of Information Technology era has led to significant contribution in the field of information distribution. As information become one of the most crucial in most organizations, the trend is clear that the technology for disseminating information has increased dramatically. The trend of technology grows ranging from web to mobile, information nowadays not just in a stateless environment but always in pervasive manners. As such, this paper attempts to describe the development of e-parcel system with integration with SMS using GSM. The purpose of the system is to utilize the SMS services that notify the end user regarding the particular parcel upon arriving from the authorized personnel to university administrators.

In Universiti Tun Hussein Onn Malaysia (UTHM), the incoming parcels are pooled and handled by System Management Unit under Registrar Office. The unit then distributes the parcel to particular department as stated in parcel's addresses. Then the owners have to collect it at the respective department. The whole processes could be done easily if the parcel is small and easy to put in the respective pigeon hole. However, there is possibility the parcel is missing along the transfer process. Based on records it has been sent to administrator and distributed to the respective department but the recipient did not receive the parcels.

Thus, this system is proposed to solve this problem. Using this system, any incoming parcel will be tagged with bar codes that associate with staff information in the system. Then the notification will be sent to staff's mobile phones and e-mail. Upon the receiving the notifications, immediate action can be taken to collect the parcels.

As mentioned by Sandri, Goncalves, and Martini [12] SMS has become a low-cost alternative for research and education development and performance analysis of parallel applications. The cost of SMS is still reasonable and provides an option to users nowadays even though e-mail has been ranked as vast communication medium due to its free and provides variety of services.

This paper is organized as follows; section 2 describes the related work which discussed the utilization of SMS-based system on particular information system. Section 3 describes the development process and conclusion is in section 4.

RELATED WORK

This section discussed some related work regarding the utilization of SMS-based systems. The system can be categorized based on the area-based applications. GSM Network was introduced in 1991 with more than 100 countries have adopted the protocols [1] and SMS is developed as a part of GSM Phase 2 specification. Currently, SMS text message can hold up to 160 characters per block and delivered within a few seconds where GSM coverage is available. There are a number of applications developed integrated with GSM networks and sent notifications through SMS or Multimedia Message Services (MMS).

Particularly, most information system integrated with SMS technologies implemented in educational area. This can be proved by development of system such as

WEB2SMS by [7], [2], [3] and Digital Notice Board [8] consists of similar purpose of system that deliver urgent information to students but the difference lies in the development platform and the way the systems work. Most of the system mentioned utilizing SMS text as notification mechanism to students. Unlike the SMS-based Digital Notice Board [8], the lecturer can send an announcement to the digital notice board while they are away from campus. Student then can check the digital notice board to look for updates. Next innovation then perform by Helmy [14] which integrates the current web2SMS system and digital notice board and come out with system with more functionalities. Kadirire [4] developed a SMS system which students can send SMS text to teacher or presenter during seminars or conferences. The teacher then can select each message to display on a large screen and interactively deal with comments or questions. Instead of delivering urgent information to students and writing a comments to presenters, another applications were performed to support class interactivity [13] where students can send SMS during the class session and lecturers can see the SMS content and have opportunity to change the delivery method to indicate response on the message and at last the SMS still available after the class session to enable students to interact with lecturer in an online forums.

The application SMS system is not limited in education purposes only but it has a wide range of fielded areas has been successfully applied. In transportation field, the work presented by Ching and Garg [15], they developed public transport notification system in Singapore. The work outlines a wireless service system that providing real-time information on demand especially regarding on travel information. The system integrates bus and mass rapid transit information together. This enable user to the arrival information and flag the particular bus on the way. Similar work also developed by Hapsari, Syamsudin and Pramana [5] which designed a system that can provide information on vehicle position using FPGA while Johari et. al [6] and Papadoglou and Stipidis [9] developed a SMS system for monitoring vehicle location using integrated GSM-GPS systems. However, there is a different approach applied by Rashid et. al [10] and Thompson and Sheat [11] which utilize GPRS to provide public information system on departure and arrival time at central terminal on users' mobile phone.

Although the applications of SMS notification system has been comprehensively described in a area of education and transportation, there still a lot of applications of SMS notifications has been used in a wide range of field such as radiology [16], dental care [17], Stock Price [18], Sales Reporting [19], Class scheduling [20] and even in an engineering field such as smart home application [23], automated power meter [22], automated water meter [21], and speed trap [24][25].

The number of SMS application is increasing from day to day due to its popularity, since the orientation of this paper to discuss the application of SMS system in e-parcel management system. The literature has indicated that the e-parcel system has not been covered in this system. Thus this paper intends to discuss the SMS text notification for e-parcel management systems to improve the existing conventional system.

METHODOLOGY

The overall architecture of the system is illustrated in Figure 1. It illustrates an overall architecture of E-parcel notification system. Whenever a parcel reached administrator unit, the particular parcel will be tagged with barcode that associates with staff information in

database. A notification then is sent to the parcel's owner through SMS and e-mail. The development process of the system consists of five (5) phases which are i) Requirement specifications ii) Analysis iii) Design iv) Implementation and v) Maintenance.

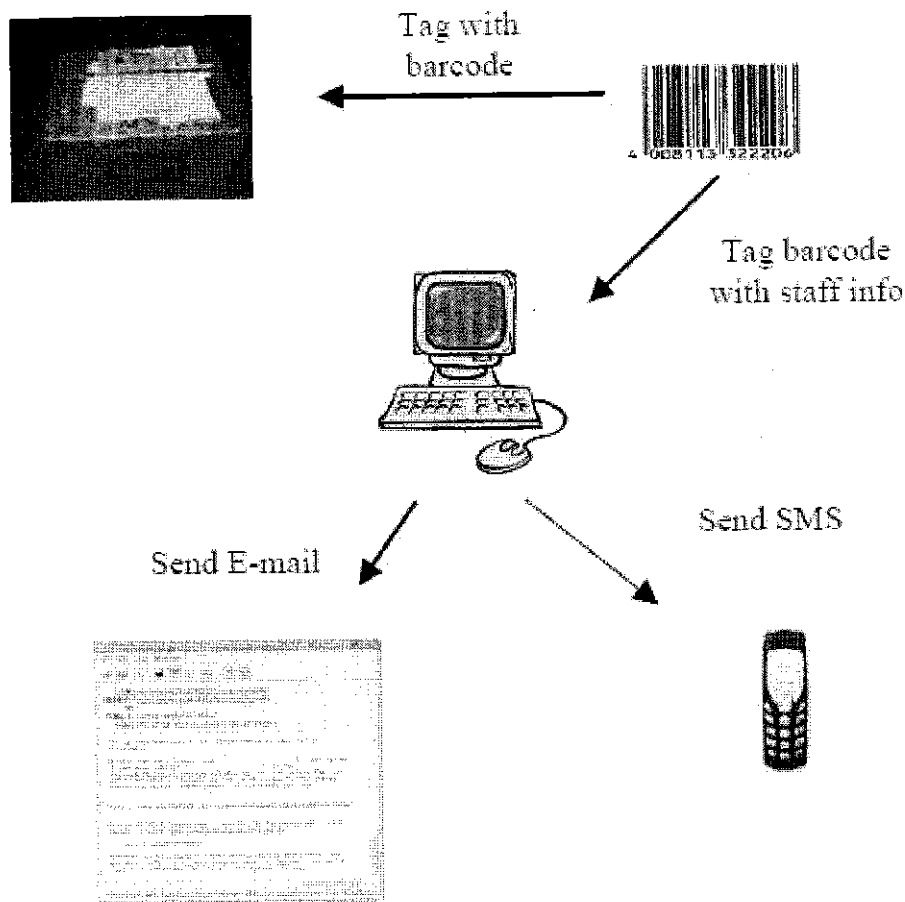


Figure 1. System Architecture

3.1 Requirement specifications

This phase reviews on current situations and provide a requirement of hardware and software. We used GSM modem connected with DKU-5 cable and developments of system are using Visual Basic 6.0 and Active Server Pages 3.0. The purpose of visual basic is to provide graphical user interface between users and provide interfacing with modem to send SMS texts.

3.2 Analysis

This phase performs analysis on the current existing system (manual system) and the proposed solution. This could determine the effectiveness of system implementation and cost incur during installation and maintenance. The manual system can be illustrated in Figure 2.

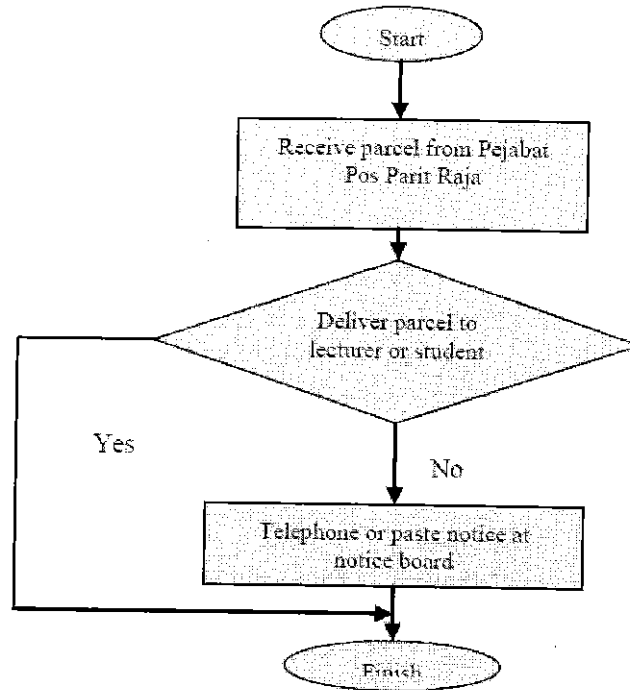


Figure 2. Manual Parcel System.

3.3 Design

This phase involves in designing the system. The design process can be separated into three components:

- i) Database design
- ii) Interface design
- iii) SMS interfacing

3.3.1 Database design

Database design outlines the structure of data to ensure its integrity. Data integrity with strong relationship contributes the robust system and increases its reliability. Generally, database design begins with logical database design followed by normalization process to check its integrity and produce the physical design which is the final design before proceed with implementation to the real database software. However, since the database design is not main orientation of this paper, thus simple logical database design is illustrated in Figure 3.

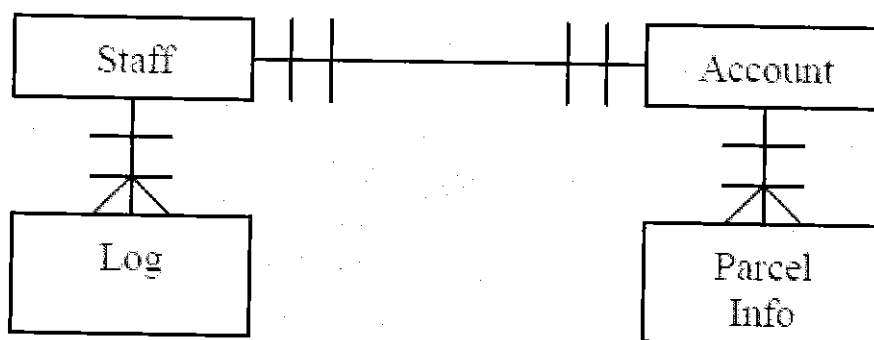


Figure 3. Entity Relationship Diagram

3.4 Implementation

System implementation involves development of all modules and their integration. Development process begins after database design has been finalized and interface design has been done using Microsoft Visual Basic 6.0. The staff data base contains their full name, staff ID, office location, telephone number and email address.

Once the parcel arrived at the main building, the recipient name is keyed in the computer system and matched with the staff data base. Barcode is then generated automatically and printed on the self adhesive barcode sticker. The barcode sticker is then sticking on that particular parcel.

The barcode is scanned and automatically integrate the staff data base with the GSM system. The recipient is acknowledged through SMS using GSM modem. Once the recipient collects the parcel, the bar code is scanned once again and data was recorded in the data base.

The system then integrates with GSM modem to ensure SMS technology can be used from the system. System configurations on GSM and database connection have been done using Object Database Connectivity (ODBC) standard database interfaces provided by Microsoft.

3.5 Maintenance

Maintenance phase started after the system has been successfully installed and required updates on schedule to avoid failure and system performances problems.

INTERFACE

This section described some interface design of the system. There are several interface designs that have been successfully developed. Figure 4 illustrates the menu system.

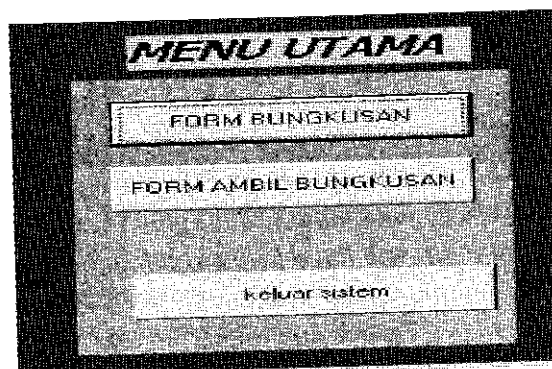
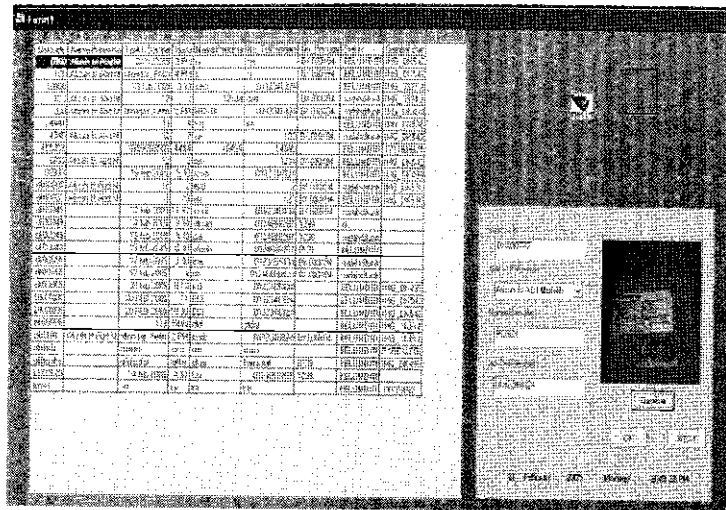
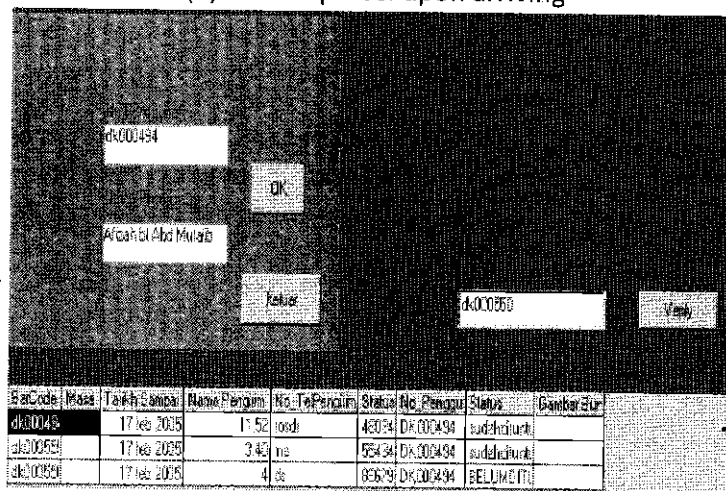


Figure 4: Menu system

As illustrated in Figure 4, this is a menu system for the prototype developed using Visual Basic 6.0. There are another two interfaces which are used to collect a parcel and to record the parcel upon arriving at administrator (See Figure 5).



(a) Record parcel upon arriving



(b) Parcel collection interface

Figure 5(a) – (b): Interface for parcel interaction

Figure 5 (a) illustrates the recorded parcel information and associated with staff information in databases while figure 5 (b) illustrates an interface when the parcel is ready to be collected. Users only require supplying staff ID to check the unclaimed parcels. Once collected, the record status will change to “claimed”.

CONCLUSION

The discussion of the paper explains the development of prototype of E-parcel management system with integration of Short Message Service. This system is expected to reduce the possibility of missing parcel in organizations and simplifying the distribution process and supporting the campaign towards “green environment” and paperless. The only paper being used in this system is a biodegradable barcode sticker. The sticker is not recyclable once stick on the parcel and its costs is very insignificant. The whole system consists of computer (data base), barcode reader, printer and GSM modem and do not cost much to the department as most of the equipments are already available in the office. The whole cost is considered worthwhile to spend with the convenience, speed and the efficiency provided by the system. The prototype is currently working successfully, however

there is a need to further improve the prototypes. For further improvement the barcode could be replaced with Radio Frequency Identification (RFID) tag and it is recyclable for use with another parcels. This however will not give any significant impact on the reduction on the cost of the system.

REFERENCES

- [1] Peersman, G. and Cvetkovic, S. "The Global System for Mobile Communications Short Message Service", IEEE Personal Communications, 2000, pp. 15 – 23.
- [2] Mohammad, M. A. and Norhayati, A. "A Short Message Service for Campus Wide Information Delivery", In Proc. Of 4th IEEE National Conference on Telecommunication Technology, 2003, 14 – 15 January 2003, UiTM Shah Alam, pp. 216 – 221.
- [3] [Curran, K. and Craig, R. "A Short Message Service Online Application for Delivering Urgent Information to Students", In Proc. of 1st Joint IEI/IEE Symposium on Telecommunication System Research, 2001, 27th November 2001, Dublin, Ireland.
- [4] Kadirire, J. "The Short Message Service (SMS) for school/conferences", In Proc. of 3rd International Conference on Multimedia and Information & Communication Technologies in Education, 2005, 7 – 10 June 2005, Spain.
- [5] Hapsari, A. T., Syamsudin, E. Y., and Pramana, I. "Design of Vehicle Position Tracking System using Short Message Services and Its Implementation on FPGA" In Proc. ASPDAC 2005. Asia and South Pacific Design Automation Conference, 2005. 18-21 Jan. 2005, Shanghai, China.
- [6] Johari, A., Ling, K. J., Danial, M. D., Ayob, M. E., Wahab, M. H. A., and Abas, M. N. A. "Development of an Integrated Embedded Global System for Mobile Communication (GSM), and Global Positioning Systems (GPS) in Monitoring Applications", In Proc. of Malaysian University Conference on Engineering and Technology, 2006, 19 – 20 December 2006, KUITTHO, Batu Pahat, Johor, Malaysia.
- [7] Mohd Helmy Abd Wahab, Norlida Hassan, and Nurul Asni Abdullah Sani. "WEB2SMS: Sistem Pesanan Ringkas atas Talian (SMS) untuk Penyebaran Maklumat dalam Pengajaran dan Pembelajaran. In Proc. of National Seminar on ECommunity, 2005, 6 – 7 December 2005, Palm Garden Resort, Putrajaya, Malaysia.
- [8] Mohd Helmy Abd Wahab, Siti Zarina Mohd Muji, and Wardatul Fadhilah Amir Nazri. "SMS-based Digital Notice Board", In Proc. of National ICT Conference, 2006, 17 January 2006, Putra Palace Hotel, Perlis, Malaysia.