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Evaluation of Mobile Number Portability Implementation in Ghana

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***Abstract*— In Ghana, mobile subscribers who weren't satisfied with the services of their mobile service providers had no option but to give up their numbers when switching service providers. As such, subscribers were reluctant to switch from their operator to a competitor thereby preventing effective competition in the Ghanaian mobile communications sector. This necessitated the National Communications Authority (NCA) to develop a Mobile Number Portability (MNP) Policy in consultation with the mobile Service Operators. This MNP Policy has been recently implemented successfully enabling mobile subscribers in Ghana who were hitherto reluctant to bear the cost and inconvenience of switching operators, to fully exercise their freedom of choice. Analysis of data shows subscribers porting in and out of all the mobile communication networks. The average net effect of porting in and out as at March 2013, expressed as a percentage of a network's most recent reported subscriber base was about 4.4% and 1.9% respectively. This paper discusses the implemented network architecture of the MNP model and evaluates the performance of the MNP system during its two years of implementation in Ghana. The average porting duration during the first two months of implementation has also been presented and discussed accordingly.**

***Index Terms*— Mobile Number Portability, MNP Policy, Performance Evaluation and Porting**

I. INTRODUCTION

ENTRY into the mobile communication market is limited by various factors including spectrum scarcity and market size. It is therefore very important to remove any barriers to competition between the limited numbers of market players in order to ensure a dynamic and fully competitive market [1].

To ensure healthy competition in the telecommunication industry, the concept of Mobile Number Portability (MNP) was introduced. The introduction of MNP helped remove a significant obstacle to competition [2]. MNP has helped bring mobile subscribers the benefits of greater innovation and variety of services [3], better quality and lower prices [4].

The push for MNP implementation in the industry has always been led by market regulators in an effort to provide mobile subscribers with the freedom to move between service providers. The introduction has eventually led to healthy competition in the mobile industry as has been discussed in pilot implementation in India, Hong Kong, Iran, Pakistan, Kenya, etc [5]-[9].

As at the end of 2011, Ghana was the only country in West Africa to have successfully implemented MNP. Ghana has being in the forefront of pioneering implementation of innovations in the Telecommunication sector in the West Africa Sub-region [10], [11]:

- It launched the first cellular mobile network in sub-Saharan Africa in 1992.
- It was among the first countries on the continent to be connected to the Internet and to introduce Asymmetric Digital Subscriber Line (ADSL) broadband services.
- It led the way in market liberalization and de-regulation when it privatized Ghana Telecom (GT) as early as 1996.

Prior to the implementation of Mobile Number Portability in Ghana, Mobile service subscribers who have been wanting to switch operators because of poor services offered by a subscribers' incumbent operator to a different operator offering better service packages were reluctant to lose their equity and bear the cost and inconvenience of changing numbers. This effectively limited subscribers' ability to exercise their freedom of choice.

The National Communications Authority (NCA), the regulating body in Ghana, developed the MNP Policy in consultation with the Mobile Network Operators (MNO) and created a collaborative structure called the MNP Steering Group which included all the communication Service operators. The MNP steering group developed the business rules for porting and conducted the vendor selection process [12]. This paved way for the successful implementation of Mobile Number Portability in Ghana, hence, making Ghana the first country in the West Africa sub-region to introduce

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MNP as an enhanced value-added service in its telecommunications sector.

In order for the implemented MNP Policy to serve as a model for other countries in the Sub-Region to emulate, the whole architecture of the porting process implemented in Ghana needs to been analyzed and evaluated. This paper discusses the implemented MNP Network topology and the relevance of the porting duration in sustaining subscriber interest in fully embracing the system.

Section II discusses the background and the consultative process during the implementation phase. Section III discusses the topology of the adopted MNP model. Section IV discusses the effects of MNP implementation on the telecommunication sector.

II. BACKGROUND OF MOBILE NUMBER PORTABILTY IMPLEMENTATION IN GHANA

The National Communications Authority announced in October 2010, Porting Access of Netherlands (PXS) along with their local partner, CIS Ghana Limited, as preferred bidder to provide the central equipment and services necessary to implement Mobile Number Portability (MNP) in Ghana. This follows after a team consisting of NCA and all five mobile networks at that time made their evaluation in a transparent manner as bids were received from nine companies for the centralized Porting equipment. By February 2011, PXS had commissioned the central system and by the end of June 2011, all mobile operators tested their systems with PXS and between each other and most were ready for the implementation. Mobile Number Portability was thus launched successfully in Ghana on 7th July, 2011.

III. TOPOLOGY OF THE IMPLEMENTED MNP MODEL

The topology of the network plays an important role in determining the porting duration. If the time to port is too long, subscribers will be put-off using the service. For subscribers, 2 days time-to-port is too long [6]. Studies have shown that the porting duration is very important [13]. Reducing the porting time increases the cost of MNP implementation. For instance, the cost of porting a number in Irish system is far more than other implementations and almost five times more expensive than porting cost in Hong Kong [4].

Speeds of porting and porting time depend on two factors: Porting Systems Architecture and the willingness of networks to speed up the porting process [14].

Ghana has adapted the Central Server configuration system where the entire network operators are connected and synchronized regularly with the centralized server. The Central Server configuration helps reduce the porting time considerably [1].

The centralized server service is provided by CIS Ghana Ltd, a local subsidiary of Porting Access of Netherlands (PXS). Each operator is required to maintain redundant connections to the network as shown in Figure 1, providing adequate redundancy for the network. Furthermore, PXS maintains a disaster recovery Database at a different location, and each operator has to maintain a connection there. This enables the network to function under failing conditions of the main server. Furthermore, the centralized server is just a rack of computer servers in a data center of Porting Access, where the database of ported numbers is stored and synchronized regularly with all the network operators in the country. This helps to reduce immensely the porting duration.

The Ported Number Database (PND) is a database register located at the NCA office and logically connected to the GMSC via HLR of each service provider as shown in Fig. 2.

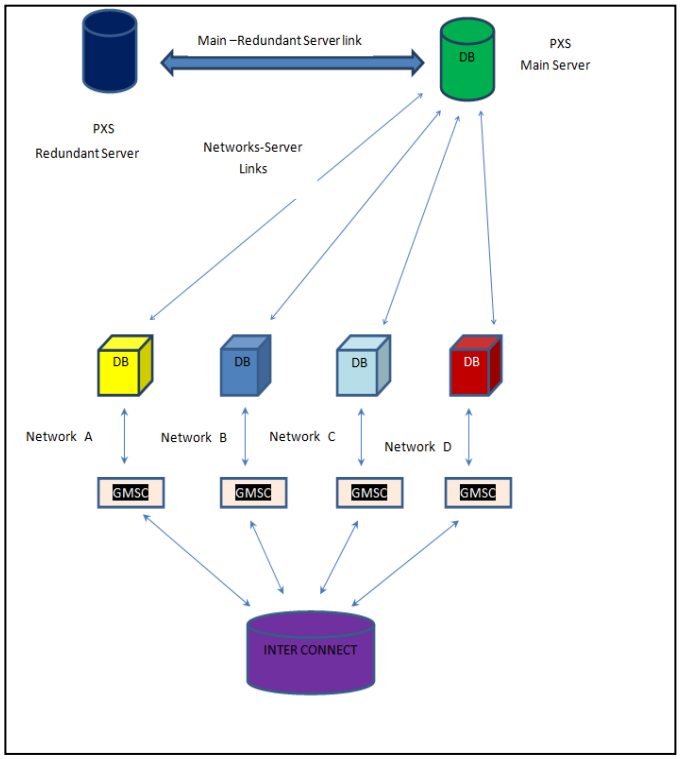

Fig. 1: Topology of the implemented MNP model in Ghana

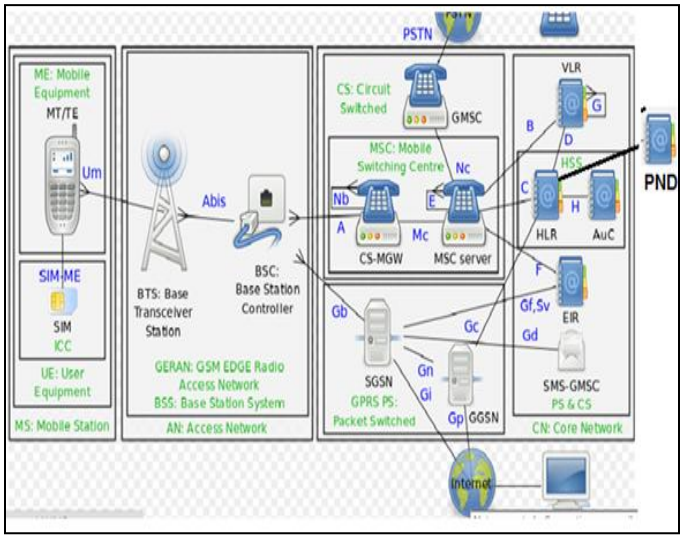

Fig. 2: GSM Architecture With Ported Number Database

This logical design makes it possible for NCA to regulate and monitor. The regulator is therefore able to do performance analysis in order to help guide all the participants to solve problems and make determinations whenever there is a dispute between participants.

NCA admits that there have been few interruptions of the Central Server. On few occasions, individual operators have had connection or request processing disruption, but these are generally short lived.

It is also worthwhile to note that since routing information for calls and SMS are kept in local copies at each network, if the entire porting system were to be disrupted, the only process that would stop is NEW PORTS, until service is restored. Calls and SMS to numbers which had already ported would continue without interruption.

IV. EFFECTS OF MNP IMPLEMENTATION ON THE TELECOM SECTOR

The MNP implementation has been generally successful. By the twenty fifth full days of implementing Mobile Number Portability (MNP) in Ghana, 21,059 mobile phone subscribers had successfully moved from one mobile service provider to another whilst retaining their mobile number. As of the end of August, 2011, eight weeks after the commencement of Mobile Number Portability (MNP) a total of 64,657 mobile phone subscribers had taken advantage of the MNP system to move from one mobile service provider to another whilst retaining their mobile number [15].

The fastest port recorded so far in Ghana took place in 1 minute 10 seconds. The average port took place in 5 hours, 21 minutes from start to finish for the first month of introduction of MNP in Ghana. Figure 3 summarizes the porting duration for the first month of implementation.

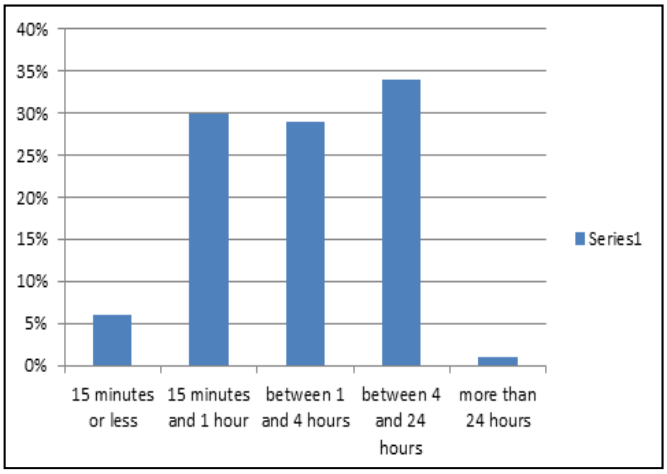

Fig. 3: Summary of Porting duration in July 2011

The porting duration for the month of August 2011 was similar to that of July, 2011. Analysis of the data for the month of August 2011 shows that the over 43,598 porting requests were completed in that month. The average porting duration was 4 hours, 16 minutes

The market share of the six communication service operators as at July 2012 has been summarized in Table 1. At the end of the first year of MNP in Ghana, July 6 2012, 370,107 mobile numbers had ported successfully. This represents approximately 1.6% of the total active mobile numbers in the market, a figure reasonably comparable to European markets where MNP is considered successful [3]. Each of the mobile networks in Ghana had gained and lost customers through MNP.

Table 1: July 2012 market share in the Telecom sector [15]

Mobile Operator	Subscriber Base	Percentage Share
MTN	9,655,538	48.75%
TIGO	4,147,105	20.94%
VODAFONE	3,577,563	18.06%
AIRTEL	1,928,179	9.74%
EXPRESSO	219,290	1.11%
GLO	277,287	1.40%

The overwhelming majority of customers who had ported had remained on the networks to which they ported, implying satisfaction with the process and the choice they made. The success rate of porting requests submitted in the first year of operation was 75%, including the early days of operation when the process was still unfamiliar. Average porting speeds in the 7 - 8 minute range have now been achieved. At the end of March 2013, 657,703 numbers had been successfully ported with a monthly average of 31,319. Monthly ports are generally in the range of thirty to forty thousand. The reduced porting duration from between 4- 24hrs to 7-8 minutes played an important role in sustaining subscriber interest in porting.

The market share of the MNOs as at July 2013 has been summarized in Table 2.

Table 2: July 2013 Market share in the Telecom sector [15]

Mobile Operator	Subscriber Base	Percentage Share
MTN	12,289,991	45.64%
TIGO	3,729,611	13.85%
VODAFONE	5,728,091	21.27%
AIRTEL	3,350,497	12.44%
EXPRESSO	154,265	0.57%
GLO	1,681,417	6.24%

Mobile subscribers ported in and out of all networks, but the net effect of porting to July 2013, expressed as a percentage of that network's most recent reported subscriber base ranges from positive 4.4% at one network to negative 1.9% at another network. The other five networks are between those numbers. TIGO seemed the most affected dropping from 4,147,105 in July 2012 to 3,729,611 subscribers in July 2013. The other five operators reported marginal increase in their subscriber base.

Total port compared to market subscriber totals was 2.5% as at May, 2013. The annual average is 1.6%. The success rate for porting requests submitted reached a new high in March 2013 of 88.2%. Time to complete a porting request has improved, from the several hours it took in the first year after launch to minutes.

V. CONCLUSION

Ghana's mobile telephony sector is growing exponentially and is gradually becoming a highly competitive market. Given such a market with six competing network operators, the implementation of MNP is very relevant in providing Mobile subscribers the freedom in choosing which operator to subscribe to.

Ghana now has what may be one of the fastest porting systems in the world. In March 2013, 91% of ports were completed in 5 minutes or less. A monthly porting average of 31,319 and an annual average of 1.6% of the subscriber base indicate how successful the MNP implementation in Ghana has been. Although there seems to be a seasonal variation developing in which porting volumes reduce in November and December, it is too early to draw any conclusions about seasonality.

This paper has shown that the introduction of MNP into the telecom sector in Ghana has not been technically simple. Effective regulation and consultation has been seen to help reduce the porting duration for a successful MNP implementation. A survey is currently underway to determine the factors informing on subscribers to port. Results from the field survey will be presented when enough data is available.

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