Online Recharge Card Loading: A test case for m-banking implementation

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ABSTRACT

This paper attempts to move mobile services from information-based to transaction-based. This procedure solves a number of problems associated with cell phone recharge such as: network failure, recharge card fraud, and elimination of foreign exchange cost.

The system involves toll-free calls to an online bank. The bank checks the status of the account and sends notification to the mobile telecom operator who immediately credits the callers account and notification sent to both the user and the bank for account reconciliation with outright elimination of the Secret PIN card(Locally produced or imported). This system requires no special account but the usual current or savings account in any bank and works on the platform of the existing telephone/Mobile banking technology. This gives more ease and convenience, reduced cost of calls and better management of the network as well as encouraging a trusted banking culture.

Keywords: E-payment, M-banking, Tele-banking, Wireless Technology and

   Security Measures.

1.0   INTRODUCTION

Recent advances in wireless technology have contributed in no small measure to the emergence of Global System for Mobile communication (GSM). The introduction of GSM into the Nigerian market has brought a tremendous subscriber base of 10million lines across the various telecoms operators [1]. The GSM operators in Nigeria are MTN Nigeria, V-Mobile, Globacom and M-Tel[2]. The GSM operators within the short period of existence have helped create directly over 3,500 well paid people in addition to over 25,000 people employed indirectly as dealers, distributors, franchise dealers, card hawkers, road-side phone operators and business center operators. However, GSM services are still developing with attendant problems of network congestion/failure, inability to recharge resulting from unavailability of recharge cards or cost of recharging and poor services in general.

Beside the use of GSM for communication, it has revolutionized the business environment. This has added

mobility to business, thus we have M-Commerce, M-Banking, M-Health and M-Learning to mention a few[3]. With wireless technology, cell phones and personal digital assistants have become veritable tools for better and efficient delivery of products and services [4]. Thus the technology has brought about the ability to interact and transact with anything and anyone, anytime and anywhere with enhanced speed and convenience. It has the prospects of eliminating time and location.

2.0   ELECTRONIC BANKING

Over the recent years, banking and customers' access to financial services have transcended beyond the traditional retail banking with local branches to branch networks, internet banking, home banking, mobile banking to mention a few[5]. The emerging electronic and wireless technologies have enabled the Nigerian banks to carve a niche for themselves among the league of banks. Thus, there is a world of difference between the new generation banks and the old, which is as a result of the level of IT utilization [6].

There are divergent degrees of IT utilization within the banking industry. Virtually all the banks have automated their operations with network of branches called online banking for easy transactions anywhere within some designated cities in Nigeria. However, with the integration of Telephone, internet, PC and GSM, there is enhanced speed and convenience in terms of service delivery.

2.1   E-BANKING SERVICES

The various e-banking services comprise of PC-banking, Internet banking, Telephone banking, Mobile banking and Online banking.

1.   **PC-Banking:** This is a banking service particularly for customers without Internet access. It is otherwise known as home banking where the customer gets connected for banking transactions with the PC.

2.   **Internet Banking:** This is a form of banking transaction carried out on the Internet. There must be internet access and transaction is through a PC or any mobile device.

3.   **Online Banking:** Often used as a synonym to Internet banking but predominantly used to reference banking automation as against manual operations.

4.   **Telephone Banking:** A form of banking transaction that is done with the aid of a telephone set. The system responds to audio requests from customers.

5.   **Mobile Banking:** This is banking transactions through the mobile devices (cell phone, PDA, Notebook etc.).

Most new generation banks and few of the old generation banks have all these e-banking services with the attendant benefits geared towards improved customer care.

2.2   Mobile Banking (M-Banking)

Mobile banking is the smart choice for busy people on the move. It involves the use of mobile devices such as cell phone, PDAs, Palm handheld and notebooks. Mobile banking has brought about ease, convenience, privacy, and security of online banking through mobile devices that neatly fit into one's purse or pocket based on SMS facility [7].

Mobile banking is a financial management solution of the future and it is here right now. It comes as a part of an attempt by the banking industry to offer multiple channel banking providing convenience to customers. It is a versatile multifunctional free service that is accessible and viewable through the cell phone.

A sizeable number of banks in Nigeria have embrace the concept of e-banking with services cutting across Telephone banking, Mobile banking, Internet banking and PC banking to mention a few [8,9,10,11]. Thus with M-banking, a customer can view account balances, track transactions on accounts, transfer fund between accounts and to external account, make payment for bills, receive notification on account as well as order a new cheque book.

The benefits of m-banking are enormous. It is safe, it saves time and effort of visiting the bank; It is cost effective and available 24/7.

2.3   E-Payment

The drift from the brick-and-mortal business arena to electronic arena has necessitated the need for a cashless business environment. E-payment operates on a smart card (debit or credit card) that stores information on a microchip. It takes the following forms: electronic financial payment system where payment is done through a debit card, internet payment system that involves payments being made through some specified protocols; and smart card payment system where the information on the silicon chip is used to effect payment for services. The various forms of e-money in Nigeria are: Smart card/Valucard, credit card, debit card, SWIFT and ATM [12]

3.0   THE GSM OPERATORS

Currently there are four GSM operators in Nigeria namely, MTN, V-Mobile, Globacom and M-Tel. These operators have diverse service delivery channels aimed at offering convenience and ease to consumers with the ultimate goal of dominating the sector. Particularly MTN has; bizTIME, Pay As You Go, MTN Family and Friends, MTNflexi, MTN Messenger, MTN4U etc [13]. Some of the services are based on either periodic loading of recharge cards as needs arise or through a fixed minimum deposit in the banks that offer customers the liberty to make uninterrupted calls.

Similarly for V-Mobile, it offers prepaid services, family Top Up, Business Top Up and Conference calls among others[14]. The mode of operations is similar to MTN. Similarly for Globacom and M-Tel though late comers, they are fast developing and have the Pass As You Go

facility in common with others.

3.1 EXISTING ONLINE RECHARGE SYSTEMS

Some efforts have been made in the immediate past to incorporate online recharge of mobile phones into the telecommunication sector of the Nigerian economy. The consequent products/services that have rolled out as a result of these efforts are Wema Virtual Airtime and Swap Mobile Club.

Wema Virtual Airtime is an electronic means of purchasing GSM re-charge vouchers. Electronic refill vouchers are purchased through the use of the SMS facility on GSM phones. The requirements for using the service include, a domiciled account in any of Wema Bank connected branches, filling of Mobile banking application form and submission of the form at the applicant's branch. To activate the service, the subscriber would send an SMS to the Mobile Banking line which is supplied after the processing of the application form[15].

To register as a member of Swap Mobile Club, the subscriber needs to get to any First City Monument Bank, any Swap Mobile ltd. branch office or register online. The Subscriber would be required to have an investment account in which he deposits 200 percent of his monthly airtime limit as fixed by him.

These two systems adopt the same approach at meeting the recharge card needs of consumers. The consumers are required to open separate accounts for this purpose

and make cash deposits into the account based on the frequency of recharge card consumption.

However, the proposed online recharge card eliminates the need to open a separate account solely for servicing the purchase of recharge card since it will be deployed on the existing mobile banking account and infrastructure. Also, consumers will not be limited by time or space in recharging their phones. A consumer that needs to recharge his phone in the dead of the night will only need a toll free call to his mobile banking service provider, which is an automated service. The service provider (a bank) will connect to the appropriate GSM operator to grant the desired request based on the status of the consumer's bank account. This offers a seamless and dynamic solution for the maximum benefits of GSM consumers and operators.

4.0 SYSTEM ARCHITECTURE FOR ONLINE RESEARCH

4.1 The Challenges .

Generally, the level of development of the telecom industry is still very low. They capitalize on the massive population to roll out lines at the expense of efficiency and better services. To this end we have witnessed incessant network failure (inability to make calls at precious times); recharge card failures which makes it impossible to make calls among others (application busy). Besides there is enormous investment in foreign exchange because of importation of recharge cards that

tells in no small way on the Nigerian economy. Lately, the Nigerian government has approved the production of recharge card locally, this gesture will only reduce the amount of foreign exchange, as some raw materials are still imported.

4.2   The Proposed System

This online recharge system is based on the existing e-business facilities of the banking sector particularly Telephone banking and Mobile banking. With this there is minimized cost.

Consumers can initiate recharge through a toll free call/ SMS to the bank where accounts are maintained. All calls/SMS to that service (special recharge-request number) implies a request for recharge. The bank upon confirmation of account status sends signal request to the operator who then credits the callers account based on its ID while his bank account is debited to the value of the recharge card.

Considering the number of banks in Nigeria (a little less than 100 Banks), with millions of GSM Subscribers and just four GSM operators, there is a need for the incorporation of a router or access point that route each bank's requests intelligently to the operators to avoid data collision and broadcast storm.
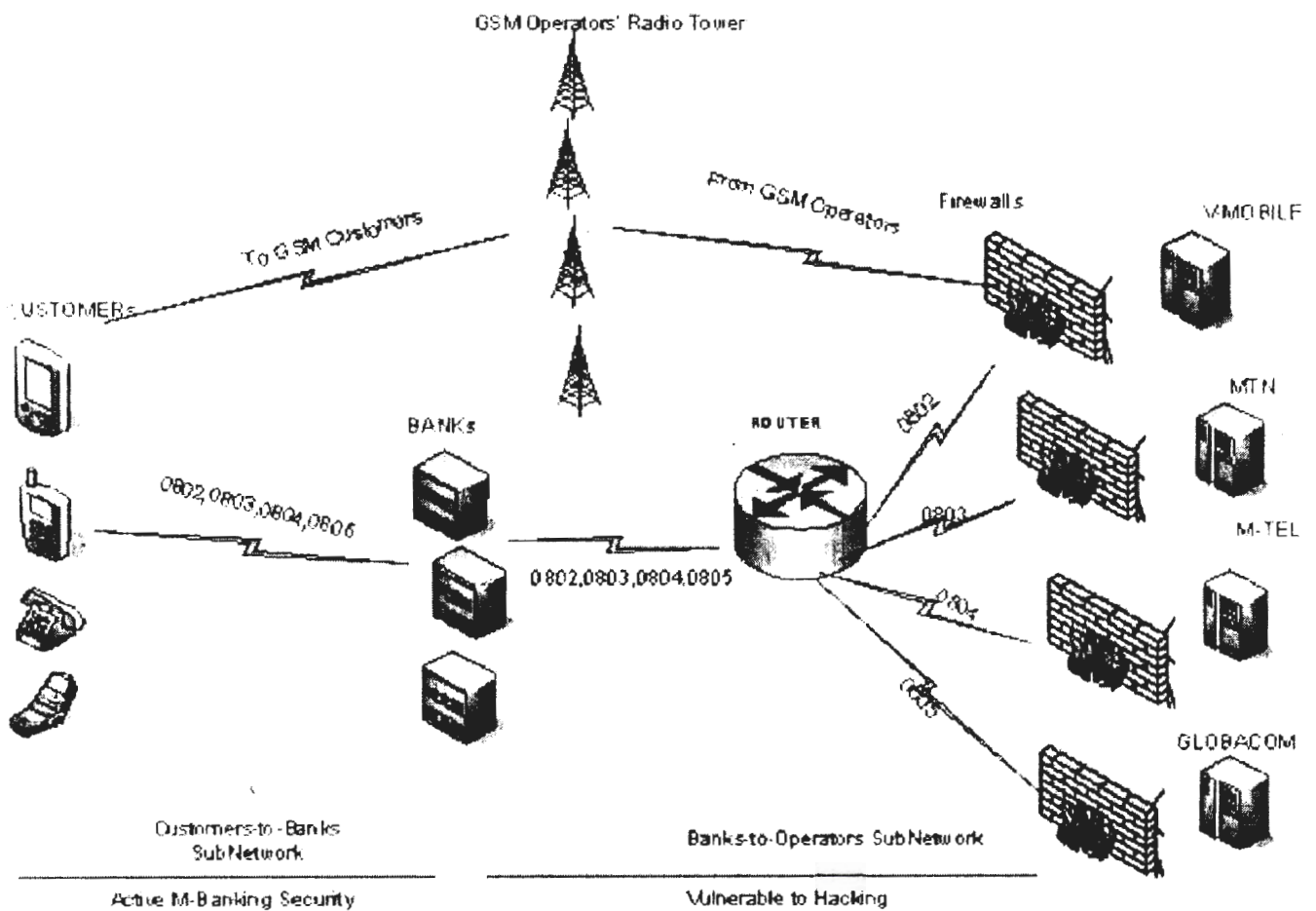

Fig 1.0 Online Recharge Card Architecture

5.0 SECURITIES IMPERATIVES OF THE PROPOSED ONLINE RECHARGE CARD

The proposed online recharge card has two sub-networks which are both wireless; Customer-to-Bank and Bank-to-GSM Operators' sub-networks. However, wirelesses vendors have realized that security has become of critical importance that must be addressed appropriately. Detailed research and analysis of security requirements of a given wireless network is the first step in this hurdle and network security/design experience could help to exploit and utilize available and emerging security technologies.

To keep our focus on this subject, we will consider the required level of security, possible security threats, applicable security policies and implementation of the applicable security policies with respect to online recharge card network

a. Levels of Security:

There are three major points to enforce security in mobile devices and mobile devices based networks in order to provide the highest level of security. The points are, Access to the device; Access to stored data and Access to wireless network. More often than not, the first two points are catered for by the designers and manufacturer of the various mobile devices, but for the proposed online recharge card network, due attention must be paid to the third security sensitive area i.e. Access to wireless network. The first part of the network is based on the existing M-Banking infrastructure that is already enabled with formidable security features. Therefore, we will inherit this to make the project highly cost effective.

For the second sub-network (i.e. banks-to-operators link), the various potential security risks and the appropriate security remedy are discussed as follows:

(i) **Malicious Software:** Malicious Software can take different forms; which include viruses, Trojan horses and worms. Viruses are often propagated through some kinds of user-initiated action, such as opening an attachment or running a script or application. They attempt to spread undetected through the system by attaching themselves to other files. Trojan horses are programs that masquerade as genuine applications in order to perform some unauthorized activities once they gain access to a system. Worms in their own case destroy data as they work their way through a system. It must be ensured that the banking system which accesses the operators network does not compromise the security of the systems on the network by the installation of appropriate anti Virus/Trojan horse/Worm software.[15]

(ii) **Hacking:** The link between the bank and the operators' network is a potential route for unauthorized access by hacker. Malicious hacker can intercept the call made by the bank

which contains th · credentials of the current transacting customer. These credentials could be exchanged with fictitious values that consequently would divert the recharge code into a wrong hand. If the banks' connection to the operators network use clear text transmission rather than end-to-end encryption, the customer's identity (GSM Number) which is very critical to the success of the transaction could be compromised. Because different types of network connections require different security setups, connection from the bank to the operators' network may need multiple types of connectivity protections. A bank connecting to a Virtual Private Networks(VPNs) over wide area networks (WANs) could encrypt transmission using Secure Socket Layer (SSL) technology. Those connecting over Local Area Networks(LANs) using 802.11b protocol need Wired Equivalent Privacy (WEP), 802.1x or Wi-Fi Protected Access(WPA) security and those connecting through a Personal Area Bluetooth connection need Bluetooth security technology[16].

(iii)   **Cracking:** The Banks can as well pose another form of security threat on the operators' network by disguising as crackers rather than authorized business partners. This threat could assume the form of a practice called **port scanning.** With the privileged access granted the bank by the GSM operators, fraudulent bank officials could form a consortium of criminals by using a DNS server to locate the IP address of the operators' recharge card database. They can scan the ports on this known IP address, gain access to its TCP/UDP stack to see the ports that are not protected by firewall. File Transfer Protocol(FTP) transmissions are typically assigned to port 21. If this port is unprotected, it can be used by the cracker for recharge codes theft, if they succeed at this, the particular bank can by-pass the operator and have direct shady deals with prospective customers.

Protecting against port scanning requires software that traps unauthorized   incoming data packets. Deployment of secure access methods that implement strong authentication policy will protect the operator's network from non-registered banks or router stations. Since there is no personal contact with the operators, Password and Secured ID card could be adopted as the authentication policy. Registered banks could be granted limited access privilege on the operators network in order to reduce the menace of cracking.

6.0   Benefits

I.   This system eliminates recharge card hawking which is better for the society.

2.   It encourages a banking culture.

3.   There is better services as congestion is managed by the bank and operators.

4.   Huge savings on foreign exchange.

5.   There is reduced cost of Telephony.

6.   Available 24/7 recharge services.

7.   Recharge is possible even without a credit on the GSM.

8.   The Routing Station/Access Points service providers will serve as a means of employment generation.

9.   Environmental degradation due to indiscriminate dumping of recharge card plastic will be drastically reduced.

10.   Low tariff due to low over head cost.

11.   Expansion of network to other potential markets.

12.   Elimination of recharge card counterfeit.

7.0   CONCLUSION

The advent of GSM in Nigeria has helped boost her teledensity. Thus, a sizeable number of Nigerians have access to telephone services. This is encouraging if the country must appreciat e the IT world we currently live in particularly e-banking, m-banking, e-commerce and m-commerce.

This system helps to advertise and popularize the banking industry and helps in no small measure to demystify the phobia for electronic technologies. Generally, there is enhanced ease of recharge and convenience. In addition, the system is transaction based although micro-payment as against m-banking and telephone banking that are information based.

It is obvious that the manufacturers cannot meet the deadline given for the locally produced recharge cards. This system helps in no small measure to meet the demands to the teaming population.

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