Challenges of Broadband Penetration in Africa (Nigeria)

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Abstract: *Deploying broadband access networks plays an integral part in strategic policies in the world in order to promote growth and innovation in all economic sectors, social and territorial cohesion etc. Despite the growth in the use of the internet and the availability of information technology, there exists a divide between societies that have access to internet facilities, those that have less access and those that have no access. Rural/Remote areas in most developing countries tend to impose a challenging environment in which to install communication infrastructure for broadband access networks. The main challenges include lack a of customer base, as these areas are highly scattered, have low incomes and there are fewer opportunities to upgrade their socio-economic status and low population density. As a result of these factors, most service providers tend to implement network infrastructure in major cities. Hence, leaving the rural/remote areas as unserved or underserved areas. The main focus of this work is to identify the factors that limit broadband penetration in Africa (Nigeria), evaluating the current state of broadband access in Nigeria and also describe some policies and initiatives laid by the Government in tackling the issue of the digital divide.*

Key words: *Broadband Access, Broadband Penetration, Network Infrastructure, Mobile Communication, Broadband Limitation*

Introduction

The adoption of mobile devices worldwide has created an unending demand for access to e-commerce, social media and entertainment application at a different times and places. This trend has not only resulted in an increase in the amount of mobile broadband data transferred by the host network but has changed its composition. Mobile traffic that was conventionally voice only is now dominated by video and data due to the design of applications that supports live video streaming etc. As this major trend continues to increase, the number of applications and triple-play services (voice, video and data) increases and leads to growth in the subscriber base. Hence, there is a need to effectively provide an access network that will meet the requirements of the consumer at all times

[13].

The use of internet and mobile communication in recent years has increased around the world. In Nigeria, statistics shows that there are about 50 million or more internet and mobile users as of May 2012 [17]. Nigeria has the highest number of internet and mobile service users in the continent that is Africa and ranks amongst the top 20 in the world. Having a population of more than 180 million people, the rate of internet penetration in Nigeria is low, about 27% [7]. The majority of the population in Nigeria resides in remote areas with little or no access to the internet, telephony etc. Broadband wireless access technology is the primary means to meet the demand for rapid internet connection and integrated data, voice and video services around Nigeria.

Rapid increase or growth in wireless subscriber numbers, advancement in the deployment of multi-play application for mobile platforms, delivery of "triple play" service with voice, video and data and the related demand for excellent user experience are the driving forces requiring a high quality of service in the broadband access network. Despite its African/World ranking, Nigeria has an urgent need of broadband internet penetration in most areas. The existing broadband network infrastructure in rural areas in Nigeria shows a low level of broadband penetration having a lot of "white areas", where no broadband coverage is available [14]. The main focus of this work is to identify the factors limiting broadband internet penetration in Nigeria as well as describing the current state of broadband within the geo-political zones.

Broadband Access

Broadband access is to the 21st-century information age what electricity was to the industrial age. It has a significant transformative impact on how people live and work. It empowers the end users with capabilities that were previously unimaginable and a global reach [3]. Broadband solutions in general can be classified into two groups, fixed line technologies and wireless technologies. The fixed line technology communication is carried via a physical network which provides a direct "wired" (copper based and fibre based) connection from the service supplier to the customer, it relies mainly on a direct physical connection to the subscriber's residence or business, common examples are digital subscriber lines, broadband power line and hybrid fiber-coax cables [12]. Wireless broadband technology in general refers to certain technologies that use point to point or point to multipoint microwave transmission in various frequencies ranging between 2.5 to 43 GHz for the purpose of transmitting signals between hub sites and end user receiver, these include wireless Fidelity (Wi-Fi), Microwave links, Direct Broadcast Satellites (DBS) etc. [8]. There are several competing technologies which can provide the bandwidth needed to deliver broadband services, but each of these technologies has its limits in terms of reliability, bandwidth, cost or coverage. Optical fibers have effectively limitless bandwidth capabilities, with excellent reliability and are increasingly economical to install [4]. However, many competitive copper and wireless technologies are developing at a significant pace and some of the technologies have managed to continually meet the ever increasing bandwidth requirements of the end users.

Broadband is traditionally referred to as a high–speed communication network where connected end users can transfer data at a rate greater than 256 Kbit/s. Global organisations have chosen to define broadband in a manner that reflects the end user's experience. Broadband within the Nigerian context can be defined as an access experience

where the end users can access real-time content (voice, video and data) at a minimum connecting speed rate of 1.5 Mbit/s. This definition may well be reviewed over time to keep in line with subsequent developments in technology [15]. The term digital divide refers to the divide between individuals that have full access to modern communication technology and those that have less or no access. The definition of digital divide has evolved overtime, it was referred to as the divide between those with and without telephone access in the early 20th century. Afterwards, it was referred to as the gap between those with internet access and those without [10].

The Current State of Broadband Access in Nigeria

The national broadband supply link in Nigeria consists of an international connectivity, proposed national backbone network, metro-link access and the last mile network. The landing of several submarine cables at the coastal shores of Nigeria has provided about 9Tbit/s of combined capacity. Nonetheless, there is a growing concern relating to the cables landing only at the coastal part of the country while access to other areas (urban and rural) of the country are affected due to the limitation in communication infrastructure [16].

Figure 1 below shows the undersea cables landing in the coastal region of Nigeria. The major broadband submarine cables infrastructure in Nigeria includes; West African Submarine Cable (WACS), Main-One, South Africa Trans-Atlantic (SAT3) and Glo-1 fibre optic cables.
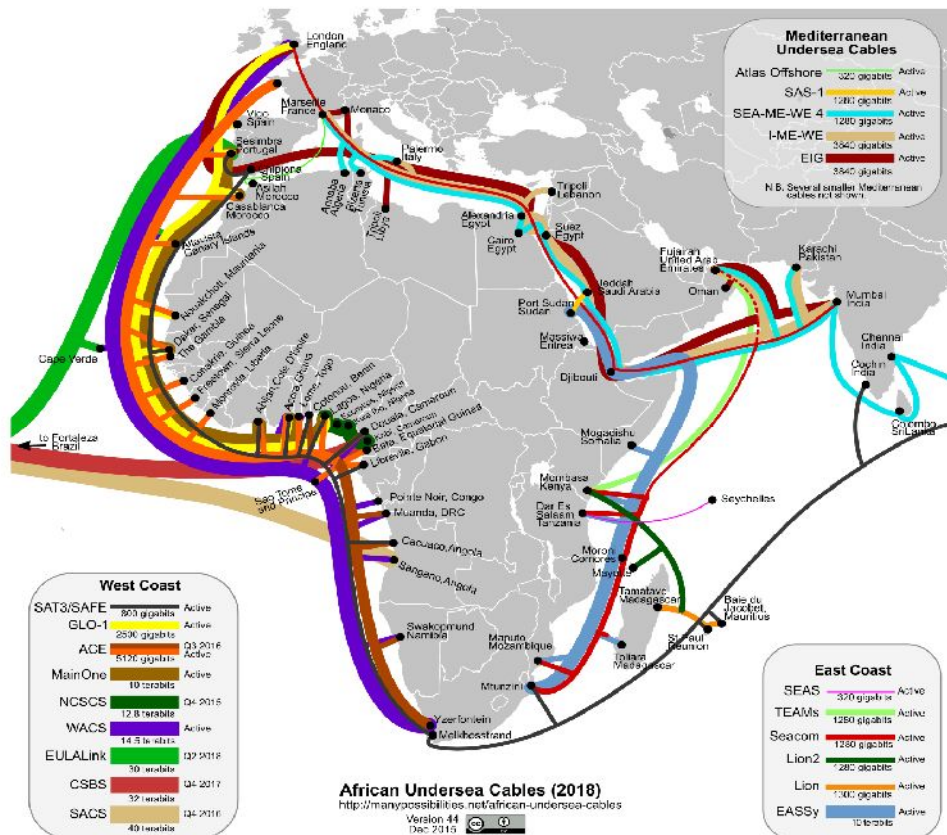

Fig 1 Fibre optic cable landing in Africa (African Undersea Cables 2013-2018)

As shown in the figure above the major part of development recorded is in the international connectivity known as the core networks. The capacity of the last mile access network to provide effective broadband services in terms of bandwidth, service quality and availability remains a major challenge that has deterred the growth of broadband access services.

In emerging economies like Africa, infrastructures are constantly being built. Roads are enhanced or laid, water and sewage pipes installed and replaced. This creates major challenges for network operators with fiber cables underground, these cables are cut far more often than they should be and as a result network service is disrupted. Judging by what has been achieved in the broadband sector in Nigeria today, the moderate success recorded so far in this sector is the landing of several high-capacity submarine cables, resulting in a drop in international bandwidth wholesale prices. However, inefficient inland bandwidth transmission and distribution has continued to pose a major challenge and is an obstacle for the desired broadband boom in Nigeria.

Wireless technology is the main means of last mile broadband connectivity in Nigeria. Studies reveal that about 80% of the households in Nigeria use wireless broadband (Microwave access) which is higher than those using fixed wired broadband access at 20% [16]. The recent advancement in wireless broadband access and usage in Nigeria is as a result of the wide rollout and upgrade of mobile network technologies as well as the introduction of smart mobile phones and devices with the potential to connect to the internet. About 58.1% of web traffic in Nigeria originates from mobile devices [19]. This statistic may appear to show a growth in microwave access usage but in reality, it shows low penetration of computer use due to the poor electricity supply and a major limitation in terrestrial networks making mobile devices a convenient and portable economic internet access tool despite the limitations in performance and applications.

Factors Limiting Broadband Penetration in Nigeria

Despite the growing need for mobile broadband access around the world, which is supported by the increase in the use of smart phones and other mobile devices. There is a vast need to increase the rate of internet penetration. The Nigerian Communication Commission has acknowledged the low percentage of penetration and provided initiatives to increase the rate. The factors limiting broadband penetration in Nigeria include;

Network Infrastructure

Infrastructure plays a major role in broadband penetration as it directly controls access, price etc. Broadband internet access in Nigeria is limited due to the lack of adequate communication infrastructure. The inadequacy of domestic backbone networks is a major underlying factor limiting the growth of broadband access. The fibre optic backbone infrastructure is not interconnected and is mainly concentrated in urban areas and a few rural areas. There is no provision for the long distance national backbone to transmit the capacities provided by the undersea cables to last mile end users at homes, offices, schools etc.

Poor Electrical Power Supply

The poor state of the power supply has a negative impact on socio-economic development in developing countries. Steady power supply is a major criterion in

accessing the internet, which unfortunately has not been addressed in Nigeria and has led to the limited use of the internet by those who desire to use it. The power supply has affected the installation and management of telecommunication infrastructure, leaving operators relying solely on power generators in powering their base stations, radios etc. which result in an increase in overhead cost thereby affecting productivity and return on investment (ROI).

Right of Way

This refers to the legal right granted to network operators to pass through certain routes either through the ground or over property that belongs to others. Telecommunication operators in Nigeria pay a huge amount of money to have access thereby limiting the building of network infrastructures and as a result contributing to lower broadband penetration.

Pricing

Broadband adoption can be affected by pricing, especially in developing countries. Service providers have increased the cost of providing broadband access to end users due to the high cost of installing network infrastructure. If the demand for internet is low because the end users can't afford these services, this affects the investors return on investment. Therefore, service providers are forced to move to urban centres with high income, high population etc. In other developing countries like Tanzania, Namibia etc. the government has built a nationwide broadband backbone infrastructure and leased it to private companies to operate at a low cost; the rate of internet penetration compared to Nigeria is high (Williams 2010)

Distance/Landing Point

Distance from the backbone base or landing station to the last mile users has made it difficult for those residing in remote locations to gain access to the internet. The farther away the users are from the base station the greater the effect of attenuation and fading on the quality of service. All the landing points are presently stationed at Lagos and the other regions of the country need to connect from this point resulting in limited distribution. Additional landing points in other coastal parts of the country will enhance faster fibre rollout around the country.

Conclusion

Providing adequate network infrastructure within Nigeria is an important factor in maintaining economic competitiveness of the unserved and underserved areas. The challenge of providing high-speed broadband access in these areas needs to be tackled effectively. Broadband penetration and access in urban communities is far better compared to rural and remote regions who often have poor or unreliable connectivity. This report identifies certain factors that limit broadband penetration in Africa (Nigeria), evaluates the current state of broadband in Nigeria based on fibre optic cable landing and rollout within the country and microwave access. It further identifies policies and initiatives laid by the Government in tackling the issue of the digital divide in Nigeria. To further overcome this issue, practical research into providing qualitative and economical broadband solutions should be carried out across all areas in the country.

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