Proceedings of the International Conference on Software Engineering and Intelligent Systems 2010, July 5th-9th, Ota, Nigeria

SEIS 2010.
Vol 1

Design and Implementation of a Mobile Express Delivery System

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Abstract. Express delivery services in the world today have advanced greatly in developed countries with the use of information and communication technology (ICT) product and services. Meanwhile, most courier companies particularly the indigenous ones in the developing countries including Nigeria still have many problems in the delivery chain of courier services operations. The existing express delivery system lack mobile facilities for customers to lodge complains and track shipment on the move and courier agents are not able to access courier information while on the field. This paper presents the design and implementation of a Mobile Express Delivery System (EDS) on a WAP-enabled platform to enable courier customers perform various operations via mobile device such as tracking of shipment, checking account statement and lodging complaints. The Mobile EDS provides the courier customers a means of tracing/tracking shipment, lodging of complaints and making financial transactions on shipment. It also assists the courier staff to effectively manage courier related data with a mobile phone. The system is therefore able to enhance time, efficiency and documentation management for the customer and courier staff.

Keyword: Courier, Mobile Express Delivery System, Shipment, UML, WAP

1 Introduction

Express delivery system (EDS) is a process that offers special delivery of packages, money, documents or information. Courier services usually boast faster delivery times than any alternative method of transporting documents, and many services in the modern world. The largest courier service in the world is the United Parcel Service (UPS), which delivers more than 12 million packages globally each day [1]. Federal Express (FedEx) and DHL are other well-known global examples of the courier service, both with their roots in the early 1970s [1]. Couriers are distinguished from ordinary mail services by features such as door to door delivery, track and trace technology [2], speed, security, tracking, signature, specialization and individualization of services. Express delivery services in the world today have advanced greatly in developed countries with the use of information and communication technology (ICT) product and services. The boom in the courier industry as a result of the increasing coverage of larger geographical areas which in turn increases the desire of people to transfer packages to their families, client, and business partners has led to significant developments in the application of information technology to the courier industry. The diffusion of ICT in the courier services sector is

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still at an average utilization rate. However, the multinational courier companies in developing countries such as Nigeria make use of sophisticated ICT products and equipment [3], courtesy of their foreign partners. Despite the application of ICT in the courier services sector in Nigeria, they are still faced with problems such as i) inability to monitor and check status of shipment on the move, ii) lack of mobile facilities for customer to lodge complains on shipment delivery, iii) inability of courier staff to access the companies database while on the field, and iv) inability of account customers to view their statement of account on the move. More so, shipment tracking and related operations support services in the courier services sector in Nigeria is slow and does not cater for customers on the move.

The services provided by Courier companies share some characteristics which differentiate them from other traditional forms of delivery services [4]: i) *Door to door delivery:* This includes the seamless transfer across multiple modes of transport. The "integrated" aspect of the service offered frees the customer from the need to make complex transportation arrangements for pick-up and delivery. ii) *Close custodial control:* Using sophisticated information systems that enhance security, EDS firms maintain close custodial and administrative control over all shipments. This is particularly important to reduce the risk of loss or damage to goods in transit, and iii) *Track and trace technology:* Shippers and consignees may track the precise movement and location of their shipments and confirm delivery with the use of sophisticated 'track and trace' technology that an EDS firm provides.

What is applicable in most courier companies in the developing world is the conventional method of processing parcel delivered to customers. This involves use of an electro-mechanical device known as sapphire to scan bar code of each shipment at customer site and thereafter download the data stored in the sapphire to the computer server in the office. Consequently, the various means of checking the status of shipment includes web-based tracking using a unique Airways bill number and use of mobile SMS where a customer sends an SMS to a particular telephone number and the details of the shipment sent as a reply after few minutes. Telephone tracking is the third, whereby customer calls the telephone number of front desk personnel to provide shipment tracking information. With the conventional shipment processing and tracking system used by most courier companies, customers often complain of missing shipments, delays in shipment delivering process and unavailability of real-time information for shipment status details when needed by clients. This is part of the motivations of this study.

One of the most recent and significant changes in the business environment has been the growing demand for mobility as a result of the numerous citizens that carry mobile phones. This means customers, partners, and employees should be able to access information resources and services of a company anytime, anywhere. Wireless Application Protocol (WAP) is a protocol that makes it possible to surf the Internet from a cellular phone or other handheld wireless devices [5]. WAP is defined and coordinated by

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the WAP Forum, a consortium of industry players who have an interest in extending the kind of information and services that we have become used to accessing over the Internet, to users of mobile devices. The functions of the WAP gateway includes: i) processing of encoded requests for Internet-based information from the mobile devices, ii) *decoding/encoding* of task, iii) conversion of Wireless Session Protocol (WSP) to HyperText Transfer Protocol (HTTP) and iv) transformation of HyperText Markup Language (HTML) to Wireless Markup Language (WML) content[6]. To demonstrate the applicability of the mobile agent technology in supply chain management, a prototype system which makes use of a wireless network link, the global positioning system, and mobile agents was developed in [7]. The system demonstrates the workability of this combination of technologies in an industrial application. One limitation of the system is that it only handles mobile shipment tracking and does not cater for other courier services operations on the move.

This paper presents the design and implementation of a mobile express (parcel) delivery system on a WAP-enabled platform to cater for customers on the move and to assist the courier agents enter shipment details as they move from customers house to another delivering and picking up shipments. The system also allows courier staffs to add, view and make shipment transactions while on the field. The remaining part of this paper is structured as follows: Section two discusses the system modeling and architectural design. Section three and four presents the system implementation and benefit of the Mobile EDS respectively. The paper is concluded in section five.

2   System Modeling and Architectural Design

The Unified Modeling Language (UML) is used to capture and model some of the functionalities in the application. The UML is a visual language that provides a means to visualize, construct and document the artefacts of software systems [8].The Mobile EDS application is modeled using activity diagram and class diagram. The entity relationship diagram of Mobile SMS is presented in Fig. 1. It shows the different classes and their relationship.

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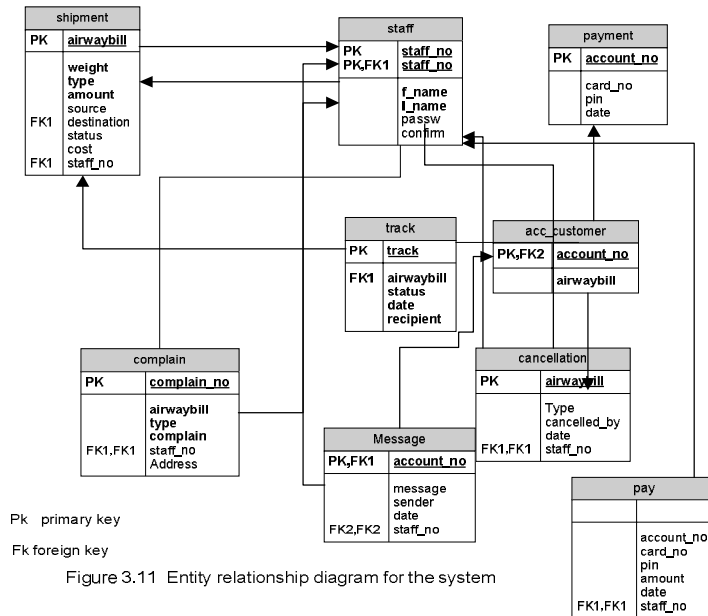Figure 3.11 Entity relationship diagram for the system

Fig. 1 Entity relationship diagram of the system

The diagram in Fig. 2 shows the system architecture of Mobile EDS. The presentation tier comprises of a WAP-enabled mobile phone and is used for accessing the application that is resident in the web server. The business logic tier is made up of the WAP Gateway and Web Server and it acts as the middle-ware and application services. The business logic tier also serves as the intermediary between the presentation and database tier. The database tier simply stores the content of the data and tables for Mobile EDS.
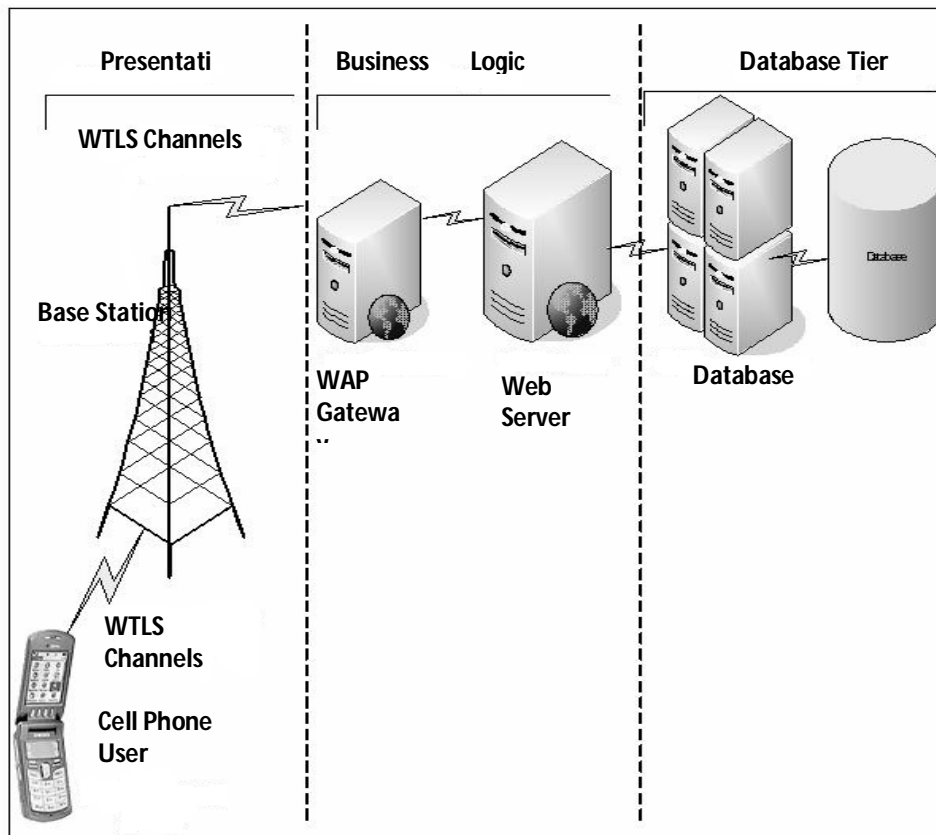
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Fig. 2   System Architecture

3   System Implementation

The mobile user interface end of the application was developed using Wireless Mark-up Language (WML), PHP was used as the server-side language, Apache was used as the middleware and MySQL as database. The application was tested using Open wave V7 simulator. The screen shot of account customer track shipment is contained in Fig. 3a, b and c respectively. The menu in Fig. 3a allows an account customer to select any operation he/she wants to perform. The account customer can track shipment, view

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statement of account, make payment, lodge complains and view messages. The administrator uses Fig. 4 to view messages of account customers.

a   b   c
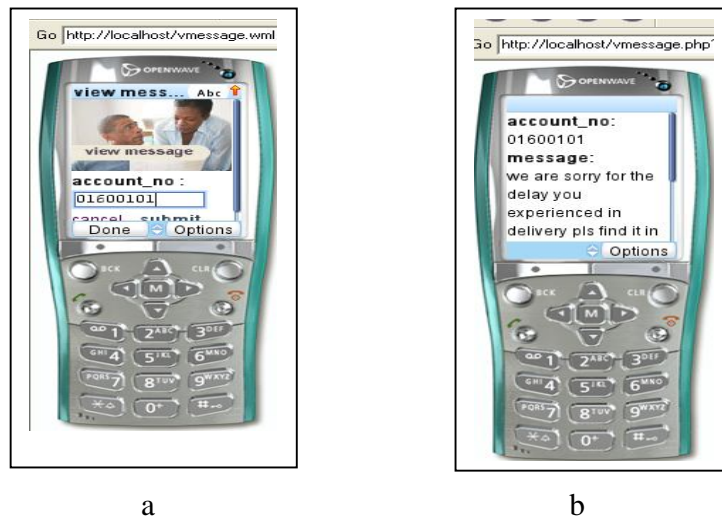
Fig. 3 Account customer track shipment menu

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a   b

Fig. 4 view message of account customer

4   Benefits

The mobile application is a dynamic system that makes it unnecessary for courier staff to visit company office before they can get courier report or input data in to the system. Customers no longer have to visit offices of courier companies or websites to perform any courier related operations, since such services can be carried out via the mobile device from any where. Courier data can be queried and report generated remotely which makes route planning and operation easier. These operation ranges from adding shipment, cancelling delivery, viewing complains, to customer being able to track their shipment, lodge complains, make payment through the mobile system. The other benefits of the system includes 1)   provides the courier customers with a means of tracing/tracking shipment, lodging of complain, making financial transactions on shipment through a mobile phone, assist the courier agent to effectively manage courier related data via their mobile phone and enhancement of speed of operation, efficiency and documentation.

5   Conclusion

In this paper, we have presented a WAP-enabled mobile express delivery system for the courier services sector in Nigeria. A critical look at the courier section in Nigeria shows

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that they were still far from using mobile device to support their operations, considering the enormous benefits of mobile applications in the global economy.

The Mobile EDS application provided in this study, when fully deployed, will help to improve the services rendered by courier companies in Nigeria. It will provide better and faster operation processes and reduce time spent on documentation. The system will provide better and faster operational services in the area of shipment delivering. This would also make postal delivery services easier and more convenient.

There is no gaining saying the fact that the mobile EDS will be able to solve various problems ranging from the inability of courier staff to access the company's database while on the field and the inability of account customers to view their statement of account. It will also provide a facility for customers to lodge complains on shipment delivery, track status of shipment via their mobile phone. This system was developed and tested using a mobile simulator, if implemented in a country like Nigeria and deployed on a WAP-enabled platform, would lead to an overall improvement and reliability in the parcel delivery sector.

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