Broadband Superhighway; A Detailed Analysis of Nigeria Trans-Atlantic Fibre Optics Cables: Comparing MainOne Cable, Glo-1 Cable, WACS and SAT3.

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ABSTRACT

About one and a half decades ago, telecommunications industry in Nigeria was at its lowest ebb, but it has grown rapidly since then, due to the rising advancement of technology which has introduced various "means" of transmitting and receiving information which includes the use of Satellite, DSL(digital subscriber line), fibre optics and cables etc.; This study analyses and compares the Nigerian transatlantic fibre cables- the Main One cable, the Glo-1 cable, the SAT-3 cable and the West African Cable System (WACS) which have all contributed greatly to the development of the Nigerian telecommunications industry. The aim of this research paper is to analyse and compare the four transatlantic fibre cables in Nigeria.

Keywords: Telecommunication, Broadband, Superhighway, Connectivity, Technology, Fibre, Cables.

1.0 INTRODUCTION

The term Broadband refers to telecommunication in which a wide band of frequencies is available to transmit information. Because a wide band of frequencies is available, information can be multiplexed and sent on many different frequencies or channels within the band concurrently, allowing more information to be transmitted in a given amount of time [1]. The Broadband Superhighway is that virtual multi path that connects this wide band of frequencies together; In Nigeria today, the evolution of this "Superhighway" has set the stage for many possibilities which has contributed in various areas of our daily lives such as the government, education, banking, trading and most of all Communications. In recent times, telecommunications have improved vastly in terms of quality, capacity, speed etc. The use of transatlantic fibre cables has also made that improvement possible.

According to Wikipedia, a transatlantic telecommunication cable is a submarine communications cable connecting one side of the Atlantic Ocean to another. A submarine communications cable can be defined as a cable laid on the sea bed between land-based stations to carry telecommunication signals across stretches of an ocean [2]. It uses the fibre

optics/optical amplifier technology which transmits information at super speeds usually at the speed of light. This paper focuses on the four main transatlantic cables that run through Nigeria which are: The Main One cable, the Glo-1 cable, the SAT-3 cables and the West African Cable System (WACS). Although, due to certain factors that might not allow consumers to enjoy the benefits of these cables as quickly as possible, a lot of opportunities have been thrown open by these multiple broadband initiatives; student would be able to get to the virtual library for relevant, contemporary and up-to-date materials for course work, there would be spring up of small ghost offices, invisible governments etc. and the use of the internet would be affordable.

2.1 BRIEF HISTORY ON THE EVOLUTION OF THE NIGERIAN TRANSATLANTIC FIBRE CABLE

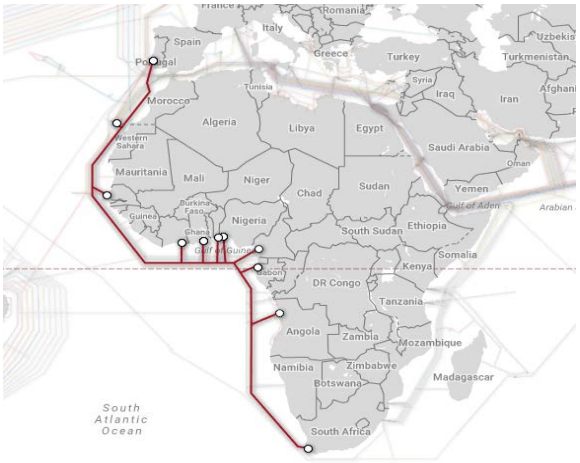
Before the use of the transatlantic fibre cables in telecommunications in Nigeria, the country depended majorly on the use of satellites and cable for the transmission of signals; In 1856 [3], the first submarine cable connecting Nigeria (Lagos) and the United Kingdom (London) was established by the Cable and Wireless Company of the UK, this development gave room for more innovations.After the amalgamation of the Northern and Southern Protectorates, the Basic National Network was formed which was as a result of linking Posts and telecommunications networks. About almost a century from then, the use of submarine fibre cables to transmit communications signals in Nigeria emerged; signals were now transmitted at more efficient rates. In 2001, the South Atlantic 3/ West African Submarine Cable (SAT-3)/(WASC) which was a replacement of the SAT-2 cable (established in early 1990s as a replacement of the SAT-1 cable which was constructed in the 1960s), was established, but began its operations in 2002 stretching across 15 countries, enjoying the benefits of monopoly as at of that period, because it was the only source of internet connectivity in Nigeria before the advent of the GLO-1 and Main One cables in 2010. The West African Cable System (WACS) which is owned by the telecommunications company MTN was introduced in 2011, establishing more competition amongst the Cabling Companies.

Prior to the advent of Main One, Glo1 and MTN WACS, Nigerians and all Internet Service Providers (ISPs) that were connected to SAT-3, suffered a great set back on internet connectivity, anytime there was a cut on the SAT-3 cable, because it was the only source of internet connectivity to Nigeria at that time [4]. Ever since then till this present date, these Cabling Companies have been striving to offer the fullest of their capacities to the growing society.

2.2 THE NIGERIAN TRANSATLANTIC FIBRE CABLES

The Nigerian Transatlantic fiber cables include: The SAT-3 cable, the Main One cable, the Glo-1 cable and the West African Cable System (WACS).

2.2.1 SOUTH ATLANTIC 3(SAT-3) CABLE

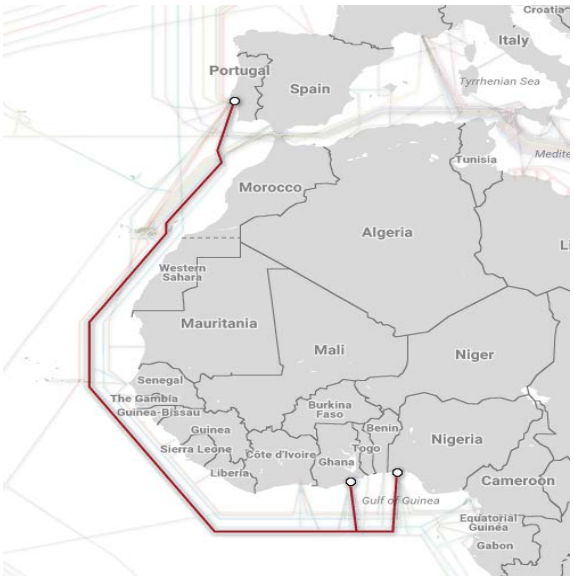


The South Atlantic 3 cable, also known as the West African Submarine Cable, was established in 2001 and began its operations in 2002.The cable system was funded and owned by 35 prominent telecoms operators around the world including the Nigerian Telecommunications Limited (NITEL). The cable system spreads across three (3) European countries and twelve (12) African countries (five (5) West African Countries of which are Senegal, Cote D'Ivoire, Ghana, Benin and Nigeria) making fifteen countries in total. The SAT-3 cable uses the optical amplifier technology; It consistof four fibres, using **Erbium-doped fibre amplifier repeaters** and wavelength division multiplexing [5]. At its time of establishment, the cable served as the only means of internet connectivity in the West African region. It provided access to global markets and enabled seamless and diverse connectivity to the rest of the world [6]. The cable which uses the trunk and branch topology system spans a total area of 28,800km making it the longest transatlantic cable in West Africa and Africa with a capacity of 340Gbit/s but currently boasting of total capacity of 1Tbit/sec [7].

The SAT-3 which was controlled by NITEL came along with many positive impacts both socially and economically, such as job creation, online activism, improved living etc. Government sources over the west coast of Africa say SAT-3 cable lessened the expense of web access by 50 percent in 2007 [8]. However, in July 2009, the SAT-3 cable was damaged, which caused internet blackouts in multiple west African countries including Benin, Togo, Niger and Nigeria [9] leaving them "completely offline", Nigeria suffered a loss of 70% of bandwidth which caused problems for her in the various sectors which included the economy, the banking sector, the government and the general society. The SAT-3 cable was harmed again in June 2013, disrupting easy access to information and also costingNigerians and the Nigeria telecommunication millions of dollars. The SAT-3 suffered disrupted service until May 2016, when its present operator NTEL, announced its returning, stating that the cable was successfully

repaired and was ready to get back on track [10]. With the new system upgrade IV, the capacity of the SAT-3 was boosted from 420Gbit/s to 900Gbit/s in the Northern segment and from 340Gbit/s to 800Gbit/s in the Southern segment which would result in the increase of Nigeria's bandwidth and also boost internet connectivity and satisfy the communication needs of Nigerians.

2.2.2 MAIN ONE CABLE

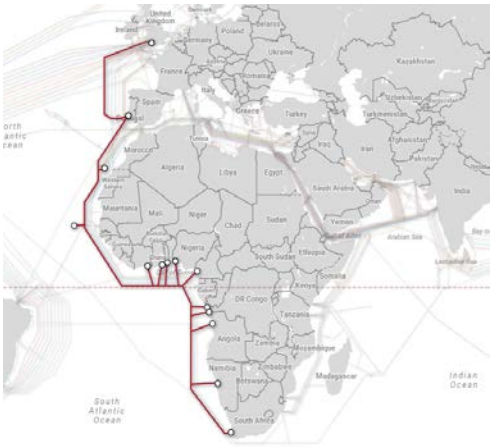


The Main one cable which is privately owned by the Main Street Technology and also international investors including Africa Finance Corporation and the Pan-African Infrastructure Development Fund(PAIDF) and a couple of Nigerian banks [11], it went live on July 22, 2010. The submarine cable stretches across three (3) countries presently, including Nigeria and Ghana, although its target stretches out to thirteen (13) countries, connecting Europe to Africa. The submarine cable was designed in two phases, with the phase one linking Nigeria to Portugal. The phase one of the cable system spans a distance of 6,900km which is about 49.28% of the total length which is measured to be 14,000km. The cable adopts the trunk and branch topology system. The cabling system uses the fibre optics technology and had a total design capacity of 1.28Tbit/s but presently delivering a total capacity of 1.92Tbit/s and has been proven to provide capacity of at least 4.96Tbit/s{mainone.net/our-network/cable-system).The main one cable which has been in the system for six (6) years now, has been experiencing tremendous growth; the cabling system is said to have provided an open access to Internet service providers and regional telecoms operator at rates that are less than 20% of current international bandwidth prices [12]. Research claims that the system would also contribute an immediate drop of 50% on the price of bandwidth in Nigeria and Ghana. The main one which is known for its reliability and quality performance is said to have boosted the broadband penetration of the country since its time of arrival. Reports from NCC says it has helped in the reduction of bandwidth cost, increase customers' capacity and has provided a phenomenal quality which has generally added impacts as regarding the operations of the ICT industry today.

2.2.3 GLO-1 CABLE

The GLO-1 cable which is owned by the Globacom Telecommunications Industry is the first successfully submarine cable from the United Kingdom to Nigeria [13]. Globacom Nigeria became the first single Telecommunications Company in the world to own its submarine cable. The GLO-1 cable which was introduced in 2010 became fully operational in 2011. The cable which cuts its length across eight (8) spans a total distance of 9800km and uses the trunk and branch topology system to connect across countries, connecting Lagos, Nigeria with Bude, UK. The cable which uses the Fibre Optics technology was designed with a minimum capacity of 640Gbit/s, but is presently boasting of a total capacity of 2.5Tbit/s. The $800million cable system has so far contributed in the reduction of the cost of internet connection and other internet services which include: teleconferencing, distance learning, disaster recovery, telemedicine etc. The GLO-1 has however, boosted economic growth in Nigeria, creating job opportunities for its citizens. The Glo-1 cable will provide excess bandwidth to all the countries/cities connected to it. This implies a much faster and robust connectivity for voice, data and video. The cable will also link and connect most West African countries through special branching units. [14]

2.2.4 WEST AFRICAN CABLE SYSTEM (WACS)



The West African Cable System (WACS) owned by a consortium of twelve companies which includes the telecommunication industry giant MTN, is a submarine cable that was established in 2011 but became operational on 11 May 2012 by the launching of the cable in South Africa [15].WACS was originally known as the Africa West Coast Cable (AWCC) and was planned to branch to South America but this was dropped and the system eventually became the West African Cable System [16].The cable traverses across fourteen (14) countries and spans a total distance of 14,500km and uses the trunk and branch topology system to connect across countries.

The cabling system uses the fibre optic DWDM technology. About four years ago, it had a total capacity of 5.12Tbit/s but an upgrade delivered by Huawei Marine in December 2015 using WDMSoft DecisionFEC and bit interleaved coded modulation advanced decoders permitted the design capacity to be increased to 14.5Tbit/s [17]. Despite the large design capacity, only about 3.45% of its bandwidth is being utilized leaving it with a current utilized bandwidth of 500Gbit/s.Nigeria CommunicationsWeek accumulated that WACS is teasing potential clients (network access suppliers (ISPs), backhaul suppliers and telecom administrators) with mouth-watering offers including data transfer capacity for as low as $10 per Mbit/s[18], creating a big competition between the other cables.

WACS has International Private Leased Circuits to any location across the globe. It also has an extensive terrestrial IP & broadband infrastructure to deliver high grade and highly-availability connectivity anywhere in Nigeria. It therefore gives high quality, low latency connectivity giving an unfettered internet experience for wholesalers/carriers and end-users alike [19].

TABLE 1- The Cables and their landing points

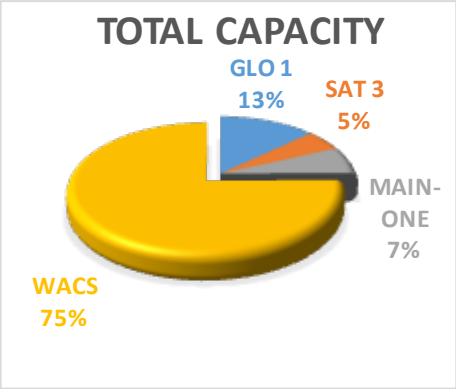
CABLE	GLO 1	MAIN ONE	SAT 3	WACS
LANDING POINTS	1.Lagos, Nigeria. 2.Accra, Ghana 3.Dakar, Senegal 4.Nouakchott, Mauritania 5.Casablanca, Morocco 6.Sesimbra, Portugal 7. Vigo, Spain 8. Bude, UK	1. Seixal, Portugal 2. Accra, Ghana 3. Lagos, Nigeria for the original stage or phase 1 then the arranged landing points for stage 2 are: 4. Casablanca, Morocco 5. Tenerife, Canary Islands 6. Dakar, Senegal 7. Abidjan, Côte d'Ivoire 8. Bonny, Nigeria 9. Libreville, Gabon	1.South Africa, 2. Western Cape, Namibia, 3. Swakopmund, Angola, 4. Sangano near Luanda, 5. Democratic Republic of Congo, 6. Muanda, Republic of Congo, 7.Matombi near Pointe Noire, Cameroon, 8. Limbe, near Douala, 9.Nigeria, Lekki, Lagos, 10. Togo,Afidenyigba	1. South Africa, 2. Namibia, 3. Angola, 4. Democratic 5. Republic of the Congo, the 6. Republic of Congo, 7. Cameroon, 8. Nigeria, 9.Togo, Ghana, 10. Côte d'Ivoire, 11.Cape Verde 12.Canary Islands, 13.Portugal 14.United Kingdom.

		10. Boma, Equitable Republic of the Congo 11. Luanda, Angola 12. Cape Town, South Africa 13. Swakopmund, Namibia	near Lomé, 11.Ghana, Nungua near Accra, 12. Ivory Coast, Abidjan, Cape Verde, 13.Palmarejo near Praia, Canary Islands, Telde near Las Palmas, 14.Portugal, Sesimbra near Seixal, 15. United Kingdom	

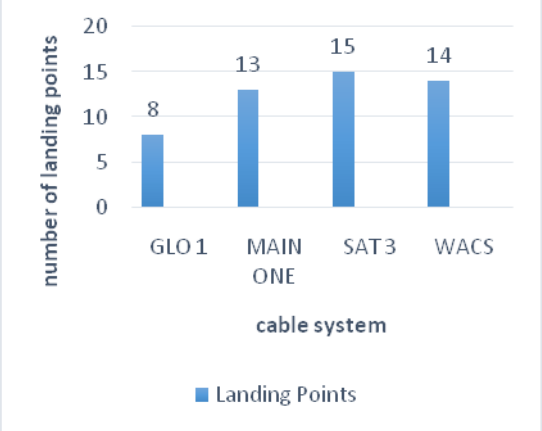
2.3 COMPARISON OF THE FOUR TRANSATLANTIC CABLES

The four transatlantic fibre cables shall be compared in terms of capacity, number of landing points, length and year of establishment.

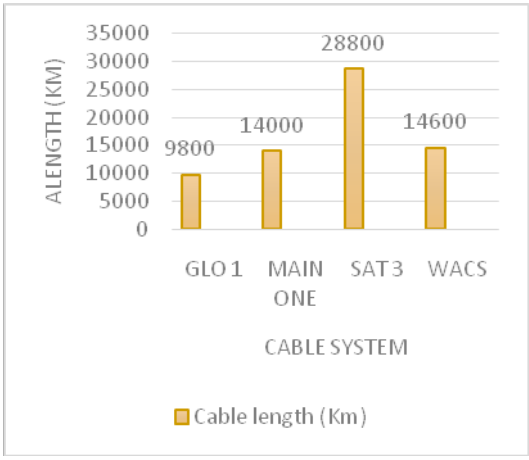
CAPACITY: The pie chart shown below shows the percentage capacity of the four transatlantic cables, clearly indicating that the main WACS as the most capacity.



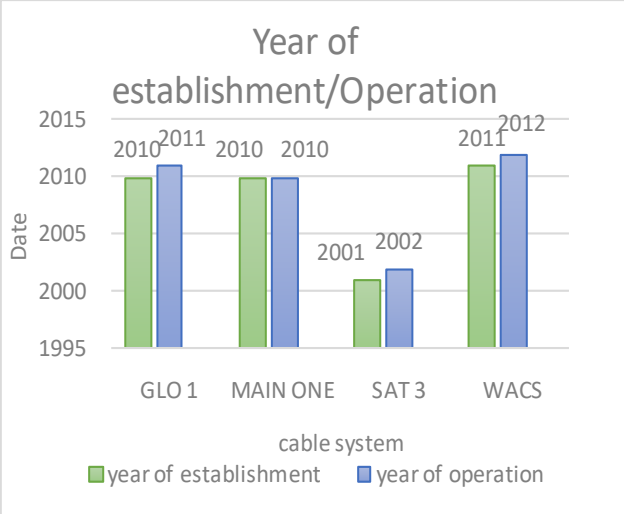
LANDING POINTS: The chart indicates that the SAT 3 cable has the most landing point, stretching out to a total of 15 countries.



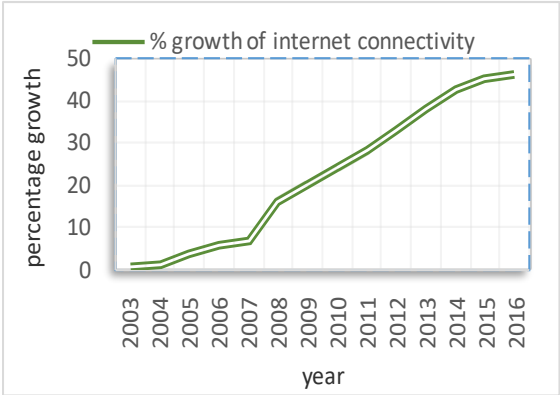
LENGTH: from the chart below, the SAT 3 cable which is the largest cabling system in Africa, spans a total distance of 28,800km.



Year of Establishment/Operation: The chart below shows the year of establishment/Operation of the four cables



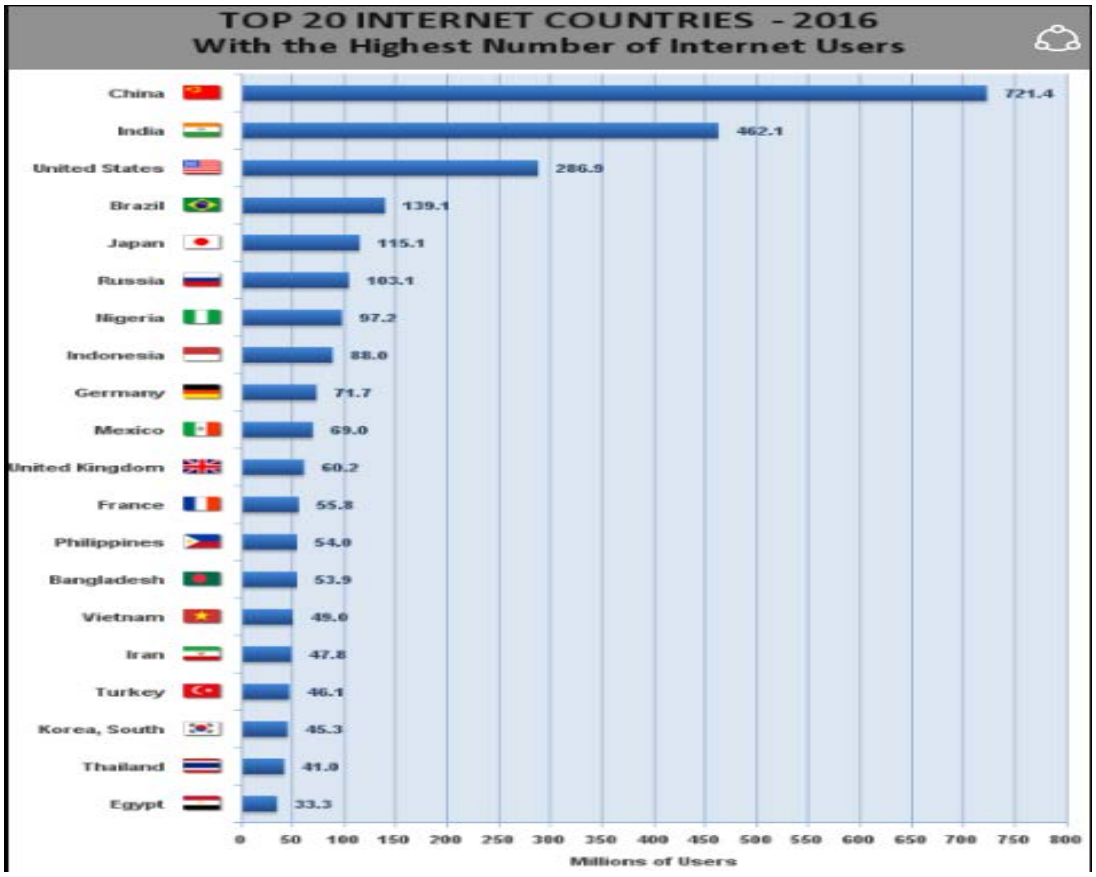
2.4 GENERAL ANALYSIS



No doubts that the four transatlantic fibre cables have greatly impacted on the ICT industry of Nigeria today, internet access has increased drastically over the last eleven (11) years. Nigeria has become Africa's most connected country with 46.1% of its population having access to the internet [20].The statistics above shows the growth/increase in internet connectivity in the last thirteen years.

Despite this development, the broadband penetration in the country is low; approximately 19.3 Tb/s broadband capacity that was brought into the country, it has been noticed that less than 10% of this capacity has been utilized leaving the country with one of the lowest speeds in Africa, although an increase from 10% to 14% broadband penetration has been observed in the last two years.

However, the presence of these cables has made a notable contribution to the Nigerian economy; the former Executive vice chairman, NCC, Dr. Eugene Juwah during an interview, noted that a double in the bandwidth would increase the national GDP by 0.3%.



2.5 CHALLENGES FACED

The New Telegraph gathered that the concentration of the cables in Lagos has posed challenges of last mile connectivity, as factors such as multiple taxation, multiple regulations, delays in the Right of Way (RoW) permits to deploy the fibre cable across the country to hamper accelerated intra and inter country fibre development. The cables also stand potential threat of vandalism of infrastructure, cable theft and other possible factors which may hinder its growth.

The issue of inadequate electricity supply has also caused a major decline in the growth of theses cables; cost of operation in Nigeria has also been part of the challenges these transatlantic cables have faced, having to deal with different regulatory bodies and various government policies.

3.0 CONCLUSION

Propelled by the desire to satisfy the capacity-starved consumers, the SAT-3 cable, Main One cable, the Glo1 cable and WACS have invested over $1.4 billion to hasten the broadband revolution. Over the years, price of bandwidth has reduced drastically due to the high demand of capacity by consumers. The Nigerian Communications Week gathered that the WACS offered bandwidth for as low as $10 per megabyte which is more than 3000% reduction in prices of being offered by existing cable system providers worldwide. In spite of the total capacity brought into the country, it is however saddening to see that the capacity is not fully utilized despite the increasing demand of this capacity by the consumers.

In order for the total capacity brought in by these cables to be fully maximized, the Government should create an infrastructural policy supporting the cable operators, thereby making their cost of operations cheaper which would in turn reduce the price of bandwidth provided by these cables to the demanding customers and also improving the penetration across the country.

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