THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Implementation of a Centralized Reference Database for GSM Service Providers in Nigeria

Nwaogwugwu, Ibeabuchi Benjamin

Assistant Lecturer, Department of Computer Science,
Godfrey OKoye University, Enugu state, Nigeria

Amachundi, Samuel Ada

Graduate Assistant, Department of Computer Science,
Federal University, Wukari, Taraba State, Nigeria

Abstract:

The advent of Global System for Mobile communication also known as GSM in Nigeria (although has provided Nigerians with effective telecommunication services) leveraged many societal ills. This has not only complicated the security problem in the country; it has also affected the economy negatively. To effectively and efficiently check these ills, a centralized referenced database for all the GSM operators in the country is of utmost important. This study is concerned with the design and implementation of a simulated centralized reference database for GSM providers in Nigeria. The traditional individual operator's databases have not been efficient in providing access points that could allow security and regulatory bodies to monitor at real time, the activities of suspicious users. This study simulated a centralized reference database for GSM providers in Nigeria because of their cost implication. The Object-Oriented System Analysis and Design Methodology (OOSADM) were used for the analysis while the implementation was done using HTML, CSS, PHP and MYSQL database technologies. The system developed, provided access points to security and regulatory agents to monitor user activities at real time. It also performs user SIM registration; sends SMS; provide call detail records; blacklist suspicious subscriber at real time and monitor processes. The test result showed that security agents were able to receive feedback from the system seconds after a user action.

Keywords: GSM, database, communication, telecommunication

1. Introduction

In 2001, the Global System for Mobile communication also known as GSM was introduced in Nigeria and now has about 150 million of the entire population as subscribers (Adegoke and Babalola, 2011). Its introduction was expected to serve as an alternative to the analog system. The main aim is to provide effective telecommunication services that will enhance speech quality, roaming, spectral efficiency, minimized crosstalk, etc. (Adegoke and Babalola, 2011).

Although the industry has recorded growth and brought huge revenue to the government through tax and license fees, it has also brought severe security problems which for sure have started impacting negatively on the benefits so far gained from the System of Communication (Adegoke and Babalola, 2011). Cybercrime has become a recurring decimal in Nigeria (Aghwotu, Digitemie-Batubo and Nelly, 2016) including phone theft, kidnapping, *Boko Haram*, and increased armed robbery cases.

Consequently, developing a centralized database for all GSM operators in Nigeria that enables real time monitoring will be of immense benefit especially to security and regulatory authorities. For example, the GSM Association (GSMA), the global trade association for the world's GSM mobile operators, in order to deal with phone theft, introduced a cost-effective Equipment Identity Registers (EIR) – a centralized database used to blacklist stolen phones.

A centralized reference database for GSM operators can store ported numbers, take care of the network update, provide seamless and secure access to desired information for intelligence/enforcement agencies and administer message flows between the networks (Pigg, 2012). The database can be managed by the government agencies, a consortium of Service Providers and Network Operators or it can be outsourced to a third-party company that provides all operation and maintenance of the database (Pigg, 2012).

In this paper, a centralized reference database for GSM providers in Nigeria is implemented. The system, apart from being a store house for the activities of registered phone lines in Nigeria, would provide platforms for security and controlling agencies to do quick real time access; and analytical features that could be used for predictions or government decision making.

2. Literature

The GSM system has become the most popular system for mobile communication in the world. In Nigeria and most developing countries, it seems everyone has their own mobile phone, and GSM has taken more and more of the market. Today each service provider in Nigeria has a standalone database that does not communicate with another nor can owners of one database access the database of another. Consequently, important information that resides in one database cannot be accessed in real-time by another agency. It is however important that the information contained in the system is retrieved in real time to achieve seamless monitoring and supervision and also for the safety of lives and property. It is equally important that investigators have access into the system to effectively carry out their job. This section reviews researches that used centralized reference database systems for effective monitoring and proper decision making.

A typical example of a system where the integration of different independent technologies has been implemented is in the MITRA project (Monitoring and Intervention of the Transport of harmful produce) (Planas, Pastor, Presutto and Tixier, 2008). The MITRA project was funded by the European Commission and the goal of the project is to design, demonstrate, and test a system that allows for the monitoring of harmful produce during the transportation phase. The need for this system arose from the fact that the European civil security authorities do not currently track vehicles that transports dangerous goods. This implies that no pre-emptive measures can be taken should a dangerous scenario arise (Planas, Pastor, Presutto and Tixier, 2008). The system relays real-time vehicle location information, as well as information about the goods that are currently being transported by the vehicles, to European civil security centers (Planas, Pastor, Presutto and Tixier, 2008). The main components of this system are an on-board terminal from which the position data is derived, and a GSM module that allows for the position information, as well as the vehicle ID, to be transmitted to a central database. The system allows European authorities to detect, and possibly prevent, dangerous scenarios. This effectively allows for the monitoring and tracking of multiple vehicles, with data being managed from a central location.

Government of India, Ministry of Home Affairs (2013), proposed an integrated National Intelligence Grid (NATGRID). The project was to link the databases of several government agencies and departments in India. This is to collect comprehensive trends of intelligence that can be readily accessed by security agencies. NATGRID is considered to be a data linking and mining project and the initial stage would have involved the 'real-time linking' of data between various agencies. NATGRID will give 11 security agencies real-time access to 21 citizen data sources to track terror activities. These citizen data sources include bank account details, telephone records, passport data and vehicle registration details, among other types of data. NATGRID will utilize analytics to process the huge volumes of data generated from the 21 data sources so as to analyze events, match patterns and track suspects. Data mining appears to be at the core of NATGRID, which aims to create comprehensive patterns of intelligence by linking the 21 data sources and analyzing them.

Government of India, Press Information Bureau, and Cabinet Committee on Economic Affairs (2009) proposed the Crime and Criminal Tracking Network and Systems (CCTNS). The project aimed to create a comprehensive and integrated system for effective policing and sharing data of crimes and criminals among 14,000 police stations across all the 35 states and Union Territories of India. The CCTNS will provide a central reference database of crimes and criminals, which will enable security agencies in hunting down criminals moving from one place to another. The CCTNS will increase transparency in police administration, since individuals will be able to launch complaints online and to view the status of their reports.

In addition, Hameed (2012) proposed a New Car Monitoring and Tracking Model. The research introduces a powerful security model that can send SMS and MMS to the car owner or security organizations to have fast response especially if the car is nearby. The research used SMS, MMS and database technology; the picture of the intruder will be sent to user or police. The Database offers the required information about car and owner, which will help police or security authorities in tracking the car using GPS system that can be link to Google Earth and other mapping software. The implementation and testing results show the success of prototype in sending SMS and MMS to owner within seconds and receiving acknowledgment to the database (police or security unit) within 3-4 minutes.

Datta (2014) proposed the Cyber Coordinating Center, a system responsible for cyber intelligence and cyber security. The CCC streamlines coordination between intelligence agencies and to screen all forms of metadata. The CCC will also monitor internet traffic within the country and those coming in and out of the country at the international gateways for cyber threats.

3. Materials and Methods

The study simulated a centralized database with big data analytics that provide at real-time, access points to agencies without much delay. The simulated centralized database is be hosted on the web; access points are created for service providers and concerned agencies with relevant authentication protocols. Activities of registered users from the different service providers are also registered in the central database indicating location, time and duration of the activity. The system also provides basic analytical features that aid basic statistical reporting and monitoring.

The Object-Oriented Analysis and Design (OOAD) methodology and notation symbols of the Unified Modeling Language (UML) were used in the design. The object-oriented methodology uses diagrams to document an object-based decomposition of the systems and to show the interaction between these objects and the dynamics between them.

Presently, GSM service customer data are deployed on several network dependent relational database instances. A relational database look-up of a single mobile subscriber and the dedicated subscribed services is always a challenging

task on this system and this and the aforementioned problems gave rise to this study on the development of a centralized reference database for GSM providers in Nigeria.

After careful analysis it was discovered that the existing system has no centralized reference database for the operators in Nigeria. This has made it possible for subscribers to do multiple SIM registration and often times provide false information to the operators. Consequently, this has made it difficult for authorities to effectively monitor activities of subscribers especially at real time.

The new system will provide four platforms: for the service providers, administrators, security agencies and the subscribers hosted on the internet and connected to a centralized database. Activities from the different platform are monitored by the admin and are directly lodged into the database.

Figure 1: Use Case Diagram of the Proposed System

4. Results

This section describes the implementation of the new system proposed in the previous section. The implementation involves the simulation of the proposed centralized reference database described in the analysis and design phase.

Figure 2: Page Showing Summaries of Registered Users on Individual Network Providers

Figure 3: A Page Showing Data of a Registered User on a Particular Network

Figure 4: A Page for Security Agencies

Figure 5: Call and SMS Simulation Page for Security Agencies

5. Conclusion

This research developed a simulated centralised reference database for GSM service providers in Nigeria such that security and regulatory bodies can make use of this information at real time. In this research, the inputs are gotten from activities of users on different network platforms. The users' activity is stored in a centralised database and the descriptive analytic tools added to the system shows the patterns which could be used for decision making. The system provides access points via the internet for regulatory bodies to effectively perform their duties and to security operatives to monitor the activities of malicious users.

The simulated system provided a tool for real time monitoring of user activities across GSM networks. The system when deployed proved reliable by providing detailed information on user transactions from different network platforms. Security agencies were able to blacklist numbers of suspicious users and received prompt feedbacks.

The system is recommended for use by Nigerian Communication Commission (NCC) for effective monitoring of GSM activities in Nigeria especially now that security is a major concern in the country.

6. References

- i. Adegoke A.S & Babalola I.T (2011) Quality of service analysis of GSM telephone system in Nigeria. American Journal of Scientific and Industrial Research, Vol. 2. No. 5. pp 707-712
- ii. Aghwotu P., Digitemie-Batubo T. & Nelly B. (2016). Efforts in Combating Cyber Crime and Criminality in Nigeria. Information and Knowledge Management Vol.6, No.3.
- iii. Datta, S. (2014). Cyber Protection Body Pushes ahead. <http://www.hindustantimes.com/india-news/cyber-protection-body-pushes-ahead/article1-1174753.aspx>
- iv. Government of India, Ministry of Home Affairs (2013). National Intelligence Grid. http://www.davp.nic.in/WriteReadData/ADS/eng_19138_1_1314b.pdf
- v. Government of India, Press Information Bureau, Cabinet Committee on Economic Affairs (2009). "Crime and Criminal Tracking Network & Systems (CCTNS) project", <http://pib.nic.in/newsite/erelease.aspx?relid=49261>
- vi. Hameed, S. A. (2012). Effective Car Monitoring and Tracking Model. Australian Journal of Basic and Applied Sciences, Vol. 6 No.1: 2012, pp.1-8,
- vii. Pigg J. (2012). Network Security: Current Status and Future Directions. Partridge Number Portability White Paper. Yankee Group, 2012.
- viii. Planas E, Pastor E, Presutto F & Tixier J. (2008). Results of the MITRA project: Monitoring and intervention for the transportation of dangerous goods. Journal of Hazard, Vol. 152, 2008, pp.516–526.