Middle-East Journal of Scientific Research 23 (9): 2343-2346, 2015
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2015.23.09.22746

Global System for Mobile Communication, GSM Network Operation Call Rate in Nigeria

F.U. Nweke, S.I. Anyigor and A.E. Umahi

Industrial Physics Department Ebonyi State University, Abakaliki Nigeria

Abstract: The GSM network operation call rate in Nigeria was evaluated. From the research, it was observed that majority of people in Nigeria today use global system for mobile communication to deliver information. The result showed that GSM communication enhanced communication and effective message delivery which is more pronounced in mobile to mobile calls than land to mobile or mobile to land respectively. This has improved the social life and economic level of the citizenry.

Key words: GSM · Communication · Telecommunication · SIM · Network · Calls · Telephone

INTRODUCTION

Global System for Communication, GSM originally known as *Groupe Spécial Mobile* is globally accepted standard developed by the European Telecommunication Standards Institute to describe the protocols for second generation digital cellular communication network used by mobile phones. It is the name of a standardization group established in 1982, which created a common European digital mobile telephone standard that formulated the specification for pan-European mobile cellular radio system that operate at 900 MHz [1-7].

The development of a European standard for digital cellular voice telephony started when the European Conference of Postal and Telecommunication Administration created the *Groupe Spécial Mobile* committee. In 1987, fifteen delegates from thirteen European countries signed an understanding in Copenhagen to develop and supply a common cellular telephone system in the entire Europe which finally resulted to a unified, open and standard-based network. The system intends to provide recommendations to the operators. In 1991, the first world GSM call was made by the former Finnish Prime Minister, Harri Holkeri to Kaarina Suonio on a network built by Telenokia and Siemens operated by Radiolinja [8-11].

In 1991, the GSM standard expanded to 1800 MHz frequency band which become operational in USA and the GSM subscriber became more than 10 million worldwide with formation of GSM Association. Moreover, in 1996, the prepaid GSM cards were launched and GSM subscriber exceeded 100 million in the whole world in 1998. The first commercial GPRS services were launched with compatible handset in the market in the year 2000 and subscribers became more than 500 million in next year and it continued till date [12, 13].

GSM Network Structure: The GSM network is composed of many functional entities whose functions and interface are specific. The network is subdivided into three major parts: the mobile station, the base station subsystem, BSS and the network switching subsystem, NSS with attachment of operation and support system, OSS and GPRS core network as shown in fig 1. The complete GSM network element is shown in Fig 2 [3-7,12,13].

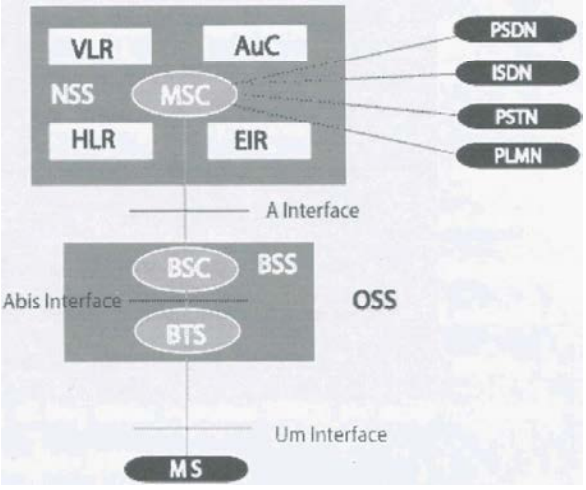

Fig 1: GSM Network Structure

Corresponding Author: F.U. Nweke, Industrial Physics Department, Ebonyi State University, Abakaliki, Nigeria.

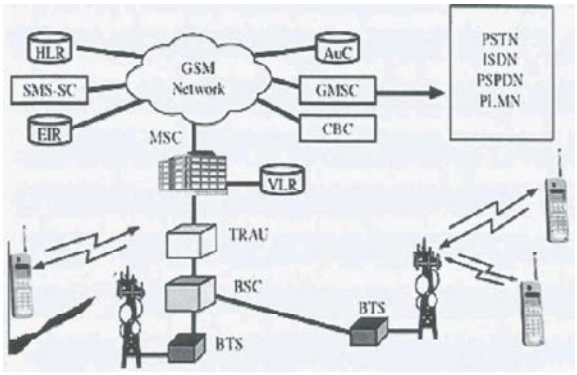

Fig 2. Complete GSM network element

Mobile Station: This is the source of human interaction with the GSM network. This consists of the mobile equipment (ME) and subscriber identity module (SIM). The mobile equipment provides the user interface and the radio connectivity to network while the subscriber module is the smart card with information containing subscriber's security parameters which enables the network to identify the user.

Base Station Subsystem: This is where all the radio related functions are performed, which consist of the base station controllers (BSC) and the base transceiver stations (BTS). The base station controller provides all the control functions and physical links between the mobile switching centre (MSC) and the transceiver station. The high capacity switch provides functions such as handover, cell configuration data and control of radio frequency (RF) power levels in the base transceiver station. The base transceiver station takes care of the mobile station. This is the radio equipment (i.e. transceiver and antenna) needed to serve each cell in the network.

Network Switching System, NSS: This is responsible for performing call processing and subscriber related functions. This include: mobile service switching centre (MSC), home location register (HLR) and visitor location register (VLR).

Mobile Service Switching Centre: This performs the telephony switching, function of the system. This controls calls to and from other telephone and data systems. Also, it is responsible for toll ticketing, network interfacing and common channel signaling etc. with major function of providing the connectivity between mobile stations within its coverage and the outside world.

Home Location Register, HLR: This the database used for storage and management of subscriptions. It is considered the most important database as it stores permanent data about subscriber, including a subscriber's service profile, location information and activities status. The HLR registers any individual that buys subscription from one GSM network operator.

Visitor Location Register, VLR: This is the database that contains information temporarily about subscribers that is needed by mobile service switching station, MSC in order to service visiting subscriber. The visitor location register is always integrated with mobile service switching centre. If a mobile station roams into a new mobile service switching station area, visitor location register connected to that MSC will request data concerning the mobile station from home location register. Then if the same mobile station makes another call later, the visitor location register will have the information needed for call set up without having to disturb the home location every time.

GSM Carrier Frequency: The GSM network operates in different number of ranges of carrier frequency separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G, with most of 2G GSM networks operating in the 900 MHz or 1800 MHz bands. However, where this bands already allocated 850 MHz and 1900 MHz are used for example USA and Canada. The use of 400 MHz and 450 MHz frequency bands were used in some countries because they were previously used for first generation system. Moreover, most 3G networks in Europe operate in the 2100 MHz frequency band.

Subscriber Identity Module, SIM: The subscriber identity module is a detachable smart card containing the user's subscription information and phone book. The SIM allows the user to retain her information after switching handsets. Moreover, the user can also change operator while retaining the handset by changing the SIM.

Data Collection: Data was obtained from a GSM network operator in Nigeria on the number of calls answered and calls not answered with mobile to land calls, mobile to mobile calls and land to mobile calls. In this research, one line was configured to serve as a land line in the switch. The purpose for this is that a mobile terminal may need to determine whether the call setup is a land terminating call or mobile terminating call.

Table 1: Calls to and fro operator GSM network operator's per hour

Calls per hour	Mobile to land	Mobile to mobile	Land to mobile
Answered calls	36,478	64,559	35,423
Non-answered calls	18,461	3,602	14,162
Total no. of calls	54,939	68,181	49, 585

Table 2: The percentage of Total number of Calls, Answered calls and Non-answered calls of GSM network operator's per hour

Calls per hour	% Mobile to land	% Mobile to mobile	% Land to mobile
Answered calls	26.73%	47.03%	25.96%
Non-answered calls	59.94%	9.94%	39.09%
Total no. of calls	31.81%	39.47%	28.71%

Table 3: Mean holding time for a particular area in Enugu

Type of calls	Mobile to land	Mobile to mobile	Land to mobile
Mean holding time (sec)	111	226	112

RESULTS AND DISCUSSIONS

Table 1 and 2 shows the number of calls to and fro a GSM network operator's per hour and the percentages of total number of calls, answered calls and non-answered calls respectively. The mean holding time for the network is shown in Table 3.

From Table 1, it was observed that the number of calls from mobile to mobile is relatively high with 47.03% of answered calls and a very small significant number of non-answered calls (i.e. 9.94%) compared to non-answered calls of mobile to land and land to mobile which is 59.94% and 39.09% respectively. This suggests that majority of people in Nigeria has resorted in using GSM communications and this has enhanced communications and effective message delivery in Nigeria than what it used to be before the advent of GSM. Also from Table 3, it was observed that the mean holding time in mobile to mobile calls is much higher than mobile to land or land to mobile which shows that many people spend much time in calls using mobile to mobile than the rest.

CONCLUSION

From the research, it was observed that the advent of Global System for Communication, GSM enhanced information and message delivery in Nigeria. Majority of people uses GSM to communicate among themselves and for transaction of their businesses. And this is more obvious in mobile to mobile communication. GSM communication has improved the social life and the economic status of citizenry.

REFERENCES

1. Sauter, Martin, 2013. "The GSM logo: The Mystery of 4 Dots Solved" (http://mobilesociety.typepad.com/mobile_life/2013/11/the-gsm-logo-the mystery-of-the-4-dots-solved html).
2. Anton A. Huurdeman, 2003 "The Worldwide History of Telecommunications". John Wiley and Sons.
3. Redl, Siegmund M., K. Weber, Matthias and W. Oliphant, Malcolm, 1995. An Introduction to GSM. Artech House.
4. Redl, Siegmund M., K. Weber, Matthias and W. Oliphant, Malcolm, 1998. GSM and Personal Communication Handbook. Artech House Mobile Communications Library. Artech House.
5. Hillebrand, Friedhelm, 2001. GSM and UMTS. The Creation of Global Mobile Communications. John Wiley and sons.
6. Mouly, Michel; Pautet Marie-Bernardette, 2005. GSM System of Mobile Communications. Telecom Publishing.
7. Rahnema, 2000. Overview of the GSM system and protocol architecture, Communication magazine IEEE, 31(4): 92-100.
8. "GSM Global system for Mobile Communication" (http://www.4gamericas.org/indexcfm?fuseaction=page and sectionid=242). Retrieved 2015.
9. "GSM" (http://www.etsi.org/website/Technologies/gsm.aspx). European Telecommunications Standard Institute. 2011.
10. "History" (http://www.gsmworld.com/about=us/history.htm). GSM Association. 2011.

11. "Cellular History" (http://www.etsi,org/website/ Technologies/cellularhistory.aspx. European Telecommunications Standards Institute. 2011.
12. Athanasopulos, A. and N. Residore, 1991. Service control point for the GSM and personal communication system, 3rd IEEE conference on telecommunications, Edinburgh.
13. Lilly, N., 1995. Integrating GSM and IN architectures and evolving to UMTS, the GSM MOU/ETSI workshop on the evolution of GSM towards IN, Brussels, Belgium.