

AFRICAN WIRELESS COMMUNICATIONS YEARBOOK 2020



From the publisher of
**NORTHERN AFRICAN
WIRELESS**
COMMUNICATIONS
**SOUTHERN AFRICAN
WIRELESS**
COMMUNICATIONS

ALWAYS CONNECTED COMMUNICATIONS

with the Smart Wireless Network

**Why choose Rajant
Kinetic Mesh® to
transform virtually any
asset into network
infrastructure?**

**It's ubiquitous,
connecting people to
people, people to things
and things to things—
mobile, fixed, or both**



**It's resilient
and self-optimizes**
as assets are added or
moved, creating a fully
redundant network



**It's smart and
delivers intelligence**
in real-time with low
latency, high-bandwidth
performance



RAJANT

IF IT'S MOVING, IT'S RAJANT.

Learn how Rajant Kinetic Mesh® can bring IoT to life.
Request a **free demo** at rajant.com/sawc-demo

AFRICAN **WIRELESS** **COMMUNICATIONS** **YEARBOOK 2020**

From the publisher of
Northern African Wireless Communications &
Southern African Wireless Communications magazines,
the continent's premier sources for wireless
communications technology news, views and features.

The contents of this publication may not be reproduced in part or in whole, including photocopying, scanning and/or recording, or transmitted in any other form by any means including electronic, digital or mechanical, or stored in any form of data storage, archival or retrieval system, without the prior written permission of the publisher and copyright holders.

All enquires should be sent to Kadium Limited, Unit 2, 1 Annett Road, Walton-on-Thames, Surrey, KT12 2JR, United Kingdom.

The views expressed in this publication are not necessarily those shared by the publisher or the editor.

Although great care has been taken to ensure the accuracy and completeness of the contents of the African Wireless Communications Yearbook 2020 ('the publication'), neither Kadium Ltd nor Kadium Publishing (Pty) Ltd, or its agents, accept any legal responsibility for the information and the opinions expressed in this publication.

The publisher will not accept liabilities for any losses incurred, direct or otherwise, as a result of using the data in this publication for any purpose whatsoever.

Use of the material in this publication is done so at your own risk. E&OE. © 2020

NORTHERN AFRICAN
WIRELESS
COMMUNICATIONS



KADIUM

SOUTHERN AFRICAN
WIRELESS
COMMUNICATIONS



POWERING A

CONNECTED FUTURE

HUGHES
An EchoStar Company

Community Wi-Fi Hotspots | Cellular Backhaul | Satellite Internet
Driven by Industry-Leading JUPITER™ System VSAT Technology
HUGHES.COM

© Copyright 2020 Hughes Network Systems LLC. All Rights Reserved.
The HUGHES logo is a registered trademark of Hughes Network Systems, LLC, an EchoStar company

Covid-19: Africa's response



Robert Shepherd,
editor,
**African Wireless
Communications
Yearbook 2020**

We're beyond the halfway mark in 2020 and it's been the most turbulent few months most of us can remember. Even war veterans – those still with us – have said the impact of World War II wasn't as bad as what we're all going through now. Our war against an invisible enemy called coronavirus (or its stablemate Covid-19) continues to negatively impact every industry directly, or indirectly.

The telecom sector in Africa was tipped to invite high value investments 2020, with many seeking to expand infrastructure as well as the booming e-commerce sector showing opportunities for M&A across the continent.

Then, what has now become a global pandemic, made its first known appearance in Wuhan, China, before proceeding to pull the rug from under every economy in the world and leaving unprecedented destruction in its wake.

Wuhan, of all places, is the largest producer of optical fibre and cable in the world, accounting for 25% of the international market. A break in the supply chain for such products means that the quest to implement fourth industrial revolution technology infrastructure in Africa could be affected. Fibre optic cable is a necessary component of high-speed broadband, which is essential for 4IR technology and implementation.

Still, it's not all doom and gloom. Africa started measures to shift a greater volume of transactions toward digital payments and away from cash — which the World Health Organization (WHO) said had helped to spread the coronavirus.

Kenya is Africa's pioneer and leader in digital payment adoption and it turned to mobile money as a public-health tool.

West Africa, where cash was king, also joined in. On March 20, Ghana's central bank directed mobile money providers to waive fees on transactions of GH100 (US\$18), with restrictions on transactions to withdraw cash from mobile-wallets.

The growth in Covid-19 cases in Nigeria, Africa's most populous nation with 200 million people, prompted one of the country's largest digital payments start-ups to act.

Lagos-based venture Paga made fee adjustments, allowing merchants to accept payments from Paga customers for free — a measure "aimed to help slow the spread of the coronavirus by reducing cash handling in Nigeria".

In South Africa, small-business payments start-up Yoco issued a directive to clients to encourage customers to use the contactless payment option on its point of sale machines.

The company has also accelerated development of a remote payment product, that would enable transfers on its client network via a web link.

Indeed, GSMA released its Mobile money recommendations to central banks missive. The organisation listed a number of temporary measures "geared at limiting the spread of Covid-19 as well as alleviating the cost of living pressure on users of mobile money services during the pandemic".

One thing I had hoped to say before I signed off is that — so far — fears the continent would be decimated by the virus have proved to be unfounded. Sadly, I can't, as the number of cases, indeed deaths, have risen dramatically in South Africa and other countries in recent weeks. Let's hope things start to improve soon. Stay safe.

roberts@kadiumpublishing.com

CHAPTER 1:	STATE OF THE MARKET	
	Introduction	7
	Review	9
CHAPTER 2:	CELLULAR NETWORKS	
	Introduction	24
	Year in review	25
	The year ahead	29
	Interviews	29
CHAPTER 3:	VALUE-ADDED SERVICES	
	Introduction	37
	Year in review	40
	The year ahead	42
	Interviews	42
CHAPTER 4:	FIXED WIRELESS ACCESS	
	Introduction	47
	Year in review	51
	The year ahead	52
	Interviews	53
CHAPTER 5:	SATCOMS	
	Introduction	55
	Year in review	59
	The year ahead	60
	Interviews	60
	Satellite footprints	65
CHAPTER 6:	BROADBAND	
	Introduction	73
	Year in review	75
	The year ahead	78
	Interviews	76
CHAPTER 7:	FIBRE	
	Introduction	81
	Year in review	83
	The year ahead	85
	Interviews	84
CHAPTER 8:	CRITICAL COMMUNICATIONS	
	Introduction	89
	Year in review	90
	The year ahead	91
	Interviews	91
	BUYER'S GUIDE	93
	ACKNOWLEDGEMENTS	99

PROVIDING
**HIGH QUALITY BROADCAST,
TELECOMMUNICATION AND
TELEPORT SERVICES**



With expanded capacity at MENA hotspot of
 $25.5^{\circ}/26^{\circ}\text{E}$

Es'hailSat supports television, internet,
corporate and government services across the
Middle East, North Africa and beyond



Es'hailSat سهيل سات
Qatar Satellite Company الشركة القطرية للأقمار الصناعية

Space to deliver your vision



www.eshailsat.qa

chapter 1

State of the market



Sabelo Dlamini,
senior research
and consulting
manager,
IDC South Africa

Last year was dominated by talks about 5G, but saw little tangible implementation of the technology. In South Africa, we have seen Rain commercialise their 5G products, largely non-standalone and thus a mixture of 4G and 5G on 3.5 GHz, with several trials across the continent. These trials are being conducted by other

large operators in South Africa, as well as in Mozambique, Tunisia, Nigeria, Kenya, Algeria, Lesotho, Gabon and Egypt to name a few, for example MTN's 5G trials in Nigeria where they performed trials with different vendors across three regions in the country to test the technology. Yet, one of the biggest challenges facing the deployment of 5G in Africa remains the cost and allocation of spectrum. South Africa is one of a few countries in Africa where 4G spectrum remains unallocated - a process that has taken years to conclude. We expect to see this 5G trend continue, but with limited tangible adoption due to a lack of relevant use cases for the region.

Other highlights included several announcements around planned undersea cable development. Google announced plans to construct its Equiano cable that will run from Portugal to South Africa via Nigeria, which is expected to be completed in 2021. SAEx International and Alcatel Submarine Networks are similarly collaborating to build a 25,000km long undersea cable with a design capacity of 108Tbit/s. The cable is expected to connect countries in Asia, the Americas, and Africa (South Africa). In 2018, Seaborn Networks also announced plans to build the SABR cable that will run from South Africa to Brazil and then onward to North America. The cable is expected to deliver capacities of between 30

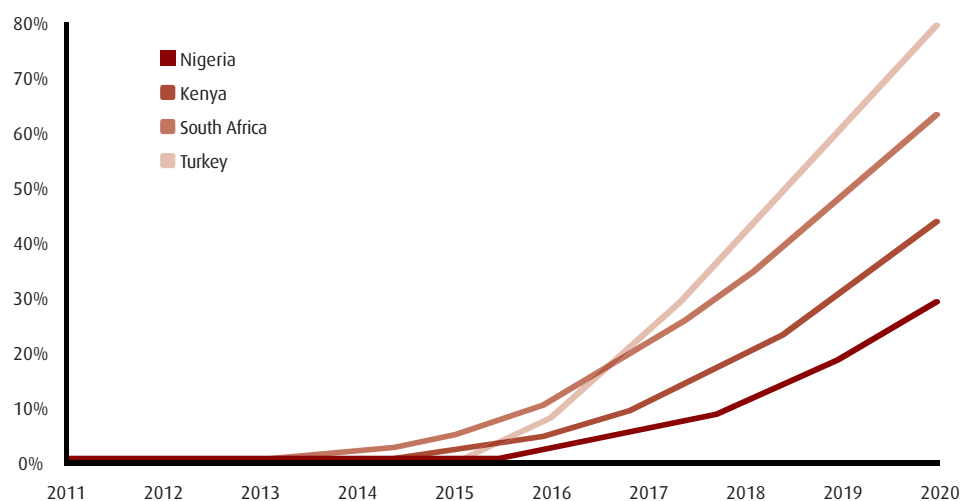
and 40Tbit/s. Facebook is also in talks to develop Simba, an underwater data cable that will encircle the continent. These developments will have a significant impact on the continent.

One of the major challenges facing Africa remains the high cost of data. Last year we saw the Competition Commission in South Africa flex its muscles to force the two dominant players, Vodacom and MTN, to drop their data prices significantly. While we are yet to see whether this will be implemented, it would have a huge impact on data pricing in the country and could also move towards the rest of Africa to drive down data prices. That said, there could also be a broader negative impact on the industry if both MTN and Vodacom halve their prices. Telkom and Cell C currently position themselves based on more affordable pricing. Should the two bigger operators bring their cost down significantly, it could have unintended

consequences on the smaller operators, making it more difficult for them to compete. Telkom and the already embattled Cell C will also be forced to reduce their prices to compete, which would further reduce their profit margins and threaten their survival in the market.

Another big announcement was that Ethiopia will award two telecoms licenses to multinational mobile companies by April 2020. While this is a step in the right direction towards market accessibility, one must ask the question around how open it will be. While all the big operators in the region are equally anxious to enter this market, there are some key considerations to take into account such as how much autonomy they would have, the requirement around using local skills, tax structures and how conducive it is for non-Ethiopian organisations to operate in the country. While we believe that most of the big operators will line up for this opportunity,

While 5G is a big talking point among telcos, most operators in the region are still actively investing in 4G/LTE networks. As such, these networks are still maturing and the telcos have not received their return on investments on them. LTE connections are still yet to surpass the 50% mark in most countries in the region, outlining that widespread 5G is still in the distant future. Figure 2: LTE Connections as a % of Total Mobile Connections SOURCE: IDC



they will have to do their homework to ensure they understand the market and its challenges, and will, therefore, be cautious about the move.

ICASA's spectrum woes

The issue around spectrum allocation in South Africa remains a huge hurdle. While we have seen some progress, we didn't believe any spectrum would be allocated in 2019 and are doubtful that it will happen in 2020. ICASA's decision to allocate both 4G and 5G spectrum at the same time could be another spoke in the wheel of the telco industry as operators will have to prioritise which spectrum to invest in. We believe they will most likely opt for 4G as it is more efficient and will fit into their existing product portfolios, while providing a return on investment much faster.

One of ICASA's biggest problems is that the organisation is dealing with highly skilled organisations that understand the fair value of each MHz of spectrum. They will, therefore, have to invest in the right skills and capacity to ensure that they are able to determine the fair value of spectrum that will be reasonable and affordable to the industry players.

We have seen this trend across the African region, with several operators still waiting to realise a return on investment on their 4G infrastructure, so 5G could be premature for the continent. Buying the spectrum only gives the telco access to a licence and still requires an equal if not greater investment in deploying the actual infrastructure. In this regard, ICASA is effectively hindering the deployment of 5G by allocating both 4G and 5G at the same time.

How does SA have 4G if no spectrum has been allocated?

South African mobile operators have gone the extra mile in deploying their networks while they did not have the required 4G spectrum.

These network operators had to work with 3G spectrum, re-farming that spectrum to deliver 4G services. They have invested a lot in terms of technological design and engineering to achieve this. On 5G, you cannot do re-farming and therefore the network operators will have to allocate the spectrum so that they can deploy 4G more efficiently. The process of spectrum allocation is also not very clear with many questions being raised around whether it will go to auction or whether outsiders will have access.

2020 – the year of diversification

Voice revenues are dropping for telcos in most countries in the region. Customers are migrating away from voice and data consumption is increasing. That said, there has been a lot of pressure from regulators and, in South Africa the Competition Commission, to reduce data costs. Most of the data revenues are also moving to over-the-top (OTT) players.

We are seeing more data centres being built in the region and more cloud providers growing their presence in Africa, which is creating an even bigger opportunity for OTTs. Additionally, innovation in technologies such as artificial intelligence (AI) and the Internet of Things (IoT) is putting pressure on telcos to rethink their business models. Telcos who continue to focus purely on providing only connectivity put themselves at risk of becoming a mere spectator in this new transition.

For telcos to survive this transition, they must develop their portfolios, expand and create diversified sources of revenue. We are already seeing some exploring fintech as an option while others are developing IT services. We believe that across the region, telcos will either try and build their IT services capability in-house or acquire a company that already has it. The next step will be to develop their presence

“One of the major challenges facing Africa remains the high cost of data. Last year we saw the Competition Commission in South Africa flex its muscles to force the two dominant players, Vodacom and MTN, to drop their data prices significantly”

in the cloud, and this will most likely be through reseller agreements with big cloud providers, to diversify their revenue streams. Other areas to consider include the IoT, but this needs specific domain expertise and knowledge to provide solutions and services to specific industries.

We have, for example, seen in Eastern Europe that telco companies are even selling utilities such as electricity, petrol, gas to ensure that their revenue streams are diversified. Connectivity alone is no longer financially viable.

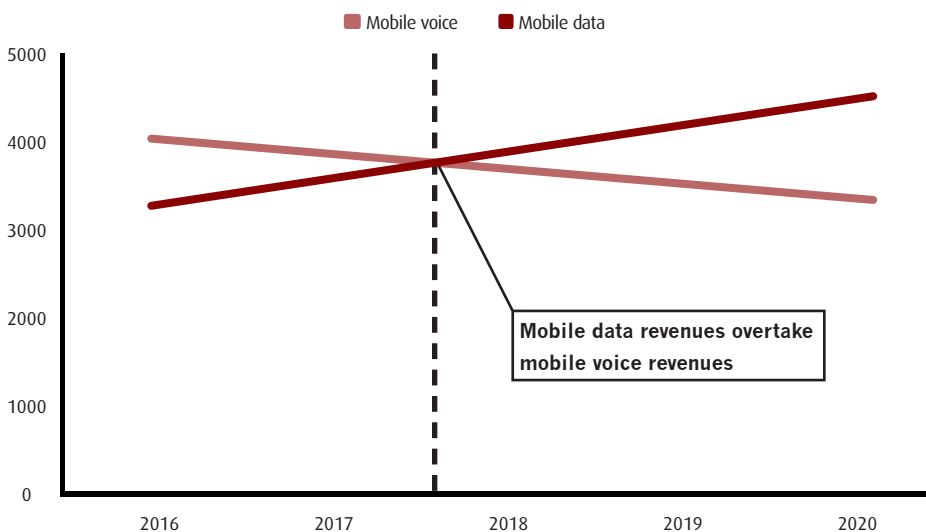
Infrastructure maintenance is also very costly, and we have seen some telcos move their infrastructure into separate entities. We believe this will be a trend across the continent as the management of infrastructure will require specialised expertise and a deeper understanding of how to work with stakeholders to ensure they get revenue- and risk-sharing models in place to earn additional revenue. In 2020 we will see more companies implementing their transformation strategies.

It's all about partnerships and collaboration

In 2020, partnerships and collaboration will be key. We have already observed some South African telcos moving towards acquiring specialist companies to bolster their skills set and this is set to continue. While some continue to try and develop capabilities in-house, we foresee a shift towards partnership with the vision to acquire those partners in the future.

This trend is likely to continue, so our advice to start-ups is, therefore, to ensure you have a solid vision and well-defined processes in place when starting your company. Ensure that all your processes are well developed so that if

Data revenues are continuously surpassing voice revenues, as can be seen South Africa has moved passed voice era. Figure 1: Evolution of Mobile Voice and Data Revenues in South Africa SOURCE: IDC



you are partnering with someone and there is an opportunity to be acquired, it is easier to get a fair value for your business. ■

Communications in Africa: an emerging platform for economic and societal growth



Joe Barrett,
president,
GSA

Much has been written about the gaps that exist in Africa's infrastructure and communications coverage, both of which are essential to achieving the kind of universal access critical to connecting all citizens of Africa to the global society. Technological advancements such as 4G

and 5G offer potential to transform the continent, drive forward economic growth, and deliver social benefits in countries throughout the region.

In that context, over 900 operators worldwide are known to have been investing in LTE, including pre-commercial trials, with dozens of others that have previously indicated their intentions to invest. 788 operators in 229 countries have now commercially launched LTE networks¹.

Africa represents a small but growing and increasingly important part of this ecosystem. In North Africa, 16 operators have launched LTE (either offering fully mobile or fixed wireless broadband services), up from 15 in 2019, and of these, eight have launched LTE-Advanced, one is deploying LTE-A and one operator is in a testing phase. In the larger sub-Saharan Africa region, 172 operators are investing in LTE (up from 148 a year ago), with 140 networks launched (up twenty in a year);

“Southern African operators are at the vanguard of the region’s 5G development efforts. Among those, Vodacom has activated a limited availability fixed wireless access network for a handful of business customers in Lesotho and states”

28 of these have deployed LTE-A (up from 23 in 12 months), and a further six plan to deploy LTE-A or are testing the technology.

As a result of these recent launches, the African region as a whole now accounts for just over 20% of the total number of operators investing in LTE and nearly 20% of all the commercially deployed networks. It remains the case that most of the countries globally that are currently without LTE are either on the continent of Africa or islands in the Pacific and Atlantic Oceans. African countries with no LTE network known to GSA include Central African Republic, Djibouti, Equatorial Guinea, Eritrea, French Southern Ocean Territories, Mauritania, São Tomé and Príncipe, South Sudan, and Western Sahara. But the national not-spots are disappearing. LTE networks were launched for the first time in Cabo Verde, Guinea, and Niger during 2019.

In terms of LTE subscribers, the continent is further behind. According to data supplied by Omdia, the number of mobile subscriptions in Africa totalled 1.086 billion by end September 2019. In absolute terms 3G was by far the fastest growing mobile technology in Africa in the twelve months to the end of September, gaining 96.8 million subscribers to reach a total of 542.3 million. In 2019 3G also became the biggest technology, overtaking GSM which continued to decline, falling from 508.6 million to 444.6 million subscribers.

LTE, meanwhile, is just gaining a foothold in Africa. LTE subscriptions reached 95.2 million by the end of September 2019, up more than 50% over twelve months, but still well short of 20% of all mobile subscribers on the continent. (By way of comparison, worldwide, LTE represents over half of all mobile subscribers). As it becomes the preferred technology, eventually delivering a Gigabit service, GSA expects a migration from 3G to 4G/LTE and then eventually, 5G. But for now, Africa represents only 2% of the world's LTE subscribers. This means there is potential for tremendous growth.

New generation technologies

Along with the rise of LTE, we are starting to see increased availability in Africa of LTE-based solutions for voice and IoT services. VoLTE is now commercially available in at least thirteen African networks, with six other operators known to be either investing in trials, planning to deploy or in the process of deploying VoLTE. NB-IoT, meanwhile, has been launched in Tunisia and South Africa, with operators also investing in the technology in Kenya, Liberia and Nigeria. MTN has been trialling LTE-M in South Africa.

5G is on the horizon. Network vendors and operators worldwide are currently testing and are already deploying 5G networks – in fact sixty-three commercial 5G networks have now been launched globally. 5G has been appearing on a small scale in Africa too. Whilst they are not yet ready to launch commercial 5G



Figure 1: LTE networks (mobile and FWA) in the Middle East and Africa



Figure 2: LTE-Advanced networks in the Middle East and Africa



Figure 3: 5G trials in the Middle East and Africa

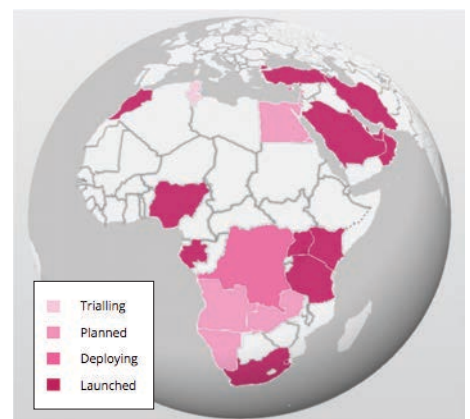


Figure 4: VoLTE status in the Middle East and Africa

services en masse, African operators have been investing in 5G. GSA is aware of twenty African operators from 15 countries that are investing in 5G networks (including pre-commitment evaluation, testing and trialling).

Southern African operators are at the vanguard of the region's 5G development efforts. Among those, Vodacom has activated a limited availability fixed wireless access network for a handful of business customers in Lesotho and states it is ready to launch services in South Africa as soon as the spectrum is made available. Rain has launched 5G FWA services in parts of South Africa. Liquid Telecom is deploying a wholesale 5G network, and in late 2019 MTN awarded the contract for the deployment of its 5G infrastructure. Elsewhere in Africa, Al Madar announced the deployment of 5G infrastructure in Libya in 2019, and operators in Algeria, Cabo Verde, Cameroon, Congo-Brazzaville, Gabon, Kenya, Madagascar, Morocco, Nigeria, Réunion, Seychelles, and Uganda are known to be testing or trialling or have announced plans to deploy 5G networks.

The year ahead

GSA expects LTE to continue its rise in Africa during 2020. With at least ten operators known to be deploying new LTE networks as of April 2020 we might expect to reach a total of 165 LTE networks providing either fixed wireless access or full mobile services in Africa by the end of the year.

Whilst it will be a few years before the technology is as widely used as 2G or 3G, given the recent increase in the number of commercially launched networks, the anticipated launch of more LTE services during 2020, and the fact that it will be physically available to a larger number of people, and networks will cover wider areas, the technology will attract more and more end users. It would not be unreasonable to expect LTE subscriber numbers in Africa to top the 130 million mark by the end of 2020.

In addition to the growth in use of LTE, GSA also expects the quality of the LTE infrastructure to improve. We forecast that the number of networks being upgraded from LTE to LTE-Advanced and LTE-Advanced Pro will increase; predominantly through the introduction of carrier aggregation to improve end users speeds, and the launch of 3GPP IoT technologies. At the moment, few networks in Africa can boast maximum (peak theoretical) download speeds of much more than Cat-4. (GSA has identified 16 operators offering Cat-6 or better).

Whilst the continent is still predominantly a consumer of technology, a harmonised approach to ICT development, including enabling policy and regulatory frameworks can transform the 60+ individual markets into an opportunity of over one billion people. The benefits of such

harmonisation include achieving new economies of scale, and creating leverage that will enable African nations to start influencing technology and policy developments to ensure they best serve the continent's requirements. We already see evidence of this in the way they have become increasingly influential in international/ICT spectrum proceedings. The African Continental Free Trade Agreement provides an additional framework to pursue harmonisation, and increased collaboration/partnership/engagement with industry stakeholders will be useful in helping to customise technology to suit African realities.

GSA is the voice of the global mobile ecosystem and has been representing mobile suppliers since 1998. The GSA, as a source of objective, current and accurate technological input, and by virtue of its membership (including innovators and suppliers of broadband solutions) offers a forum that has the potential to help open up some of those engagement opportunities. GSA intelligence is regularly referenced by the broader mobile industry, and the organisation is also very active in numerous spectrum forums around the world, including Africa.

Financial outlook Service provider results



Matthew Reed,
practice leader,
Omdia

Africa is seen as a growth market and MTN Group, Africa's biggest telecoms operator by subscriptions, saw its service revenue rise by 9.7% year on year (YoY) in 1H19, to ZAR67.9bn (\$4.58bn). MTN Group's data revenue grew at an even faster rate, increasing by 19.8% YoY in 1H19 to ZAR16.1bn, while fintech revenue increased 30.7% to ZAR4.7bn. MTN Group says it is also seeing growth in its voice revenue, which increased by 4.5% in 1H19.

However, MTN sees data as the main driver of growth in the medium term, and it also sees further growth opportunities in fintech, enterprise, and wholesale. Revenue at MTN's wholesale unit, MTN GlobalConnect, more than doubled between 1H18 and 1H19. Vodacom Group's service revenue rose by 3.9% YoY in 2Q19, with revenue at Vodacom's international (non-South African) operations increasing by 19.6%, largely due to rising demand for data and the M-Pesa mobile money service. However, Vodacom's service revenue in South Africa declined by 1.2% in 2Q19, which the company attributed to new data usage regulations and difficult economic conditions. Airtel Africa reported revenue of \$795.9m in 2Q19, a YoY rise of 6.9% (or 10.2% in constant currency terms). Airtel Africa said its voice revenue increased

by 3%, while data revenue increased by 36% as a growing number of customers used LTE. Mobile money revenue increased by 42%. Airtel Africa's subscriptions increased by 9.3% to 99.7 million at end-June. Orange described its operations in Africa and the Middle East as a "powerful engine" for growth, with revenue up by 5.8% YoY in 2Q19, compared to a rise of 0.5% for Orange's total revenue. Orange's roll out of LTE in Africa and the Middle East has played an important part in its growth: almost 20 million customers in the region were using LTE at end-June 2019 – an increase of 54% on the previous year, according to Orange.

Merger & acquisition update

In March 2019, Maroc Telecom – which is controlled by Etisalat in the UAE – completed the acquisition of the Tigo Chad unit from Millicom, which has retreated in Africa over the past few years to focus on Latin America. In April, submarine cable operator Seacom completed its acquisition of South African wholesale fibre provider, FibreCo. In June, Vodacom reached agreements to sell its Vodacom Business Africa operations in Nigeria, Zambia, Angola, Ghana, and the Ivory Coast to local partners. Vodacom is planning to buy a 51% stake in South Africa-based IoT specialist IoT.nxt. A planned merger between Airtel Kenya and Telkom Kenya was suspended in August pending an investigation by the Communications Authority of Kenya into the deal. MTN is selling its stake in Botswanan operator Mascom for \$300m, and the Travelstart e-commerce business and Amadeus investment fund for ZAR1.2bn (\$80.8m), as part of a plan to dispose of non-core assets.

Revenue forecast

Due to the overall growth in the market and continued relevance of voice calling for many customers, some major African operators such as Airtel and MTN are still seeing growth in mobile voice revenue – but data revenue is growing at a faster rate and its share of overall revenue is rising. Omdia forecasts that mobile revenue in Africa will rise from \$54.31bn in 2019 to \$67.12bn in 2024, with non-SMS mobile data revenue on the continent more than doubling over that period from \$14.91bn in 2019 to \$31.42bn in 2024 (see Figure 1). Omdia expects mobile voice revenue in Africa to rise modestly through to 2021, but to decline thereafter to the end of the forecast period.

Market dynamics Macroeconomic trends

There is a continuing economic recovery underway in sub-Saharan Africa (SSA), according to the IMF's most recent report for the region (April

2019). Economic growth in SSA will rise from 3% in 2018 to 3.5% in 2019, and stabilize at a little below 4% over the medium term, said the IMF. Additionally, SSA will account for most of the growth of the world's population over the coming decades, according to the United Nations, which expects SSA's population count to rise from 1.07 billion in 2019 to 1.40 billion in 2030 and 2.12 billion in 2050. The IMF identified two trends in economic growth in the region, with non-resource-intensive economies expected to grow at 5% or more, with a faster rise in income per capita than the rest of the world on average over the medium term, while more resource-intensive countries, including the two major economies, Nigeria and South Africa, are expected to fall behind. Conflict is also having an impact on economic growth. Although the intensity of conflicts in SSA in recent years has been lower than in the 1990s, the region remains prone to conflict, which has negative economic consequences, the IMF said. In 2018, Africa and Asia were the world regions most affected by internet shutdowns, which are often linked to political instability, according to research by Access Now, an advocacy group for digital rights. More positively, the IMF said that the newly-established African Continental Free Trade Area (AfCFTA) could be an economic "game changer" for the continent. The AfCFTA is expected to significantly raise intra-African trade, though it should be accompanied by policies to deal with adjustment costs and income inequality, the IMF said. Additionally, the World Bank is developing a new initiative for Africa to rapidly adopt digital technologies – the All Africa Digital Economy Moonshot Initiative – which the bank said would create jobs, reduce poverty, and encourage economic growth on the continent. The World Bank's April 2019 edition of its Africa's Pulse report stated that to move to a digital economy, African countries should focus on five key areas – digital infrastructure, digital skills, digital platforms, digital financial services, and digital entrepreneurship – with specific targets for each. The targets should include: universal internet coverage, affordable internet access (costing less than 2% of income), 100,000 graduates in advanced digital skills annually, universal access to digital financial services, and a pan-African payments platform. The World Bank's plan is an attractive concept, but challenges may arise in implementation.

The affordability – or perhaps more accurately unaffordability – of telecoms services remains a problem in Africa. The average cost of a 1GB prepaid mobile broadband plan was equivalent to 8% of average monthly income in Africa in 2018, according to figures from the Alliance for Affordable Internet (A4AI) cited in the ITU/ UNESCO Broadband Commission for Sustainable Development's State of Broadband 2019 report. Although the affordability of mobile broadband has improved in Africa (in 2015 a

Figure 1: Africa, mobile revenue forecast 2019-24 (\$bn)

SOURCE: OMDIA

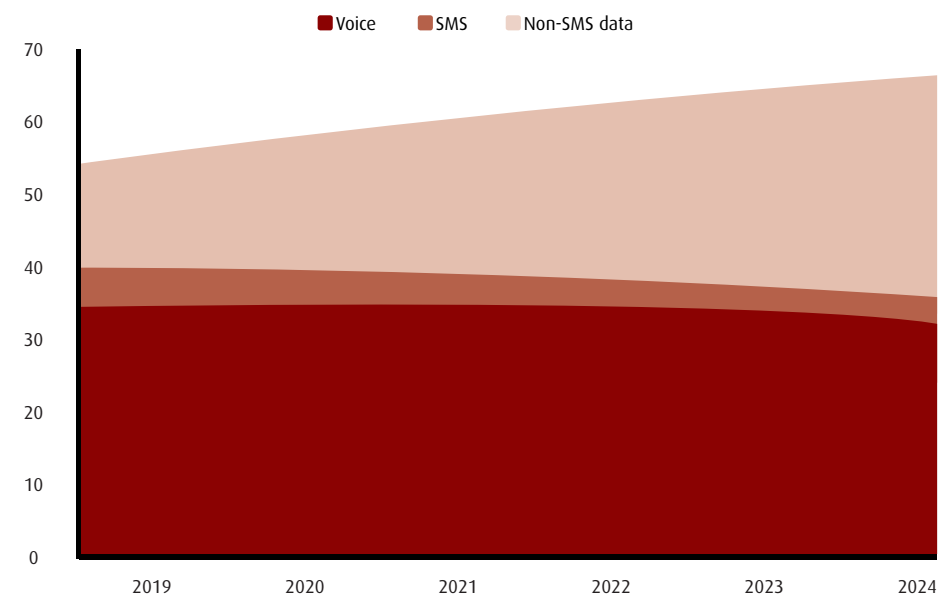
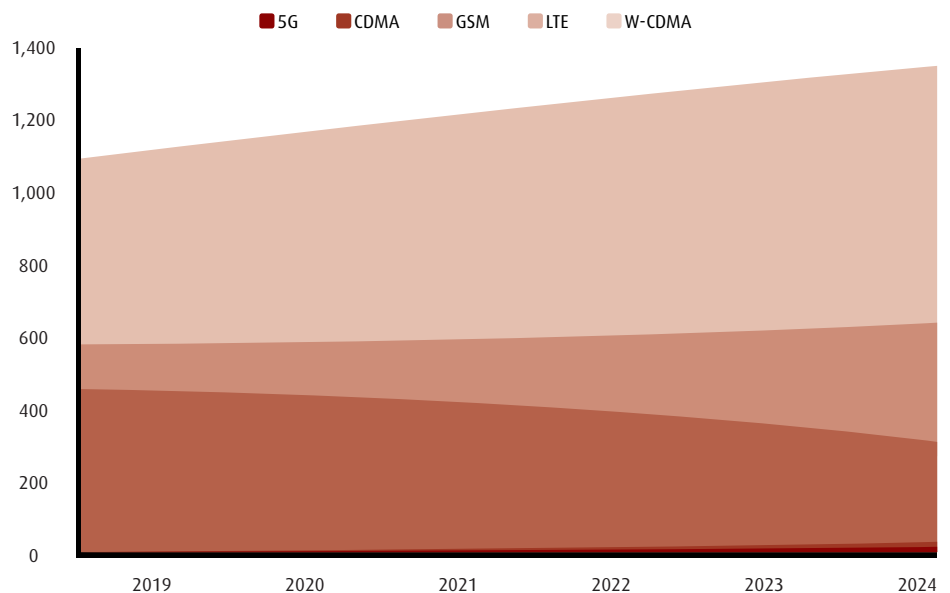


Figure 3: Africa, mobile subscriptions forecast by technology 2019-24 (millions)

SOURCE: OMDIA | (NOTE: FIGURES INCLUDE M2M SUBSCRIPTIONS)

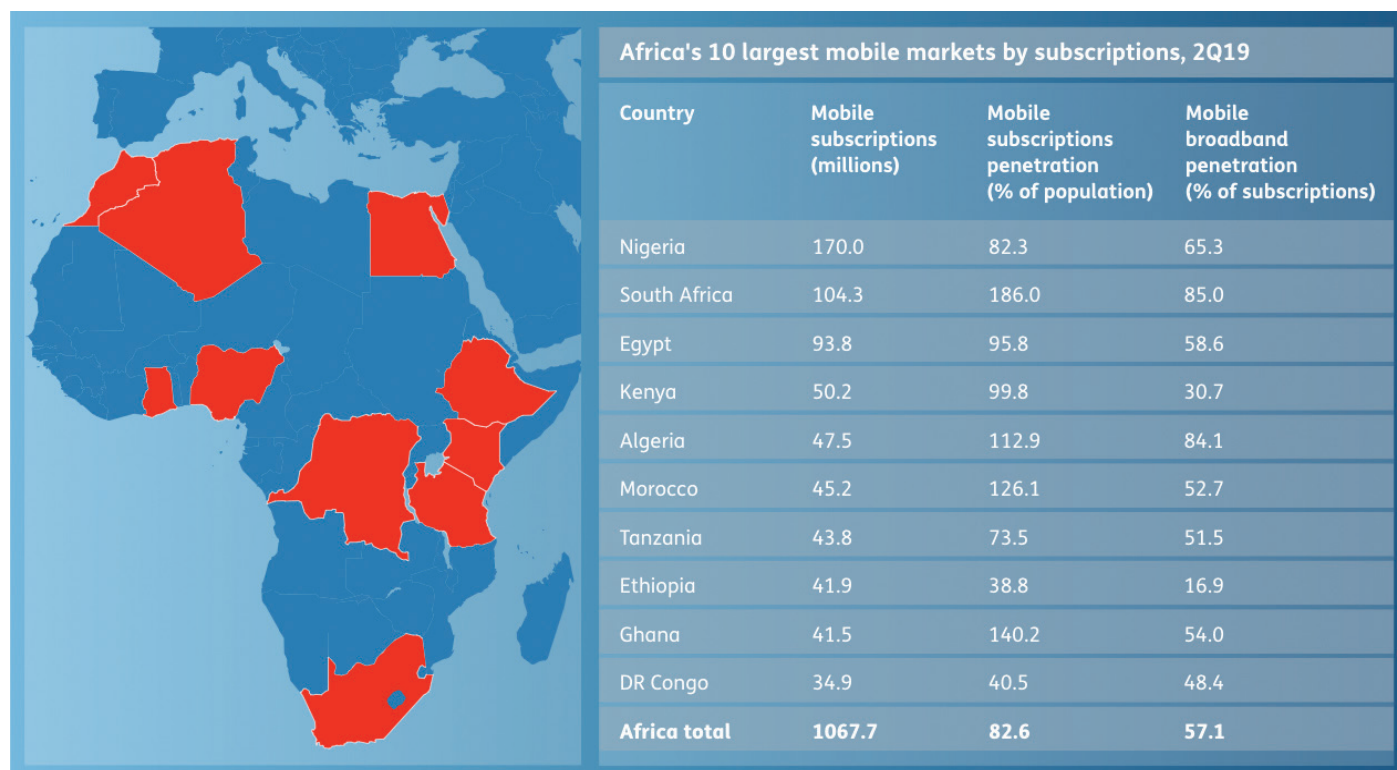


1GB plan cost 12.5% of average income in Africa), the results for the continent compare badly to equivalent markets in Asia and the Americas. In 2018, a 1GB plan cost 1.5% of average income in Asia, and 2.7% in the Americas. The Broadband Commission has adopted the A4AI's affordability benchmark, which is that a 1GB mobile broadband plan should not cost more than 2% of average monthly income. Ethiopia revealed a significant policy change with its announcement in July that it plans to award two new telecoms licenses to private companies and sell a 49% stake in state-owned operator Ethio Telecom. Currently, Ethio Telecom has a monopoly over the country's telecoms market, and previously Ethiopia has rejected the idea of competition or privatization in the country's

telecoms sector. With a population of about 108 million and a mobile penetration of less than 39% in June 2019, the Ethiopian market holds growth prospects that are likely to be of interest to most major operators on the continent (see Table 1). Mobile broadband penetration in Ethiopia is also below the average for Africa at less than 17% of total mobile subscriptions. Separately, the Angolan government is planning to sell a 45% stake in state-owned operator Angola Telecom to the private sector.

Subscription trends

The number of mobile subscriptions in Africa passed the 1 billion mark in 2017, and reached about 1.07 billion in June 2019,



with a population penetration of 82.6% (see Figure 2). Nigeria, the most populous country on the continent, also has Africa's biggest mobile market by subscriptions, with 170 million mobile subscriptions in 2Q19. The next-biggest markets are South Africa, with 104.3 million mobile subscriptions, and Egypt, with 93.8 million mobile subscriptions. Mobile broadband devices and networks – based on 3G and more advanced technologies – accounted for 57.1% of connections on the continent in 2Q19. A sizeable majority (85.3%) of mobile broadband connections on the continent were accounted for by 3G W-CDMA in 2Q19. LTE accounted for just 14.2% of Africa's mobile broadband connections in 2Q19. 2G GSM still has a substantial market share, accounting for 42.9% of Africa's mobile connections in 2Q19. Fixed broadband household penetration in Africa was about 8.5% at end-2Q19, lower than in any other world region except Central and Southern Asia.

Digital outlook Digital strategies and services outlook

Rising connectivity in Africa is allowing telecoms service providers to move into new service segments. It is also enabling growth in the broader technology sector, including start-ups. In 2018, African tech start-ups raised \$1.16bn in funding, a 108% YoY increase, according to a report by investment firm Partech Africa. Start-ups in Kenya, Nigeria, South Africa, and Egypt received the most funding. By service sector, financial services

accounted for 50% of the funding, followed by B2B services, and consumer services.

Service provider digital strategies

Part of MTN's digital strategy is to widen access to data by increasing the roll out of 3G and 4G mobile broadband networks. Another of MTN's efforts to increase data access, particularly for those on lower incomes, has been its launch of the low-cost smart feature phone that uses the Kai operating system. MTN said it had sold 281,000 of the device, the Smart S, by the end of June 2019. MTN said that its new messaging service, Ayoba, will also help to increase data adoption. By June 2019, MTN had launched Ayoba in three markets and the service had 300,000 active users. MTN has also identified fintech as a major growth sector, while in digital media it has launched its own prepaid music streaming service, MusicTime! Vodacom aims to transform itself from a traditional telco to "a fully-fledged digital services company," CEO Shameel Joosub wrote in the company's report for the year to March 2019.

Vodacom will focus on developing its financial services including M-Pesa, and encouraging take-up of its digital media offering, according to Joosub. In digital media, Vodacom offers video and music services and is developing a gaming platform. Vodacom offers a range of IoT services for enterprises and consumers, and the company is acquiring IoT specialist IoT.nxt to expand its capabilities in the segment. In enterprise services, Vodacom has formed a partnership with AWS

that will allow Vodacom to sell cloud-based technology and services. Vodacom is also using AI, automation, and big data to improve operational efficiency and business returns.

Mobile financial services

Mobile financial services continue to be the most important category of digital services for most African operators. For example, MTN Group's fintech revenue increased by 30.7% YoY in 1H19 and it had 30 million active users for its mobile money service at end-June 2019. Additionally, MTN has said that it plans to integrate payments into messaging service Ayoba. Significantly, Nigeria recently introduced regulations that will allow telecoms operators to offer financial services, in a development that could enable the kind of growth in mobile financial services in Nigeria

"Rising connectivity in Africa is allowing telecoms service providers to move into new service segments. It is also enabling growth in the broader technology sector, including start-ups"

that has already taken place in some other markets on the continent. In July 2019, MTN Nigeria – the country's biggest mobile operator – was awarded a Super Agent license by the Central Bank of Nigeria, which MTN said would allow it to offer financial services more widely in the country. MTN Nigeria also hopes to be awarded a Payment Service Bank license, which will allow it to offer a broader range of fintech services. Airtel Africa said that the 42% growth in its mobile money revenue over the year to June 2019 was largely due to the expansion of its distribution network including kiosks, branches, and merchant partners. Airtel Africa is also preparing to launch its mobile money service in Nigeria. Vodacom said in its June 2019 trading update that it aims to strengthen its financial services business through its planned acquisition, through a joint venture with Safaricom, of the M-Pesa brand and platform from the UK's Vodafone. The move could make it easier for Vodacom and Safaricom to develop new financial products and services for African markets. Vodacom has a 35% stake in Safaricom. Vodacom recently launched the VodaPay Masterpass, an app-based digital wallet that can be used to pay bills and to buy goods and services.

Enterprise digital services

Enterprises in South Africa are keen to digitize processes and operations, to cut costs, and improve efficiency, according to recent research by Omdia. And those enterprises are looking for service providers that can not only help them to transform their operations, but can also support them in their wider plans such as global expansion. Enterprises also see mobile and social platforms as being key for customer engagement and marketing, so service providers should focus on mobile applications.

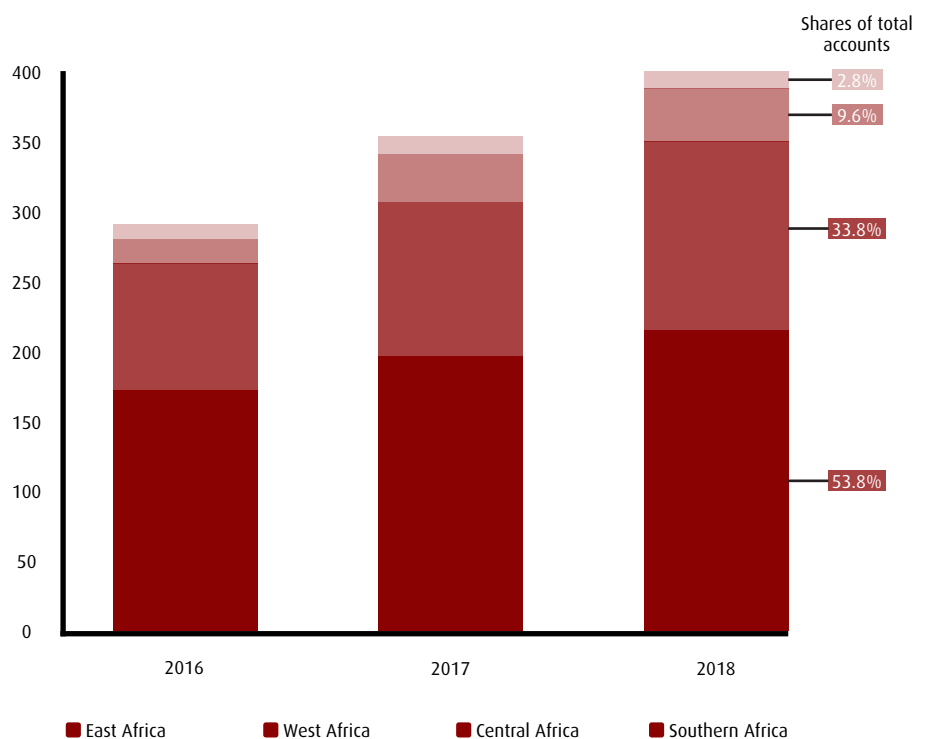
Below is taken from the GSMA report: The Mobile Economy Sub-Saharan Africa 2019

Expansion of the mobile money ecosystem

Sub-Saharan Africa remains a hotbed for mobile money services. By the end of 2018, there were 395.7 million registered mobile money accounts in the region, representing nearly half of total global mobile money accounts. The region is now served by more than 130 live mobile money services, many of them led by mobile operators, and a network of more than 1.4 million active agents. Today, more than 60% of the adult population in a growing number of countries, including Ghana, Kenya and Zimbabwe, has a mobile money account.

Over the past year, several underserved markets

Nearly 9 in 10 registered mobile money accounts are in East and West Africa – registered accounts (million) SOURCE: GSMA



in the region have taken steps to accelerate mobile money adoption and, by extension, financial inclusion among citizens. In Nigeria, regulatory reforms introduced in October 2018 allow mobile operators to obtain licences to operate payment service banks (PSBs), while in Ethiopia an ambitious financial inclusion strategy has been attracting investment into mobile money services. Meanwhile, the Angola national bank plans to submit new laws governing payment systems, including mobile payments, to parliament for approval in 2019.

These developments notwithstanding, future growth of mobile money services in the region will be largely driven by interoperability of mobile money services. Account-to-account (A2A) interoperability gives users the ability to transfer between customer accounts held with different mobile money providers and other financial system players. Tanzania led the way in 2014, but several countries across the region, including Kenya, Rwanda, Nigeria and Ghana, have now launched interoperability projects and use cases. Mobile money providers' integration with banks is one particular use case that has significantly increased volumes moving between mobile money and banking systems.

A next step in the interoperability journey will be implementation of innovative solutions to integrate mobile money platforms with the broader financial ecosystem. A number of options exist around central switching infrastructure for the industry to enable nascent use cases to scale, including merchant payments and efficient connections to domestic and international financial system players. This is already happening at sub-regional levels. For example, the eight

countries of the West African Economic Monetary Union (WAEMU) are building an interoperable system that will connect 110 million people to more than 125 banks, dozens of e-money issuers, and more than 600 micro finance institutions.

However, much of the existing bank-focused infrastructure is not optimal for mobile money. In an effort to solve this, MTN and Orange, with the support of the GSMA, launched a joint venture to enable interoperable payments across Africa. Known as Mowali ('mobile wallet interoperability'), the service is open to any mobile money provider in Africa, as well as banks, money transfer operators and other financial services providers. With its pan-African footprint allowing for economies of scale and a cost-recovery commercial model, Mowali has the potential to drive down the price of services offered to lower-income customers. Additionally, Mowali could shape the future of the mobile money ecosystem in the region by creating a common mobile money acceptance brand with the potential to connect fintechs, banks, merchants and other ecosystem players to nearly 400 million mobile money accounts across Africa.

The rise of the platform economy

Mobile-enabled platforms are increasingly disrupting traditional value chains in different verticals across the region. These platforms – mostly developed by a rapidly expanding local tech start-up ecosystem – aim to eliminate inefficiencies in conventional business models, as well as extend the reach of services and

provide greater choice to customers. Four key verticals on which mobile platforms are having a significant impact are financial services, commerce, transport and logistics.

Financial services

Over the last 12–18 months, Sub-Saharan Africa has emerged as one of the fastest growing fintech hubs in the world in terms of investments, albeit from a low base. Investment in African fintechs nearly quadrupled in 2018 to \$357 million, with startups in Kenya, Nigeria and South Africa accounting for the largest share. This trend has continued into 2019, with a number of high-profile deals. For example, three Nigerian fintech start-ups – Kudi, OneFi and TeamApt – each raised around \$5 million in funding during the first half of the year.

Commerce

E-commerce is on the rise in Africa; e-commerce sales in the region reached \$16.5 billion in 2017 and are expected to reach \$29 billion by 2022. This trend is primarily driven by lifestyle changes among the expanding middle class, increasing internet and smartphone adoption, and the growth of digital payment solutions.

Mobile money, in particular, has become a key enabler of e-commerce, by facilitating online payments amid low bank card penetration and the risks associated with cash-on-delivery. In Kenya, the Central Bank has attributed the growth in mobile money transactions to e-commerce adoption. Safaricom's recent payment partnerships with PayPal and Aliexpress.com further open up global marketplaces to Kenyan consumers and entrepreneurs.

Leading e-commerce platforms in the region:

- Jumia – the largest e-commerce retailer in Nigeria with operations spread across 14 countries. Jumia's post-IPO results showed that gross merchandise value for the first quarter of 2019 grew by 58% year-on-year to €240 million.
- Mall for Africa – enables local buyers to directly purchase goods from global retailers online. It is present in 15 countries across the region.
- Takealot – the largest e-commerce retailer in South Africa. Takealot is majority owned by Naspers and Tiger Global following significant investments in 2017 and 2014, respectively.

Safaricom's Masoko

In November 2017, Safaricom became the first mobile operator in Africa to launch an independent e-commerce platform, as part of plans to grow revenues outside its core connectivity business. The e-commerce platform, Masoko, builds on the reputation and trust of Safaricom's successful mobile

money proposition, M-Pesa, which can be used to complete transactions on the platform. Safaricom also offers other payment methods (such as VISA and MasterCard) but does not provide the option of cash-on-delivery. As a payment service provider itself, Safaricom can guarantee payment for an order the moment it is placed – a core added value.

Masoko follows the marketplace model used by Amazon and Alibaba. While it screens merchants and provides e-commerce enablement services (such as payment processing and customer support channels), it operates on an asset-light basis and does not own the inventory on offer. With regards to logistics, Safaricom leverages its sizeable mobile money agent network (160,000+) as delivery and collection points, as well as multiple delivery partners. This approach enables Masoko to deliver products to 45 of 47 counties in Kenya. By November 2018, Masoko had 120 (pre-approved) active vendors and more than 30,000 stock keeping units (SKUs) on the website.

Transport

Increasing urbanisation across Sub-Saharan Africa means more people will rely on public transportation. However, conventional public transport services in many parts of the region are notoriously inefficient and fraught with poor quality and safety standards. The arrival of global taxi-hailing service Uber in 2013 and Taxify (now Bolt) a few years later has started to change that narrative. Today, both services are well established in major cities across the region, with an estimated 4 million active passengers between them. In recent years, a number of homegrown platforms have emerged to challenge the established platforms, and create solutions that aim to address uniquely local transport challenges.

The disruption of the transport sector using digital technologies has significant implications for society. The solutions offered by transport platforms are often designed to provide greater safety, convenience and predictability for users. There is also the potential for increased transparency in revenue collection and usage to support governments' scale and planning objectives.

Côte d'Ivoire: mTick enables passengers to pay for bus tickets via mobile money, eliminating the risks and inconvenience of making cash payments in person, while also enabling transport companies to receive and monitor sales updates in real-time, reducing losses due to fraud.

Uganda: SafeBoda is one of several ride-hailing apps for motor cycle transportation – one of the most popular forms of urban transit – in the region. Kampala-headquartered SafeBoda offers on-demand

ride-hailing services in Uganda and Kenya.

South Africa: Lifti is a lift-club app that matches car owners with passengers from the same neighbourhoods. For riders, the service can be up to 90% cheaper than a typical taxi.

Kenya: In early 2019, ride-hailing firm Little launched a bus sharing service in Nairobi to disrupt the widely used but often chaotic Matatu buses. Little Shuttle owns and operates its own buses, with free WiFi and vehicle tracking among the comfort and safety propositions for users. Buupass.com also launched a platform to reserve, book and pay for long-distance bus travel in Kenya, paying remotely by mobile phone.

Logistics

As consumers turn to e-commerce, enabled by increasing connectivity and online payments, there is a growing expectation for safe and speedy delivery of their online purchase. This is a key factor behind the emerging disruption of the hitherto inefficient, expensive and in some cases non-existent last-mile logistics in several countries across the region. While the physical infrastructure challenges still exist (for example, poor road and rail networks and a lack of addressing system), tech start-ups are leveraging digital platforms, such as mapping, tracking and even basic SMS, to optimise deliveries and drive cost efficiencies.

Zambia: In 2016, Musanga Logistics launched an on-demand, mobile-based delivery solution that connects independent cyclists, motorbike riders and truck drivers to those in need of last-mile logistics support. The platform offers a fast, low-cost delivery service within one to three hours in the capital, Lusaka. Users can also track their packages via smartphone until they are delivered. Meanwhile, cyclists and drivers with smartphones and underutilised assets (bicycles, motorbikes or trucks) can earn additional income on the Musanga Logistics online marketplace. Musanga Logistics had more than 1,500 trucks registered on its platform as of early 2019.

In October 2018, Musanga Logistics signed a mobile money integration partnership with MTN Zambia. The partnership simplifies Musanga's payment collection and reduces reliance on cash. It also allows users and drivers to access other mobile financial services on the MTN mobile money platform, such as microloans.

Musanga Logistics has reduced the average customer delivery time in Lusaka from seven to three hours. By making use of underutilised assets, Musanga Logistics has reduced inefficiencies in the supply chain (half-empty trucks doing most deliveries) and the negative per capita environmental impact, thereby contributing to a more sustainable city.

Musanga Logistics received a grant from the GSMA Ecosystem Accelerator Innovation Fund in February 2018 to expand its operations and platform in three cities across Zambia.

Nigeria: Kobo360 launched in Nigeria in 2016, enabling individuals and businesses to schedule pickup of packages, and track the driver to the final destination. Through an integrated system that leverages mobile technology, IoT solutions and data analytics, the platform aims to match a user's request with a selection of trucks, delivery options and transparent pricing within six hours.

The company has partnered with global brands, including Dangote Group, DHL, Unilever and Lafarge, serviced over 1,450 businesses and aggregated a fleet of more than 10,000 drivers and trucks. In the last year, Kobo360 has raised \$7.2 million from investors, including the

IFC, YCombinator, WTI, Cardinal Stone Partners, Chandaria Capital and TLcom, to fund its expansion into other countries in the region. Kobo360 is now present in Ghana, Kenya and Togo, with plans to expand into other countries in the coming years.

Digital transformation is already happening across Sub-Saharan Africa. Increasingly, governments, public institutions, private sector players and development organisations are using digital platforms to increase engagement and improve service delivery to citizens, as well as drive social development and economic growth. With mobile technology at the heart of Sub-Saharan Africa's digital journey, it is essential for policymakers in the region to implement policies and best practices that enable sustainable growth for the mobile industry.

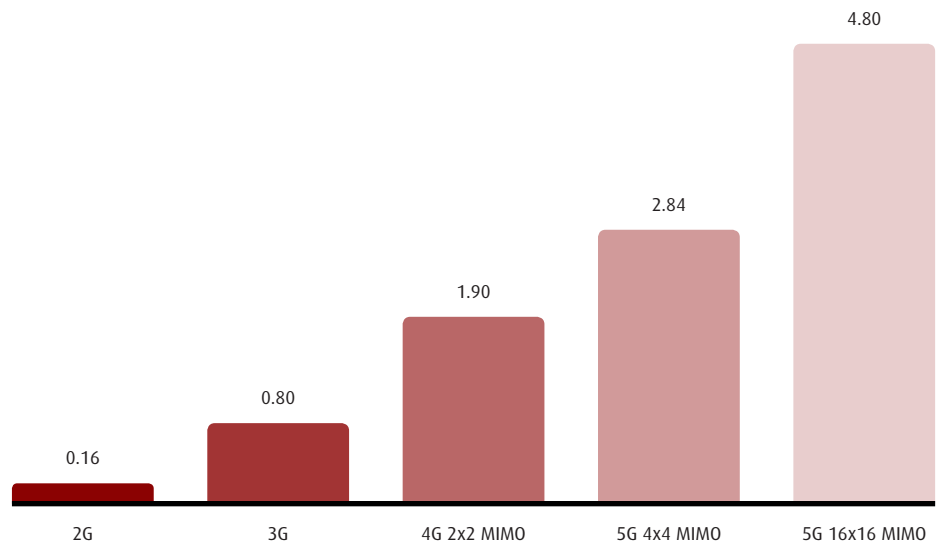
Arguably the most significant enabler is radio spectrum. Efficient and effective management of this vital but finite resource is key to maximising the opportunities that mobile connectivity can bring to society. This is especially important as the region transitions from 2G to next-generation mobile broadband networks. While high mobile broadband speeds and increased mobile data consumption have been proven to generate economic benefits, they also require adequate and sufficient spectrum to function effectively and attract the necessary investment for network infrastructure development. Here, we highlight best practices for two key areas: technology-neutral spectrum licensing and spectrum auctions.

The need for technology-neutral spectrum licensing

For governments that want consumers and businesses to benefit from the best possible mobile broadband experience, support for technology-neutral spectrum licensing is a must. It is widely recognised as best practice when assigning spectrum to mobile operators.

Regional Average spectral efficiencies (bits per Hz)

SOURCE: GSMA



It enables 2G or 3G spectrum to be reformed for 4G as well as 5G, at a pace driven by market demand. Beyond mobile broadband, the rapidly growing IoT market is also making the need to adopt neutral licences more urgent.

To get technology neutrality right, key considerations include the following:

- Attempts to extract additional revenue have misfired and held back the introduction of new mobile technologies.
- While a renewal process provides an opportunity to re-issue spectrum licences as neutral, regulators should not delay the introduction by waiting for the expiry dates of existing licences.
- When assigning new spectrum, regulators should do so in a technology-neutral manner or at the very least not restrict the introduction of next-generation technologies, such as 5G.

Some countries in the region have not yet moved to technology-neutral spectrum licences and are still issuing technology-specific licences or have not decoupled spectrum licences from operating licences. This means consumers and businesses do not benefit from the best possible mobile broadband experience and can end up paying more for inferior services.

Senegal provides an example of where a technology-specific 4G licence has been issued. The 800 MHz licence issued to Sonatel in 2016 has a duration of 17 years and is technology specific to 4G. It is highly likely that prior to the expiration of the 4G licence the operator will want to reform at least one 2x5 MHz block of the 800 MHz to 5G. With 5G on the horizon, mobile operators elsewhere are taking advantage of specifications that allow 4G and 5G to operate in the same radio to deploy multi-mode radios capable of 4G and 5G with a software upgrade. Regulators that issue 4G spectrum licences are limiting the use of spectrum to what could be a legacy technology before the expiration of the licence.

If spectral efficiency is to be maximised, operators need to be free to deploy the latest technology. For example, using 4G (LTE) rather than 2G (GSM), operators can produce much higher levels of throughput for the same cost (a lower cost per bit). This enables mobile operators to offer their customers large data bundles at the same cost.

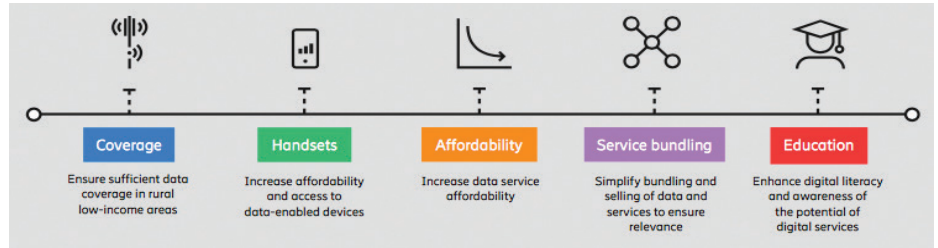
Creating an effective framework for spectrum auctions

Over the past three decades, auctions have become the dominant mechanism for mobile spectrum assignment. They were designed to provide a transparent, impartial and legally robust means of assigning spectrum to those who will use it most efficiently to support competitive, high-quality mobile services. Alternative approaches such as administrative awards and beauty contests have generally proved less able to assign spectrum in an efficient, impartial and legally robust way. Against this backdrop, effective auction design has become vital to delivering the best possible mobile services. The GSMA public policy on spectrum auctions outlines 10 best-practice positions:

- 1. Spectrum auctions should support affordable, high-quality mobile services** – Given the limited supply of mobile spectrum, the primary goal should be to ensure spectrum is awarded to operators who will use it most efficiently to support affordable, high-quality mobile services.
- 2. Auctions are a tried and tested award mechanism but can and do fail when poorly designed** – Failures are frequently due to the auction design or wider regulatory issues, such as high reserve prices, artificial spectrum scarcity and auction rules which prevent price discovery or flexible bidding.
- 3. Auctions should not be the only award process as they are not always suitable** –

For example, alternatives to auctions can be considered when there is evidence of lack of excess demand, or when all qualified operators and the government/regulator are able to find a mutually agreeable split of the spectrum on offer at a fair price. Auctions are almost always inappropriate for renewing expiring mobile spectrum licences. The key focus for renewals should be to provide the predictability licence holders need to invest heavily in their networks throughout the term of the licence.

4. **Auctions that are designed to maximise state revenues risk impacting consumers** – Policy measures that inflate the price of spectrum can result in spectrum remaining unsold, or sold at such a high price that the affordability and quality of services are adversely affected, thus impacting the broader digital economy.
5. **Assign a sufficiently large amount of spectrum and publish future spectrum roadmaps to support high-quality mobile services** – Regulators should publish, and regularly update, a spectrum roadmap for at least the following five years, detailing how much is planned to be made available in which bands and when.
6. **Spectrum caps and set-asides distort the level playing field** – Setting aside spectrum or stipulating spectrum caps can restrict the amount operators can access, which in turn can negatively impact mobile broadband speed and coverage, and inflate spectrum prices.
7. **Licence obligations and conditions should be designed to minimise the cost of covering non-profitable areas** – Coverage obligations should be used with caution. They should not result in inefficient duplication of networks in non-profitable areas or distort efficient assignments. As a first step, once policymakers have decided which objectives they wish to prioritise, they should consult with



stakeholders on how best to achieve them.

8. **The chosen auction design should not create additional risk and uncertainty for bidders** – There is no single auction design for all types of spectrum award; factors such as individual market dynamics and the type and amount of spectrum auctioned need to be factored into the auction design.
9. **Poorly chosen lot sizes or inflexible packages of spectrum lots risk inefficient outcomes** – Auctioning frequency-specific lots can lead to distortions. Auctions should be designed to allow operators to secure the optimum spectrum to meet their needs (e.g. amount, type and location)
10. **Policymakers should work in partnership with stakeholders to enable timely, fair and effective awards** – A comprehensive consultation with all stakeholders allows sufficient time for all issues to be adequately discussed and where necessary revised. Mobile users and the wider digital economy are best served when key spectrum management decisions support sustainable growth in the mobile industry. To this end, telecoms regulators and policymakers should take steps to make all existing spectrum licences technology neutral, ensure the spectrum will be made available in time to meet market demand, and adopt spectrum auction best practices for continued investment in next-generation mobile networks and cutting-edge mobile services.

The Ericsson Mobility Report provides key industry projections and analyses of the latest trends in the mobile industry, including subscription, mobile data traffic and population coverage. The following was taken from the June 2019 edition

In the India region, LTE subscriptions are forecast to increase by 150 million during 2019 and pass GSM/EDGE as the dominant technology. Mobile broadband1 technologies will account for 57 percent of mobile subscriptions at the end of the year, and the share of smartphone subscriptions is expected to have increased from 48 percent to 54 percent.

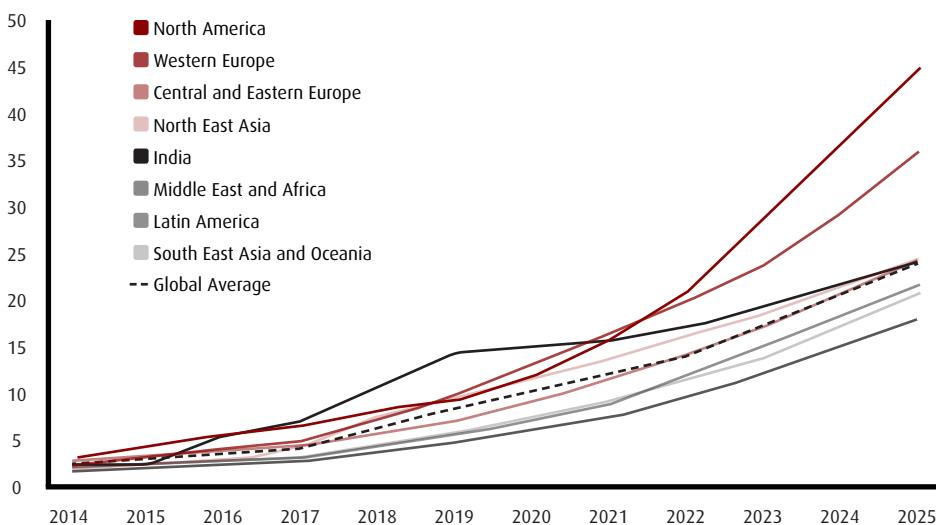
As the transformation toward more advanced technologies continues in India, LTE is forecast to represent 80 percent of mobile subscriptions by the end of 2025. 5G subscriptions are expected to become available in 2022 and will represent 11 percent of mobile subscriptions at the end of 2025.

The Middle East and Africa comprises over 70 countries and is a diverse region. It varies from advanced markets with 100 percent mobile broadband subscription penetration, to emerging markets, where around 40 percent of mobile subscriptions are for mobile broadband. At the end of 2019, around 25 percent of mobile subscriptions are expected to be for LTE in the Middle East and North Africa, while in Sub-Saharan Africa, LTE will account for around 11 percent of subscriptions. The region is anticipated to evolve over the forecast period, and by 2025, 82 percent of subscriptions in the Middle East and North Africa are expected to be for mobile broadband, while in Sub-Saharan Africa mobile broadband subscriptions will increase to reach around 70 percent of mobile subscriptions. Driving factors behind this shift include a young and growing population with increasing digital skills, as well as more affordable smartphones.

The Middle East and Africa region is expected to have the highest growth rate during the forecast period, increasing total mobile data traffic by a factor of 7 between 2019 and 2025. The average data per smartphone is expected to reach 18GB per user per month in 2025 in the

Regional Average spectral efficiencies (bits per Hz)

SOURCE: GSMA



Middle East and Africa region – as Sub-Saharan Africa is expected to reach on average 7GB.

Network performance as a lever for business growth

Of the global population, 13 percent lives in Sub-Saharan Africa, which is served by less than 2 percent of the mobile base stations installed worldwide. Mobile data penetration is relatively low, with data usage, smartphone penetration and 4G population coverage all only around 30 percent. However, there is increasing demand for digital services and financial inclusion, including in rural low-income areas.

Operating in 21 markets across the Middle East and Africa, MTN is pursuing 6 distinct growth opportunities, 4 of which target the consumer segment. Voice is still a significant business, presently generating almost three times more revenue than data does for MTN. However, the data revenue market is projected to increase at a compound annual growth rate (CAGR) of 20 percent in MTN markets over the coming 3 years, while the voice revenue market is expected to decline at a rate of 2 percent over the same period. Nevertheless, MTN continues to protect and increase its voice business, while pursuing data revenues to drive growth. Another ambition is to increase revenues from new digital services (mobile music, advanced messaging, mobile advertising and local content). However, from its small base, an expected 50 percent CAGR will bring the market size in 2021 to only about one-tenth of that for data and voice respectively. The fourth opportunity is financial services (mobile money, banking and insurance). MTN considers data to be its core medium-term growth driver and is deploying 3G and 4G network technologies to provide sufficient data coverage in rural areas to meet increasing demand.

In the Sub-Saharan Africa region, mobile broadband subscription penetration of the population is approximately 30 percent, but – with a young and fast-growing population – it is forecast to reach over 50 percent by the end of 2025. With customers still early in the data adoption journey, MTN is focused on realizing its belief that everyone deserves the benefits

of a modern connected life, and contributing to the UN's Sustainable Development Goals, which include reducing poverty, improving health and wellbeing, and stimulating economic growth.

Strategy to connect the unconnected MTN applies a “connect the unconnected” strategy, named CHASE. It includes initiatives to build sufficient data coverage in rural low-income areas, to make data-enabled devices accessible and affordable, to promote mobile money solutions for those without banking opportunities, and to expand awareness and availability of digital services.

A cornerstone of MTN's operational strategy is to achieve best network performance in its markets by 2022. Initiatives include employing rural coverage solutions to increase 3G and 4G population coverage, plus steps to improve network quality and user experience to become a leader in network Net Promoter Score (NPS). These initiatives support an overall objective of providing best customer experience in markets where MTN is present.

Customer experience program: a structured approach MTN's objective of improving overall customer experience is built into the entire group's processes. In addition, there is dedicated management and governance directing central and local expertise in a program to identify network quality issues and implement appropriate improvements – reusing best practices across the different markets, including forward-looking services and recommendations for constant performance improvements.

Important measures when improving network quality are moving subscribers to the highest possible network layer, activation of key software features, removal of inconsistencies and alignment of parameters supporting selected network improvements.

MTN applies this methodology in several markets across the Sub-Saharan region. Two examples are Rwanda and Ghana, which illustrate different aspects of the strategy.

Network improvements in Rwanda

Rwanda is a country in central Africa, with a young, mostly rural population of nearly 13 million. It is very densely populated, with an average of 460 people per square kilometer. Over

80 percent of inhabitants live in rural areas.

The mobile internet user penetration is around 40 percent in Rwanda, indicating strong growth potential for mobile broadband, addressable by expanding 3G/4G network coverage into rural and other previously under-served areas.

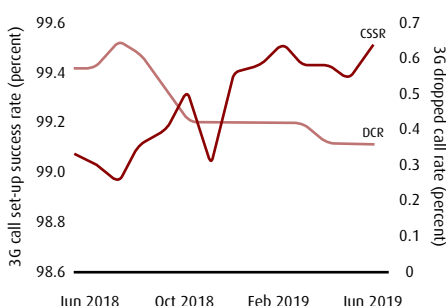
The 3G/4G subscription uptake is forecast to be high, driven by more affordable data plans. Monthly average revenue per user (ARPU) was USD2.24 in Q2 2019. Rwanda currently has a single 4G wholesale network with national roaming. Consequently, MTN's focus is to extend and improve its 3G coverage. It does this through aligning network and handset planning, and focusing on voice stability and data growth. Economically, expanding rural coverage requires cost optimization through prioritized capex planning and opex optimization.

MTN Rwanda's 2G network carries one of the highest average loads of data traffic per site and voice traffic per subscriber in the region. In 2018, there was high growth in smartphone usage and average data consumption in the MTN Rwanda network, driven by significantly improved 3G coverage and a growing customer base with 3G/4G devices. UTMS 900MHz technology was deployed to enhance internet coverage, cater for data traffic growth and improve data speeds across the countrywide network.

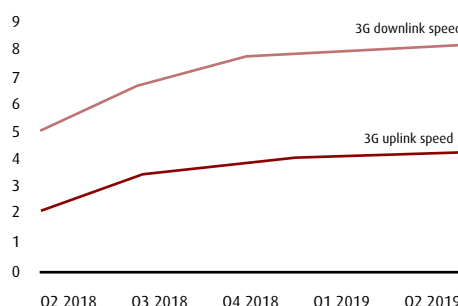
During 2019, MTN rolled out more capacity and additional sites on its 3G network to drive efficiency and better customer experience. Steps included adding software features and parameter settings to improve voice accessibility, call set-up time, and 3G data uplink coverage and capacity.

From Q2 2018 to Q2 2019, MTN Rwanda's network improvements led to positive developments across the board, with all key network indicators improving, including call set-up success rates and dropped-call rates. The network KPIs and data from performance monitor (PM) counters, combined with improving median uplink and downlink speeds gathered from drive tests, are correlated with the network NPS data. Recent root cause analysis of the network NPS data indicates the positive contribution of a good, reliable, strong and fast internet connection.

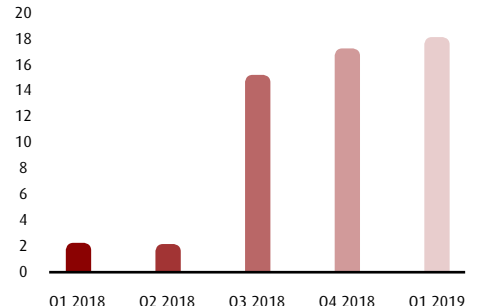
MTN Rwanda – voice 3G



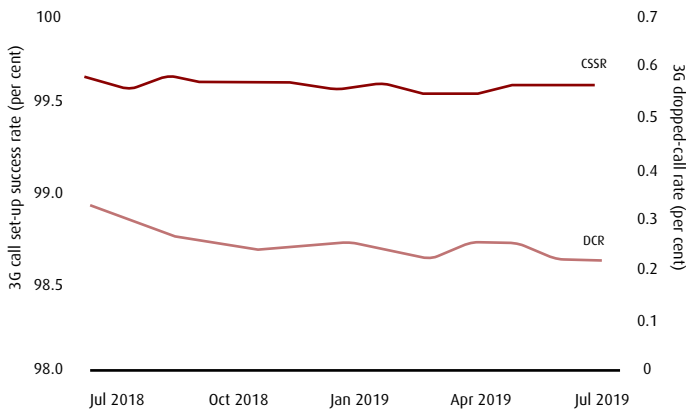
MTN Rwanda – data 3G (Mbps)



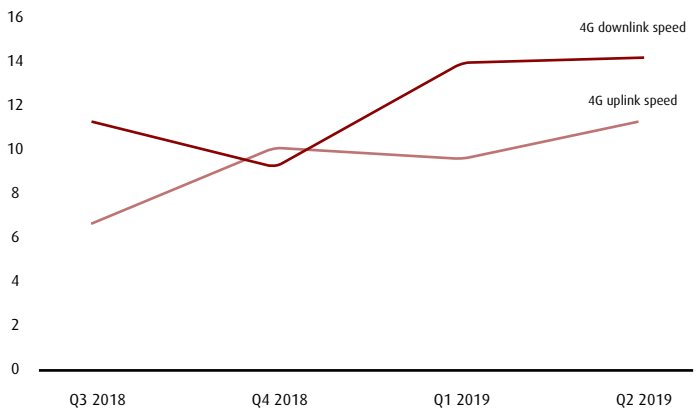
MTN Rwanda network NPS (per cent)



MTN Ghana – voice 3G



MTN Ghana – data 4G (Mbps)



The network improvements and customer satisfaction increases are reflected in solid business performance for MTN Rwanda. This includes a market share increase of 11 percentage points to 54 percent at the end of the first half of 2019, compared with the first half of 2018, as subscribers grew by 23 percent – with revenue and EBITDA up 27 percent and 24 percent respectively over the same period.

Network improvements in Ghana

Ghana, in West Africa, is a nation of 30 million inhabitants with a moderate population density of 130 people per square kilometer.

The mobile internet user penetration is around 30 percent, ARPU is over USD 4 per month, and service revenues are increasing at more than 20 percent per year.

MTN Ghana network improvements during 2018–2019 have included expanding and densifying 3G and 4G, as well as optimizing each access layer in turn, steered by KPIs covering availability, retainability, quality and traffic volume.

The 4G share of devices is rapidly increasing, driving data traffic volumes. with over two-thirds

of the total data traffic volume coming from 4G devices. The number of 4G devices is projected to outnumber that of 3G devices by early 2020.

With low voice tariffs, average voice traffic per device in the network is very high. Around half of voice traffic comes from 2G devices, while the 2G network carries two-thirds of voice traffic.

From Q2 2018 to Q2 2019, the MTN Ghana network improvements also led to better KPIs, including call set-up success rates and dropped-call rates. As in Rwanda, Ghana's KPIs were tracked along with data from PM counters, and matched with improving median uplink and downlink speeds gathered from drive tests to be correlated with network NPS data. Recent root cause analysis of these scores highlighted the positive contribution of good coverage and data speeds.

The network and customer satisfaction improvements translated into positive business results. Comparing MTN Ghana's first half of 2019 with the first half of 2018, voice revenue was up 13 percent, and data revenue increased by 26 percent. Overall, in constant currency, revenues increased 19 percent and EBITDA increased 24 percent over the same time period.

Leveraging network performance to address growth opportunities

The effects of network improvements on customer loyalty are measured monthly through NPS, then disaggregated into major root causes, including network performance. NPS benchmarking illustrates how user-experience improvements translate into loyalty. The network NPS is further separated into detailed root causes to analyse contributing factors.

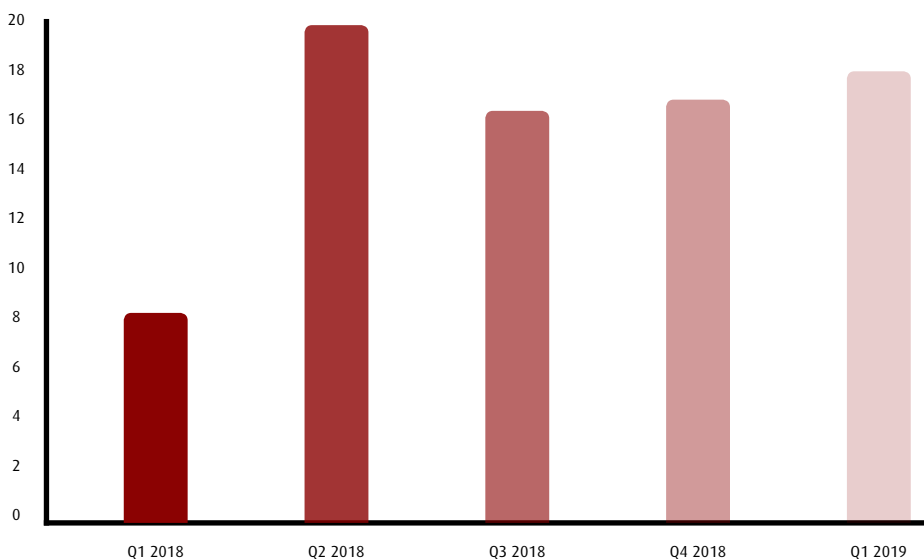
It has substantially evolved over the past year, allowing greater precision in assessing network improvements, and is a major component in gauging performance throughout the MTN group. All network improvements are carried out within the context of actively lifting users to the highest network technology possible, to optimize the cost per Erlang (voice) and gigabyte (data) served. Integral to this is the smart capex concept which involves ranking and prioritizing radio sites identified for improvements. The goal of smart capex is to achieve the greatest return from budgeted network investments.

From network KPIs and NPS benchmarking to business performance, both Rwanda and Ghana's networks are improving user experience and results, while expanding further into rural areas and offering services to connect the unconnected. While much attention worldwide is focused on initial 5G roll-outs, for many regions the reality is continued demand for expanding 2G, 3G and 4G network coverage and capacity. The insight from these countries is that customer satisfaction and commercial success are not mutually exclusive but require regular and consistent processes to expand and optimize network services.

Regional subscriptions outlook

In Sub-Saharan Africa, LTE accounted for around 11 percent of subscriptions in 2019. Over the forecast period mobile

MTN Ghana network NPS (per cent)



broadband subscriptions are predicted to increase, reaching over 70 percent of mobile subscriptions. LTE share will reach around 30 percent by the end of the forecast period, but HSPA will remain the dominant technology with a share of around 40 percent, which is similar to 2019. Driving factors behind the growth of mobile broadband subscriptions include a young, growing population with increasing digital skills, and more affordable smartphones. Over the forecast period, discernible volumes of 5G subscriptions are expected from 2022, reaching 3 percent by 2025. In the Middle East and North Africa region, around 23 percent of mobile subscriptions were for LTE at the end of 2019. The region is anticipated to evolve over the forecast period, and by 2025, 77 percent of subscriptions are expected to be for mobile broadband. Commercial 5G deployments with leading service providers have taken place here during 2019 and 5G subscriptions have already passed 500,000, mainly in the Gulf countries. Significant volumes are expected in 2021 and the region is likely to reach around 80 million 5G subscriptions by 2025, representing around 10 percent of total mobile subscriptions.

Voice and communication services trends and outlook

VoLTE is the foundation for enabling globally interoperable voice and communication services on 4G and 5G devices. Subscriptions are expected to reach 3 billion by the end of 2020.

Reliable, high-quality voice services are more crucial than ever. Service providers continue to evolve their networks to support VoLTE-based services. These have now been launched in more than 210 networks in 100 countries. VoLTE services are being deployed using cloud technologies to enable cost-efficient network operations, easier capacity scaling and faster service deployment.

VoLTE subscriptions are estimated to reach 3 billion at the end of 2020 and 6.4 billion by the end of 2025. This will account for almost 90 percent of all combined LTE and 5G subscriptions. The shutdown of 2G and 3G networks will accelerate VoLTE adoption and VoLTE roaming agreements. VoLTE will support subscribers and roamers with voice services, as the current most used 4G voice solution, Circuit-Switched Fallback (CSFB), will not work without 2G or 3G. VoLTE (using IP Multimedia Subsystem, or IMS) is also the foundation for enabling 5G voice calls, SMS, rich communications services (RCS), and new communication services on 5G devices. IMS is the only standardized voice solution for 5G, and there is no CSFB of voice from 5G. 5G voice will be deployed stepwise in 4G and

5G networks, using LTE-NR dual connectivity, Evolved Packet System fallback and voice over New Radio (VoNR). Successful end-to-end testing of 5G voice (VoNR) and 5G video calling with network infrastructure and the device ecosystem has been conducted.

Device availability and use case uptake There are over 2,650 VoLTE-enabled 4G devices, of which around 85 percent are phones. More than 40 5G phones include VoLTE support. VoLTE-enabled smartphones also have enhanced functionalities, such as the latest voice codecs and native video calling. There are more than 165 models supporting HD Voice+ (Evolved Voice System, or EVS), and more than 400 devices capable of video calling over LTE (ViLTE).

The latest service provider market offering is smart speakers with voice calling capabilities, using the same mobile phone number as that of a smartphone. This builds on VoLTE multi-device network capabilities which tie several devices, such as phones, smartwatches and smart speakers, to the same phone number. Over 90 service provider networks support cellular smartwatches enabled with voice services.

Other VoLTE-based services include additional phone lines on the same phone, shared phone lines, video calling, enterprise collaboration services in combination with mobile HD voice, and voice for IoT devices. 5G-related service innovations for consumers, enterprises and industries are being explored, including combinations with AR and VR. 5G interactive calling – combining a 5G voice call with real-time content sharing, for example, joint web browsing on 5G smartphones, or business and enterprise media sharing between different devices and endpoints – could become a radically improved, mainstream 5G voice service in the future.

Analysis of VoLTE usage across Europe during the weeks before and after the recent global lockdowns began revealed a significant increase in traffic, mainly due to longer call times. Due to reduced mobility of users across networks, the retainability of voice calls was improved. The VoLTE traffic increase varied by 20–50 percent across different markets in Europe. In some other markets, service providers experienced up to a 90 percent increase in Voice over Wi-Fi calls as people spent more time at home.

Mobile data traffic outlook

In 2025, 5G networks will carry nearly half of the world's mobile data traffic. Global total mobile data traffic reached around 33EB per month by the end of 2019, and is projected to grow by a factor close to 5 to reach 164EB

per month in 2025. This figure represents the mobile data that will be consumed by over 6 billion people using smartphones, laptops and a multitude of new devices at that time. Smartphones continue to be at the epicenter of this development as they generate most of the mobile data traffic – about 95 percent – today, a share that is projected to increase throughout the forecast period.

Populous markets that launch 5G early are likely to lead traffic growth over the forecast period. By 2025, we expect that 45 percent of total mobile data traffic will be carried by 5G networks.

Traffic growth can be very volatile between years, and can also vary significantly between countries, depending on local market dynamics. In the US, the traffic growth rate declined slightly during 2018 but recovered to previously expected rates during 2019. In China, 2018 was a year of record traffic growth. India's traffic growth continued its upward trajectory and it remains the region with the highest usage per smartphone and per month.

Globally, the growth in mobile data traffic per smartphone can be attributed to three main drivers: improved device capabilities, an increase in data-intensive content and more affordable data plans.

In the India region, the average monthly mobile data usage per smartphone continues to show robust growth, boosted by the rapid adoption of 4G. Low prices for mobile broadband services, affordable smartphones and people's changing video viewing habits have continued to drive monthly usage growth in the region. Only 4 percent of households have fixed broadband, making smartphones the only way to access the internet in many cases.

Total traffic is projected to triple, reaching 21EB per month in 2025. This comes from two factors: high growth in the number of smartphone users, including growth in rural areas, and an increase in average usage per smartphone. A total of around 410 million additional smartphone users are expected in India by 2025. Even if the traffic per existing smartphone user continues to grow significantly over time, the increase in average traffic per smartphone is expected to moderate as more consumers in India acquire smartphones. The average traffic per smartphone is expected to increase to around 25GB per month in 2025.

The Middle East and North Africa region is expected to have one of the highest growth rates during the forecast period, increasing total mobile data traffic by a factor of almost 9 between 2019 and 2025. The average data per smartphone is expected to reach 23GB per month in 2025. Sub-Saharan Africa also has a very high growth rate, but from a relatively small base, with total traffic increasing from

0.33EB per month to 4EB by 2025. Average traffic per smartphone is expected to reach 7.1GB over the forecast period

The Fourth Industrial Revolution and digitisation will transform Africa into a global powerhouse



Landry Signé,
senior fellow,
The Brookings
Institution,
global economy
and development
program

The Fourth Industrial Revolution (4IR)—characterized by the fusion of the digital, biological, and physical worlds, as well as the growing utilization of new technologies such as artificial intelligence, cloud computing, robotics, 3D printing, the Internet of Things, and advanced wireless technologies, among others—has ushered in a new era of economic disruption with uncertain socio-economic consequences for Africa. However, Africa has been left behind during the past industrial revolutions. Will this time be different?

So far, it does not appear that Africa has yet claimed the 21st century, as it still lags behind in several indicators essential for a successful digital revolution (see Figure 5.1).

Improvements in Africa's ICT sector have been largely driven by expanding mobile digital financial services: The region had nearly half of global mobile money accounts in 2018 and will see the fastest growth in mobile money through 2025.

But artificial intelligence (AI) and blockchain are also attracting interest in Africa, as they have the potential to successfully address social and economic challenges there. And there are so many other areas in which 4IR technology can be transformational.

The transformative potential of 4IR in Africa is substantial

Encouraging economic growth and structural transformation

In recent years, the ICT sector in Africa has continued to grow, a trend that is likely to continue. Of late, mobile technologies and services have generated 1.7 million direct jobs (both formal and informal), contributed to US\$144 billion of economic value (8.5 percent of the GDP of sub-Saharan Africa), and contributed \$15.6 billion to the public sector through taxation. Digitisation has also resolved information asymmetry problems in the financial system and labour market, thus increasing efficiency, certainty, and security in an environment where information flow is critical for economic growth and job creation.

Failure to recognize and capitalize on 4IR opportunities, conversely, will impose considerable risks on African stakeholders: Without attempts to move beyond existing models of innovation, entrepreneurship, and digital growth on the continent, African businesses risk falling further behind, exacerbating the global “digital divide” and lowering their global competitiveness. Going beyond the existing models requires discipline in governance to allow an endogenous innovative environment. At the same time, institutions must protect the market through consumer protection laws and regulations that encourage competition.

Fighting poverty and inequality

The spread of digital technologies can empower the poor with access to information, job opportunities, and services that improve their standard of living. AI, the Internet of Things (IoT), and blockchain can enhance opportunities for data gathering and analysis for more targeted and effective poverty reduction strategies. Already, we have witnessed the transformational power of formal financial services through mobile phones, such as M-Pesa, reaching the underserved, including women, who are important drivers for sustainable poverty eradication. These financial services allow households to save in secure instruments to enlarge their asset base and escape cycles of poverty.

Reinventing labour, skills, and production

By 2030, Africa's potential workforce will be among the world's largest and so, paired with the needed infrastructure and skills for innovation and technology use, the 4IR represents a massive opportunity for growth. Indeed, the 4IR is dramatically changing global systems of labour and production, requiring that job seekers cultivate the skills and capabilities necessary for adapting rapidly to the needs of African firms and automation more broadly. Already, Africa's working population is becoming better educated and prepared to seize the opportunities provided by the 4IR: For example, the share of workers with at least a secondary education is set to increase from 36 percent in 2010 to 52 percent in 2030.

Increasing financial services and investment

Digitisation has impacted economic growth through inclusive finance, enabling the unbanked to enter formality through retail electronic payments platforms and virtual savings and credit supply technological platforms. More broadly,

digitisation is enabling entrepreneurs and businesses to rethink business models that are more impactful, sustainable, and connected to other sectors of the economy. For example, with fintech, digitization has gone beyond the financial sector to affect the real sector and households, transforming product designs and business models across market segments. Businesses are able to design products and trade online, and individuals are able to operate financial services and payments for shopping and investments. The government is also migrating to online platforms to conveniently provide public services.

Other 4IR technologies are also having impact. For example, in West Africa and Kenya, blockchain has enabled efficient verification of property records and transactions, and expanded access to credit in some previously informal sectors of the economy. Since blockchains are immutable, fraud—and thus the cost of risk—is reduced. There are also immense opportunities for job creation in Africa. Given the informal sector is estimated to constitute 55 percent of sub-Saharan Africa's GDP (with significant heterogeneity across countries), these tools can be transformational. Their consequences can cascade: Increased financial inclusion contributes to greater capital accumulation and investment, hence potential for employment creation.

Modernising agriculture and agro-industries

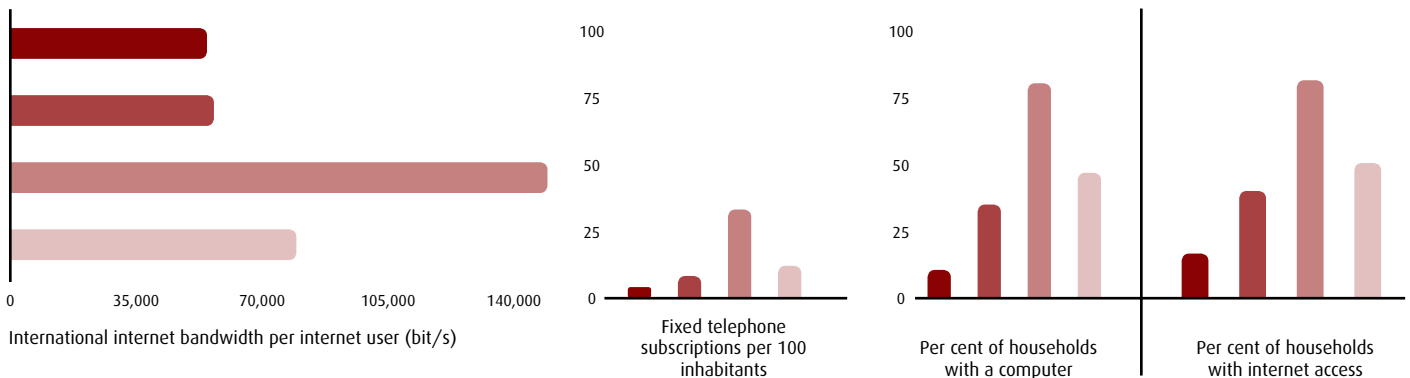
Africa has yet to harness the full potential of its agricultural sector, and 4IR technologies provide an opportunity to do so. Farming alone accounts for 60 percent of total employment in sub-Saharan Africa, and the food system is projected to add more jobs than the rest of the economy between 2010 and 2025. Farm labour and income is especially important in sub-Saharan Africa, where on-farm activities represent almost 50 percent of all rural income in countries like Ethiopia, Malawi, Nigeria, and Tanzania. Information on competitive pricing, monitored crop information, disease prevention tips, and disaster mitigation support has the potential to transform the agriculture sector to improve income, production, and demand throughout the continent. Furthermore, as incomes rise across the continent, growing consumer demand for food and beverages will coincide with business-to-business growth in agro-processing.

Ghana-based companies Farmerline and Agrocenta offer farmers mobile and web technology for agricultural advice, weather information, and financial tips. Zenvus, a Nigerian

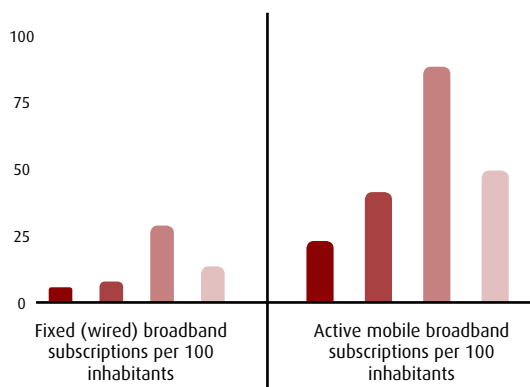
This research was originally published by the Brookings Institution's Africa Growth Initiative. You can find the original paper here: brook.gs/39a40Hl

Africa's ICT development indicators: Africa still lags behind both developed and other developing countries in several indicators essential for the Fourth Industrial Revolution, especially in infrastructure, technology access and education

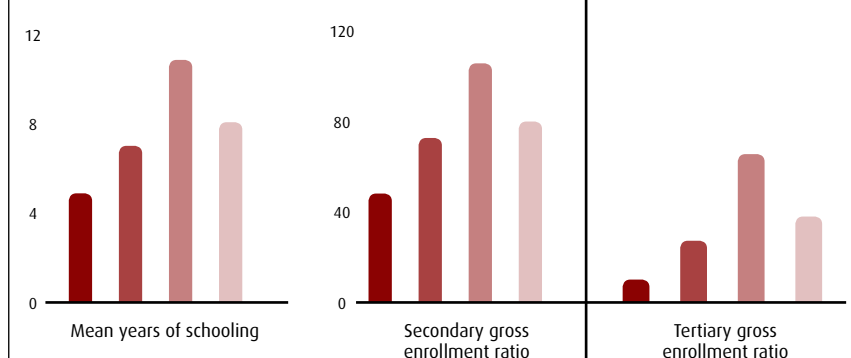
Technology access



Technology use



Technology preparedness



■ Africa ■ All developing countries ■ Developed countries ■ World

startup, measures and analyses soil data to help farmers apply the right fertilizer and optimally irrigate farms. The “Sparky Dryer,” a dehydration machine invented by a Ugandan engineer, uses biofuel to dehydrate produce and reduce food waste. African entrepreneurs and start-ups are also using the Internet of Things to help farmers optimize productivity and reduce waste through data-driven “precision farming” techniques.

Improving health care and human capital

African countries face numerous health challenges exacerbated by climate change, limited physical infrastructure, and a lack of qualified professionals. 4IR technology can help mitigate these threats and build sustainable health care systems, especially in fragile states.

Mobile technology has become a platform for improving medical data and service delivery: About 27,000 public health workers in Uganda use a mobile system called mTrac to report medicine stocks. The SMS for Life program, a

public-private partnership, reduces medicine shortages in primary health care facilities by using mobile phones to track and manage stocks levels of malaria treatments and other essential drugs. Rwanda became the first country to incorporate drones into its health care system, using autonomous air vehicles to deliver blood transfusions to remote regions. Technology has also improved disaster response: During the West African Ebola outbreak in 2014, WhatsApp became an easy method of dispersing information, checking symptoms, and communicating under quarantine.

Illness detection and pharmaceutical production have most immediately benefited from digitization. AI is being slowly implemented in Ethiopia to help medical professionals correctly diagnose cervical cancer and other abnormalities. IBM Research Africa is also using AI to determine the optimal methods for eradicating malaria in specific locations and using game theory and deep learning data analytics to diagnose pathological diseases and birth asphyxia.

Strategies for overcoming key challenges facing Africa

Clearly, the 4IR presents significant opportunities as well as challenges for Africa. The key issue for policymakers is how to position their economies to benefit from the 4IR while managing the challenges that it presents. Below are three strategies that leaders should prioritize.

Fixing the labour-skills mismatch

Since creating jobs for the burgeoning youth population is a priority in most African countries, many governments are reluctant to support technologies that threaten existing jobs. Some of the current technologies tend to replace low-skilled workers—of which Africa has an abundance—with higher-skilled workers, constraining participation in the 4IR to economies with relevant skills. African governments must invest in education and reskilling programs to ensure that technology supplements, instead of replaces, labour.

Enhancing agile governance for secure, effective management of the 4IR and integration into global value chains

As innovation is at the heart of the 4IR, reinforcing state and institutional capacity to drive and support innovation and create an enabling business environment is essential for success.

A major regulatory challenge involves increasing cybersecurity. Most African countries lack a comprehensive legal framework and institutional capacity to address cybercrime. Instead, efforts to prevent cybercrime are appearing at the more local level or are implemented by private sector actors themselves. For example, between 2015 and 2016, there was a 73 percent increase in Information Security Management System-certified companies, from 129 in 2015 to 224 in 2016, with the majority in South Africa, Nigeria, and Morocco. Adopting widely accepted and appropriate norms and regulations, such as these, is a first step to increasing cybersecurity. At the same time, companies should invest in their employees to develop

cybersecurity skills and integrate cyber risk protection in their decision making process.

The African Continental Free Trade Agreement offers a unique opportunity to enhance governance around the 4IR. With aligned policies and procedures, the continent can adapt to the rapid changes of the 4IR and leverage it to accelerate participation in global value chains.

More broadly, the 4IR can actually empower service delivery, through, for example, national identification and a new generation of biometrics that can centralize data for a variety of uses and users.

Developing physical and digital infrastructure

Access to advanced technology in Africa is constrained by infrastructure parameters such as lack of electricity and low tele-density, internet density, and broadband penetration. As a result, mobile phone and internet use remains low (Figure 5.2). (For more on strategies for upgrading Africa's ICT infrastructure, see the viewpoint on page 71). Other technological bottlenecks include a lack of standardized application programming

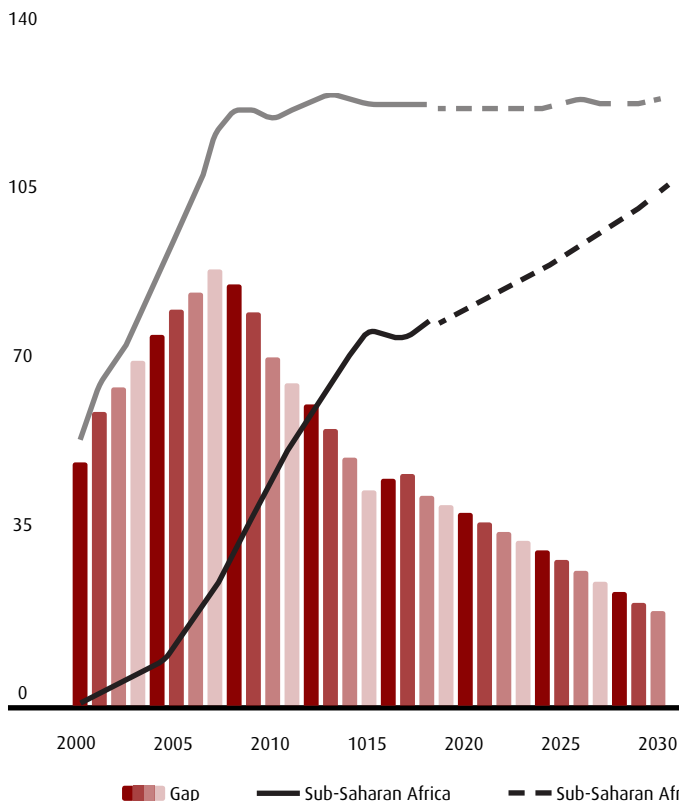
interfaces and common data languages for the increased integration of largely self-sufficient systems as well as exposure to the dangers of cyberattacks. Accelerating the physical connectivity of fibre-optic networks as well as the interoperability of virtual platforms is critical not only for upgrading technology on the continent, but also for reaching and lowering unit costs for the underserved.

More broadly, adequate infrastructure development will drive and sustain economic transformation in Africa. With lower transport and communication costs, countries with suitable agro-ecological conditions can produce high-value products. Closing the internet connectivity and access gap with advanced economies will enable more African countries to enter service export markets. Small-scale manufacturers in Africa may also become more competitive with access to digital platforms for research, sales, and distribution.

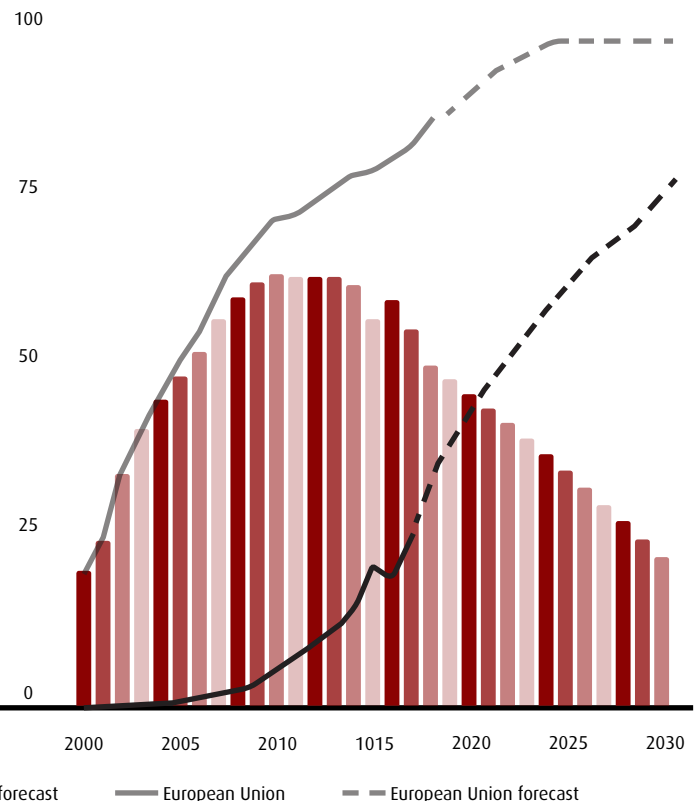
To make the most of the 4IR, African governments and entrepreneurs need to recognize new niches for industry and leverage them to achieve sustainable, inclusive growth, and take decisive steps to close the gaps in digital skills, infrastructure, and research and development. ■

in recent years, Africa has begun to close the gap in mobile phone and internet access. In 2018, compared to the European Union, the average gap in mobile phone access was only 44.6 mobile cell phone subscriptions per 100 people, down from a high of 92.8 in 2007. For internet access, the gap is also lessening, although at a slower rate: The access gap in 2017 was 55.4 percentage points, down from a high of 63.8 in 2010. By 2030, given current trends, these gaps are projected to decrease to 19.4 and 21.8 for mobile phone and internet access, respectively

Mobile cellular subscriptions (per 100 people)



Individuals using the internet (% of population)





Mobile Mark is a leading supplier of innovative, high performance antennas to wireless companies across the globe. We've been in the wireless industry for over 30 years and have our roots in the early Cellular trials. Today, we benefit from enhanced design capabilities and expanded production capacity – along with a greater understanding of new and emerging markets such as mining and exploration.

Modern mining operations rely on a battalion of vehicles, ranging from massive extraction vehicles to modest-sized material transport trucks. These vehicles operate in tough environments where high vibration is a frequent wear and tear challenge. Mining companies throughout Africa have relied on our rugged, foam-filled mobile antennas for consistent connections. Mobile Mark's infrastructure antennas have been used for rapid deployment and redundancy coverage for effective wireless coverage in isolated settings.

www.mobilemark.com | enquiries@mobilemarkeurope.co.uk | (+44) 1543 459 555



chapter Cellular networks 2



Nicolas Blixell,
vice president,
Ericsson Middle
East and Africa

The world as we know it is becoming more digital than ever, and this is just the beginning. Emerging technologies are opening up new opportunities that were unimaginable just a few years ago and changing the way we lead our lives, both at work and during our leisure time.

Connectivity is not just limited to devices and cars, it is revolutionizing industrial sectors from transport to utilities and health care and public safety, which is changing the way we do business.

The pace of change is staggering. In the Sub-Saharan Africa region, mobile broadband subscription penetration of the population is approximately 30 percent, but – with a young and fast-growing population – it is forecast to reach over 50 percent by the end of 2025.

The increasing demand for digital services and financial inclusion is driving the growth in mobile data traffic and most of the investments, traffic and subscriptions are in 2G, 3G or 4G networks. Modernizing existing networks, improving network performance and increasing user experience continue to be at the core of every service provider's day-to-day business.

Strategies for growing data revenues include improving network quality, providing data coverage in rural areas and making data-enabled devices more accessible and affordable. For service providers, there are risks, challenges and opportunities. They now need to focus on real-time network capabilities, to provide service differentiation, and they need to do it across a broad range of subscriber segments and across industries.

Important measures when improving network quality are moving subscribers to the highest possible network layer, activation

of key software features, removal of inconsistencies and alignment of parameters supporting selected network improvements.

And there have been success stories.

During 2019, MTN rolled out more capacity and additional sites on its 3G network to drive efficiency and better customer experience in Rwanda. Steps included adding software features and parameter settings to improve voice accessibility, call set-up time, and 3G data uplink coverage and capacity.

MTN Rwanda's network improvements led to positive developments across the board, with all key network indicators improving, including call set-up success rates and dropped-call rates. Recent root cause analysis of the network NPS data indicates the positive contribution of a good, reliable, strong and fast internet connection.

The network improvements and customer satisfaction increases are reflected in solid business performance for MTN Rwanda. This includes a market share increase of 11 percentage points to 54 percent at the end of the first half of 2019, compared with the first half of 2018, as subscribers grew by 23 percent – with revenue and EBITDA up 27 percent and 24 percent respectively over the same period.

Similarly, MTN's network improvements in Ghana – which included expanding and densifying 3G and 4G, as well as optimizing each access layer in turn, steered by KPIs covering availability, retainability, quality and traffic volume – also led to better KPIs, including call set-up success rates and dropped-call rates and translated into positive business results. Comparing MTN Ghana's first half of 2019 with the first half of 2018, voice revenue was up 13 percent, and data revenue increased by 26 percent. Overall, in constant currency, revenues increased 19 percent and EBITDA increased 24 percent over the same time period.

All network improvements are carried out within the context of actively lifting users to the highest network technology possible, to optimize the cost per erlang (voice) and gigabyte (data) served.

Attracting subscribers and keeping them happy depends not just upon the promise of compelling user experiences, but on the operator being able to deliver them, too. Service providers are increasingly bundling 'over-the-top' content in their service offerings – including music, premium sport and TV optimized for mobile networks in an attempt to create an environment where everybody wins.

Everyone – content owners, network operators, equipment vendors, and device manufacturers – can work together to create attractive services and elevate user experiences. Service providers benefit from the added perceived value of bundled content, using it to augment their brands through association with carefully-selected players. On the other hand, content owners benefit from the service providers' reach as well as their established capabilities for marketing, charging, and revenue sharing.

Improved network performance paves the way for sophisticated policy control, traffic categorization and quality-of-service delivery to flexibly respond to opportunities. These features can be used to allow location-specific service access, and for the tailoring of promotions.

Together, service and application providers can prioritize traffic, reducing download times for selected premium websites. Load times for web pages can be critical in determining a user's quality of experience, especially when browsing and buying online.

Every user, from a consumer or a connected car or a doctor, has different needs and different expectations. Each one is equally valuable, and their experience of network performance is all that matters.



Johann Adjovi,
partner,
consulting,
Analysys Mason

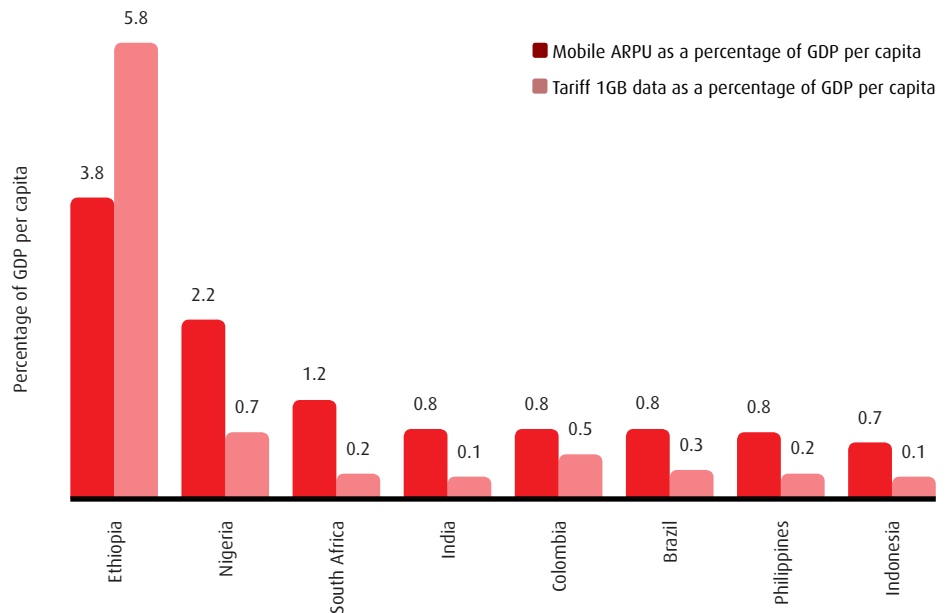
Ethiopia's telecoms market is opening up to outside investment, with interest from regional and global telecoms groups."

Ethiopia is one of the few telecoms markets worldwide that still operates under a monopoly. Government-owned Ethio Telecom (Ethiotel) controls Ethiopia's mobile market, as well

as the fixed telephony and fixed broadband markets, and the international gateway. This monopoly has resulted in an underdeveloped telecoms market: as of the end of 2018, only 42% of Ethiopians have a mobile phone, and only 14% have mobile broadband, which is low compared with other countries of a comparable size within the region, including Egypt, Sudan, Tanzania, Kenya and Uganda (see Figure 1). However, the government in Ethiopia has recently captured the wider attention of the global telecoms industry through its many initiatives to expedite the liberalisation of the telecoms market and to modernise the local telecoms infrastructure. This article discusses these initiatives in more detail.

Mobile SIM penetration of the population and mobile broadband take-up in Ethiopia are both low compared with other developing countries worldwide, and these trends are driven primarily by high mobile tariffs and the country's poor network coverage (see Figure 2). While 2G networks are widely available in Ethiopia (99% population coverage), 4G coverage is restricted

Figure 1: Comparison of mobile SIM and mobile broadband penetration in Ethiopia and in neighbouring countries, 2018



to the Ethiopian capital of Addis Ababa.

Ethiopia also has a notably low level of international connectivity, with international capacity to this landlocked country being provided exclusively by terrestrial cables. This has resulted in an average of only 0.6kbit/s of international bandwidth per capita, whereas Ethiopia's neighbour, Sudan, has nearly four times as much (2.5kbit/s per capita), and Kenya's and Egypt's international bandwidth per capita is significantly higher at 17kbit/s and 14kbit/s, respectively.



Derrick Chikanga,
senior analyst,
Africa Analysis

The Internet of Things (IoT) landscape in Africa continues to evolve as more industries adopt IoT technologies in their business processes. Key drivers of the development of this industry have been the need to increase productivity while reducing costs and eliminating potential losses. Furthermore, advancement in the ICT

JANUARY 2019

Safaricom announces its trial of new base stations for urban areas, involving new network technology with the ability to enhance urban area coverage. Tubestar base stations are claimed to be able to replace standard towers by a tubular structure occupying 75% less land area and requiring no protective perimeter, as all equipment is located within the tower. Powered by Lithium batteries and ideal for constrained spaces. Safaricom partnered with technology firm Huawei to construct its first Tubestar base station at Clay Works on the Nairobi-Thika Highway. The new base station location was previously plagued by call drops and signal convergence from other base stations causing interference and poor connectivity.

FEBRUARY

The Egyptian mobile phone market saw a sign of recovery in February, according to a report by International Data Corporation (IDC). The IDC report indicated that shipments in the Egyptian market increased to 14.4 million units. The

IDC's Quarterly Mobile phone Tracker found that shipments were 7-5% up, year on year, compared with a 20.6% decline in 2017, when performance was hampered by limited foreign currency reserves and the central bank's decision to float the Egyptian pound. While smartphones accounted for 63.8% of the market's units in 2018, shipments of these devices increased by just 3.4% year-on-year according to IDC.

The overall market's growth was driven by the feature phone category, where shipments were up 15.4% over the same period. Although the main vendors, Huawei, Samsung, Oppo and Xiaomi dominated the market, a local brand SICO achieved a 2% share of the smartphone market.

MARCH

Zimbabwe announces plans to merge two of its state-owned telecoms businesses, TelOne and NetOne ahead of proposed majority stake sale, to help offset state debt. Finance and economic development minister

Mthuli Ncube told a media briefing, that the government was looking to sell a significant stake in the two state-owned telcos. Ncube said the move would make the business more attractive to would-be investors.

South African telecom providers, Telkom and MTN have reportedly previously expressed interest in the two Zimbabwean companies. Ncube intimated that an approach would be made to the South African companies along with other interested parties for the purchase of the combined Zimbabwean telcos.

APRIL

In April the Kenyan Air Force was subject of an allegation of causing structural damage to communications masts in Jaldyse Village near Afmadow. According to Somalia's Hormuud Telecom an attack took place in late March and was the tenth such attack, previously staff members had been killed by the actions. "Hormuud Telecom regrets the senseless and unlawful attack by the Kenya Air Force on

sector and governments' ambitions to achieve their Industry 4.0 targets have been some of the key market drivers recently.

Industries have started appreciating the potential benefits from increased automation and the financial rewards thereof, hence the increased adoption of IoT technologies.

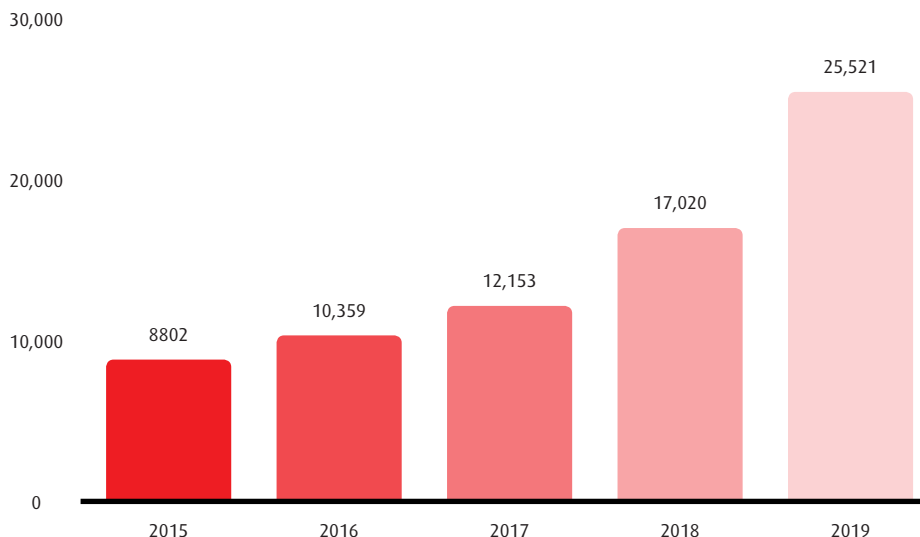
Major players such as Vodacom and MTN have continued to invest heavily in their IoT technologies to enhance their business offerings and tap into areas that present opportunities for long-term growth. As such the number of local IoT connections in South Africa, as measured by the SIM cards, has increased substantially, from approximately 7.3 million connected devices in 2015 to approximately 25.5 million devices in 2019. This represents a compound annual growth rate (CAGR) of 30.4%.

Key connectivity technologies that have been experiencing increased usage include mobile machine-to-machine (M2M) and Telemetry, as well as low-power wide-area network (LPWAN) connectivity. However, Wi-Fi and satellite connectivity have been experiencing modest growth due to the limited network coverage offered by such technology types.

LPWAN technologies that include Narrowband IoT (NB-IoT), LoRa and Sigfox continue to experience high demand in SA.

SquidNet remains the sole licensed Sigfox network operator in SA. The company has been expanding its network coverage to numerous industries that include agriculture, insurance, manufacturing, retail, transport and logistics, and utilities and energy. In the transport and logistics sector the compa-

Number of connections (thousand)



ny has enabled the development of smart logistics services that include asset tracking, warehouse security, food safety and stolen vehicle recovery. As such companies that utilise SquidNet's solutions have been able to optimise the supply chain by closely monitoring the performance of their assets as well as ensuring that transport conditions remain ideal for the products that will be transported such as agricultural produce and medicines.

Through various partnerships with companies such as IoT360, Macrocomm, Visiosoft, Adroit Technologies and Vox Technologies, SquidNet has been able to develop IoT solutions that enable the development of smart cities, smart buildings and smart retail. As such, SquidNet has

positioned itself as a major player in the South African IoT market, which is further supported by the backing that it receives from its holding company, Dark Fibre Africa (DFA).

Recent Developments

In 2019, Vodacom continued developing its IoT capabilities through upscaling its internal capabilities and acquiring emerging start-ups. Hence, in August 2019 the mobile operator acquired a 51% stake in IoT.NxT to leverage the technological capabilities of IoT.NxT in creating data-connectivity between new data sources and legacy systems. This acquisition will enable Vodacom to effectively drive its IoT strategy and transform its dedicated IoT

our masts at Jaldyse village near Afmadow," the company said. A major breakdown in communications and outage meant, residents could not access phone calls, internet and mobile money services. The company gathered forensic evidence to be handed over to any investigating authority since the actions were unjustifiable under international law. The United Nations Panel that monitors sanctions on Somalia had received reports concerning 12 attacks on towers from Hormudd Telecom. Subsequently the United Nations in a report says it has corroborated evidence of five attacks allegedly carried out by Kenya's military on communications masts in Somalia. Kenya denies the attacks, which have resulted in an estimated US\$5 million infrastructure damage.

MAY

Zambia announces implementation of biometric SIM card registration in January 2020 to combat fraud. Meeting held on May 21st, between regulator the Zambia

Information and Communications Technology Authority (ZICTA) and mobile network operators (MNOs), where the new directives were explained, and agreement achieved.

Edward Mulenga, corporate communications manager at ZICTA stated that all MNOs would be required to comply with the biometric standards, conduct regular interval verification exercises to ensure accuracy of SIM databases and furnish the authority with a report of all deregistered SIM cards.

He added that MNOs are required to relay to ZICTA the total number of subscribers with more than 10 registered MSISDNs under the same identity card.

"The authority will place obligations on the seller of SIM cards including use of identity cards for ease of identification," Mulenga said, "Failure to adhere to the directive will attract punitive measures within the law. MNOs should also send an updated dealer's register to the authority and a report on the agents responsible for any inaccurate registrations and fraudulent activities."

JUNE

At the launch ceremony in June Airtel announced Niger's first 4G LTE network. A year on from after Airtel paid US\$22m for its 4G license, the network is available nationally, making Niger the first country in Africa where Airtel's 4G network is available nationwide from launch.

Airtel, the dominant player in the country, described the feat as "a new chapter in the telecommunications revolution in Niger".

At the official launch ceremony, Niger's minister of posts, telecommunications and digital economy, said the launch chimed with the government's vision for the digitalisation of the country. Airtel believes that the implementation will promote a phase of accelerated inclusive growth. The government has the hope that a 4G LTE network will revitalise the telecom sector, improve digital services and accelerate growth of the local telecom sector.

Airtel controls more than 50% of the market, according to the Regulatory Authority for Telecommunications and the Post.

business unit into a highly profitable entity.

Vox Telecom continued to develop its IoT solutions to address the challenges that are currently faced in the farming sector. These solutions are related to livestock tracking using smart livestock collars. This has reduced animal losses and stock theft, and improved animal health. The animal collars that have been developed by Vox Telecom are linked to Sigfox towers that transmit information to Vox IoT Cloud infrastructure. This cloud infrastructure stores and relay alerts on the state and health of livestock to end-users.

Hence users of such technologies can set geofence to closely monitor livestock within a certain area and receive notifications should the livestock breach the geofence. Other benefits include observing animal activity and closely monitoring the health of livestock.

The weather conditions in South Africa and the rest of Africa have been changing dramatically with rainfall distribution becoming increasingly erratic in recent years. The City of Cape Town has experienced recurring draughts and erratic rainfall, and this has led to the growing need to develop technologies that address the challenges presented by adverse weather conditions. Hence, key areas that have been earmarked to address the weather-related challenges include environment monitoring, equipment monitoring and animal tagging.

Other key areas where IoT usage has gained traction in Africa include supply chain and logistics, smart manufacturing, insurance telematics, utilities and energy, farming and wildlife management.

Year in review: African 5G, it's coming sometime soon?

The year saw a steady flow of announcements of commissioning, implementation and roll out of 5G networks throughout the African continent.

The promise of an enhanced broadband experience with speeds of up to 1 Gbps and latency of less than 4 milliseconds and potential for a world of Artificial Intelligence, cloud based computing and interconnected devices with the Internet of Things offers a dream of a brave new communications world for African nations.

The reality, beyond the marketing hype, is more down to earth, in that only specific African areas and regions have implemented constrained 5G footprints.

The ongoing dilemmas for African nations are can they afford to invest billions of dollars and should they employ Huawei to provide networks at risk of the wrath of the United States, or do they go with reliable and non-contentious providers such as Ericsson or Nokia.

In considering these dilemmas, African nations should consider that China is the largest financial lender to Africa while also being its largest trading partner. Huawei is the major player in Africa when it comes to telecommunications infrastructure and much of that infrastructure has been made available to African nations via Chinese loans.

Africa needs to forge ahead with next-generation mobile telecommunications systems. If it is to develop a competitive advantage, beyond mineral and metal ore extraction, and needs to do it at a financial cost it can afford.

African nations have a history of infrastructure

building prompted by colonial occupying powers, using the free labour of indigenous peoples. In the last century African nations sought their place on the world stage and have pushed forward with the infrastructure of modern communications. In this century they have been slow to implement technological change across the board, partly based on the costs of implementation, lack of skills and, lack of need, beyond the transport, extractive and security sectors.

There must be a business case for new technology implementation and for many enterprises in Africa 4G meets all their present business requirements. This is where 5G operators step in to convince and try to sell 5G to enterprises, that will not see a return on investment. 5G is promoted as being the springboard into the High-speed internet era.

With African countries suffering the impact of the world recession can many of those nations justify the cost of 5G?

Back in July, 2019, The GSMA highlighted that the trend was towards a growing demand in sub-Saharan Africa for enhanced connectivity, but also pointed out that although 5G is a natural progression, its implementation is not necessarily imminent in most parts of the continent, basically because the existing technology supports the current use cases and demand for mobile internet connectivity. The African consumer market for 5G will be a trickle until affordable 5G compatible devices become available.

Having a 5G network that can support AI, in for example health applications, in an African nation that doesn't have a health system might

JULY

At the 9th North African Suppliers' conference in Morocco in July, Huawei put forward its goal for its Moroccan operations.

Chakib Achour, the marketing and strategy director at Huawei in Morocco said, "We want the kingdom to be the first to launch 5G in Africa." According to Achour, the company is now only waiting for the green light from the government. In March 2019 rival company Ericsson organized a live 5G demonstration at Maroc Telecom headquarters in Rabat, showcasing 5G's capabilities of faster data upload, download, stable connection and wider coverage.

According to a report by the Moroccan National Telecommunications Regulations Agency, access to the internet by Moroccan households has increased three-fold over the last eight years. Some 74.2% of households now have internet access.

AUGUST

Nigeria's telecom subscriptions increased by two million to 176.9 million in August

compared with the previous month of July at 174.9 million subscriptions, as notified by the Nigerian Communications Commission (NCC). Teledensity rose from 91.65% in July to 92.67% in August and has subsequently risen to 96.7% at the end of 2019. The NCC also revealed that broadband subscriptions had risen to 67 million in August from 64.4 million in July. The NCC attributes the increases over the last 5 months to steady telecom regulation.

SEPTEMBER

Mobile Broadband Limited trading as Vodafone Zambia, was put up for sale after shareholders were unable to keep the firm above water, because of stiff competition in the southern African data market. The country had 16 ISPs all fighting for market share, according to a report released by the Zambia Information and Communications Technology Authority (ZICTA). They include Liquid Telecom Zambia, Hai, Zamtel and Paratus Telecommunications, a subsidiary of the Namibia headquartered Paratus Group Holdings. Cash

strapped Vodafone Zambia struggled to maintain operations a year after it entered the local market in 2016, citing "financial distress". In July 2019, the company issued a statement announcing that the delay in recapitalising itself by the shareholders resulted in network outages in the capital Lusaka and the Copperbelt region. Vodafone Zambia said the so-called "financial distress" triggered a petition by employees to the High Court in Lusaka for business rescue. It led to the appointment of the business rescue administrator Luwita Sayila as the firm looked to attract new shareholders. A business plan to restructure the company's affairs was put in place, but Sayila issued a notice inviting bids to secure new ownership.

OCTOBER

October saw the release of a new report at the World Bank/IMF Annual General Meetings, which posed the question as to how Africa will connect an additional 1.1 billion people online by 2030. A statement from the World Bank highlighted that by the end of 2018 Africa had crossed the 400

not be justifiable. Though in March Microsoft opened its African Development Centre at two sites in Nairobi Kenya and Lagos Nigeria followed by Google in April 2019, opening its first Artificial Intelligence laboratory facility in Africa, based at Accra Ghana. Safaricom plans to launch Kenya's 5G internet service sometime in 2020.

GSMA gives its view of the progression of 4G to 5G in 2019

The GSMA, which represents the interests of mobile operators throughout the world, reported in 2019 that 4G had become the dominant technology, with 4 billion connections and was set to grow significantly up to 2023. Consumer awareness has increased in relation to 5G but the costs of migrating to it are still prohibitive for most Africans.

Business must consider the costs of migrating to 5G while 4G is presently adequate for their needs.

Therefore, network providers, ever eager in seeking new revenue streams must balance demand and willingness to pay, against their own financial investment in new technology and networks to provide a service, that might not be fully needed at present.

The vast financial investment needed to roll out 5G networks to support the growing Internet of Things (IoT) market might be justifiable, but network providers still need to see profits and a return on the investment they made in 4G.

The GSMA indicate that by the close of 2019 there were some 5.2 billion mobile services subscribers or 62% of world population. Almost an additional 1 billion people have been covered by mobile broadband networks in the last 5 years,

continued increases will be partly dependent on cost and content as well as the services provided. As for those in the manufacturing, power generation and aerospace sectors, GSMA indicates that they are still in the evaluation stage, as to if they will migrate to 5G for the digitisation of product assembly and general operational management. For African enterprises to capitalize on Artificial Intelligence, robotic working, sensor operation and automated production they will of course need to migrate to 5G.

MTN starts testing of 5G in West Africa

MTN started testing superfast mobile internet in the West African state of Nigeria, towards the end of 2019. Specifically, it trialed 5G in Abuja and Calabar, which naturally invoked excitement in the tech sector. Nigeria has the expectation that it will be able to roll out 5G in its larger cities in 2020. South Africa and Lesotho consolidated their small scale 5G rollouts in 2019, while Gabon starting a system trial.

AMN and ip.access partner up in Zambia for 4G/LTE

Africa Mobile Networks and ip.access announced their deployment of 4G/LTE in Zambia.

The partners stated the deployment was a progression from their 3G Small Cell deployments in order to extend rural cellular coverage across the underserved countries in Africa.

The rollout is intended to cover seven countries, Zambia being the first. The

network was constructed around the ip.access Viper™ solution, consisting of the nanoVirt™ 3G/4G virtualised gateways and management system. The company stated that the small cells are installed on a tower near, for example, the centre of a village to deliver mobile coverage to the community. African Mobile Networks (AMN) builds, owns, operates and maintains the infrastructure.

Biometric SIM card registration, a way forward for Africa in Fraud prevention

Fraudsters are creative in their ways, always seeking innovative methods to relieve the weary of their hard-earned wealth. Mobile phone fraud is an insidious creature and has no sympathy for the individual it harms by means of fraud.

In June Zambia announced it was to implement a plan capable of limiting some aspects of fraud. A simple plan, that some might say was invasive in relation to privacy, but one that works on information the state already holds. The Identity Card (ID) needed to register a SIM card in Zambia has been available for some time. The biometric ID cards are embedded with a secure chip containing both biographical and biometric data. The system of SIM card registration will allow the state to identify the purchaser of a SIM card and thus assume as to who is using it to send messages, download data and make calls.

The system is open to the criticism that it infringes the right to privacy and to freedom of expression, but Zambia is just joining a long list of countries that have SIM card

million mark for broadband connections at 20 times the number in 2010. The report, entitled Connecting Africa Through Broadband, A strategy for doubling connectivity by 2021 and reaching universal access by 2030, found that less than a third of Africa's population has access to broadband connectivity and achieving universal, affordable and good quality internet access by 2030 will require a US\$ 100 billion investment or close to US\$9 billion per year. In sub-Saharan Africa, nearly a third of people are out of range of 3G connectivity compared with 2% for North Africa, which is an indicator of the challenge being faced. In order to get 1.1 billion people online, the report said there was a need for exceptional and coordinated efforts from governments, the private sector development partners and that the investment is worth it.

"Additional challenges, such as the lack of access to reliable and affordable electricity, make accelerating Africa's digital transformation journey even more difficult," the organisation stated. The report further mentioned that nearly 80% of all required investments are directly

related to the need to roll out and maintain broadband networks. About 20% of required investment consists in building the user skills and local content foundations, and another 2-4% should be allocated to setting up the regulatory framework.

NOVEMBER

Gabon and Congo signed a mobile roaming memorandum of understanding (MoU), with the agreement to be implemented before December 2019. Under the terms of the deal, subscribers would not be charged for incoming calls, up to a maximum of 300 minutes per subscriber a month. Outgoing calls would be billed at the local network operator's rates, while the higher of the two national rates would be applied for calls made to both countries.

The deal was agreed and signed by the heads of Gabon's Regulatory Agency for Electronic Communications and posts (L'Agence de Regulation des Communications Electroniques et des Postes, ARCEP) and the Republic of Congo's

Regulatory Agency for Electronic Communications and Post (L'Agence de Regulation des Postes et des Communications Electroniques, ARPCE.).

DECEMBER

In December the chief executive officer of MTN south Africa warned that the nation's economy could take a hit if troubled Cell C failed, as the former continues to be linked with acquiring its rival.

Speaking to South African financial newspaper Business Report, Godfrey Motsa said MTN would offer aid to its rival if there was a clear economic value to the move, highlighting the potential loss of thousands of direct and indirect jobs if Cell C collapsed. He also cited a broader ecosystem of suppliers along with the loss of taxes as examples.

If MTN did enter the race, it would go head-to-head with local rival Telkom and the world's biggest mobile operator, China mobile. Subsequently Cell C and MTN have after a long-negotiated agreement entered a roaming deal, thought by some to be the precursor of a merger of the two entities.

registration procedures backed by legislation. South Africa is an example of one that has had such requirements since 2002 and worldwide fewer countries each year come within the non-registration arena, such as the USA and UK but they have existing sophisticated levels of establishing the identity of a SIM user.

An announcement by the Manager for Corporate Communications at ZICTA (Zambia Information and Communications Technology Authority), Edward Mulenga informed all Mobile Network Operators (MNOs) that they would have to comply with proscribed standards for the registration of biometric details of mobile phone users. They will also be required to undertake regular verification processes and provide lists to ZICTA of all SIM cards that are deactivated. Failure to comply with the new regulations would attract punitive fines. MNOs will have to provide lists of SIM card dealers as well as lists of those who hold more than 10 SIM cards registered under the same identity card.



Stuart Kelly,
VP, market
development,
Bladon Micro
Turbine

During 2019, Bladon saw a number of factors starting to drive real innovation in the telecommunications industry, says Stuart Kelly, vice president market development. “The acceleration of the rollout of capacity and coverage of broadband networks, particularly to remote and rural sites across Africa, and a grow-

ing awareness of environmental responsibility, thanks in part to the ‘Greta’ effect,” he says.

Kelly adds that the rollout to rural and extra-rural parts of Africa “really gathered pace” through 2019, with governments increasingly focusing on the need to connect the unconnected. This is being driven by the huge demand for services such as mobile financial services and media. Meanwhile, some African countries are laying the foundations for 5G.

However, Kelly says this demand is happening alongside a growing need for sustainability to support this roll-out.

“Historically the premium placed on choosing the ‘cleaner’ fuel option to power telecoms equipment has tended not to make it cost-effective,” adds Kelly. “Penalties from government, regulators and investors in Africa have been almost non-existent, reducing incentives to pick cleaner fuels. Some of the more progressive countries in Africa however are hinting at providing incentives/penalties for deploying cleaner, low-carbon emitting solutions.”

In 2019 this started to change, adds Kelly, as actions by global firms such as Blackrock, which recently informed shareholders that sustainability would be at the heart of its investment agenda, have underlined the urgency around sustainability and this is coming to the forefront of policy for the telecoms infrastructure industry in Africa.

“Bladon’s fuel agnostic approach supports both these trends: our Micro Turbine Genset (MTG) is fuel agnostic and can operate on anything from lamp oil to clean biofuels,” Kelly continues. “This means that distributed

“Penalties from government, regulators and investors in Africa have been almost non-existent, reducing incentives to pick cleaner fuels”

power can be supported anywhere, with the fuel flexibility needed to support sustainable development in a cost-effective way. Marrying this quiet, clean engine with a combination of other innovations give some options and flexibility in how to deploy discrete, but reliable and cost-effective energy where it’s needed. These complementary energy solutions include supercapacitors, flow batteries, and Li-Ion cells as well as bifacial solar panels.”



Simon Pearson,
business
development
director,
World Telecom Labs

At the start of 2019, WTL invented a new term: Deliberate Digital Exclusion, which describes the millions of people who continue to be failed by traditional MNOs in Africa – and regulators,” says Leigh Smith, MD of World Telecom Labs (WTL). “However, thankfully we felt that during the year the tide was finally moving to



Johann Adjovi,
partner,
consulting,
Analysys Mason

The year ahead: Ethiopia’s telecoms market is opening up to outside investment, with interest from regional and global telecoms groups. However, prime minister Abiy Ahmed declared in June 2019 that Ethiopia will privatise and liberalise its economy to spur competition in several critical sectors, including telecommunications. The

World Bank is also supporting the government in Ethiopia with implementing these institutional reforms. The Ministry of Finance has recently clarified that the government will adopt the following strategies to liberalise the telecoms market and open it up to foreign investment.

- An independent regulatory authority will be set up to oversee the development of the telecoms sector in Ethiopia.
- Two new licences will be issued, for which foreign operators can bid.

- A significant (minority) stake of Ethiotel will be divested and made available for foreign investors to acquire.

Many regional and global telecoms group across the value chain (including operators such as Etisalat, MTN, Orange, Viettel and Vodafone) have already expressed an interest in bidding for these licences. This liberalisation of the telecoms market is expected to introduce competition to the market and help address the key challenges around high tariffs and low mobile SIM and broadband penetration.

The liberalisation of Myanmar’s underdeveloped telecoms sector could serve as a useful predictor of how successful similar changes will be in Ethiopia. When the government in Myanmar liberalised the telecoms sector in 2013, mobile SIM penetration accelerated from 10% to 99% and mobile broadband penetration increased from 3% to 67% within only 4 years. Liberalisation paved the way in Myanmar for reduced prices and increased mobile SIM penetration and

higher international bandwidth.

- Prior to liberalisation, the only operator in the country offered SIM cards for as high as US\$300. The entry of two new players reduced the price of a SIM card to just US\$1.50.
- Mobile broadband penetration also quickly rose from 3% in 2013 before liberalisation to 67% in 2017 after liberalisation.
- International connectivity increased significantly in Myanmar, from only one international gateway and a single international submarine cable prior to liberalisation, to six international gateways and three submarine cables after liberalisation.

Most of the major operator groups are likely to consider the investment opportunity in Ethiopia – either to acquire a stake in Ethio Telecom or to deploy greenfield operations. When assessing this opportunity, operators will need to carefully consider how the legal/regulatory environment is likely to change, as well as understand the demand characteristics and the other challenges of this market.

address the challenge of providing connectivity for everyone, regardless of where they live and work - and what their incomes are."

Smith says "there are now serious efforts being made to address the challenges of build and maintain commercially sustainable networks" in rural areas including significant announcements from MTN, Orange and Vodafone". There were challenges in 2019 and to help address Deliberate Digital Exclusion, WTL has been championing the national roaming model for several years with regulators, government ministers and other influencers. This has a two-part approach: it advocates the allocation of dedicated spectrum by the Regulator specifically for rural coverage - and the building of new open wholesale networks in rural areas where there is little or no coverage at the moment.

"The removal of the CAPEX cost of building a rural network will enable regulators to pressure previously reluctant operators to start offering services in these areas," adds Smith. "Indeed pressure might not even be needed. For-profit telcos are naturally competitive beasts and will not want to see their rivals scooping up rural customers. Pricing and customer service will, as ever, be the key differentiators.

We have also been lobbying regulators to allow open access to all existing Government-owned or sponsored telecom infrastructure."

So, what's the big push for WTL?

"We really need different operating models, different licensing and different funding sources emerging alongside regulators and MNOs with the political and commercial commitment that is needed to move forward in building rural networks," says Smith. "We will be working with all of our friends and contacts across the African ecosystem to achieve this."

He says the company is essentially pushing hard to provide low-cost, low-power small cells that can be deployed easily in remote locations. "An innovative approach we have taken is to offer our Vivada C3 rural communication hub," Smith says this changes the model by not trying to cover the whole rural landscape - which may be very expensive for minimal reward - but offers a central point for the local population to access voice, data and power provision."

Although the company has particularly focused on the ongoing monthly operating costs of a site, it also thinks that greater attention has to be given to the revenue side of the equation. "That is why we have included elements like cyber cafés, money transfer and pre-paid payphones in our rural solutions." However, Smith says WTL does not presume that phone calls and browsing from handsets will be enough on its own to make the business case sustainable.



Alp Uysal,
VP, strategy,
technology,
innovation and GIR
market area MEA,
Ericsson

Delivering the full 5G experience will involve enhancing many existing use cases and creating new ones that cannot be fulfilled using current technologies, according to Alp Uysal, vice president, strategy, technology, innovation and GIR market area Middle East and Africa.

He says decisions on where, when and how operators deploy 5G are not only driven by commercial considerations but also on the availability of spectrum, network equipment and devices. Furthermore, he says development of expert human capacity to innovate on services and creation of awareness in the consumer domain to new and innovative services should be undertaken by the 5G eco-system stakeholders.

"Internet of Things (IoT) and 5G have incredible potential to add new value for operators in the digital era. IoT will provide the means for delivering innovative solutions to meet the socioeconomic challenges and will transform businesses to enable more growth in Africa," he says. "Smart City solutions, such as using IoT to curtail water scarcity in large informal settlements, to intelligent transport solutions, are increasingly being investigated to find answers to the challenge of urbanisation."

Uysal points to the fact the first 5G devices were pocket routers and the first 5G smartphones have launched in 2019 in line with the first commercial 5G service launches in many parts of the world. "Despite challenging 5G timelines, device suppliers are expected to be ready with different band and architecture support in a range of devices given the device availability, over 10 million 5G subscriptions are projected worldwide by the end of 2019, and more substantial volumes of 5G devices in different bands are expected from 2020 onwards," he adds.

On the other hand, Uysal says modern mobile networks need a variety of spectrum with different frequencies providing different key components. "We expect that 5G will need a mix of low, medium and high frequency spectrum, some of which will be 'new' spectrum and some will be 're-farmed' spectrum, previously used by other services or even shared with existing services," he continues. "Ericsson proposes spectrum sharing as one of the techniques for improving spectrum availability in the realm of 5G."

Uysal is also of the belief that goals set by countries, though sometimes ambitious, varies and there is little basis for the sector to determine where the opportunities for

"Ericsson proposes spectrum sharing as one of the techniques for improving spectrum availability in the realm of 5G"

greater effectiveness lies and where efforts should be focused. The enabling capacity of ICT is expected to make a great contribution to areas such as mining and agriculture, which resonate with the African economy and African enterprises. These areas, he says, are interesting for us to look at.

"Current 4G cellular systems provide a high level of security and trustworthiness for users and operators. Second generation (GSM) systems were the first to have standardized, built-in security functions, which then evolved through 3G and now 4G networks," says Uysal. "Moving on, the evolution of LTE is a vital part of 5G. Building the inherently secure 5G system requires a holistic effort, rather than focusing on individual parts in isolation. This is why several organisations have worked together to jointly develop the 5G system, each focusing on specific parts."

Uysal says these enhancements come in terms of a flexible authentication framework in 5G, allowing the use of different types of credentials besides the SIM cards; enhanced subscriber privacy features putting an end to the IMSI catcher threat; additional higher protocol layer security mechanisms to protect the new service-based interfaces; and integrity protection of user data over the air interface.



Aji Ed,
chief technology
officer,
Nokia Middle
East and Africa

Last year was an interesting year for Nokia and for the whole telecommunications industry thanks to 5G, says Aji Ed, chief technology officer, Nokia Middle East and Africa. Ed says the new technology was the compass for almost all discussions, engagements, and demonstrations throughout the year. Nokia ended the year with 62 5G commercial contracts and 18 live 5G networks worldwide.

"Despite all the challenges, Africa is not far from the action," says Ed. "Telcos have been very excited to study the new world of opportunities brought by 5G and Nokia has played a leading role in consulting its customers to support them in defining their strategies for the coming years."

Nokia also has achieved many successes

across Africa in different technology domains by securing several key deals from customers to modernize and expand their networks with the latest Nokia technologies including the Nokia AirScale portfolio which paves the road to 5G.

He says the continent hosted several interesting events demonstrating new technology innovations and telecom regulators across the continent were also very active in 2019, playing a key role in planning for the future. "The message was clear: 5G is definitely on the horizon for Africa, in spite of all the challenges," says Ed.

Penetration of 4G in Africa is still a challenge due to low ARPU and weak penetration of 4G devices. However, different forecasts show big leaps in smart handset volumes and data consumption rates in many locations around Africa. "We believe this will be a good engine for telco revenues and will urge them to think about 4G/4G+ strategies for the upcoming years," Ed adds.

Rural coverage remains a big challenge, despite it being a social responsibility. Hundreds of millions of people remain unconnected in Africa. Ed says expanding coverage is a game changer to those unconnected communities and that it has been proven that ubiquitous connectivity stimulates economic growth and it will remain a key priority to ensure that these communities are connected.

"Nokia continues to support its partners in Africa to overcome those challenges," Ed continues. "Not only by providing the latest technology and end-to-end solutions in the telecom domain but also by playing the consultative role while sharing awareness and best practices to identify the best fitting solutions."

As far as 2020 is concerned, Ed says it will be an important year for telecommunications globally. "We are waiting for more 5G networks to go live and more traction for 5G with new use cases exploiting 5G end-to-end architecture," he says. "The 5G Standalone model, SA, would come to life giving more potential to the new technology."

He says 5G does not mean to focus on data connectivity for handsets only like it was the case before but is all about machine communication now. Ed adds that going forward, 5G is going to revolutionize manufacturing again, what we call "the 4th industrial revolution".

Elsewhere, TD-LTE continues to grow in Africa and with Massive MIMO provides a magical solution to enhance radio network coverage & capacity. "It also paves the road for 5G," Ed says. "We have seen that Africa refuses to be left behind when it comes to adopting to new technology and exploring new 5G use cases. We have seen the progress achieved in South Africa and we expect more to come in 2020 and beyond. The most important aspect is to proceed with the discussions to reach answers for those vital questions such as how to benefit from 5G, what the right time to market is, which spectrum should be used and, most impor-

tantly, what the use cases are."

Looking to the future, Ed says standardisation of technologies will continue through 2020 and that 3GPP Release 15 has been a key milestone, yet the upcoming releases will bring a bright future with new bands, ultra-reliable low latency communication URLLC, software defined networks (SDN), network slicing and more.

"Nokia expects a lot of dynamics in Africa with more progress towards higher data throughputs, end user experience and coverage expansions across the continent to reach the uncovered communities," says Ed. "African telecom operators still need to invest in these vital domains while keeping an eye on the future. We should be looking to define the bold lines of the digital transformation strategy. The classic model of a CSP must be transformed into DSP, Digital Services Provider, with a wide focus on services & content delivery."

One final point Ed makes is that "we can expect the rise of new models like private 4G/5G networks for different purposes" and exploiting different bands. "It's machine communications, and Artificial Intelligence, AI, that will play a key role in the transformation of other vertical sectors such as manufacturing, health, and transportation," he says.



Miriam Tuerk,
co-founder, CEO,
Clear Blue
Technologies

// The marketplace changed radically when everything went from landline to wireless," says Miriam Tuerk, co-founder and CEO, Clear Blue Technologies. "In Africa everyone has wireless capability. In Toronto when I was a kid we had one phone and now I have two kids we have four phones. So wireless unlocked and changed the world and brought the internet to us. As you look at what's happening in the marketplace today, the last cable that has to be connected to all of these sites is a power cable and that is connecting to grid that's very expensive and doesn't work well. So, what we have focussed on is 'wireless power for wireless operators' that's our tagline. Bringing off-grid power solutions to the marketplace."

She says there's a lot read about people using diesel generators, which cost a lot of money, but Clear Blue is 100% solar. "Solar is lights out, no maintenance, nobody has to go to the site – it's a complete remotely operated service," she adds. "All the power electronics at the site is our technology, then we add solar panels and batteries. Our secret sauce is that we tie that to data analytics and predictive energy and weather forecasting."

Tuerk gives an example of how the company helps African nations. "What we do is we're able to run the system in a way where instead of it going off after no sun for a few days, we control

it so it's turned off from say 1am-5am," she continues. "We make smart off-grid systems for telecom, wireless, Wi-Fi. No other vendor in the world does what we do. We provide a complete standalone system and so low-cost, reliable, high up-time, long-life and green."

Indeed, she uses Tesla as the paragon, a huge company and it has key things that make it a viable.

"If I buy a Tesla I will get 400km on a charge and the battery is going to last me at least 10 years," she says. "If it turned out that I only got 50km on that charge and I had to replace the battery after 18 months, the dog wouldn't hunt. Tesla wouldn't exist. That is the experience of telco operators in Africa. When they put in solar systems today, they think they're going to have X up time and performance, that the battery is going to last between five and 10 years. What they're finding is they get no up time. We're doing a project now for large provider where we're replacing their existing system because after 12 months it's dead."



Eric Mujera,
sales director,
Syniverse

Eric Mujera, sales director at Syniverse who is overseeing the business in Africa, says 2019 in summary was a relatively good year for the company. That's despite the tough economic challenges in some parts of the region coupled with risks associated with the foreign currency, political and regulatory compliance, most of its customers experienced growth, which in turn worked positively in our favour. "I can sum up 2019 as our year of sowing new seeds in the market by introducing new possibilities like policy management, blockchain enabled clearing, RCS and fraud management solutions, and we anticipate 2020 will be our year of reaping from these initiatives," he says. "The high was that our market experienced increase in mobile subscribers, voice and data traffic and growth in volume of roaming traffic – which was a plus for us. The low was the speed of adoption and therefore finalisation of contracts has slowed. This is due to 2019 seeing a reduction of some clients' budget in this area, which means investing in new solutions is higher risk for them and therefore, in some cases, perceived as daunting."

With regards to trends, he points to business process automation, RCS and increased traffic roaming.

"In 2019 we saw an increased demand from our customers and potential customers who saw the need to automate their internal processes – especially within the roaming departments," Mujera continues. "Ideally they want a shift from complicated manual spreadsheets, that takes days to decipher, analyse and get detailed reports, to real-time data which allows them to make quick

decisions. This presented an interesting challenge and opportunity as it pushed us to think out of the box to address this emerging need."

He says RCS is now moving from a buzz word in the African telecom space in board rooms and increasingly getting into the board and senior leadership implementation roadmaps, we saw a significant interest from the market. In addition, a significant increase in roaming traffic came especially fuelled by IoT use cases.

Mujera's thoughts on 2020? "There's expected to be a big push around blockchain enabled clearing and settlement use cases that will transform the industry in alignment with the New GSMA BCE standards," he says. "Pushing through RCS and growing more in the enterprise space with our suite of messaging solutions."



Ahmad Sayed,
regional director,
Middle East and
Africa,
Nexign

Last year was a massive year for Nexign, when the Russian-based business support system (BSS) had its first full year covering Africa.

Nexign, Ahmad Sayed as regional director, Middle East and Africa, who runs the operation from Dubai, says setting up a new team and strategy for the market over the 12 months has kept him and his team busy.

"As soon as you land in a new territory, there is a lot of expectation from the shareholders," he says. "It's a critical first 12-18 months, when you start to see how the market is reacting, what the opportunities are for you etc."

Sayed and his team have been busy with business development, which requires travelling the length and breadth of the continent.

"This has been encouraging to see that there is huge potential for us as we present the company and meet new customers," he continues. "We have also anticipated a number of roadshows, forums and exhibitions and that has given us lots of leads and lots of new ideas where to reach and touch the first low-hanging fruits.

Of course, in any business, priorities have to be made and Sayed says the African market has been a positive experience to date.

"Usually in new markets, the first thing you

"The market had been a bit stagnant in the last few years but due to 5G coming, there is huge spending and growth expected in the next year"

do to explore," he says. "In Africa we have done much more than that. Opportunities are lining up and we are starting to choose and participate."

Still, there are differences dealing with northern and sub-Saharan Africa (SSA).

"Broadband connectivity in the north is much stronger than in SA because of fibre to home," he says. "In SSA more people are dependent on wireless connectivity as there is very little fibre connectivity. This has given the edge to the north."

So, what are Nexign's plans in 2020 and beyond?

"We need to close a number of opportunities where we have been developing in the last 12 months," says Sayed. "The market had been a bit stagnant in the last few years but due to 5G coming, there is huge spending and growth expected in the next year and surely we as Nexign, as an experienced BSS vendor, with the support of our group holding and the companies in it, will help us take a good share from the market."



Femi Oshiga,
VP, service
providers of the
Middle East and
Africa,
CommScope

// There's still several network operators who are investing increasingly in 4G, so that obviously presents an investment opportunity for us in terms of sending out tenders," says vice president of service providers of the Middle East and Africa, Femi Oshiga, CommScope. Also, they want to fiberise the backhaul. Then because of the localisation of traffic, they're investing increasingly in in-building and venues, so we also have an opportunity there. We've done fairly well in exploiting in-building solutions."

CommScope works with almost every network operator across the Middle East and Africa and when it comes to 5G, Oshiga says it has gone from the over-exuberance to the reality of what it means in truth. "That realisation has been good for us," he continues. "We've gone from fancy technology, active solutions and only a few companies can do it to now there's a whole suite of solutions possible to help these services. For example, in relation to antennas – they are something the vendors want to push. However, that's only going to address up to 12% of the sites. For the rest there are passive antennas that CommScope leads the market in."

Oshiga says the mergers and acquisitions in the sector have yielded mixed results.

"Some of them have been good, but for us some have resulted in a slow down until decisions are made in the future," he adds. "There are some big tenders in the market as operators try to push volumes and look at it as a group of sales. MTN is looking to purchase as a group, Airtel is another interesting one and Orange has made a lot of

announcements and pushing its subsidiaries a lot."

So, what of 2020? "Operators need to continue to increase their investments around fibre," he says. "They have to backhaul all these sites with fibre, so that represents an opportunity for us as we have a strong portfolio that addresses these immediate and specific needs. The other is continued investment in 4G, site modernisations, base station antennas. If we see continued and steady growth in in-building solutions that would be a positive."

Oshiga opines that 5G will be very localised but it has the potential to replace fixed wireless or really provide an alternative to fibre to the home in many areas. "I actually think it won't be ubiquitous but in those areas you'd find a pretty decent pick up rate," he continues. "I remember hearing about WhatsApp in Nigeria before I did in the Gulf countries – because there was a real need. I think you'll see that kind of shift with 5G. It won't go with ARPU and wealth, it's going to go where there is demand, use cases."



Wu Jianjun,
marketing
director in Africa,
ZTE Corporation

Mobile and internet penetration in Africa has been growing rapidly over the past few years. Communication technologies and services have been responsible for a high percentage of economic growth throughout the region (~11% in 2019) and as the supplier to over 140 operators across Africa, ZTE is an active participant in this. The enhanced connectivity of these networks has also been hugely important in improving the development of education, health, agriculture and much more. Our dedication to sustainable development in all areas of our business in Africa has been a driving force behind what we achieved in 2019 and our plans for the region moving forward.

2019 was a relatively good year for ZTE in the Middle East and Africa region, which was focused on improving customer satisfaction, industry recognition, employee engagement and judicious compliance throughout our African branches.

To this end, we continued to deepen cooperation with operators and achieved breakthroughs in multiple countries in the African region, focusing on valued customers in key countries to ensure increase in market shares. In the field of 5G, we have signed 5G contracts with the South African, Nigerian and Ugandan branches of the MTN, and co-hosted multiple 5G use-case demonstrations and conferences in these three countries.

In other areas, we have achieved in-depth

“With many African countries being currently under lockdown, we have seen a dramatic increase on the network load due to people staying at home”

operations in high-quality networks with our wireless products throughout the region. MTN South Africa and ZTE have jointly won the first P3 test in the region for four consecutive years and ZTE’s cloud & core product has already been widely applied by Airtel and Orange, marking a breakthrough in MTN. And for transport wireline access, ZTE has maintained long-term cooperation with mainstream customers in Africa, helping these countries achieve broadband speedup, including telecom customers in Egypt, Ethiopia, Algeria and Morocco.

In terms of innovation and research, ZTE has opened three innovation training centres in South Africa, Ethiopia, and Saudi Arabia – two further centres are currently under construction in Egypt and Algeria.

Looking ahead to 2020, it would be remiss of us not to mention the ongoing and evolving situation around COVID-19. With many African countries being currently under lockdown, we have seen a dramatic increase on the network load due to people staying at home. Our team is fully focused on providing the best quality of network possible and has already proposed technical analysis and solutions to quickly ease these capacity issues. Throughout the duration of this global pandemic, we are determined to secure our network service for all our customers and users in Africa to minimize any disruption to people’s lives.

There are other areas also in which ZTE plans to make advancements in the coming year. Despite a high growth in connectivity penetration in Africa, the level is still far behind other regions such as Europe and Asia. Issues around coverage – particularly in rural areas – need to be resolved quickly in order to ensure that the 33% of the region that doesn’t yet enjoy the benefits of connectivity can do so in a fast, easy and economical way. Additionally, more needs to be done to ensure that the areas of the region that are already more developed are equipped with the most cutting-edge technologies such as 5G, IoT and AI to diversify their revenue streams and fulfil their various end-users needs.

This year will be an important year for development in the region and we are keen to continue to closely engage with telecoms operators in the Middle East and North Africa who we are already in talks with to launch further 5G projects across the region.



Albrecht von der Recke,
founder & COO,
fonYou

Almost a third of adults across the world don’t have a basic transaction account. However, two-thirds of the world’s population have a unique mobile subscription, creating an opportunity for mobile operators to bring financial inclusion to these millions of unbanked citizens. Operators have access to a goldmine of personal and usage data on each of their subscribers, which they can tap into and use as a means of generating revenue.

Alternative credit data such as utility bills or mobile payment history can provide insight into a consumer’s risk profile. By providing third-party financial services providers with access to this information, operators open the door to a plethora of new digital and financial services that benefit all their subscribers – not just a privileged few.

Some operators already use artificial intelligence (AI) to mine customer data in real time in order to check whether a subscriber qualifies for a microloan. For example, a prepaid customer may run out of credit overnight when buying an over-the-counter top-up is impractical. Whether the customer has a bank account or not, by assessing their usage and payment history data the operator can offer a personalized microloan that gives the customer continuity of service and keeps them connected.

Applying advanced AI-led analytics to this data provides operators with even deeper insight into the behaviour of subscribers. Algorithms, rules and conditions can be used to calculate a customer’s propensity to repay a loan. Such alternative credit data can benefit subscribers in other aspects of their lives because the inclusion of mobile phone payment history has a positive effect on overall credit scores.

Applying alternative credit data to the issue of financial inclusion requires an “open telco” environment, in which mobile operators provide financial services providers and associated third parties with secure access to subscribers’ credit score information via dedicated application programming interfaces (APIs). Such an environment collectively unlocks a range of new digital financial services that can be accessed by anyone, whether banked or unbanked. Delivering this valuable insight and intelligence in real time enables lenders to make decisions on loan applications almost

instantaneously, either face-to-face, online or via mobile. And by establishing themselves as credit brokers, operators themselves open up new revenue streams.



Salman Tariq,
manager, Middle
East and Africa
region,
Optiva

Africa is rising — it is large, diverse, and presents amazing growth potential for information and communications technology (ICT) companies. Across the region, we are seeing improvements in connectivity and the fibre landscape, as well as increasing focus on the cloud as communication service providers (CSPs) evolve their digital transformation journey.

While public cloud data centers are currently very limited to non-existent, the big public cloud players have robust and low-latency private fiber networks that could be accessed through multiple points of presence across the region, offering the benefits of scale, availability and advanced technology. Africa understands now that we live in an open-source world, and public cloud technologies present an amazing platform to build on for the future.

In fact, forward-thinking CSPs are pushing the boundaries of traditional technology to find new ways that Africa can leverage and ride the tide of investments by major public cloud players, transforming their business by moving from traditional, on-premise BSS systems to a more agile and cost-efficient business model.

In the past, data privacy and regulation has been an issue in the region. While some of it was more about control — or letting go of it — there were some issues related to trusting the data security safeguards in place in the public cloud as well. However, security measures in the public cloud have evolved tremendously over the last few years. In fact, prominent industry analysts such as Gartner are predicting that public cloud will suffer fewer security breaches than on-prem data centers in 2020, and with that, privacy will be better managed on the public cloud. The rise of privacy regulations like GDPR also has helped to reduce subjective interpretations, alleviating concerns around data privacy.

On the other hand, the pace of innovation in the region is still being hindered by the issue of data locality, restricting certain types of customer data from leaving a geographical boundary. In a world where connected users don’t think twice about signing license agreements that allow internet giants access to their private information, data locality does not make a lot of sense. If consumers trust these companies, one would expect

that organizations defining these locality regulations would do the same.

At Optiva, we believe in leveraging the fast-paced innovation in the public cloud space and using that to build superior products. A business model that aligns spend exactly where it is needed is a game changer — and it's only possible with a cloud-native product on the public cloud.

Indeed, Africa is rising, and so is the disruptive effect of the public cloud in the telecom space. It is time to embrace this innovation, and it is time to think big.



Kostas Kastanis,
deputy CEO,
Upstream

It's not difficult to quantify the worldwide impact of the Internet: enterprises instantly create a global marketplace for goods and services; online education reaches learners from primary schools to universities and beyond; knowledge and insight from millions of sources is immediately searchable and influences every aspect of our daily lives and lifestyles; and vertical markets like healthcare, finance, travel and entertainment continually create new services for consumers and enterprises.

Given the massive impact that the Internet has on our lives, it's difficult to reconcile the fact that 41 percent of the world's population lacks access to the Internet. The majority of people who can't access the Internet are from developing economies, where lack of Internet connectivity stymies economic opportunities, limits access to important news and stifles communication.

Moreover, hundreds of millions of people lose Internet access when financial limitations and physical restrictions limit their ability to top off data when they run out. Increasingly, these factors are leading governments and enterprises to view Internet access as a basic human right.

The disparity in Internet access creates an opportunity for mobile operators to provide an ad-funded free mobile Internet platform that ensures subscribers have a connection to the digital world even when they run out of credit. The platform provides essential Internet services, including basic information about local and international news, as well as the ability to search the web.

For mobile operators, the benefits of an ad-funded free mobile Internet platform are two-fold: The service answers a critical subscriber need for Internet coverage, while also initiating a new revenue opportunity for operators. Within the portal, subscribers are given the option of digitally topping up their service for increased airtime or data.

South Africa's largest mobile operator, recently instituted ad-funded free Internet, and in doing

so now provides Internet access to 25 million mobile users in South Africa. Already, 55 percent of the operator's subscriber base engages with the portal. Subscribers that run out of data are automatically redirected to the portal, keeping them connected. At the same time the operator improves the user experience, engagement and satisfaction, enhancing their brand perception. Funded via advertising the platform solution, behind the free captive portal, unlocks new revenue streams through ads and stimulates the adoption of digital services.

Mobile operators worldwide can emulate this example to provide uninterrupted access to the Internet and ensure millions of people have access to this basic human right via a solution that at the same time supports the digital transformation of operators.



Shanks Kulam,
co-founder,
x-Mobility

// We work with African MNOs, MVNOs and brands to help them launch their MVNO or AppVNO offering," says Shanks Kulam, Co-Founder of x-Mobility. "We are especially working with a number of travel brands and MNOs looking to target their diaspora."

The company's AppVNO – an app-based MVNO service – allows users "to be local" when travelling to the likes of the UK, France, the rest of Europe or even the US. Users subscribe to a local mobile number which also gives them the ability to make super low cost calls and texts back home.

"Both our traditional SIM-based MVNO model and our AppVNO service allow African MNOs and brands to create international revenues outside of Africa, something that excites a lot of the people we're talking to," Kulam adds.

He says what the company has seen in particular is just how agile African brands and MNOs are when it comes to the next generation, digital mobile services.

"This can be seen with the success of strong consumer brands, such as banks (e.g. FNB, Equity Bank) launching their own MVNOs and quickly acquiring millions of users," Kulam continues. "Alongside that, there was also the recent 'pivot' of the South African MNO CellC looking to become an MVNO itself."

Kulam says x-Mobility has been "very engaged" with MNOs, MVNOs and consumer brands across Africa to develop a new digital first MVNO approach with our AppVNO OTT service. "We feel like we're riding the crest of an ever larger movement for African brands to scale outside their home territories to win international revenues – be that via launching as an international MVNO or digitally via the

AppVNO offering," he adds.

Looking ahead to 2020, Kulam says his company sees a continuation of this trend, more launches and further execution scale as more and more Africans travel and more of the African diaspora have the ability to connect with their home brands via the likes of an AppVNO offering.



Mahmoud Oubraham,
sales director,
Middle East and
Africa,
EXFO

EXFO'S main priorities for Africa in 2019 were to support operators bringing the latest technologies in the most advanced countries but also to equip the operators in emerging areas with solutions to maximize the ROI on their network, according to Mahmoud Oubraham, sales director – Middle East Africa. To make it concrete, the company deployed, as an example, solutions addressing where would be the best spots for 5G early adopters or 4G next roll-out, how to prepare a network to automation and virtualisation by being able to have a real-time automated topology, from physical to logical layers, which subscribers are impacted by a network issue. "As another example of advanced technology, we supported securing the massive deployment of fiber over the continent including super high-speed backhauls which would be competitive worldwide," says Oubraham.

On the other side of the operators spectrum, EXFO helped customers define which sites are the most relevant for revenue catch-up when it comes to outage management. "In other words, for which sites is it worth better securing the energy supply to maximize revenue and reduce churn," continues says Oubraham. "As another example, we helped operators looking for niches to increase data revenue from the same subscribers' base with more relevant offering."

Although he has already named some highlights, Oubraham says that "the main one for us is to see that we are relevant to the continental market with its specificities".

As for the main struggle, EXFO sees the gap widening in certain areas of the continent vs the rest of the world. "Technology is Capex-intensive and that's hard to follow for Operators which are mainly on prepaid markets," says Oubraham. "Data is the huge revenue driver for majority of the Telecom word and we see that prepaid markets with low ARPU can hardly follow on the investments needed, as revenue to be spent is limited per capita. Video is increasing the gap there and makes the market addressable for

“We expect automation and AI to help us reduce further outages, understand better the network development needs according to subscribers usage and profiles”

satellite telecom players.”

As far as 2020 is concerned, Oubraham says the main focus is to be even more relevant to the continent, although there is a big discrepancy to be relevant to different country profiles. “So we aim to continue bringing the latest technology in a way which is relevant to our customers’ ROI, while being profitable ourselves,” he says. “We expect automation and AI to help us reduce further outages, understand better the network development needs according to subscribers usage and profiles. It is not anymore about selling an additional tool or add a source of data, it is now more about how to combine smartly all the data gathered to have relevant outcomes making an impact on operators revenue and churn.”

Oubraham says the second important focus will be on remotely securing the fibre network and its quality. “You can send a technician out in the city to check on a detected issue,” he adds. “If you need several hours to do so, you better do it remotely to save money, time, increase security but also massively decrease the time to detect and time to fix.”



Sebastien Codeville,
CEO,
KaiOS
Technologies

// The importance of offering affordable yet capable mobile devices and enriching the content ecosystem were key focuses for us in 2019, as we explored opportunities to grow in new, underserved markets,” says Sebastien Codeville, CEO of KaiOS Technologies, which has developed the mobile operating system KaiOS which

powers a new category of devices known as smart feature phones. “This meant developing regional partnerships that allowed us to expand into several new African countries, connecting previously isolated people to the internet for the first time through incredibly affordable smart feature phones, and encouraging users to go online with improved mobile resources and a better on-boarding

experience. Due to increased accessibility and awareness, we saw adoption rates of smart feature phones increase, which will lessen the digital divide in key African markets.”

Codeville says that in Africa, consumers in the entry-level segment of the market continue to push for devices that are simultaneously more affordable and capable. He adds that many of these consumers have been excluded from the digital revolution due to the high cost of entry-level smartphones, along with expensive data and a lack of digital literacy. “To combat this we’re working to expand the number of countries in which people have access to smart feature phones, while fostering a local developer community in Africa through workshops and events, which will ensure content is localized and relevant to this new user base,” he continues. “Additionally, we’ve partnered with coding schools to further facilitate the next generation of mobile developers in the region.”

KaiOS, Codeville says, was particularly excited to forge several new partnerships in Africa with brands including Vodacom, TECNO, Tigo and Africell, which introduced accessible smart feature phones to more than a dozen new countries in the region. The company was also honoured to win the Changing Lives Award at AfricaCom, and to be named one of TIME Magazine’s Best Inventions of 2019, in the social good category.

“Last year, we brought our in-house educational app, Life, to Africa, and in 2020 we’re looking to expand its reach to even more countries across the continent and other regions around the world,” Codeville says. “Education inequality is a major consequence of the digital divide, and by connecting people to the internet we intend to connect them to free, high-quality educational resources. We’re excited to continue expanding KaiOS’ global presence, and connect millions more people to invaluable digital resources for the first time through smart feature phones. Moving forward we’ll continue to partner with more content providers to ensure trusted, user-first digital resources created specifically for KaiOS users.”

Many analysts and tech firms have made predictions for 2020 and KaiOS is no different.

“We see the demand for smartphone-level features like popular apps and higher levels of connectivity continuing to grow, with consumers searching for that elevated digital experience in a more cost-effective package in emerging markets,” says Codeville. “New categories of digital content, along with new form factors, will emerge to address this demand.

In addition, there is a growing trend of minimalistic companion devices in developed countries, both for specific applications (back-up phone, construction, outdoors) and as a break

from the ultra-connectivity of smartphones.”

He believes the idea of a “Digital Detox” will continue to grow in popularity, as people increasingly see the value in reducing their contact with, or dependency on, smartphones and various forms of digital communication that can distract from their daily lives.

“Finally, the capabilities, and thus importance, of digital assistants continues to expand. Consumers use them increasingly to not only ask basic questions, but control other devices and complete a range of tasks on their phones,” Codeville adds. “This development streamlines the user experience for smartphone users, but also more importantly enables first-time users to complete previously complex tasks without any prior knowledge of, or experience with, digital devices.” ■

“Education inequality is a major consequence of the digital divide, and by connecting people to the internet we intend to connect them to free, high-quality educational resources”

SHAPING THE FUTURE OF HOW THE WORLD CONNECTS

At ST Engineering iDirect, we're taking satellite from limited to limitless. Our highly intelligent VSAT solutions are multi-service and easy to scale, and deliver superior connectivity to the right application at the right cost.

Whether you're providing services to remote locations, monitoring assets with Internet of Things sensors, or simply ensuring business continuity, we offer the lowest cost of ownership.

**JOIN US TODAY TO PREPARE FOR
TOMORROW'S CONNECTIVITY.**

**LEARN MORE AT
idirect.net**

chapter 3

Value-added services



Samantha Naidoo,
SAP industry
value advisor,
services & telco
industries,
EMEA south

For the last 5 years, we have seen Mobile Value Added Services (MVAS) such as SMS, MMS, Locations based services, mobile money and mobile multimedia dominate the telecommunications market in terms of additional revenue streams from the traditional mobile offerings as we know it.

According to a recent report published by Market Research Future (MRFR), the global mobile

value-added services market will be valued exponentially by 2023, with a CAGR of 18.5 percent in the period of 2018 - 2023.

Up to now, value added services have been seen as a nice add on to the core mobile products with the majority of these services originating from app stores. With the decline of voice revenue in the last 6 years, and the high cost of mobile data, Telcos need to identify additional revenue streams else be capitalised by OTT players.

The traditional product centric business model is no longer sustainable. A greater drive for telcos is to position themselves into a solution centric business model focusing on the end to end customer journey and the overall customer experience. What this means is a fundamental shift in the Telco mindset, to optimise and extend their current platform and transform into a software defined network (SDN). By bringing Value Added Services in-house, it will allow the telcos more control over their customer behaviour. Instead of the proverbial 'Customer is king' we now see a shift to 'Data is king'.

For the customer, the focus on value and quality is greater than ever and will be seen as the differentiating factor in Africa. There is still immense opportunity in Africa as a result

of it's still developing mobile infrastructure across agriculture, healthcare, education and banking industries. According to Prof Umar Danbatta, Executive Vice Chairman of Nigerian Communications Commission (NCC), Nigeria has generated US\$ 200 million revenue as a result of Value Added Services in the first quarter of 2018.

Value added services such as M-PESA integrating into Paypal and Western Union in 2018 has now moved the total number of users to 28.5 million in East Africa enabling M-PESA to integrate with 500,000 global agents in over 200 countries and by doing so, connecting the rural population to the world and becoming a new way of life.

The drive towards social consciousness is prominent in India where most kids in rural India do not have access to formal education and often end up working on the farms during the day. A project called Millee is currently in progress which uses mobile gaming technology as a means of education to those of school going age.

Voice recognition smartphone capability is another capability that has been successful due to the focus on uplifting the lives of the community as a whole and ease of use even amongst non literate users.

But one cannot ignore the factors that have impacted the performance of VAS over the years and need to be considered going forward:

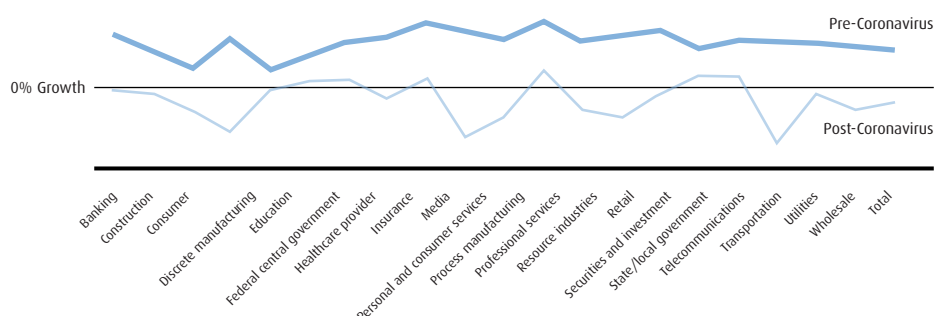
- **Regulatory conditions** – Withholding Tax, Forex repatriation challenges, different regional regulatory operating frameworks
- **Affordability** – From a Telco perspective, this will include costly system integration requirements; for customer – this will mean affordable products and services
- **Brand loyalty** – customers require quality of service. Network speed and poor connectivity is always a challenge in Africa. Telcos have the opportunity to provide a differentiated offering to customers by bundling products and value added services based on customer behavioral segmentation
- **Fraud risk** – Telcos need to ensure that severe data security and access procedures are in place to guard against malicious and fraudulent customer activities.

What the future holds for MVAS

According to IDC: 'Software will be the bright spot in technology spending, with growth of nearly 2% led by purchases of collaborative applications and content workflow and management applications.'

Traditional telcos need to build strategic partnerships across industries such as media to provide bundled offerings to their market. We've seen the start of this trend in the last 3 years

2019-2020 ICT spending growth SOURCE: IDC MEDIA CENTER, 21 APRIL 2020



with Telenor, Singtel, Altice, Verizon, Comcast and AT & T acquiring ad tech and media companies where traditionally they have lost billions of revenue to these media companies that have leveraged off their networks. Not only is the increase in demand for mobile music and gaming prominent amongst the youth, there is also an opportunity to provide educational services.

Fifth Generation (5G) cellular will enable many new advances such as greater capacity, lower latency, and optimized support for Internet of Things (IoT) networks, blockchain, mobile music, mobile gaming and enhanced voice and audio capability such as Voice over 5G (Vo5G) and Voice over LTE.

Telcos need to become an enterprise-ready one-stop-shop with global reach and horizontal scale. They can create significant value for both themselves and their enterprise customers: from improving business processes, to creating new business models, extending their customer base and allowing for complete business re-innovation.

- **Internet of Things** – IOT should allow telcos to predict, analyse and action information in real time. This is important from a customer intimacy perspective to provide a single view of

customer across internal and external sources.

- **Blockchain done right** – Blockchain provides customers with the ability to track invoice transactions against actual usage of value added services reducing the element of fraudulent activities.



Jennifer Mbaluto,
partner,
co-head,
east Africa,
Clifford Chance

recently connected to west Africa – avoiding having to fibre link the continent through London. In addition, there are some very strong tower companies like IHS which continues to grow.

The improving quality of connectivity is being driven by technologies, such as 3G and 4G – which are doing a fantastic job of

Africa is currently witnessing a number of major advancements in the wireless space, despite this incredibly challenging time.

There are also companies in the infrastructure space, such as Liquid Telecom, which is doing amazing things like building 50,000km of fibre from Cape to Cairo and have

penetrating underserved areas.

Of course, more recently there's broadband connectivity through fibre but that still has the challenge of the last mile. So, I'd say the main player is wireless mobile connectivity.

Take Safaricom and MTN, which have both been hugely successful not just in terms of telecoms, but they've also positioned themselves as leaders in digital creation. To put that into context, look at what Safaricom has done with M-Pesa. It's become a generic term regarding mobile payments now.

The Covid-19 impact

What Covid-19 has done is that it has driven data consumption to unprecedented levels, which places significant strain on existing networks. You've got people staying at home due to restrictions. In many countries like South Africa, Kenya and parts of west Africa, the governments have been very active with regards to Covid mitigation. They have encouraged the use of mobile money for payments instead of cash. That's driven a lot of activity in the payment space.

Kenya has been leading the way with mobile money because there is an administrative

JANUARY 2019

MTN and Orange Group announced a joint venture enabling cross continent interoperable mobile payments, named 'Mowali' (mobile wallet interoperability). It gives a low cost, real time capability for money transfer from any mobile money account provider. Mowali is a digital payment infrastructure that connects financial service providers and customers in one inclusive network. It is open to any mobile money provider in Africa, including banks, money transfer operators and other financial service providers. The partners say the objective is to increase the usage of mobile money by consumers and merchants. Mowali is said to bring together more than 100 million MTN and Orange mobile money accounts and operations in 22 of sub-Saharan Africa's 46 markets.

FEBRUARY

Vodacom Lesotho and Facebook form new partnership Vodacom Lesotho has joined forces with Facebook to launch a free connectivity service that both companies claim will enable "hundreds of thousands of Basotho" to follow news and stay connected. Facebook Flex will allow Vodacom Lesotho customers to switch seamlessly between free and data modes, making it possible for them to chat, post, comment, like or share content for free with family and friends. The mobile network operator said it hoped the alliance would help more people access Facebook and become "first-time

users of the internet" in a part of the world with limited connectivity. Vodacom Lesotho managing director, Philip Amoateng said it was important to give Basotho "the best possible tools for them to lead successful and fulfilling lives", and that the network and tools would make their lives easier. "This partnership is one of the many ways in which we hope to achieve that," he said. "In the face of blinding unemployment rates, hundreds of thousands of Basotho have found ways to build thriving businesses that use the power of Facebook. Thousands more have developed and built meaningful relationships in Lesotho and outside to further enrich their lives." Last August, Vodacom Group said it created "Africa's first standards based, commercial 5G service in Lesotho", using its assigned 3.5GHz spectrum to initially deliver fixed wireless access broadband services to two local enterprises. The operator hopes the partnership will help more people become "first time users of the internet" in a part of the world with limited connectivity.

MARCH

The Bank of Zambia started work on a key project to enable the linking up of money service providers across Zambia. The project was a collaboration with the Zambia Electronic Clearing House Limited (ZECHL) and was implemented under the National Financial Switch (NFS), which is an electronic platform that can link all mobile money operators and

thus increase financial inclusion. The Bank of Zambia said the pricing structure will be set by the payment providers and should reflect costs, while being affordable and non prohibitive to consumers accessing the systems. Lazarus Kamanga, Director of banking, currency and payment systems at Bank of Zambia said that there is no way for mobile money clients of Airtel Zambia, MTN Zambia and Zamtel to send money to competitor operator networks. He added that the NFS is expected to go live by June 2019. By March the country's ATMs and Point of Sale machines had been linked to the system at a time when the number of mobile money customers stood at just over 4 million.

APRIL

Centbee in South Africa claimed the "world's favourite bitcoin wallet" had landed a new R18.3m round of funding. Centbee stated that the entrepreneur Calvin Ayre best known for his company CoinGeek, had committed the funding based on its proven ability to attract users and ability to make the use of bitcoins easy. The announcement was unfortunately made just as the variant of bitcoin slumped in price. Centbee was co-founded by blockchain specialist Lorian Gamaroff and former eBucks chief executive officer Angus Brown and is associated with AlphaCode, a "club" created by Rand Merchant Investment Holdings to find and support businesses that could disrupt the financial sector.

system in place for people who don't have bank accounts to register with agents because they already have an identification system. However, the key difference is regulation. The Kenyan government decided not to stifle innovation and – while watching its progress very carefully – it still allowed it to succeed. The regulator only got involved when it was clear that it had moved to beyond just mobile payments to things such as lending.

Contrast that with Nigeria where until recently telecom wouldn't go anywhere near payments. You had to partner with a bank licensed for payment services. The lesson for the continent is while regulation has an important part to play, it's important that it doesn't stifle innovation. Of course, there's also been consumption of digital content increased use of media and social media.

In Africa, there is clearly going to be a shift to remote working as many companies have realised that can save huge amounts in costs. That will require heavy investment in infrastructure. We've seen destruction of supply chains and companies will have to fix this. In addition, we've seen high growth in e-commerce during the Covid period. I should

also mention e-learning in places like Kenya where certain private schools have continued to provide education virtually. Again, is giving rise to increased consumption of data driving the demand for connectivity and therefore driving investment in infrastructure.

Of course, all the other things that were there pre-Covid such as the 4th industrial revolution have been doing amazing things in Africa and amazing innovations in agriculture, leveraging the Internet of Things, machine learning and artificial intelligence. All of that will continue in a post Covid world and will require good connectivity.

Ethiopia has, for a long time, been a sleeping giant and there's been a lot of reform in the sector. There are new licences up for grabs, the privatisation of Ethio Telecom, which has been a monopoly. The country has over 100 million people.

On the contrary Rwanda is hardly ever mentioned because it's such a small country, but if you look at connectivity, investment in technology, nearly 95% of the country is connected to 4G. There's a government-funded scheme and innovation hub and lots of respected tech companies are investing in Rwanda.



Landry Signe,
senior fellow,
global economy
& development,
Africa Growth
Initiative

Africa is currently the fastest-growing mobile telecom market in the world. Since 2000, an annual increase of approximately 30 percent in mobile phone connections has led Africa to become the world's second-largest mobile market behind Asia. Almost half of all Africans report going online on a daily basis, and the general spread of information and communications

technologies (ICTs) provides new avenues for consumer spending and marketing. The variations in different countries' ICT sectors may increase the uncertainty of returns; though, an increasingly mobile financial sector proves there are high returns if companies can capitalize on the continent's projected digitization. Africa's consumer e-commerce

This commentary was originally published on the Brookings Institution's Africa in Focus blog. You can find the original commentary here: brook.gs/2ZAljyf

MAY

Airtel Uganda and URA partnered to ease tax payment in Uganda. A collaboration between Uganda's tax collection authority and Airtel Uganda was implemented to ensure that paying tax demands was easy and convenient. The two entities launched an Airtel Money payment mode, called Airtel Easy Tax, which facilitated the payment of all taxes while offering telecom subscribers convenience, reliability and efficiency.

In just a few steps, users can register a payment and pay their taxes from the convenience of their home, office or even while on the go. The tax collection body said that the initiative will be key in achieving two specific objectives.

Firstly, to improve "voluntary compliance" through the delivery of an improved and convenient service with efficiency at a reduced cost to the taxpayer, especially in small to medium sized businesses. Secondly it will effectively account for government revenue, while minimizing reconciliation challenges associated with payments especially those conducted online.

JUNE

DumaCard launches in Tanzania. Direct Pay Online (DPO), the African service provider, has launched the DumaCard business-to-business payment card in Tanzania and neighbouring Kenya.

It is available in both plastic and virtual forms, the latter provides a 16-digit card number, expiry date and security code as a physical card has.

Furthermore, the DumaCard can be used as a single or multiple use card and can be topped up regularly using mobile money so holders do not have to have a bank account in order to use it.

It gives businesses in Africa access to new markets by allowing online payments both regionally and internationally and allows customization so that merchants can pay single or multiple recipients.

JULY

The Malawi Communications Regulatory Authority (MACRA) announced that it will introduce a law to stop the import of ICT devices that do not comply with international standards.

The new rules, mainly targeting imports, will list all standards to bring imports into the country, in accordance with the regulatory, technical and minimum safety requirements.

Dan Chiwoni, who heads up MACRA's legal department, said this is an urgent matter in regard to the new challenges facing consumers and the country of Malawi caused by lack of appropriate regulation.

Poor quality of service, hacking and data theft, health and environmental risks are all threats that the Telecom watchdog wants to stop before they spread further. The law on conformity and interoperability will be added to a series of technical mechanisms for quality control of ICT devices already adopted by the national telecoms market.

AUGUST

Data free service BiNu said its Moya Messenger and content application is now being actively used by over one million people in South Africa every month, with 65,000 people using it every day. It enables enterprises to reach mass market mobile audiences through toll free data services. The main difference between Moya and WhatsApp is that no data cost is incurred by users to send and receive one-to-one or group messages and to visit a range of zero-rated websites and apps.

SEPTEMBER

Value Added Service (VAS) revenue in Nigeria down 74% in two years, as subscribers continued to opt-out of unsolicited messages through the 'Do Not Disturb' option.

According to the VAS providers in the industry valued at some NGN300bn in 2017 now only generates NGN79bn per annum. The Nigerian Communications Commission (NCC) stated that it had introduced the 2442 Do-Not-Disturb code activation for subscribers who did not wish to receive unsolicited text messages. A toll-free line was provided for consumers to report issues related to unsolicited messages and data renewals, among others.

The director, technical standards and network integrity at the NCC, Bako Wakil said, "The intention is not to bring down the market or the performance of the sector but as a regulator, we considered the consumers, with the kind of

market was valued at \$5.7 billion in 2017 and these revenues will increase with an increase in the number of internet users across Africa.

Juvo is a mobile financial services platform made for people without access to traditional banking services. In November 2019, it partnered with Oxford Economics to produce The 'Yes' Economy: Giving the World Financial Identity. Here are some of the findings:

Sub-Saharan Africa is the region that would experience the strongest relative growth in both savings and GDP from our FiDaaS scenario, with 17 and 2.4 percent increases respectively. The region's credit growth, at 13 percent, is second only to the Latin America and Caribbean region. At an earlier stage of development, Sub-Saharan Africa has relatively low saving and borrowing levels, but the large share of unbanked adults pose a big opportunity for the financial services industry if the financial identity problem can be resolved.

Under our FiDaaS scenario, the Middle East and North Africa region would add US\$25 billion to its GDP, while raising savings and credit by US\$41 billion and US\$30 billion respectively. Driving these numbers are countries like Egypt and Morocco where 67 percent and 71 percent of the adult population are locked out of the financial system, respectively. ■

Year in review

The continued decline, worldwide, on the dependence of physical currency was significant last year. In the major industrial economies, the use of debit/credit cards, digital money transfer and payments systems are pushing governments to consider the future of expensive to produce, bank notes and coins. In developing countries, the growth in use of mobile money is exponential and nearly 50% of all mobile money transactions, by total value are undertaken in Africa.

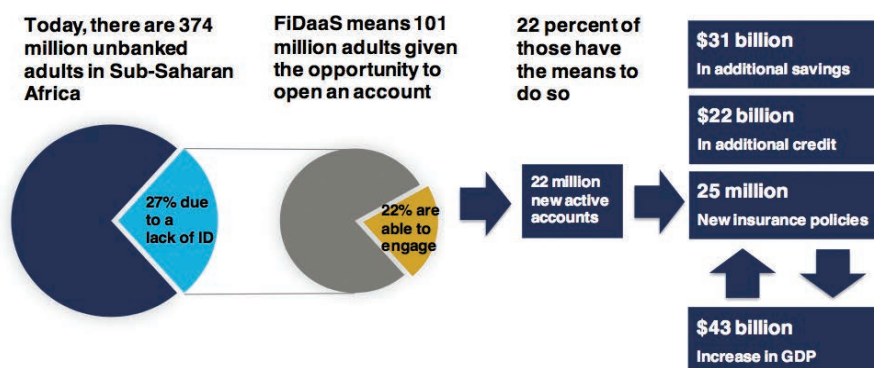
Operators such as MTN and Safaricom M-Pesa are pushing ahead with mobile money services to the African market, not only accessing the unbanked but also the wealthy and emergent middle classes. The banks have not been idle in recent times and are making available platforms for digital banking via mobile phones.

Airtel and Ecobank Transnational Incorporated, signed a partnership agreement to enable each company's customers across the African continent to improve their access to mobile financial services. Airtel Money customers, via Ecobank's digital financial services ecosystem, can now make online deposits and withdrawals, effect real time money transfers, make in store purchases

Key statistics on sub-Saharan Africa

GDP (USD, billion)	Population (million)	Household savings (USD, billion)	Household credit (USD, billion)	Insurance policies (million)
1,800	1,000	200	200	200

Fig. 17. Estimating the value of 'YES' in Sub-Saharan Africa

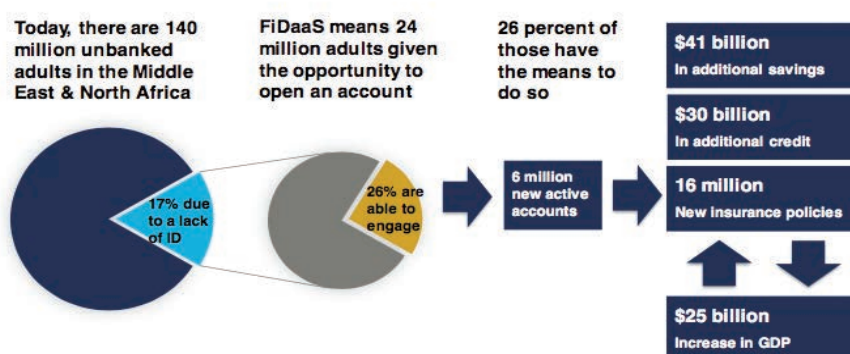


Source: Oxford Economics, Juvo, World Bank

Key statistics on Middle-East and north Africa

GDP (USD, billion)	Population (million)	Household savings (USD, billion)	Household credit (USD, billion)	Insurance policies (million)
3,400	400	1,000	800	300

Fig. 19. Estimating the value of 'YES' in Middle East and North Africa



Source: Oxford Economics, Juvo, World Bank

and access a variety of banking products. Eco-bank Group are of the belief that financial inclusion can ultimately contribute to African countries economic development. Their collaboration with major telecommunications providers in Africa is therefore a key strategic driver towards closing the gap between the banked and the underbanked.

Cashing in: MTN banks on money again

MTN announced that it was set to re-enter the mobile money space, via its launch of a new mobile money service. MTN stated that there were 17 million people who are unbanked or underbanked in South Africa and that this was an opportune time to come back into the market. With 30 million customers on mobile money already and revenues of Rand 8 billion

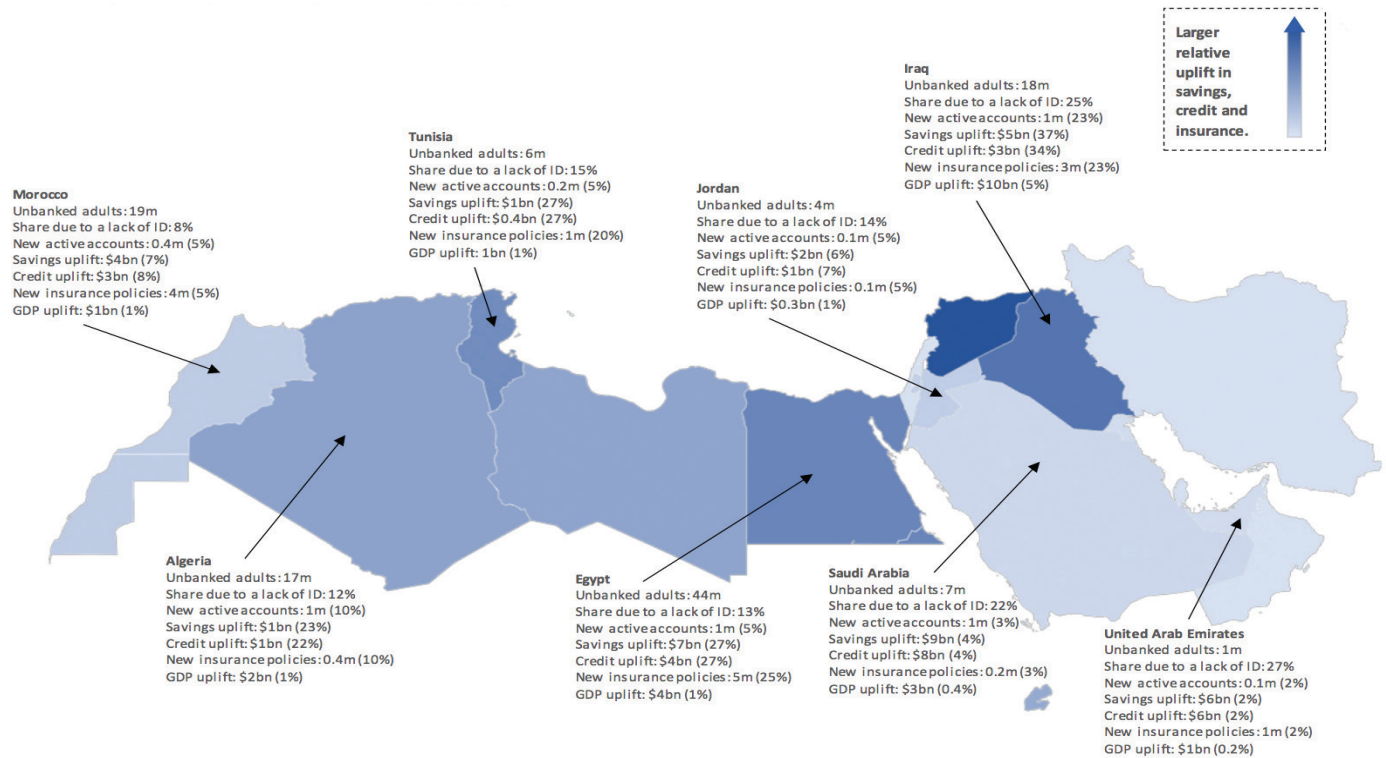
last year, it is well placed to push forward in South Africa, despite its previous experiences of commercial viability being a causal point in the closure of its mobile money service in 2016.

Growing a healthy Africa

Commercial viability and potential for profit are givens in the world of telecommunications but there is also the social aspect that governments often wish to see. In advanced technological societies with high per capita incomes, there is invariably a robust and universal health system in place, be it financed by the state or by the private sector and paid for by service users.

Many African states have developing health services, and many are faced with having to provide health services over great distances and varied, environments and terrains. In

Middle East and north Africa



African countries health provision is patchy and varies greatly from nation to nation.

With some African nations only having hospitals in urban areas it is also important to be able to provide some form of health care and diagnosis in remote rural areas.

Telemedicine or the provision of health information, training and education or care over distance using information technology is a growth area in Africa, a continent that has susceptibility to epidemics and viruses.

The HIV/Aids and Ebola crises were a wake-up

call for Africa and highlighted the need for universal and robust health care provision, which most African states still cannot afford. Thus, the need for an affordable solution using new technology supported by satellite, broadband and wireless communications, with the addition of access to electricity

money they are losing without their consent.”

The NCC is looking into the needs of the consumer and how industry can address them. “If we get any solution that will take into cognisance the concerns of the consumers, we will look into and implement it so that the sector will bounce back to its former glory,” Wakil said.

OCTOBER

Airtel and Ecobank Transnational Incorporated the parent company of African banking group Ecobank announced a joint partnership agreement allowing both Airtel money and Ecobank customers in Africa to use Ecobank’s digital financial services ecosystem to make online deposits and withdrawals, effect real time money transfers, make in store merchant payments and access various products. The partnership will also allow Ecobank corporate customers to make bulk payments, such as payroll, directly into Airtel Money customers accounts. The deal was subject to regulatory approval in each African market of operation.

“This partnership is a further demonstration of Airtel Africa’s commitment to provide affordable, simple and innovative solutions for our consumers across Africa,” said Raghunath

Mandava, chief executive officer, Airtel Africa. Chief executive officer at Ecobank Group, Ade Ayeyemi said the firm was of the belief that financial inclusion can ultimately contribute to economic development, collaborating with major telecommunications providers in Africa is therefore a key strategic driver towards closing the gap between the banked and underbanked.”

NOVEMBER

MTN was set to re-enter the mobile money space before, according to MTN South Africa chief executive officer Godfrey Motsa. Speaking at the 2019 MyBroadBand Conference in Johannesburg, Motsa said that there are 17 million people who are unbanked or underbanked in the country, which made it an opportune time to re-enter the market. Although, he noted that similar mobile money services had failed twice previously, Motsa said that its current offering has remained incredibly popular in the rest of Africa. “We have over 30 million customers on mobile money already and made around R8 billion last year,” he said. “While I often hear people say that ‘South Africa is not Africa’, there are still 17 million people that are unbanked and need to be serviced,” he said. The Johannesburg-based

operator launched a mobile money platform in 2012 – attracting over two million customers in the process. However, it shut the service down in 2016 citing ‘commercial viability’. Despite shutting down its mobile money service, MTN said it was still committed to having a key presence in the financial services arena.

DECEMBER

Orange Liberia and the United Bank for Africa Liberia have joined forces to launch the Mobile Money Push and Pull service for customers of both businesses.

The service is also known as “Bank to wallet” and will provide an alternative channel deposit or withdraw money from a UBA account to the customer’s Orange Money Wallet and vice versa. Customers can also check their bank account balance and their last five bank transactions. They first need to register on Orange Money using star 144 hash and then proceed to any UBA Business office in the west African nation to link their UBA account and Orange Money Wallet account.

In order to promote the service, for the first three months it will be free of charge for all customers with a minimum fee of LRD 0.50 per transaction after that period.

supply, to enable telemedicine health services.

This adoption of telemedicine is slow but will increase as the telecommunications infrastructure of the continent increases, economies expand and ironically the workforce becomes healthier. The South African health care system has the competence to provide world class health care, but this comes at a price.

The rollout of 5th Generation (5G) technology will improve the provision of e-health and telemedicine as well as enable the use of Artificial Intelligence (AI) as a diagnostic support tool. Software Applications to support teleconferencing and video conferencing, FaceTime and Skype are available for medical professionals to make remote diagnosis. Dealing with viruses such as Ebola and Coronavirus using remote diagnosis in the first instance reduces the potential for cross infection of medics. Given that about 2% of Africa's medics leave Africa to work in non-African countries, the ability to seek diagnosis help from anywhere in the world via telemedicine is an excellent facility to help cope with the shortage of qualified medics.

Mobile health facilities have been available for some rural areas in Africa for several years now and for specialist treatments such as eye and cataract treatment. But it is the development of a network of health advice, guidance and diagnosis via mobile communications that is important here. To provide access points in remote areas linked by cable, fibre optic, wireless or satellite to a central command and control point for health, such as a major city hospital.

If every African country builds a telemedicine network, it would be possible to connect them to each other and to other countries throughout the world to benefit from modern AI health condition diagnosis or to link with a doctor or other health professional.

In the March/April 2019 edition of Southern Africa Wireless Communications, the work of Médecins Sans Frontières was highlighted.

Working in the Democratic Republic of Congo their Telemedicine Team can work remotely yet access and consult a network of medical experts, whenever they are confronted with a case that exhibits symptoms, they are unsure about. In order to provide a functional service, it must be available 24/7, coordinators work with their counterparts across the globe to diagnose and treat patients as soon as possible.

Having available internet access by satellite or mobile allows for images and film to be sent to anywhere in the world for medical analysis. The use of portable satellite receivers and satellite phones allows data to be sent quickly and securely.

Without improved access to health care to ensure a healthy working population Africa will not be able to achieve its full economic potential. ■



Anil Krishnan,
head of Africa
region,
Comviva
Technologies

// Comviva has transformed its business successfully in Africa over the past two decades with greater focus on the market and learnings from our key customers," says Anil Krishnan, head of Africa region at Comviva. "We are betting big on some of the key growth levers of data analytics, digital payments, sales & distribution and enterprise messaging.

In addition to consolidating business within key accounts in the region, we have been making forays into newer markets within Africa and focusing on Telcos outside the major groups in the SADC and WECA regions." In the recent past, Comviva has expanded its presence in these regions with some significant wins in markets like Senegal, South Africa, Angola, Equatorial Guinea, etc.

As far as 2019 was concerned, Krishnan says operator revenues from international calling have declined with cheap availability of data spawning VoIP. "The usual challenges of other markets like plateauing of voice revenues, VAS revenues, etc. are reflected in the African market as well," he continues. "The growth of data and mobile money services provide hope to telcos in the region. Telcos are watching the enterprise segment very closely, with aspirations of tapping into this market by enhancing value through the Data, Analytics and A2P messaging."

Hence, Comviva sees telcos making significant investments in enhancing infrastructure in these areas to push for growth. Krishnan says the promise of high-speed connections will help operators leverage multiple untapped applications, especially in a market like Africa. However, all this will depend upon improving connectivity in the continent.

"Low ARPUs, capex investments in network expansion, 4G/5G, etc. will be the key challeng-

"Low ARPUs, capex investments in network expansion, 4G/5G, etc. will be the key challenges going forward as well"

es going forward as well," he continues. "This is also the reason we are seeing less of greenfield players. The competition from larger group opcos and QOS expected by regulators would pose problems for the smaller players in a fragmented market and therefore we are seeing consolidation of telco operations in some of the markets and will probably hear more such announcements in the coming months."

When it comes to 2020, Krishnan says Comviva is looking at sustained growths within existing markets and push into newer markets where we were not active earlier through direct or partnership route.

The company is also confident that it's "robust suite of digital offerings" along with its industry expertise will continue to resonate with telcos having digital transformation on the top of their agendas. "In the last few years, we've successfully transitioned telcos with legacy customer engagement systems into digital front and back office operational systems with sales and distribution transformation," he says. "As telcos continue to transition into the digital space, we hope for many such successful transformation initiatives in the future. Similarly, we have launched a new age digital platform, which will help telcos to manage their digital services end-to-end. We expect major developments on this front in the region, as telcos take incremental steps to cater to the increasing demand for digitization from their customers as well as enterprise customers." Similarly, in mobile money, Comviva has identified new technologies that will help it reinforce its position in the continent.

At an organizational level, we have identified key growth levers from within our product portfolio based on the addressable market and are looking at an aggressive push in these product areas in the coming quarters. Comviva has fine-tuned its geo-focus and is in the process of consolidating its markets in Asia and Africa and growing its markets in Latin America and Western Europe. We plan to implement this through a combination of organic and choice inorganic initiatives, where we are looking for more M&As in digital payments, data analytics and enterprise messaging space. It is expected that the sum total of Comviva's growth strategy will lead to growth of 14% CAGR in the next 4 years with industry leading profitability metrics.



Samantha Naidoo,
SAP industry
value advisor,
services & telco
industries,
EMEA south

The year ahead: Telcos that harness new developments and invested in value added services will see return on investment as well as the creation of new business value. By embracing the transformation smartly in collaboration with the right partners, Telcos stand to become a key enabler and provider of a differentiated customer experience by embracing products and services that will provide that one stop shop to customers.



Pieter de Villiers,
CEO & founder,
Clickatell

A part from South Africa winning the Rugby World Cup, 2019 yielded other good memories for Pieter de Villiers, CEO and founder of Clickatell.

"It was one of our biggest years as we rolled chat commerce and chat banking for some of the leading brands in Africa," he says. "It means that just a year ago things like WhatsApp Business API weren't available. In the last 12 months from that becoming available, all of a sudden a telco like MTN has made a big investment on its app and we extend that investment to a channel like WhatsApp - all of a sudden it reaches many more consumers."

De Villiers says the "China trade war/Huawei debacle" has been a disappointment because it slows things down and makes people uncertain with regards to investment in the telecom space.

"I also think that the Africa renaissance hasn't really come to fruition, because many African countries have been struggling with challenges," he continues. "I saw some light toward the end of 2019 where there was investment in infrastructure and 5G. However, 5G creates some challenges in urban areas with regards to how you roll these things out."

As far as 2020 is concerned, de Villiers says Clickatell is very much leveraging the power of automation, AI and bots to help large consumer brands, particularly telcos, banks and utilities to reach and serve consumers. "So, the power of chat commerce is that for the first time ever, we can take the consumer brand and put it right inside of the address book of their customers, right next to their friends and family," he adds.

In a global context all markets are complicated in different ways, says de Villiers. "For example, If you're a communications company trying to roll out in Africa, it's hard because of the initial infrastructure investment you need," he continues. "We do more than 45 million transactions a month in Nigeria - a very complex market - so we're thriving."

"In the last 18 months there's been a tipping point where consumers spend more time on chat than any other platform, so we believe it's the time of the chat economy," he says.

"It was one of our biggest years as we rolled chat commerce and chat banking for some of the leading brands in Africa"



Shantanu Kulkarni,
head of NG OSS/
BSS,
business unit,
Sterlite
Technologies

"We've seen a solid performance as a company, our growth is great. Of course, we can always be better but with the double-digit growth rates in the market and the environment we operate in is phenomenal and speaks about company and our relationships in the three areas we are involved in. As we look to the future, everyone has a cliché as to what data is, but we know it's growing. We do fibre and cable, network services and we do software.

In each one of those three areas we've got a different set of competition. However, one key thing to keep in mind is there is no company in the world that does all three things in the way that we do it. From fibre to software, we are positioned uniquely.

There is different competition - legacy competition and merging competition. The former is based on fear, uncertainty and doubt in the minds of customers. The latter is more about futuristic solutions, which is much more focused on the customers what they need.

We have to deal with the inertia in customers related to legacy but we are more about modern software products and people.



Inderpal Singh Mumick,
founder,
chairman,
CEO,
Kirusa

"Messaging has become the most utilised channel of communication," says Inderpal Singh Mumick, founder, chairman and CEO of Kirusa. It has evolved and transitioned from SMS to data messaging, which is also known as IP (Internet Protocol) messaging. IP messaging is a two-way messaging channel over the internet (mobile data / Wi-Fi). It includes OTT (over-the-top) apps and RCS (Rich Communication Service). OTT apps include WhatsApp, Facebook Messenger, WeChat, Skype, Viber, etc. while RCS is the telecom carrier supported evolution of SMS, that works in the built-in Android messages app."

Mumick says these channels have the advantage of a huge, ever-growing user base of individuals which is now being leveraged by enterprises for A2P (Application-to-Person) and P2A (Person-to-Application) messaging.

He adds that with the advent of IP messaging, appealing services and features that enable real-time communication and sharing of rich media content like never

"There has not been enough clarity on the potential and capabilities of various IP messaging channels, how it can help businesses and the kind of impact it can have"

before has become achievable. These include sharing of images, audio & video files, location sharing, group chats, read receipts, provides transactional details and performance metrics. "In 2019, IP messaging has started to significantly impact enterprise messaging, in particular how enterprises communicate with their customers," says Mumick.

Kirusa Konnect is a cloud-based Communications Platform as a Service (CPaaS) offering for enterprises designed to bolster customer engagement using instant, two-way and interactive communication over multiple channels including messaging, voice and rich media bots. It enables enterprises to reach customers effectively over mobile channels. An enterprise has various reasons for communicating with their audience, and Kirusa Konnect offers multiple channels to help enterprises achieve their objectives in an efficient and pocket-friendly way.

"In 2019, we launched services to help enterprises move to IP messaging. These services include designing rich conversational experiences, developing IP Messaging applications, developing omnichannel bots combining the most important channels for users, integrating with existing applications such as SMS and IVR, and helping implement RCS," Mumick says.

There were some big challenges too and Mumick says while IP messaging is gaining popularity in different parts of the world, the adoption rate for this new channel has been slow, especially for RCS. "There has not been enough clarity on the potential and capabilities of various IP messaging channels, how it can help businesses and the kind of impact it can have. RCS has been facing the challenge for its adoption by carriers across the globe, and lack of universal availability of an RCS capable messages app on the handsets," he continues. "As messaging apps in more handsets will start supporting RCS, and as more carriers will enable RCS, this channel will become more acceptable in the market."



Hugh Muller,
account director,
Openet SA

// The past year has been particularly interesting for the African telecoms space,” says Hugh Muller, account director, Openet South Africa. “We’ve noticed an uncomfortable trend whereby resellers come on board, complete a few sales and then abandon the operator without rhyme nor

reason. We’ve also seen a gap in the market whereby previous equipment vendors have installed legacy BSS solutions, but have since pulled out of the market, leaving many African operators without an adequate BSS solution.”

Muller says Openet wants to “address this clear need” for better BSS and help operators across the continent deliver the right services for their subscribers. “This is one of the reasons why we have recently opened a new office in Johannesburg,” he adds. “Africa is of unique interest to us as our agile, digital BSS portfolio lends itself well to a region where digital services, such as media streaming and online banking, are becoming more popular.”

However, this isn’t Openet’s first venture into Africa. It has a successful track record, providing BSS solutions to a number of African operators. Given its previous success, the move into Africa’s tech-hub is therefore an obvious decision and the company is excited to benefit from having localised knowledge and employees on the ground to build long-term relationships with existing and future operator customers, “giving them the right level of support” and offering solutions that meet their needs today and tomorrow.

Muller adds: “2020 will be a year of change for African telecoms, and while all of our solutions are 5G ready, we also recognize that 3G and 4G services continue to play an important role in Africa. We want to ensure we deliver the right BSS solutions to support this evolution of services, and eventually see more and more African operators deploy 5G services.”



Keith White,
CEO & founder,
SellApp

SellApp is a peer-to-peer (P2P) premium marketplace platform that is mobile-centric operating in Nigeria. It enables sellers of high-quality items (fashion, smartphones, electronics, cars and more) to sell to premium buyers fast, easy and secure.

Keith White, founder and CEO says the company’s big achievement in 2019 was securing investors in Nigeria and launching SellApp on Android as well as achieving a really low cost of customer acquisition in Nigeria.

“As our users number in Nigeria grew rapidly month-over-month we had to search for more capital fast”

What about the biggest challenges? “Recognising that the size of our mobile app was too large and ate into some of user’s data plans,” he says. “As our users number in Nigeria grew rapidly month-over-month we had to search for more capital fast.”

White says the big push for 2020 is to scale the SellApp platform to other African countries and run its backend on a mega data centre on the continent.

“Africa will continue to see growth in the digital media space, mobile and desktop advertising spend and revenues,” White adds. “Africa will become the frontier for double digit growth and the mobile and online eco-system will serve as key foundations for transforming economies and increasing productivity within nations.”



Biju Nair,
president & CEO,
Hyla Mobile

Africa remains an incredibly important market for secondary devices, according to Biju Nair, president and CEO of Hyla Mobile.. “While much of the developed world is deploying 5G networks, many people in Africa still depend on 2G and 3G networks, and the legacy devices which

connect to these networks. However, smartphone adoption in Africa is on the rise, and having doubled over the last three years, it is a market with huge potential,” he adds.

In the last year, Hyla has seen various attempts to fill the demand for cheap, yet smart devices—but these attempts have largely been unsuccessful. Nair says Smart devices which can connect to newer networks are required to access a plethora of services, from streaming video services better supporting extended healthcare services and education as well as gaming and social media. “But in Africa, the high cost of even the most basic smartphones makes them unattainable to the average consumer. While we have seen the introduction of the “smeature” phone, a cheaper hybrid smart-feature device at a reduced cost—even this cost has been too high for local consumers,” he says..

With developed countries deploying 5G networks and launching 5G devices to

match, there is soon set to be a deluge of 4G smartphones. While these devices may be considered old and outdated in developed markets, they are in perfect condition to live a second life in a market like Africa where 4G network coverage is increasing and an important step for a future 5G. High quality pre-owned devices are usually a better alternative to low cost devices for such countries where voltage fluctuations and environmental elements tend to be harsh on electronic devices. The better quality components in higher grade devices are able to withstand these factors better than low cost devices with cheaper components.

Looking forward to the coming year, the main talking point for the mobile device industry is of course 5G. We are seeing operators globally deploy expensive 5G networks and scrambling for use cases other than “enhanced connectivity” to realize a return on investment. There is huge incentive for operators to get customers to upgrade to 5G devices, as they can’t monetize the network without subscribers on it.

Even in the U.S., according to our research, consumers today are holding onto devices longer averaging close to 3 years before they upgrade to a new model. And, with the price of 5G devices costing in excess of \$1,000, operators, retailers, and OEMs will need to help consumers get there through incentives and leveraging programs such as trade-in towards purchasing 5G devices that can place them on the new 5G networks.

For HYL A Mobile, combining its unparalleled access to the secondary device market with new insurance provisioning technology is also a priority for the year ahead. HYL A recently announced a new partnership with Admin Plus, a provider of short-term insurance in South Africa, which is utilizing HYL A’s patented Machine Learning (ML) technology. This technology remotely determines whether a mobile device is functional and free of screen

“While we have seen the introduction of the “smeature” phone, a cheaper hybrid smart-feature device at a reduced cost—even this cost has been too high for local consumers”

damage prior to insuring, thereby significantly reducing its risk of exposure to fraud.

Looking ahead, 2020 should be another year of growth for the secondary device market. By maximizing the life of pre-owned devices, not only can consumers become better connected, but with enhanced offerings like device protection, those owning pre-owned devices can ensure that they are able to protect them. Together, this will save the environment from e-waste, save consumers money, generate revenues for operators and insurance providers by lengthening the life of devices within the circular economy.



**Padma
Ravichander,**
CEO,
Tecnotree

Tecnotree is proud to have served the African market for over a decade now, says Padma Ravichander, company CEO. She says the company does so by enabling communication service providers (CSPs) across the continent with its full stack digital business management product and service, Tecnotree Digital BSS Suite 5.

"We are a trusted partner of several local CSPs, though we have a long-standing partnership with MTN Group," she adds. "Tecnotree serves as the MTN Group's primary BSS provider in many of their operating countries including Ghana, Nigeria, Uganda, Cameroon, Ivory Coast, Rwanda, Swaziland, Benin Guinea Conarky, Congo, Zambia & Sudan. We also serve CSPs in the African sub-continent in Zimbabwe, Malawi, South Africa, and Namibia with our platforms and products."

Ravichander says Tecnotree is committed to ensuring that it employs local talent in each of these countries. As a result, it does its utmost to provide training so that these employees can be upskilled and educated in the firm's technologies, providing them with the chance to work in a global company.

She adds that Africa is a rapidly growing market for Tecnotree. "We see the penetration and adoption of smartphones, mobility and the use of data increasing rapidly across Africa – and this is crucial," Ravichander adds. "The increase in the use of connectivity and communications alone will bring the benefits of a more modern, connected life for all countries in Africa, be it through financial inclusion, education, access to modern health benefits or employment creation and hence economic growth."

With regards to the next 12 months, Ravichander says the challenges are many, but they are not necessarily different to any other emerging market. "The availability of basic amenities like drinking water, energy, access to basic goods as well as clean,

"We see the penetration and adoption of smartphones, mobility and the use of data increasing rapidly across Africa – and this is crucial"

hygienic environments and medical facilities is challenging," she continues. "Similarly, there are problems because of a lack of financial inclusion and very little quality infrastructure. These problems need to be resolved expeditiously and in a massive way before we see genuine digital transformation on the continent."

Tecnotree is in the business of empowering digitally connected communities that will help Africa leapfrog into the 21st century ahead of some of the most established players in the global market. Ravichander says this is because of the way the African ecosystem is embracing the use of communication and connectivity. "Tecnotree is delighted to partner with customers in Africa, as we know we can strategically help them to achieve their main aim: a digitally connected Africa," she says. "Through our technology, we believe our customers will be able to improve the lives of local African communities with better connectivity and access to bigger markets. This will create economic growth, financial inclusion, and lead to better services like healthcare, education and employment in Africa." Ravichander says Tecnotree welcomes working in the African market and take pride in the small part it has to play in its success.



**Mountasser
Hachem,**
CEO,
Monty Mobile

Our main mission at Monty Mobile is to help operators maximise their revenues and to support them through innovative revenue-generating products," says CEO Mountasser Hachem. This is reflected through all our offered services and products, especially with our newest and most diversified VAS portfolio that is guaranteed to boost Operator's revenues. The African market has always been a major player in the telecom business, and thus a big focus for us."

With this said and with more than 20 years of experience within the telecom industry, Monty Mobile, Hachem says, has always found that many African Operators have a lot of

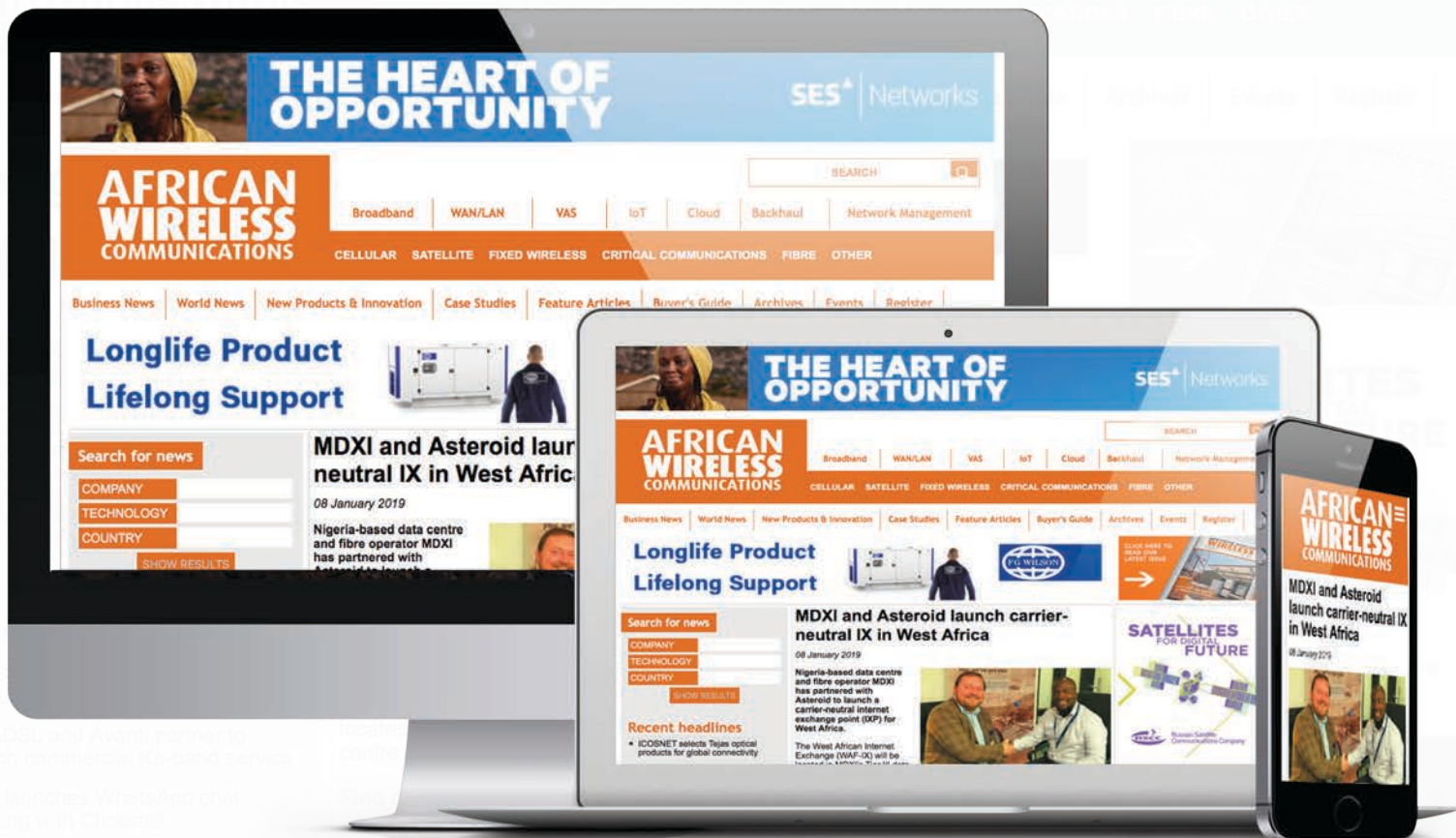
lost opportunities, mainly when it comes to customer data, value added services (VAS), mobile advertising and financial services among others. "This is why we have worked hand in hand with many of them to help them discover their hidden gems and find the best way to monetize them," he continues. "Lately, we have been fully focused with our African clients on services such as MVB (mobile virtual banking), our latest innovation within the Fintech industry, transforming operators into virtual banks; in addition to our M-Wallet that allows the banked and unbanked customers to make money transactions anytime, and directly from their mobile phones."

Hachem says Monty has also been investing in other VAS services such as call completion, call lending and story RBT, all of which enhance the subscriber's experience and offer call facilities, thus enhancing the operator's total profits.

"We look forward to ground-breaking changes within the telecom field in 2020, especially in terms of Fintech and IoT sectors," he says. "We are constantly developing our portfolio to grow with the technology changes and to fit Operators' needs." Consequently, this year, Monty is offering a variety of IoT devices and solutions, in addition to our M-Analytics platform, game portal, health care and other mobile applications that help operators adapt to the world of digital transformation and move their businesses forward. ■

"We look forward to ground-breaking changes within the telecom field in 2020, especially in terms of Fintech and IoT sectors"

AFRICAN WIRELESS COMMS.COM



for African wireless communications, as it happens

www.africanwirelesscomms.com

chapter 4

Fixed wireless access



Lehlohonolo Mokenela,
senior analyst,
Africa Analysis

African operators have struggled to meet the continent's growing demand for connectivity due to the limited wireline infrastructure. Despite Africa's access to a growing number of undersea cables, deployment of fibre in the last mile is still limited. As a result, fixed wireless access (FWA), also referred to

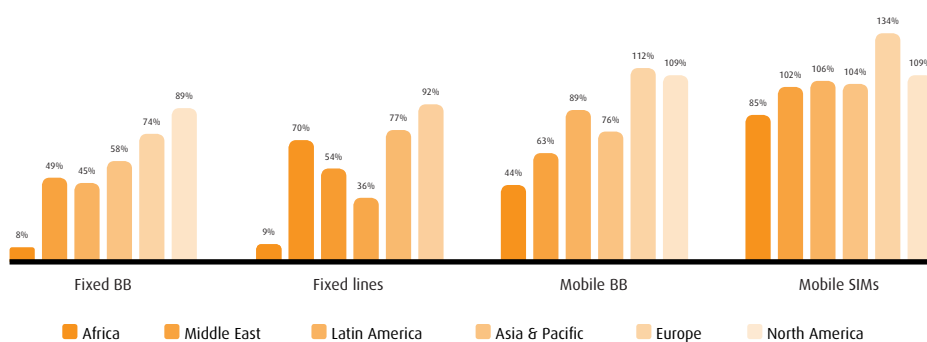
wireless to the x (WTTx), has come to represent the solution to Africa's last mile challenge that wired networks have been unable to solve.

While fibre to the home (FTTH) and fibre to the business (FTTB) deployments are on the rise in Africa, they are still not growing quickly enough to meet the broadband demand. With FWA operators are to provide internet access for the residential and enterprise markets, in areas with poor wireline infrastructure. Due to the slow pace of fibre deployments, African operators are expected to continue to focus primarily on growing their FWA business while gradually building out their fibre networks.

The status of connectivity in Africa

Africa has a legacy of under-investment in infrastructure that has left the development of the telecoms sector lagging behind most of the rest of the world. When the first high-capacity undersea cables landed in Africa in 2009, they were heralded as the key to unlocking the potential of the telecoms sector. However, the biggest challenge is still in taking the cables from the shore to provide affordable internet access. This has been due to the limited investment in terrestrial fibre networks, which have left countries such as Nigeria, the largest economy on the continent, under-utilizing its fibre capacity.

Exhibit 1 – Mobile and Fixed Broadband Penetration by Region and Technology, 2019



By 2019, Africa had the lowest fixed line penetration in the world at 8%, well behind LATAM's 45%, the region closest to Africa in terms of service penetration.

Africa's FTTH penetration stood at 0.5% in 2019, compared to the LATAM regional average of 4.1% and 9.9% in the Middle East. While most African countries have low FTTH penetration, Mauritius is the standout exception with a FTTH penetration 65.4%. This comes on the back of concerted efforts by the government and leading operators in the market to drive fibre deployment across the country. With a customer base of 640,000 in June 2019, South Africa had the highest number of FTTH subscribers in Africa, but a household FTTH penetration rate of only 2.7%. Other highly populated countries in the region such as DRC, Ethiopia, Kenya and Nigeria either have low FTTH penetration rates or are yet to launch the service. As a result, customers have come to rely on mobile connectivity to access the internet.

Evolution of FWA technology

Subsequent generations of mobile technology have widened the range of applications that can be offered over mobile networks. While the first and second generations supported voice,

messaging and basic value-added services, LTE and 5G networks offer higher speeds on wireless broadband networks than on legacy wireline networks. They also offer operators the opportunity to drive innovation in more advanced applications such as, analytics, artificial intelligence, IoT and robotics. Moreover, with the high speed networks it offers, 5G is increasingly being touted as an alternative to FTTH services.

There is still some debate over the viability of 5G FWA as an alternative to fixed-line networks. While the argument for 5G FWA over xDSL and cable for fixed broadband services may be more straightforward, it is less in comparison to fibre. In developed markets where the coverage of fibre is fairly extensive, 5G FWA is likely to remain a long-term solution for rural and remote areas, with the metros mostly relying on fibre-based networks. In the early phases of 5G however, operators such as Verizon in the US are using 5G FWA to launch new services as well as lay the foundation for a full rollout for mobile services.

At the 2019 AfricaCom Conference in South Africa, the general consensus was that 5G represented a massive opportunity for African operators to provide high speed internet for regions with limited fibre coverage. The spectrum that it uses and the technology that it is built on, makes it ideal for offering consumers and enterprises a fibre-like experience. African

FIXED WIRELESS ACCESS: INTRODUCTION

operators are therefore expected to use their 5G networks to offer FWA services as the supporting technologies such as smartphones and the cost of the service may not make it commercially viable for mobile market.

Most of the focus for 5G FWA will be on the higher-income residential sector such as those targeted by fibre, and on the larger enterprises making extensive use of cloud and IoT applications. The challenge for the 5G networks however, is that operators in Africa are still awaiting allocation of the spectrum they need to offer the service. Vodacom SA and MTN SA have been

running tests 5G and believe the only hindrance to their launching 5G is access to spectrum.

The introduction of FWA services based on LTE and 5G has opened the market to a range of potential applications that make it relevant to the consumer and enterprise market. While the uptake of LTE FWA in the residential segment was fairly rapid in Africa, it is expected that the enterprise segment will lead the 5G FWA adoption. The speeds and cost of the technology will initially be more relevant and viable for enterprises who can make more use of its potential capabilities such as artificial

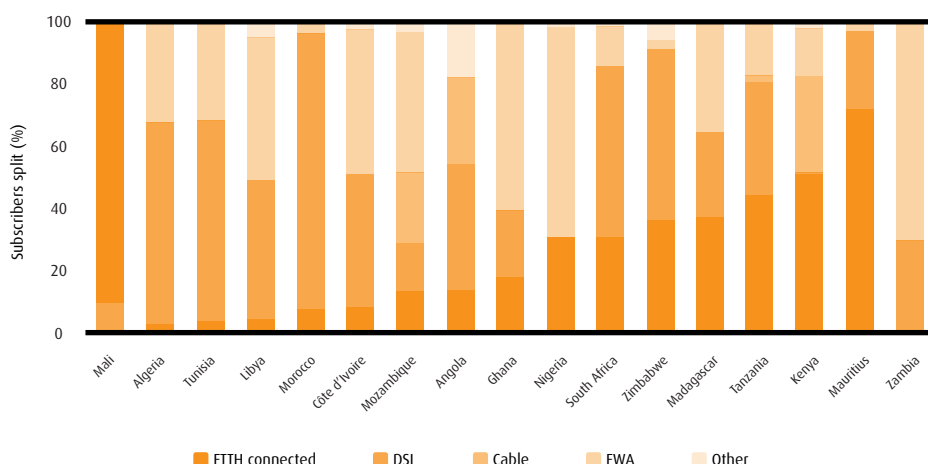
intelligence, robotics and augmented reality. In the residential sector, there will be a case for using 5G FWA for smart home applications. This is particularly the case as Africa is still lagging behind the rest of the world to get customers on 3G and LTE, while other parts of the world have gone on to switch off their 2G networks.

FWA networks in Africa

In Africa, most of the focus has been on developing LTE-based FWA services targeted mostly at the residential sector. This is due to the dramatic increase in data consumption by subscribers who had in the past mostly used 3G networks for basic internet services, such as emails, browsing, social media and messaging applications. However, 4G/LTE networks promise higher speeds and better user experience to support more bandwidth-intensive applications such as video content and calling. Pan-African mobile operator, MTN, reported a 95% 4G/LTE population in South Africa.

The operator also began offering LTE-based FWA as a wholesale service that ISPs across the country could resell in the consumer market. The introduction of 4G/LTE networks has also seen the emergence of data-only operators such as Smile Telecom, Surfline Communications and Rain who are looking to capitalize on the limited reach of fixed-line networks. Smile has

Exhibit 2 – Fixed Broadband User Split by Technology in Selected Countries



JANUARY

Liquid Telecom plans to invest EGP8bn (USD400m) in Egypt as part of a major partnership with Telecom Egypt that includes network infrastructure and data centres. Over a three-year period, Liquid will initially spend USD50m in data centres and cloud services. It then plans to invest a further USD350m in broadband and financial inclusion initiatives, as well as what's described as "high capacity" data centres. The precise number and locations of these facilities have yet to be announced. Telecom Egypt will partner with Liquid to build the data centres across the country as well as use the network to connect local businesses to the rest of Africa. Egyptian president Abdel Fattah el-Sisi welcomed the development as a major milestone in connecting his country to the continent. el-Sisi said he would continue to push the initiative after he takes over from Rwandan president Paul Kagame as chair of the African Union (AU) later in 2019. Liquid reckons this latest deal will enable it to "significantly expand" its position as a connectivity and cloud solutions provider in North Africa. The company adds that through its data centre subsidiary, Africa Data Centres, it is providing a platform for cloud services to be delivered locally in many markets for the first time. As part of

the 'One Africa' broadband network initiative, Liquid signed a partnership agreement with Telecom Egypt last year to mark the completion of the first direct terrestrial fibre link from Cape Town to Cairo (see *News, Jun/Jul 2018 issue*). Strive Masiyiwa, executive chairman of Liquid Telecom's parent company, Econet Group, the next mission is to complete a link between Cairo and Dakar as well as the rest of West Africa. He says "We have already crossed Africa from East to West through Sudan and Chad. We are at the Nigerian border and we expect to reach Abuja by the end of January in time for the AU summit. We want to reach Dakar before president el-Sisi finishes his term."

FEBRUARY

Internet speed in Nigeria is still slow despite an increase in subscriptions to 3G and 4G in the past year, according to the latest data from the Ookla Speedtest Global Index (OSGI). Nigeria ranked 107th with a mobile internet download speed of 12.22 megabits per second (mb/s) compared to 12.76 mb/s in January. The OSGI, which compared internet speed data from around the world each month, found that the global average for mobile internet download speed for the 136 countries surveyed in February was 25.27mb/s, while

10.05mb/s was the global average upload speed achieved. Industry data from the Nigerian Communications Commission (NCC) indicated that about 23 million new 3G and 4G subscriptions were added by telecom operators in the 11 months since March 2018. As of January 2019, the country attracted 61.7 million new 3G and 4G subscriptions. The OSGI also found that Nigeria's ranking for fixed broadband download speed also dropped six places from 133rd position in January to 139th position globally in February this year. In the fixed broadband category, the country recorded a 10.47mb/s average download speed and an 8.83mb/s upload speed in February. The global average for fixed broadband download speed for the 177 countries examined was 55.58mb/s while it recorded 27.64mb/s for the upload speed.

MARCH

The Zambian government has entered into talks with Chinese tech giant Huawei over the possibility of deploying 5G in Zambia. The move was disclosed by transport and communications minister Brian Mushimba who met Huawei officials. Mushimba said Huawei, the technology partner for the GRZ Communication Tower Project Phase II, has committed to upgrading

built its growth on the consumer and enterprise markets in East and West Africa, where it has built a strong and growing customer base.

By June 2019, all but 4 of the 54 African countries had a 4G network but is still some way to reaching full coverage on the continent. However, some operators are already exploring and testing the next generation of mobile connectivity 5G. Vodacom Lesotho became the first operator in Africa to offer a commercial 5G network, when it launched the network in August 2018. This was followed by Rain Mobile when it launched its commercial 5G network in South Africa in October 2019. While Vodacom Lesotho's 5G network is targeted at enterprise market and Rain at both enterprise and consumer, both operators are offering 5G access as an FWA service. Other major operators in the region, such as Vodacom and MTN have also been testing 5G technology, with launch expected in 2020 pending the allocation of spectrum by the regulator.

The case for FWA in Africa

Despite the strides operators have made to extend terrestrial fibre, particularly in the metro areas, most of the region is still expected to rely on mobile networks for broadband services. The growing deployment of LTE networks

and the arrival of 5G, will plug the gap left by the limited fibre network. One of the main advantages of FWA over fibre-based networks is the relatively low cost of deployment.

Conversely, while fibre is relatively more CAPEX-intensive, once laid, it has a comparatively lower OPEX than wireless networks, which require more maintenance. The fibre CAPEX per capita can also be significantly reduced when the network is deployed in densely populated areas. Some of the leading FNOs in South Africa are gradually turning their attention to the highly populated townships with households in close proximity to each other, in order to lower the cost of deployment. In addition, as a wireline infrastructure, fibre tends to offer a more stable network, suffering less line degradation than FWA services.



Christoph Fitihi,
director sales,
Africa,
Parallel Wireless

As the new decade dawns, the telecommunications industry (specifically mobile), has finally woken up to the fact that its economics need to change, especially with the advent and expected widespread uptake of 5G. Much of this realisation has been driven by a need to move away from the

consolidation of the RAN industry that has seen Huawei, Ericsson and Nokia dominate the space and in the process, creating a closed, almost anti-competitive market. The development of OpenRAN, which in 2019, really gathered momentum, has really changed the playing field.

OpenRAN by its very nature, has also facilitated a more open and collaborative approach among a host of service providers who have collectively, developed more innovative solutions to the rapidly developing communications space's needs. This ability to be creative and offer alternatives to operators, has also created the ability for operators to expand their networks and include more users for their services.

An open market and mindset have also driven efficiencies. The traditional proprietary and closed nature of RAN technology has made it costly and difficult to upgrade technology once it is deployed. The option to choose and use multiple vendors, changes this now that a wide range of product, price and services are on offer. The competitive nature of an open market will also mean that innovation will be a constant – not a bad thing if you consider just how fast the sector is evolving.

Here in Africa, OpenRAN is set to play a vital role in the connectivity race. Much of the continent is still unconnected and those that are, are largely dependent on legacy

all the sites seamlessly to 5G capability. He was speaking at Zamtel House in Lusaka in April when he officiated at the launch of ZamPay Number Neutral Capability Feature. He added that Zambia does not want to be left behind in innovation and adoption of internet technologies. 5G is the next generation of mobile internet that is expected to enable everything from instant downloads of movies to connected self-driving cars.

APRIL

Orange has launched its 4G mobile technology in Conakry, making the service available in all the areas of the capital: Kaloum, Dixinn, Ratomma, Matoto and Matam. As part of a second phase, it will be deployed to cover the whole country, in accordance with the guidelines set by the specifications, which provides coverage for at least 90 per cent of the population. Sékou Dramé, managing director of Orange Guinea, said that 4G would give the company the opportunity to offering the country and its people growth and development opportunities to which they aspire to shine in the subregion, the continent and globally. The launch of 4G by Orange occurred almost two months after the company obtained a global 10-year licence valid, for some USD90m. With the launch of the

4G, Orange takes comfort in its position as the market leader with 67 per cent market share ahead of Cellcom and MTN, its main competitor.

MAY

Malawi Telecommunications and fibreoptic network operator SimbaNet last month joined the list of African service providers that have experienced disrupted internet connectivity during crucial election periods. The internet providers saw service interruptions as results from the general election came in on Tuesday May 21st. It is understood the disruption lasted six hours in some cases. According to reports, the suspension came after a tight election in which president Peter Mutharika was seeking a second term in office. Data from digital advocacy group NetBlocks showed the outage began at 6:30pm local time, half-an-hour after counting began around the country and results were being sent to the electoral commission. Fixed network carrier Malawi Telecommunications and SimbaNET were reported to be among those affected. Local media also noted television and radio communications were taken off air in different parts of Malawi. Despite the high cost of internet combined with low internet and mobile penetration in Malawi, fake news

made its way on to social media in the weeks prior to the elections, prompting a warning from the telecom regulator, The Malawi Communications Regulatory Authority.

JUNE

Telecom firm Airtel has launched Republic of the Niger's first 4G LTE network, almost a year after it paid US\$22m for its 4G licence. The 4G network is available nationally, making Niger the first country in Africa where Airtel's 4G network is available nationwide from launch. Airtel, the dominant player in the country, described the feat as "a new chapter in the telecommunications revolution in Niger". At the official launch ceremony in the capital Niamey, Sani Maigochi, Niger's minister of posts, telecommunications and digital economy, said the launch chimed with the government's vision for the digitisation of the country. Airtel Niger chief executive officer Pierre Canton-Bacara agreed. "Airtel's 4G LTE network will undoubtedly trigger a new phase of accelerated, equitable and inclusive economic growth, thanks to the increase in broadband services," he said. The Nigerien government said it was hoping the introduction of the 4G LTE network would revitalise the telecom sector, improve digital services and accelerate the slow growth rate of

infrastructure, with 2G and 3G abounding, and 4G still in its infancy. That has not stopped the sprint to bring 5G to Africa though, with Uganda recently being the first country in Western and Central Africa to deploy 5G Internet.

However, although there are capabilities to deploy 5G, Africa-based operators will require the ability to run 5G alongside their existing 2G, 3G and 4G networks. At present, that can only be solved with either erecting new infrastructure or, deploying OpenRAN, which can run alongside existing infrastructure. It's a no brainer really...

On that note, here's what I see as the key components that will happen in the African telecoms market in 2020 to set up for the next decade:

5G

- Widespread rollout of 5G, including Africa.
- The first commercial deployment of stand-alone core. With the 3GPP Release-16 standard being finalized mid-2020, companies will be racing to be the first in the world with stand-alone 5G core.
- Further development of network slicing.
- 5G advancement will also accelerate OpenRAN hardware and software, and open collaboration partnerships to run 5G technology efficiently alongside their 2G, 3G and 4G networks.

4G and OpenRAN

- 4G is growing and will grow even faster in 2020. OpenRAN will allow operators to perform more deployments, including connecting rural and hard-to-reach areas.
- We may see operators move heavy data users from 4G to 5G to improve user experience for those on the 4G network.

Legacy 2G & 3G Networks and OpenRAN

- Uptake in transition from legacy infrastructure (2G and 3G) enabled by widespread deployment of OpenRAN solutions. 3G sunset but 2G will more than likely remain.

Internet of Things (IoT)

- IoT will continue to grow, but at a slower pace than previously predicted. The connectivity will include many different options, including cellular, wi-fi, Bluetooth, non-cellular LPWA technologies, and more.
- Enterprise use of IoT will increase, specifically with regard to smart manufacturing.

Private Networks

- Private networks will start to gain importance, which will help solve tasks that were traditionally difficult to perform using other wireless technologies, while improving performance and productivity and ensuring security.

Smartphones and Smart Feature Phones

- As 5G rollout becomes more widespread and consumer interest grows, we will start to see cheaper 5G smartphones. Apple have already hinted at a small, cheap 5G handset for first half 2020
- Smart Feature Phones will continue to gain traction, especially in developing countries, allowing people to move from 2G technology to 3G and 4G technologies.

Blockchain and Payment gateways

- The World Economic Forum's Africa Growth Platform and the development of open public Blockchain initiatives like The African Chain, will see Africans connecting to the digital economy in a big way. This will work hand in hand with expansion of the telecoms network across the continent.

2020 will also see the roll-out and uptake of other smart technologies such as XR/VR SIM driven glasses, advancements in the research of Autonomous Vehicles, smart homes and cities (a focus will be on bettering privacy and security). All in all, the advent of this new decade is an exciting time for the global telecoms sector, but especially for Africa and Africans who can look forward to being actively involved in a vibrant and sustainable digital

the local telecoms sector – specifically to help achieve the goal of 70% penetration by 2020. Airtel controls more than half of the market share, according to the Regulatory Authority for Telecommunications and the Post (ARTP). Other players are Atlantique Telecom Niger SA, Orange Niger SA and Niger Telecom SA.

JUNE

South Africa's Competition Commission (CC) has welcomed the government's new spectrum policy and has pledged that customers will experience better coverage and lower data prices. The CC said in a statement that it backed the department of communication's plans to establish a wireless open access network (WOAN) and offer high demand spectrum to smaller players. "At a time when public finances are under such pressure, it is tempting to try (to) maximise revenues by simply auctioning spectrum to the highest bidder," the CC said. "However, as the data market inquiry provisional recommendations counselled, such short-term thinking would deny South Africa a unique opportunity to bring about lower data costs both now and in the future. High demand spectrum is a scarce national resource and its allocation should be done in a manner which ultimately benefits the citizens of the country," it said. The CC added

that it would continue to be engaged with the spectrum licensing process as the new policy takes shape. "This may include obligations to ensure affordable data prices immediately, but also how relative allocations between operators may shape competition going forward into new generation networks such as 5G," it said. "It will also include measures to ensure the commercial and competitive success of the WOAN, avoiding some of the difficulties faced by other late entrants, as well as appropriate regulatory oversight of that entity." The CC published a provisional market inquiry published in April, in which it said that international benchmarking confirmed that South African data prices are high – particularly for mobile prepaid data. It also said that existing data prices were "anti-poor" and "lack transparency" – and recommended that South African telecom firms address the problem. It recommended that networks should also reduce the price of sub1GB bundles to within range of an "objectively justifiable and socially defensible range of the 1GB price".

AUGUST

Huawei has partnered with Belgium non-profit organisation Close the Gap to provide digital skills training to rural and remote communities in Kenya. Huawei's DigiTruck is a mobile digital classroom implemented by

Huawei as part of Tech4ALL. Huawei stated, "In Kenya, for example, despite being the ICT hub in Africa, internet users account for less than 50% of the total population, not only because more than 75% of the population live in remote areas, lacking stable power supply, but also because many people do not realise the real value of digital skills, who have never been exposed to smartphones or used the internet,". Huawei said its DigiTruck is designed to deliver digital skills to remote homes through mobile digital classrooms converted from truck containers. It is equipped with wireless broadband enabled by fixed wireless access, laptops and smart phones enabling internet skills to be taught aboard and incorporating VR content in digital education. It also has solar panels and batteries capable of powering it, so it can reach remote rural villages without electricity. "For over 15 years, Close the Gap has been bridging the digital divide in developing countries by providing high quality refurbished ICT-devices to more than 5700 projects with a social impact," said Olivier Vanden Eynde, founder and chief executive officer of Close the Gap. "With the different DigiTrucks we have been able to reach even the most isolated communities that have little or no

economy, facilitated by the dawn of open thinking and open markets that deliver on what's best for the whole. ■

Year in review

There was worldwide growth in Fixed Wireless Access (FWA) in 2019 and Africa was a major beneficiary of this growth. The previous negatives of using copper cable and resultant thefts are now being consigned to history in Africa, as wireless broadband takes the lead in urban and rural areas. The capability of 4G and 5G networks, with high data throughput and low latency to provide fibre like performance is now well established.

Wireless has the key advantage in that it doesn't require the physical connectivity of cable or fibre and the associated trench digging for cables and is therefore a cheaper alternative.

5G to start producing a ROI

Ericsson believes that African and Middle Eastern network developers can expect potential revenues of up to US\$46 billion by 2030, if they adapt their business model and become service enablers and creators. Ericsson's 5G Business potential beyond mobile broadband report, alludes that operators could adopt new

business models and develop new services, applications and revenue streams.

Given that Ericsson predicts that 5G will cover 65% of the world's population by 2025 and handle 45% of global mobile data traffic, the African market will consequently substantially benefit. With a projected 2.6 billion 5G subscribers by 2025 it is a market that Africa cannot ignore.

The leading communication providers outside of the African continent, switched on their 5G networks in 2019. Africa is in the early stages and just commencing, a very limited, roll out which will see consumers facing high costs of 5G access, as well as the cost of acquiring 5G compatible devices such as smartphones, compared to the ever widening coverage of 4G LTE.

It will be the mining, oil, gas, transportation systems, public safety and manufacturing sectors that will have the greatest opportunities to increase profits by capitalizing on 5G. Potentially there could be 60 million mobile 5G users in the Middle east and Africa by the end of 2024.

African internet access is priced too high

With all the advances in African networks and service improvements in 2019, there is still the inequality that African nations are paying some

of the highest rates, for what is often basic internet access. Although access costs have fallen and continue to fall, they are still higher than what most of the world must pay.

Research by the Alliance for Affordable Internet highlights the need for policy makers and regulators to promote competitive and diverse broadband markets as key ingredients to drive down the cost of internet access.

Being able to connect to the internet can be transformative for individuals in Africa, due to educational, health and business opportunity that such access enables.

In Africa limited competition means that the absence of a strong pressure of market competition, results in the price of mobile data remaining high. The cost of establishing networks in Africa also means that the return on investment is limited to the ability of consumers to pay for services to produce profit. The Alliance reported that citizens of Chad, the Democratic Republic of the Congo and Central African Republic pay more than 20% of average earnings for 1 GB of data. The most affordable areas of the continent are in Egypt at 0.5% and Mauritius at 0.59%. There has been some indication of price reduction such as in Sierra Leone, where the relative cost of 1GB of data fell from 25.9% to 9.9% after the introduction of more affordable data plans by

access to ICT, also bring quality training and education to these areas.

SEPTEMBER

South African telecom operator Rain has launched a commercial 5G wireless home broadband service, becoming the first in the country to do so. The mobile data-only provider has started rolling out the service, offering uncapped internet usage for R1,000/ month, to selected areas where the company has network coverage. The fixed-wireless 5G service is aimed at home broadband and is currently only available in parts of Johannesburg and Pretoria for now. "During 2019 and 2020, coverage will expand to Cape Town, Durban and other major metros," said Rain chief marketing officer Khaya Dlanga. "Selected customers in Rain's 5G coverage area have been invited to be the first to purchase ultra-fast 5G". The service has been promoted as an alternative to ADSL, fibre and fixed-LTE offerings. "In the next couple of weeks, Rain will open up the offer to all homes and small businesses within the coverage area of Johannesburg and Tshwane," Dlanga added. Rain has built its 5G network using technology from China's Huawei atop its spectrum allocation in the 3.6GHz radio frequency spectrum band. South Africa's bigger and more established mobile operators are still unable to launch 5G services until they get access to more spectrum from the regulator.

OCTOBER

African and Middle Eastern network developers can expect a potential revenue opportunity up to US\$46bn by 2030, provided they adapt their business model to become service enablers and creators. That is according to Ericsson's 5G Business Potential beyond Mobile Broadband report. A sequel to the 5G Business Potential report, Ericsson highlighted the "industry verticals" that are prominent in the region and offer clear opportunities for 5G use cases. "5G will introduce opportunities that will allow operators to adopt new business models and develop new services, applications and revenue streams," Chafic Traboulsi, VP and head of networks, Ericsson Middle East and Africa said at GITEX Technology 2019 in Dubai. "These new 5G applications and services are expected to have a profound impact on consumers, businesses and industry digitalisation which underscores the importance of releasing our research at this time." Ericsson has identified four industry verticals that form the primary focus in the addressable 5G business potential opportunity and cited clear opportunities for the following 5G use cases: oil and gas (mining), transport and automotive, public Safety and critical infrastructure and manufacturing.

NOVEMBER

Seychelles company Intelvision, which provides TV and internet services to the local market, is

understood to be moving into the mobile sector.

The only fixed broadband and pay TV provider across the archipelago revealed that it was planning a network rollout in 2020 alongside Chinese tech vendor Huawei.

There will be an initial focus on 4.5G services but deploying 5G technology will also be part of the plan. The company said that it intends to roll out a 5G network in Seychelles' inner islands as and when 5G devices become more accessible. The next generation will be introduced in June 2020 in the largest island Mahé, beginning with the capital, Victoria, north Mahé and the airport. Over the following 12-18 months it will be extended through much of the rest of the nation.

Currently only two network operators share the mobile market of the Seychelles: Bharti Airtel and Cable and Wireless Seychelles.

DECEMBER

Ghanaian technology company Celltel Networks has appointed local finance company Ed&Co Capital as financial advisors for the US\$500m Ghana Smart Cities project. The idea is to provide an affordable nationwide Wi-Fi network in collaboration with local government institutions and other strategic and relevant government agencies in the west African nation. It is scheduled to begin in the second quarter of 2020.

the country's largest operator. Income increases for some customers drops the relative cost of data, even if the data cost itself is not reduced. The Alliance has shown that seven countries in 2019 reached the international threshold of affordability, including those at below average income levels in Algeria, Cape Verde and Namibia.

Are Towers growing in importance?

The last 12 months has seen changes in tower design to improve sustainability, security and operation. The importance of towers for the provision of 4G and 5G is self-evident and with the requirement for a greater density of towers for 5G, the future for tower companies and component providers looks bright.

In a world that demands sustainability and compliance with low carbon emissions, the question has been raised as to why so many towers in developing countries are still powered by diesel generators.

Commercial alternatives are available that can provide relatively clean power for tower site operations, ranging from solar and wind power, to batteries and fuel cells.

Companies such as, MTN Cameroon, have been trail blazers in Africa by going green with solar-powered base stations. Estimates of the number of towers in Africa come in at just over 180,000 with some 35% not connected to the electricity grid, while diesel still provides a cheap and readily available fuel to generate electricity.

The last year has seen some tower companies increase their number of towers, while others have been involved in number reduction or consolidation.

South Africa's tower market has been up and down, with just over 30,000 operational towers. One company, MTN is in the process of consolidating its tower numbers, after several years of growth, as is Telkom's Gyro Group. American Tower has seen modest growth in its operational tower number. The latter part of 2019 saw the listing of shares in Helios Towers on the London Stock Exchange which raised over US\$300 million to help towards its expansion in the African market and to fund the purchase and development of new sites. Helios has over 6,900 sites spread across South Africa, the Democratic republic of Congo, Ghana, the Republic of Congo and Tanzania, which it rents to Mobile Network Operators providing wireless voice and data services. It saw an increase in tower numbers and acquired SA Towers to increase its tower presence in South Africa, though Helios Tower saw a rationalization of its towers in Central Africa.

Things can only get better, IoT in 2019

The Internet of Things (IoT), or the connection of sensors, smart meters, machines, appliances and devices amongst an ever increasing list of things, via networks and technology to the internet is a growing sector and a potentially very profitable one, which has seen strong growth in 2019. Its application in smart cities, remote monitoring and consumer items is growing exponentially, as is the amount of data being generated by IoT devices.

Leaving aside two aspects, firstly the fear that Huawei could share IoT derived information with the Chinese state and secondly the consumer aspect, (and specifically the growth generator of Smart home devices) that consumer activity can be monitored via IoT and the potential privacy issues which this raises, both of which are for governments to legislate on, the major benefit of the Internet of Things will be for industry and commerce. With predictions that connections for IoT will be in the region of 25 to 28 billion in the next 5 years up from the 10 to 12 billion estimate at the close of 2019, business will need to address the massive increase in data generation.

Africa is a continent comprised of regions that are developed and developing and the impact of IoT is therefore mixed. The deployment of devices in undeveloped regions that have IoT capability, but no connectivity or poor connectivity will limit the potential for revenue generation. This should be addressed as Africa benefits from a future increase in deployment of Nano Satellites, that will provide a lower cost connectivity to support the IoT market.

It is data mining and analysis of data that is the challenge in an African market that will generate immense amounts of data from IoT devices, and no doubt the deployment of Artificial Intelligence and machine learning will fit in somewhere in the solving of these problems to

enable the generation of income streams.

The division between consumer aspects and business aspects will see an overwhelming shift to the importance of enterprise connections, as IoT connections in the Machine to Machine (M2M) and Cellular IoT Business increase, enterprise IoT connections will exceed consumer ones by 2024 and are expected to triple between 2019 and 2025.

For the Africa market, Big Data Analytics is a challenge, without the provision of extensive 5G coverage, data centres and a market for the mined and analysed information.

The relative underdevelopment and poverty of some African regions means that consumer IoT generated data may not lead to additional sales. As mentioned previously the privacy aspect for the individual and the data IoT devices will generate, needs to be legislated for. The reality of interconnected autonomous cars is still some time away for most of Africa and the last year saw little development of that market. But on the positive side agricultural applications for IoT devices, from monitoring cattle to crop protection and supply chain support are important to African regions as they can increase productivity and crop production, not only to feed Africans but also to increase revenue from food exports. The questions an African enterprise needs to consider are: why is the enterprise attracted to IoT, are its competitors using it and using it for the right commercial reasons and is there an IoT fit in the enterprise's strategy? The reality is, that many African enterprises still require the skilled individuals to implement IoT and to draw down the benefits for the enterprise. African enterprises must decide if IoT is critical to their business, that it will produce a return on investment, is safe and secure from hacking, that they have the right people and skill sets in place to implement it and the funding to implement and maintain it.

Fixed Wireless Access (FWA) African growth

Africa has a long way to progress to increase the penetration of Fixed Wireless Access across the continent. This is where the progression of 5G, although itself not rapidly deploying, can increase the percentage of FWA coverage. LTE has been launched via FWA in dense population areas and where there is a concentration of potential enterprise use.

There is slow but increasing demand, though this demand is end user cost related for FWA and its enhanced capabilities for low latency and stability. Although FWA is readily accessible as regards coverage and ease of application and installation, the cost as mentioned above, for domestic users means that provision is directed at the more affluent communities. The opportunity for cost



Lehlohonolo Mokenela,
senior analyst,
Africa Analysis

The year ahead: As a result of the Covid-19 pandemic, more companies have adopted "work from home" models to ensure their employees remain productive during the lockdown. This has included assisting them with broadband access from the home, using FTTH and LTE and 5G-based FWA connectivity. During the lockdown, mobile operators have witnessed a growth in data traffic on their networks as consumers use FWA solutions to access the internet. With the conclusion of the pandemic still unclear and companies realizing the viability of the "work from home" model, the demand FWA and fibre broadband services for the home are expected to remain fairly high even after the lockdown.

saving by means of using spare capacity for FWA that may be available on existing tower constructions is advantageous.

FWA is not a universal solution but is dependent on the topography of a location and its suitability to provide the best connection for domestic and business customers.

Business has a slightly different requirement to that of the domestic customer, in that business will pay a premium for reliability and speed. The potential for 5G to be the primary support for the development of the Fourth Industrial Revolution, which is touted as the upheaval of societal, political, economic and cultural aspects of the last century due to an increase in digital technologies of this century. The convergence of biological and physical innovations with digital innovation is the core to the fourth industrial revolution. The constraint is the willingness for humans to be acquiescent to the impact of the new revolution and its supercomputing, intelligent robots, self-driving autonomous cars, augmented reality and Artificial intelligence and ubiquitous Internet of Things.

According to the research company Ovum, there were 4 million Fixed Wireless Access subscriptions towards the close of 2018 in sub-Saharan Africa, representing some 62% of the region's fixed broadband usage. South Africa and Nigeria accounting for the Lion's share of this. Although Mobile broadband is the faster growing technology in sub-Saharan Africa. FWA has its place especially when mobile is more of a scattergun approach with FWA networks being more defined as regards geographic coverage and designed as a network around a specific user's needs. This specific design network can guarantee the enterprise a specific service level and continuity. ■



Justin Farnell,
founder,
WiFiontheMove

WiFiontheMove delivers managed cloud (mobile LTE data, passenger WiFi access and analytics, geo location and advertising) services to the following transport verticals across the southern Africa region: coach tour and inter-city operators, public commuter buses and trains.

The company was founded back in April 2018 by Justin Farnell, an English telecom entrepreneur who has been delivering connectivity solutions to Southern African enterprises for over 10 years.

The value proposition is offering managed Wi-Fi to bus and coach operators, with the vehicle router, passenger access and analytics, and mobile data, all managed through the cloud.

To date, there are seven coach operators who are currently using the service. In South Africa, the principal customer is Mega Coach, but through an

OEM partnership with global coach builder Irizar, there are now Zambian, Zimbabwean, Malawian and Botswanan operators looking to offer value add services to their long haul intercity passengers.

"The focus for 2020 is to monetise the WiFi through personalised advertising and loyalty promotions," Farnell says. "In addition, he is testing a new integrated Wi-Fi and VOD platform that also has vehicle telemetry data, all managed via a single cloud dashboard.

Finally, Farnell sees the public transport sector in South Africa opening up "in a big way: in 2020. "For too long the focus of transport operators has been to move people from A to B and that's it," he adds. "Onboard Wi-Fi presents a fantastic opportunity to offer a host of cloud services to commuters, whilst enabling the operator to build an interactive (mobile app) based relationship with their customers, enhance security, optimise travel routes, and reduce operational expenses, by improved telemetry."



Robert Schena,
CEO,
Rajant

Rajant Corporation has been involved in some heavy-duty industries for a number of years now, such as mining and oil and gas, spanning Africa and other continents.

"It's no secret that those are potentially hazardous sectors to work in, so the thrust is, understandably, to make conditions safer by moving toward autonomy," says Robert Schena, CEO Rajant. That means a combination of deploying robots underground and turning 300 and 400 ton trucks into robots above it. In other words, letting robots do the dirty work. Autonomous trucks are able to operate in unforgiving conditions, be it high altitude, sparsely populated desert areas, while reducing the need to recruit a workforce in a given region. Emissions are also saved, as the trucks always take the most efficient route possible. What's more, while trucks need maintenance, they don't need lunch breaks, they don't get vacations and are very consistent in their behaviour."

Schena says "that's not to say adopting and embracing automation is a simple operation" – far from it. "First a start, key things need to be in place. If you are going to rely on networking technology in order to have trustworthy autonomous networks, your network better really work otherwise you're going to get people killed," he adds. "That means partnering with the right people is essential. Secondly, should autonomy work as planned – it will, but may take a little longer than some people think – when it's deployed, functional and reliable, the operating costs are going to be tremendous. The aim, therefore, is to make it affordable, particularly to

the industries and people that need it most.

He compares Africa/with Asia, highlighting the different needs, highlighting the fact autonomous technology will evolve in various places at different speeds. "For example, there is a separation between the local economy and mining in particular. Mining is a global market in terms of who the customer is. Sometimes the local economy has less impact on the need for the output of mining. You're selling it to China and US and so customers may not be local.

That means the local economy may not have as big an impact on a particular global vertical."

As far as Rajant's client base goes, they're giant multinationals. "Whether its Rio Tinto, De Beers or Anglo, they are thinking in five to 10-year increments and the amount of dollars they invest before they ever take a shovel to the ground is so big that they have to think long term, so the individual vagaries in a local environment impacts them less," Schena says.



David Sumi,
vice president,
marketing,
Siklu

// The year 2019 will be remembered as the year of 5G as companies and the media rushed to talk about and share their 5G plans, both 5G Mobile and 5G Fixed," says David Sumi, vice president of marketing at Siklu. He says this is all being driven by the 'need for speed' as gigabit connections become table stakes for consumers and enterprises alike.

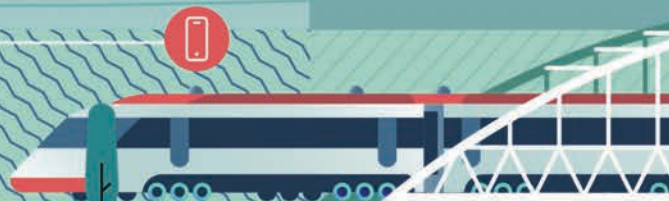
"For Siklu, we have been a gigabit company for years, and now the market demand for what we offer is soaring," Sumi continues. "As operators and cities become familiar with wireless fibre and what it can do, they realize that no one box will meet all their needs. With the industry's broadest portfolio of point to point, point to multipoint and mesh products backed by a suite of SaaS applications Siklu has everything necessary for massive city wide or regional wide mmWave, wireless fiber networks and continued to add products – hardware and software in 2019."

Sumi adds that the Telecom Infrastructure Project launched by Facebook also saw progress in offering Terragraph (TG) compliant systems to the market. "This industry forum is delivering interoperable equipment for 60GHz mesh networks to deliver gigabit connections to homes and businesses," he says. "Siklu was proud to announce at the TIP Summit in November a complete TG line of products which will be rolled out over the course of 2020 further driving Fixed 5G to the end user."

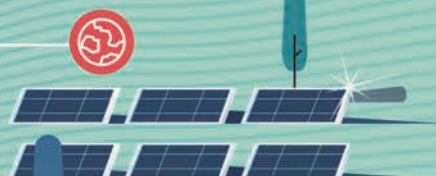
With 2019 being the year of 5G announcements, Sumi says Siklu expects 2020 to see a massive ramp in deployments of fixed 5G networks - all being driven by the demand for gigabits. ■



Russian Satellite
Communications Company



SATELLITES FOR DIGITAL ECONOMY



rsc.ru

chapter 5

Satcoms



Martin Jarrold,
vice president,
international
programme
development,
GVF

GVF's foundational mission direction focused heavily on regulatory matters through its Regulatory Working Group (RWG). The Group focuses on dialogue with government policy and regulatory administrations, and with inter-governmental organisations, to improve the regulatory and market access conditions that facilitate a cost-effective operating envi-

ronment for affordable satellite-based services. The RWG works to develop consensus-based satellite regulatory guidance for governments, liaising directly with administrations to facilitate implementation of effective Earth station/VSAT licensing, satellite landing rights, licensing fees, and other elements of regulatory conditions applied to the industry and its customers.

The RWG continues to leverage its global experience with satellite regulation to provide guidance to regulators on best practices for fair, transparent, and efficient satellite licensing policies, urging regulators to adopt streamlined licensing requirements, fair fees, and blanket licensing or registration wherever possible, and continuing its advocacy for a global Open Skies policy.

GVF has successfully brought together facets of its regulatory-related work with its training and capacity building initiatives. In late-2018 we collaborated with the ITU in introducing a value-added capacity building element to the World Radiocommunication Seminar (WRS), delivering a symposium focused on capacity building for national regulators. Delivered at ITU HQ in Geneva, the objective of the Symposium programme was to inform national regulatory authorities about the latest technology innovations in satellite communications, creating a greater level of understanding of the

nature of the rapid mobilisation of satellite-based communication links, and providing an understanding of methodologies and approaches to reducing and mitigating the causes of satellite interference.

During the Symposium, WRS2018 delegates from around the world had the opportunity to advance their understanding of the latest satellite communications systems and service trends, as well as of regulatory, policy and spectrum coordination issues. Other Symposium sessions addressed the coexistence of small satellite constellations in low Earth orbit (LEO)/non-geostationary orbit (NGSO) with existing systems in geostationary orbit, related regulatory issues and new solutions on space monitoring.

World Radiocommunication Conference

More recently, GVF's Secretary General attended the latest (2019) quadrennial gathering of the ITU's Sector R (the Radiocommunication Bureau), known as the World Radiocommunication Conference (WRC). Telecommunications regulators and industry representatives gathered to discuss competing claims for spectrum among different radiocommunications services. As at previous WRCs, the 2019 Conference was an opportunity to determine spectrum allocations between the satellite and other sectors such as the International Mobile Telecommunications (IMT) industry, and an opportunity to create new spectrum rights for satellite and provide operational flexibility. These opportunities were largely successful.

The agenda item receiving the most attention from the satellite industry proposed allocation of over 33GHz of spectrum to IMT. A little over half of that which was being sought was ultimately identified for IMT (i.e., 17.25GHz), and important protections for key satellite spectrum in the C, Ku, and Ka-bands was secured.

Another agenda item of significant interest for much of the satellite industry that saw a positive outcome concerning identification of spectrum for mobile uses via satellite, providing high bandwidth services in transportation. ESIM-based ('Earth Stations in Motion') satellite services are enjoying a growth cycle which is forecast to continue. WRC-19 increased the spectrum for ESIM services in the 28GHz band and harmonised the international framework for authorising ESIM services. The Conference also decided to have a study performed for WRC-23 to define the conditions for communications of ESIMs with geostationary satellites.

A further positive outcome for the satellite industry was the decision to allocate spectrum, 51.4GHz to 52.4GHz, for uplinks for fixed satellite service (FSS) gateways. This will improve services to end-users by freeing up Ka-band spectrum for user uplinks which can be used to provide new services such as 5G.

Also established were new rules regarding NGSO satellites which mitigate the risk of signal interference between the NGSOs and the GSOs sharing the same frequency bands. Protection of GSO satellites from NGSO satellites at C-band frequencies was maintained and a framework for NGSO satellites to operate in the Q/V-bands (40GHz to 50GHz) was established.

In relation to the building of the NGSO mega-constellations, rules were adopted requiring these systems to adhere to a specified milestones schedule, with failure to meet deadline targets leading to possible loss of assigned spectrum.

As with prior World Radiocommunication Conferences, WRC-19 carried the risk that the satellite industry would lose spectrum rights currently enjoyed by the industry as new technologies emerge and others develop. Advances in mobile telecommunications technology such as 5G, and the development of High-Altitude Pseudo Satellite (HAPS) platforms, also rely on spectrum and WRC-19 considered proposals that could have

provided spectrum to enable these technologies at the expense of the satellite industry. Various decisions were taken which mitigated these risks.

Another area of keen interest for the IMT and satellite industries is the provision of services in the C-band. Satellite video and business services delivered via C-band are currently utilised by millions of customers worldwide. Billions of dollars have been invested by the satellite industry in providing infrastructure needed to deliver these services. This 'mid-band' spectrum is also attractive to IMT as it does not possess many of the shortcomings of the higher frequency millimetre wave bands. At WRC-19, the decision was taken to protect C-band downlinks in Africa and Asia using the 3.6GHz to 4.2GHz range and it will not be on the agenda for WRC-23.

Decisions taken at WRC-19 lay the groundwork for future spectrum battles. Studies initiated at WRC-19 create the possibility of battles with Mobile (not IMT) in the European region over primary status in the 3.6GHz to 3.8GHz. Similarly, a study to be completed for WRC-23 creates the possibility of a spectrum battle with IMT in the Americas region around the 3.3GHz to 3.4GHz and 3.6GHz to 3.8GHz bands. Another study initiated at WRC-19 for conclusion at WRC-23 is one that calls for studying the use of IMT for fixed wireless broadband in the frequency bands allocated to the fixed services



ITU Satellite Symposium 2018. Left to Right: Jorge Ciccorossi, Senior Engineer, Space Services Department, Radiocommunication Bureau, ITU; Alexandre Vallet, Chief, Space Services Department, Radiocommunication Bureau, ITU; Martin Jarrold, Vice President, International Programme Development, GVF; Fehmida Lamak, MBC

on primary basis and identified for IMT.

While these studies carry risks for satellite that will be addressed at WRC-23, other decisions carry the potential of favourable decisions at WRC-23. WRC-23 will address an agenda item for both mobile and fixed satellite service spectrum along with ESIMs operating with GSO/NGSO in Ku- and Ka-band, respectively. Studies to be concluded prior to WRC-23 will also evaluate inter-satellite ('space-to-space') links which are important for global NGSO and hybrid NGSO-GSO networks.

Also important to the satellite industry is what is not on the WRC-23 agenda. Specifically, the C- (3.6GHz to 4.2GHz), Ka (particularly 28GHz), and Ku-Bands are all off the WRC-23 agenda and this should deter some of the initiatives launched by other telecommunications platforms to acquire spectrum at the expense of satellite communications.

Terminals type-approvals

Another core feature of GVF's mission has been development of a consensus-based framework to improve efficiency in satellite operators' terminals type-approval procedures. This initiative is manifested through the GVF Mutual Recognition Arrangement (MRA) administered by the GVF MRA Working Group (MRA-WG).

Using the framework, once a type approval is provided to a manufacturer by any one of the participating satellite operators, other operators may recognise the results of the tests conducted during the first operator's type-approval process, avoiding test repetition.

To achieve this, the MRA-WG created procedure GVF-101, which defines the standard tests that an antenna/Earth station manufacturer should perform to apply for type approval from any satellite operator. This not

JANUARY 2019

The Nigerian Communications Commission (NCC) developed commercial satellite communications guidelines for its local telecoms market. The guidelines now in force regulate commercial satellite services in all orbits in Nigeria. All commercial space segment providers with footprints covering the country as well as earth station operators are required to regularise their operations with the commission as specified in the guidelines on or before 29 February 2019. It is now a criminal offence to provide communications services without a requisite license, authorisation or exemption. The requirements can be seen at ncc.gov.ng/licensing-regulatory/legal/guidelines

FEBRUARY

Satellite operator Hellas Sat has confirmed that the Hellas Sat 4 satellite was successfully launched from French Guiana and will be positioned to provide coverage over Southern Africa, as well as Europe and the Middle East. Hellas Sat, a subsidiary of Arabsat, said the new Ku-band satellite, positioned at 39 degrees, "will extend Hellas Sat's capacity and geographical reach to meet the growing demand for

applications that include video, maritime connectivity, cellular backhaul, corporate networks and government services". The Hellas Sat 4 satellite was successfully launched by an Ariane 5 launch vehicle from the Guiana Space Centre in Kourou. Christodoulos Protopapas, chief executive officer, Hellas Sat, described the satellite as "a powerful addition to our network and a major milestone to our business plan". He said: "It brings new capacity that will enable our existing and new customers to unlock new growth opportunities in applications including broadcasting, mobility and private data networks. Moreover, it will enable us to deliver high quality services at competitive prices as well as unmatched performance, resiliency and redundancy to our customers."

MARCH

Eutelsat Communications successfully mated the platform and payload of the Konnect Satellite, a step towards providing 75gb/s of capacity across a network of 65 spotbeams to cover Africa and western Europe. Konnect is a next generation all-electric High-throughput satellite (HTS). It uses Thales Alenia Spaces new Spacebus Neo platform. Eutelsat described it as "a major pillar

of its strategy to return to growth, enabling the company to bolster its presence in the fast-growing broadband market. According to Eutelsat, the operation was an important milestone in the construction of the satellite in preparation for its launch by the end of 2019. Yohan Leroy, deputy chief executive officer and chief technical officer at Eutelsat, said "This mating operation represents a key step in this significant satellite programme." Eutelsat Konnect had a successful launch in Guiana in January 2020, via an Ariane 5 rocket. It is expected to be fully operational by the end of 2020 providing coverage over Sub-Saharan Africa. According to Eutelsat it will address direct to user consumer and broadband for enterprises, as well community networks connecting to Wi-Fi hotspots, mobile phone backhauling and rural connectivity.

APRIL

Sudatel, through one of its companies Sudasat and Hajar Group, and in partnership with Canar Telecom, helped send Arabsat 6A satellite into orbit. The satellite will allow Sudatel-owned Sudasat to provide broadband services across Sudan to internet service providers, VSAT subscribers and mobile network operators. It also provides multi-purpose solutions for commercial and government sectors. The

only improves the quality and completeness of test data but helps reduce the time and cost required to bring new ground-segment technology to market.

Ground terminal equipment serving the satellite service industry has to meet high performance standards to avoid causing interference to adjacent satellite operations. Minimum performance recommendations are defined by the ITU and operators are required to adhere to these but often increase the specification requirements to enhance the quality and reliability of the service provided to their customers. Compliance with ITU or satellite operator specifications can only be demonstrated by conducting thorough product testing.

These initiatives enhance the reliability of satellite communications services and reduce factors that cause interference to primary and adjacent satellite services. This work has resulted in the development of GVF's internationally recognised type approval test procedures, used to qualify the performance for Earth stations leading to formal type approval by a satellite operator. Industry has seen advances in the technology regarding the design and manufacture of satellite ground terminal equipment, advances calling for the development of new test methods to characterise terminal performance to support the growing volume of satellite terminals.

SOMAP – Satellite Operator's Minimum Antenna Performance

Working within the overall framework of the GVF MRA-WG, a group of satellite operators – AsiaSat, Eutelsat, Inmarsat, Intelsat and SES – have collaborated to develop updated guidance to antenna manufacturers regarding operators' expectations for new antenna products, and on demonstrating compliance with the specification requirements of SOMAP, effective September 2019.

The SOMAP initiative was started, and related requirements codified, to improve Quality of Service (QoS) worldwide for the industry and to minimise interference. The availability of quality products demonstrating compliance with operator specifications provides manufacturers with a valuable sales tool to differentiate their products. The SOMAP satellite operator group has the final authority for resolving questions regarding product compliance.

The SOMAP framework consists of: Minimum Antenna Testing Requirements; Minimum Antenna Performance Requirements; and, Performance Data on Manufacturer Product Datasheets, and has the objective of offering consistency for customers and antenna manufacturers. It does not replace the formal type approval procedures for each of the operators but establishes minimum performance that each of the operators expect when deploying equipment which has not been formally type

approved. SOMAP is an important tool for achieving the QoS which satellite users expect and for the prevention of satellite interference.



Andrey Kirillovich,
director,
integration
services &
projects,
RSCC

Africa is the most unconnected region with 40% of the world's population but with underdeveloped communications. Satellites can solve this problem quickly but can the Africans afford this?

When we speak about Africa, everybody is excited by the magic of the numbers. It has a population of one billion, which is expected to double by 2050. As far as the pros are concerned, 60% of the sub-Saharan African population is 400 million, which is made up of 230 million households.

However, Africa only provides 2% of the world's GDP. By 2050, when the population is expected to double, 90% will be very poor, living on less than \$2 a day. The electrification rate is a mere 43%.

As a result, fixed broadband penetration is just 8%. Mobile broadband is a bit better, but still the penetration rate is below 30%.

If you look at the sub-Saharan Africa fact sheet, you will see the spread of the population and GDP per capita is relatively uneven.

launch was watched by Sudatel CEO Eng. Tarig Hamza Zain Elabdein, who is also chair of the board of directors at Sudasat.

MAY

Avanti Communications, the UK-based operator, has penned a five-year agreement with MGI Global services which enables the latter to provide high-speed satellite broadband services across Angola, South Sudan and Chad.

The new partnership will improve the penetration of reliable satellite broadband in these three countries, and significantly increase access to the internet.

Using Avanti's latest Ka-band satellite HYLAS 4, MGI will provide affordable high-speed satellite broadband to connect governments, enterprises, schools, clinics and communities in Angola, South Sudan and Chad, especially in rural and other locations where terrestrial networks are either limited or unreliable.

Avanti chief executive officer, Kyle Whitehill, said: "HYLAS 4, the latest addition to our satellite fleet, was launched to complete our coverage of sub-Saharan Africa."

MGI Global Services' managing partner, Lijia Raymond, added that the company was committed to providing governments,

NGOs, businesses and communities across sub-Saharan Africa with reliable and top tier telecommunications services. Raymond added, "Avanti's HYLAS 4 enables us to provide customers with affordable high speed and quality broadband flexible Ka band satellite technology.

JUNE

PCCW Global and Télécoms Sans Frontières (TSF) have received official recognition from the Mozambique National Institute for Disaster Management (INGC) for their combined and ongoing mission to provide critical communications services following the two tropical cyclones which recently hit the country. One VSAT communications system was installed in the Matarara coordination centre, from which relief operations to five surrounding communities were conducted. A second VSAT was also installed at the Médecins Sans Frontières (MSF) cholera treatment centre in Mafambisse. A further two VSATs provided by PCCW Global have been handed over to Mozambique's INGC, enabling the organisation to rapidly deploy critical communications for any similar emergency in the country. The cyclone also devastated the region's electricity and communications infrastructure, frustrating disaster response teams that require

effective communications in order to coordinate emergency services and relief efforts. Beira city itself suffered extensive damage, with almost 80 per cent of the economic infrastructure destroyed. One month later, Mozambique was struck by yet another tropical cyclone, Kenneth, resulting in the deaths of more than 40 people, displacing a further 21,000, and again damaging infrastructure critical for rescue and relief efforts. "PCCW Global's prompt reaction and instrumental aid, since the beginning of our operations in the country, have been essential for the positive impact of our mission for the affected population," said Jean-François Cazenave, chairman, Télécoms Sans Frontières. "The situation on the ground has been very difficult since the beginning, with isolated areas hard to reach and a significant need for rapid telecommunication connections. The contribution of PCCW Global's team on the ground has thus been very important for the success of TSF's operations."

JULY

Eutelsat Communications announces that it had secured a contract with GLOBAL technologies for the provision of C-band capacity on its EUTELSAT 10A satellite for connectivity and communications for the

According to GSMA, mobile internet adoption has a 46% usage gap, due to lack of affordability. There is also a 30% coverage gap, due to lack of accessibility.

Mobile affordability is improving in the continent. The cost of one Gigabyte of data is around 6% of the average monthly income, but the main barriers to internet mobile adoption in Africa are lack of digital skills, illiteracy and affordability.

As a result, the majority of mobile connections in Africa are 2G and 3G for voice and SMS. Meanwhile, 4G has started to emerge in most countries but mainly downtown in the big cities. However, 5G is still somewhere beyond the horizon.

Broadband

There are a lot of challenges for broadband connectivity in Africa. First of all, the definition of broadband. A 2019 report issued by the Broadband Commission said that US\$100bn would be required to bridge the digital divide. That includes the installation of 250k new 4G base stations required.

Very interestingly, around 20% of this investment will be needed to fight illiteracy and improve digital skills in Africa.

Another interesting estimation, this time carried out by the World Bank is that 25% of Africa's population is located further than 10km from fibre network infrastructure. This is a higher percentage than in any other continent.

That's a nice opportunity for satellite. Below you can see the visualisation of fibre infrastructure in

Sub Saharan Africa – Fact Sheet

Pros

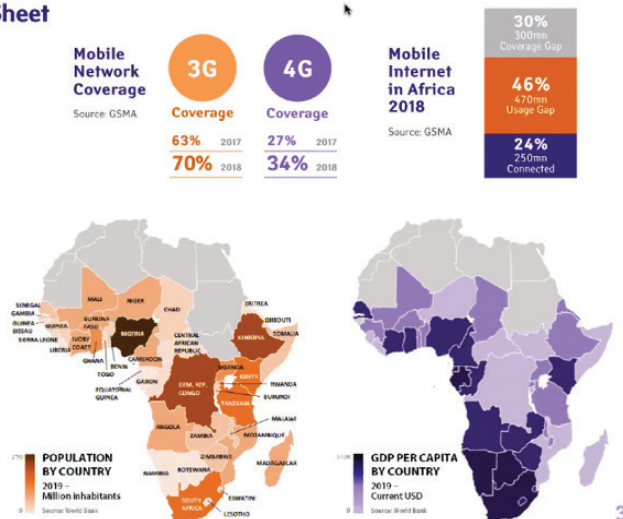
- 46 Countries
- 1 Billion Inhabitants
- 230 Million Households
- 60% Rural Population (400 mn)

Cons

- 2% of the World's GDP
- 90% of new population will live for <\$2 a day
- Electrification rate – 43%

Telecom

- Fixed Broadband penetration – 8%
- Mobile Broadband penetration – 24%
- 40% of global population not connected
- Average affordability of 1Gb – 6.8% of monthly income (>2% for 75% countries)



Sub Saharan Africa – Connecting the unconnected

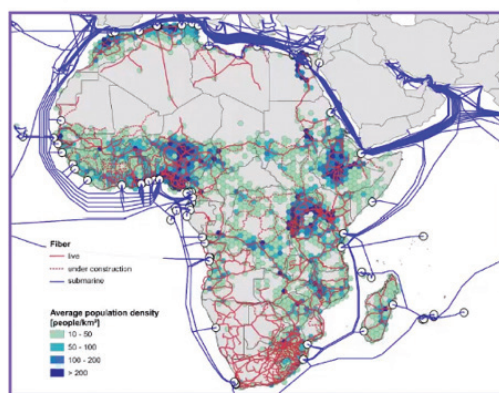
Challenges

- Broadband definition: 3, 6, 10 mbps?
- \$100 Billion for bridging digital divide (Broadband Commission)
- 250K new 4G base stations required
- SLA
- 45% of population >10 km from fiber infrastructure

Topics for discussion

- Does satellite fit?
- Terrestrial – partner of rival?
- LEO satellites are the cure?
- 5G and C-band, how to co-exist?
- Future satcom and telecom landscape?

Visualization of fiber infrastructure in Africa and population density, showing unserved regions



Source: World Bank

West Africa Power Pool Project (WAPP).

Global was awarded the telecommunications part of the project to monitor major power distribution sites across the region.

Established by the Economic Community of West Africa States (ECOWAS) in 1999, the main aim of the project is to bring about the interconnection of the power grids of 14 West African countries. Philippe Olivia, Eutelsat's Chief Commercial Officer, said: "After a successful partnership in Mauritania three years ago, we are delighted to be working alongside Global technologies once again with assisting WAPP in achieving its ambitious shared energy project in the West African region over the coming months."

Global Technologies plans to contribute a fast, reliable and cost effective satellite coverage for the region, that will add to achieving a better and cheaper access to power for millions of people by delivery of a telecoms infrastructure to connect WAPP members.

AUGUST

Amos-17 was successfully launched on August 6, by a SpaceX Falcon 9 rocket. It is located at

17 degrees East where it reaches across the African continent, along with Middle East and Africa. Amos-17 is billed as the most advanced high-throughput satellite (HTS), providing communication services for Africa.

Its technical capabilities include C-band, Ka-band and Ku-band to meet Africa's demand for fast, reliable communications.

Built by Boeing, Amos-17's advanced digital payload will enable a combination of broad regional beams and high throughput spot beams to maximise throughput and spectral efficiency.

It will also offer connectivity spanning Africa, the Middle East, Europe, India, China and Brazil.

Prior to the launch, Spacecom signed a deal with Nigerian broadcaster IDS Africa to use Amos-17 to broadcast Channels TV across Nigeria and to the Nigerian diaspora in Europe.

SEPTEMBER

In September Algérie Télécom Satellite (ATS) selected Hughes' Jupiter System to provide satellite broadband services to small-to-medium enterprises (SME) and home users. ATS wants to develop and promote satellite

telecommunications throughout Algeria. It will launch satellite internet services employing the Jupiter System, including a hub and thousands of user terminals. "To connect people throughout Algeria with satellite broadband service, we need a satellite platform that can deliver high performance and efficiency, with the right economics," said Yassine Sellahi, chief executive officer, ATS. "We chose the Hughes Jupiter System for these reasons, and also for its scalability as we look to grow our satellite Internet business and extend connectivity everywhere." Ramesh Ramaswamy, senior vice president and general manager, international division of Hughes said the firm's strategy globally is "to connect the unconnected by delivering services directly where we operate the business" and working with selected partners like ATS in places where it does not. "We appreciate the opportunity to help ATS launch service throughout

Algeria and to bring the benefits of high-speed Internet access to the many that are unserved or underserved by terrestrial providers," Ramaswamy added. The Jupiter System is the next generation very small aperture terminal

Africa and population density in unserved regions.

Another important issue is quality of service and there is a special term used by service providers in Africa – African SLA. In fact the actual quality of connection very often differs from the service level agreement (SLA). ■

Year in review

Although Africa's space industry is still in a development phase it is well aware of the potential revenue that the capability to build and launch domestic satellites can bring, coupled with the benefits of better communications and weather forecasting for the African continent that launched satellites will bring. Africa's space industry has started to grow and even has ambitious targets exemplified by countries such as Nigeria and its desire to put a person into space by 2030. With such wide expanses for many African nations, satellite is the only cost-effective way to provide telecommunications, data and internet. The ability to improve critical communications and for agricultural areas of Africa, weather forecasting is a positive of satellites. According to the African Space Industry Report for 2019, Africa has already reached revenues of US\$7 billion for the year.

Ever increasing satellite coverage

2019 saw an increase in the number of African nations expressing an interest in launching their own satellites. Some African countries such as Uganda and Zimbabwe see exploring links

with Russia to develop the capacity to launch satellites as a way forward, while countries such as Ethiopia are being helped by China.

Last year the continent of Africa launched 8 satellites, these included, Egypt's EgyptSat-A, CubeSat, NARSSCube-1, TIBA-1, Sudan's SRSS-1 and Ethiopia's ETRSS.

Rwanda benefited from the launch of its first satellite in February, named Icyerekezo. A low earth orbit satellite, it will provide a fast, reliable broadband signal for the internet, benefiting educational and emergency services amongst others. The satellite was launched by OneWeb in partnership with the Rwandan government.

On the topic of Low Earth Orbit (LEO), satellite launches, SpaceX progressed its Starlink project. SpaceX stated, "As demand escalates for fast, reliable internet around the world, especially for those where connectivity is non-existent, too expensive or unreliable, SpaceX is taking steps to responsibly scale Starlink's total network capacity and data density to meet the growth in users' anticipated needs."

SpaceX's 60 Starlink satellites offer the potential to help with Africa's ever-increasing demand and in cases need for reliable, secure and low latency broadband services. We will have to wait and see as to how many telecom companies serving Africa take up the capabilities of Starlink.

Back in August Spacecom launched its AMOS-17 satellite to boost connectivity in Africa, providing HTS beams from a geostationary orbit of 17 degrees east orbital position, with technical capabilities

including C-band, Ka-band and Ku-band, to meet Africa's growing demand for fast, reliable communications. Amos-17's advanced digital payload was built by Boeing to enable a combination of broad regional beams and high throughput spot beams (HTS) to maximise throughput and spectral efficiency. The satellite covers the growth area of Africa's sub-Saharan markets and will provide a large selection of services to a variety of broadcast, broadband and telecom clients.

Ethiopia's success in becoming the 11th African country to accomplish a satellite in space was achieved in December. The cost of the satellite was mainly funded by China and provides a satellite that can collect data for use in agriculture, mining, climate and weather forecasting. It was launched from China.

CETel, Central European Telecom Services based in Germany, a provider of Satellite, fibre and wireless enabled communications started to deliver connectivity in remote areas of northern Africa via Intelsat's EPIC 37e satellite. It will deliver a Ku-band spotbeam to land locked areas of Chad and south of Libya, which require stable, reliable and efficient solutions for their data and voice transmissions.

VSAT

Mozambique disaster sees PCCW Global and TSF connect. Both organisations received official recognition from the Mozambique National Institute for Disaster Management,

(VSAT) platform from Hughes for broadband services over both high-throughput and conventional satellites. It supports applications such as community Wi Fi hotspots, cellular backhaul and in-flight connectivity services, as well as broadband internet access.

OCTOBER

Hughes Network Systems, announced that Algerian Telecom Satellite (ATS) company, a public satellite telecoms provider had selected the Hughes Jupiter system to enable satellite broadband provision to homes and small to medium size enterprises in Algeria.

Yassine Sellahi, chief executive officer at ATS said, "To connect people throughout Algeria with satellite broadband service, we need a satellite platform that can deliver high performance and efficiency, with the right economics." The Jupiter system is, according to Hughes, the next generation Very Small Aperture Terminal (VSAT), providing both high-throughput and conventional satellites. Employing the DVB-S2X standard for highly efficient use of satellite bandwidth.

NOVEMBER

Egypt's TIBA-1 military comms satellite was en route to Guiana Space Centre launch. The satellite was developed by Airbus Defence and Space and Thales Alenia Space (TAS) and due for launch on an Ariane 5. Airbus and Thales had joint responsibility for building TIBA-1 and delivering it into orbit. TAS supplied the Eurostar E3000 platform and assembled and tested the spacecraft. The communications payload consisted of a dual mission in Ka-band for secure and broadcast communications, it has the capability to provide internet and broadband services for Egypt, the Nile Basin and other parts of North Africa. TIBA-1 was designed to remain in service orbit for more than 15 years. Egyptian President Abdel Fattah el Sisi signed a US\$600 million contract with the French President Francois Holland in April 2016 for TIBA-1 and its launch by Arianespace. Controversy was caused when the International Telecommunications Union allowed Egypt to keep an orbital and frequency slot that had expired because Egypt had failed to place a satellite in orbit

within the required time frame.

Due to be launched on the 15 November it was eventually launched on 26 November.

DECEMBER

China and Ethiopia make a satellite pact, with China helping Ethiopia to build a continental satellite and data receiving station, according to the director general of the Ethiopian Institute for Space Science and Technology (ESSTI).

Speaking to China's Xinhua news agency, Solomon Belay said the partnership also includes training programmes for Ethiopian space engineers, while assistance to Ethiopia for the launch of space satellites is being negotiated.

The technological infrastructure expected to be completed in the next three years, is said to be ideally located in the capital Addis Ababa, which is also home to the headquarters of the African Union (AU).

The east Africa nation is in the process of opening to foreign investment and is determined to capitalize on Chinese knowledge to learn more and contribute more to the satellite communications space.

for their combined mission to provide critical communications services following the two tropical cyclones which hit the country.

One VSAT communications system was installed in the Matarara coordination centre from which relief operations to five surrounding communities were conducted. A second VSAT was also at the Médecins Sans Frontières cholera treatment centre in Mafambisse. A further two VSATs provided by PCCW Global were handed over to Mozambique's INGC, enabling the organisations to rapidly deploy critical communications for any similar emergency in the country. ■



Brian Jakins,
regional vice
president,
Intelsat

Brian Jakins, Intelsat's regional vice president, Africa says the market has been very receptive to a lot of the products the company has released. "We've got our Flex platform, which is really a managed service and we're in the process of releasing Flex on the Move, Comms on the Move and Comms on the Pause based on the flex platform.

Intelsat also released a blended connectivity product in 2019 with Djero, which is called IronRoute. This really takes broadband connectivity, wireless or GSM connectivity and blends it with satellite connectivity," adds Jakins. "Often you might have a drop in cell coverage which automatically switches over to satellite connectivity, or go from a broadband

connection to GSM. So, this is ideal, for a lot of our services and products are developed so that the new evolution is software-defined satellites and everything will be cloud-based."

He says the big challenges are not unique to Intelsat because they relate to the continent. They are lack of infrastructure, lack of investment coming in, with the fact much has to be localised.

"If you have a dollar-based product and your selling it into a South African rand-based economy, you need to make sure you meet the local demands and you can convert that into your cost base," Jakins continues. Infrastructure remains the big challenge across the region, so even though you're deploying infrastructure, if it depends on a stable electrical grid, that's a challenge."

Intelsat has been busy forming partnerships, too.

"We've partnered with a company called African Mobile Networks (AMN) for a unique solution in how we connect the last mile," says Jakins. "We do this in a very cost-effective manner and the intention is really to show it's a sustainable model using satellite connectivity and it can generate revenue. So, connecting these communities that live on less than \$5 a month or less have connectivity now, it really changes the economics of those communities."

Jakins says since the two companies formed a partnership, they've connected close to 500 rural sites. "Some might say 500 sites doesn't sound like a lot, but if you look at rural Africa, just getting the equipment there is a huge success," he adds.

Intelsat has already partnered with MTN and Orange on these deployments and it's going very well, he says.



Ramesh Ramaswamy,
SVP & general
manager,
international,
Hughes Network
Systems

Ramesh Ramaswamy, SVP & general manager international division at Hughes Network Systems, says 2019 was a "phenomenal year" in what continues to be a highly-competitive market. "Our company's primary charter is to be the leader in satellite broadband and we do it two ways," he says. "We are obviously a service provider and as a broadband service provider we're vertically integrated, meaning we own the end-to-end infrastructure in the satellites and ground segments.

In Africa, Hughes has a 20% stake in YahClick, a joint venture that was concluded in late 2018. That JV has two satellites that cover the Africa and Middle East and as a minority partner, Ramaswamy says Hughes plays an important role in supporting the company by providing technology operations.

What's particularly pleasing for Ramaswamy is that 2019 was a year in which from a service perspective "we consolidated our leadership, expanded in new markets and from a technology supply perspective our Jupiter platform has become the de facto standard for anybody who operates in the satellite broadband business".

However, Africa has its challenges and Ramaswamy points to three of them. "Firstly, it's extremely fragmented because there are so many countries and so there's no critical mass," he says. "Secondly, while the need is there the challenge is the ARPU as the ability for people



Martin Jarrold,
vice president,
international
programme
development,
GVF

The year ahead: A GVF Member, Danish start-up QuadSAT, is developing a new approach for conducting on-site antenna verification using Unmanned Aerial Systems (UAS). The technology offers new ways to characterise performance of ground terminals not available before, with accurate performance data being acquired for deployed VSAT terminals. This is a new capability which can be used to evaluate terminal performance on mobile platforms for maritime, ground based and airborne applications.

Hardware demonstrations have been conducted for major operators and they have acknowledged QuadSAT's innovation as a valuable alternative to traditional testing methods. Similarly, the European Space Agency has recognised the potential value of this technology, awarding QuadSAT a contract to



The QuadSAT Unmanned Aerial System

continue development and validation with support from GVF. The SOMAP recommendations will be used to compare performance data acquired by UAS measurements with comparable test data acquired from a traditional far-field outdoor test range. In each case the same test antenna will be used for comparing the test results.

The equipment is transportable as a portable test range providing high-precision antenna pattern measurements. The UAS flies in a profile to simulate a satellite. Installed VSAT antenna systems are aligned to the geostationary orbital plane and the antenna

elevated to a positive angle dependent on the latitude at which the station is located.

Unlike traditional antenna test ranges operating over fixed transmission distances, the QuadSAT solution enables the transmission path length to be adjusted to provide a true far-field test environment for different sized antenna apertures.

The UAS system can be flown freely around the antenna under test, at various far field distances and at various test angles. The test equipment provides a flexible, cost-efficient method to verify antenna performance globally. This system allows for testing and verification of already operational antennas, without interrupting their services. This technology is a "game changer" for the industry.

The mega-LEOs

The decades-long history of launching communications satellites to Earth's equatorial geostationary (GSO) orbit involved a lot of "big" things. Big budgets funded the design,

to pay is not the same as the market we usually operate it. The third challenge is fundamentally when you have underdeveloped infrastructure, the day-to-day logistics of delivering and operating a business is more challenging.”

Having said all of that, Ramaswamy says Hughes is a big believer in the African market, which is why it made a strategic investment in the region. Previously it just supplied equipment to the operator.

“I think the focus in 2020 will be to build and help support YahClick and successfully deploy its gateways for the Eutelsat Konnect satellite, which launches in early 2020.”



Alexander Mueller-Gastell,
CEO,
ND Satcom
Communications

To fully understand what ND Satcom did in Africa in 2019, one needs to look back to 2018, says CEO Alexander Mueller-Gastell. In short, it turned “from technically-focused company to more of a commercially-focused” business. What does that mean? “It means that we have a great suite of technical products, but what we had to do was include the voice of the customer in it and listen to the market and see what we needed to do in order to meet the demands of the customer,” he says. “How did we do it? We started expanding our commercial footprint into the regions where we see opportunities for our business. ND Satcom now has a sales rep office in Johannesburg covering southern Africa.”

ND Satcom flexed its muscle in 2019 when it

acquired TECNA Suarl, a satellite transmission and radio telecommunications solutions provider based in Dakar, Senegal, which has given the German firm a footprint in west Africa.

“We’ve always been working from HQ in Germany on a global scale and we’ve always had projects in Africa, predominantly around air traffic control (ATC),” Mueller-Gastell adds. “Now we’re looking to get into the government enterprise sector.”

He says the highlight has really been the fact that the 2018 strategy we introduced is starting to materialise in 2019 projects.

“We have successfully closed projects in countries where over the last three or four years we haven’t done much business in Africa,” Mueller-Gastell continues.

The biggest challenge isn’t just doing business in Africa, it’s also about finding out where you can and where it makes sense to do business. What I mean by that is political stability drives economic prosperity, so when you’re talking about certain countries you want to do business in, you want to pick out those countries where you know if you do win the project and get it implemented, that you get paid.”

Many say Africa can be a trickier place to do business compared to other parts of the world, but Mueller-Gastell doesn’t subscribe to that view.

“Timing-wise, it’s not that different to other regions, especially when you’re talking on a project basis,” he adds. “You’ve just got to stick with it. We’re convinced that in order to be successful in Africa and also the other regions, you need to be there on the ground. You can’t just do the fly in, fly out. You’ve got to show commitment.”



Sean McCormick,
managing
director,
Globalstar Africa

The African continent is vast. Its rugged landscapes and limited infrastructure impact on its ability to drive economic growth and capitalise on the digital revolution, throwing up barriers to connectivity that are complex to manage and expensive to overcome. It’s challenging but solutions are emerging onto the market that are allowing organisations to develop reliable and robust connectivity systems that meet their evolving needs.

One of the drivers of this change is satellite. Satellite solutions are shifting the dialogue around African communication and collaboration thanks to their ubiquity, reach, and price. This technology is capable of bridging the infrastructural gaps to bring much needed communication services to rural and remote parts of Africa.

Africa isn’t equipped with the technology and ground infrastructure it requires to compete with the rest of the world in terms of communication and connectivity. Building terrestrial systems is expensive and severely limited in terms of support and maintenance. Satellite can bypass these complexities of building infrastructure or private networks.

Thanks to its low maintenance capabilities and relative simplicity, a satellite is less demanding of the skilled resources that are already in short supply on the continent. Satellite makes provision for rural areas, previously impossible to track and monitor, to become

construction, launch, and in-orbit operations of commercial and government satellites which, over time, became multi-metric tonne structures the physical size of a double-decker bus and bespoke design related technical complexity.

NewSpace is the overall context within which an alternative industry developmental path, that of “smallsats”, is being followed. Whilst the earlier model of commercial and government space activity is not being replaced or supplanted by NewSpace, the latter is a radical departure from the established model. It is radical because the business of getting to space, and associated applications, are increasingly endeavours within an entrepreneurially oriented domain of many small-scale technology start-ups and academic spin-offs.

Satellites are being built with shorter development cycles, by smaller teams of engineers, using off-the-shelf components and miniaturisation technologies, and mass-production assembly. Satellites exhibit

increasingly standardised form-factors and are based on a low-cost per-unit of functional capability with easier and cheaper integration with new generation launch vehicles.

The actual adoption and deployment of the new technology that is the very fabric of the NewSpace environment is not only driven by development of said space (and ground) segment technologies. The NewSpace entrepreneurs financing revolutionary expansion in commercialisation of space are driven by new commercial opportunities created by cheap satellites – costed in the millions of dollars, not hundreds of millions – and designed to last for just a few years. NewSpace technologies have created a growth cycle that has narrowed the gap between innovation and implementation, and this is happening in a widening range of countries, including in many smaller developing nations.

Small satellites – communications mega-constellations or single Earth imaging spacecraft – operate in NGSO. This permits

improvements in link budgets and reduced transmission latency, whilst also having the coverage of higher altitudes. Small Earth imaging/observation satellites operate in the Sun-synchronous orbit (SSO) LEO orbit variant which reduces revisit times/increases revisit frequencies (high-frequency change detection) for the same Earth surface territory.

Thus, satellite communications is at an inflexion point, undergoing changes that are revolutionising all facets and segments of the industry. In the space segment these changes are:

- Impacting the design and construction of launch vehicles and bringing innovation in launch procurement services;
 - Impacting satellite design process drivers and manufacturing methods; and,
 - Facilitating development of new applications and realisation of new vertical markets.
- In the ground segment, the changes encompass:
- A radical re-direction in antenna/terminal design parameters; together with
 - Changes in the nature and function of teleports..

connected, and for organisations to minimise the need to roll out large terrestrial-based infrastructures to get services to relevant areas. This has become crucial over the past few years as the inexorable push of digital, the Internet of Things (IoT), and automation have become a rush of innovation and a race to the top.

IoT and industrial IoT (IIoT) are key trending technologies, especially as we move into 2020 organisations can't afford to be left behind. They can't afford to sit and watch as other markets catch the customers because they lack connectivity and the ability to tap into the potential of digital. The pressure to innovate, develop and stay ahead is relentless, especially as the Fourth Industrial Revolution (4IR) makes itself felt.

Traditional IoT requires a terrestrial infrastructure to operate, but satellite offers IoT solutions with a 100% coverage area that can be extended globally. It doesn't require roaming agreements or terrestrial infrastructure to deliver the connectivity required, and it has fewer points of failure which can improve maintenance and reduce downtime. That said, while many companies use satellite to compete with terrestrial solutions, it can actually complement them, providing a more holistic platform for the organisation.

With satellite, companies can track, monitor and report on services in ways that were not possible in the past whilst becoming increasingly cost-effective. Satellite was considered expensive when it first entered the market, but has emerged as a reliable answer to Africa's connectivity challenges and very kind to the bottom line.

One of the biggest misconceptions that still surround satellite is the cost. Companies believe that these services are expensive and difficult to implement and manage. However, this could not be further from the truth. Satellite communications have not only evolved to meet changing economic requirements, but they can be adapted to fit into various verticals and environments.

Satellite is fairly ubiquitous, capable of adapting to a myriad of use cases that makes it useful, as well as flexible and scalable. It can be used in the consumer market, providing outdoor adventure solutions that enhance the business to consumer (B2C) segment, and it can be used in the industrial market to resolve challenges in the global supply chain or improve business to business (B2B) implementations.

We have seen some interesting satellite implementations in the wildlife sector. There have been numerous safari vehicles and wildlife animals equipped with satellite services that allow for the tracking and monitoring of these assets in real-time. They use these services to not only map wildlife movement in their own regions but across borders and varied landscapes. None of these solutions have required any investment into ground infrastructure either.

Over the past few years, satellite has also

seen an increased uptake in the logistics sector to support its cross-border requirements. It can be implemented across road, rail and water, and provides organisations with reliable and accurate asset tracking services. The mining sector has also been paying attention to the benefits of satellite, using it to track and monitor yellow goods. These are unavoidable and expensive investments for the sector, but they are at high risk of theft and cross-border fraud. Employees working in these remote areas are safeguarded with satellite communication messengers which allow communication beyond cellular service.

Satellite is a solid solution for organisations looking to expand their reach across Africa whilst ensuring connectivity and access to digital technologies. It is far more cost-effective than many realise and works within existing solutions to add an extra layer of connectivity to the business.



Eran Shapiro,
director business
and technology
ventures,
Spacecom

Spacecom operates the AMOS satellite fleet: AMOS-3 and AMOS-7 co-located at 4°W, AMOS-17 at 17°E and AMOS-4 at 65°E. A multi-regional operator, the company provides high-quality data communication and broadcast services to Africa, Europe, the Middle East, and Asia via direct-to-home (DTH) operators, Internet service providers (ISPs), telecom and MNO operators, network integrators and government agencies. With three satellites providing expert communication solutions to Sub-Saharan Africa – AMOS-17, AMOS-7, and AMOS-4 we are expanding business offerings, technological solutions and partnerships throughout Africa.

"Spacecom has been a stalwart operator in Africa, conducting our satellite business since 2005. With partners, sales teams and

an innovative Vertical Solutions team that develops and deploys turn-key communications solutions for telecom, broadband, data and broadcast clients, we are tremendously excited to be able to support Africa's connectivity needs," says Eran Shapiro, director business and technology ventures, Spacecom.

On August 6, 2019, Spacecom's AMOS-17 communication satellite soared upward towards the 17°E orbital position. From this slot above the middle of the African continent, Shapiro says it's the most advanced digital satellite over the continent with powerful steerable Ka-band HTS beams, regional Ku-band beams and C-band HTS beams offering a wide range of services to Africa. In addition, these beams can connect to Europe, the Middle East, India, China and other areas in Asia, and as far west as Brazil. "So, for the company, this year's biggest highlight was AMOS-17's successful launch and the beginning of its commercial operations," he adds..

AMOS-17's extensive tri-band capabilities enable the satellite to combine broad regional beams and high throughput spot beams to maximize throughput and spectral efficiency, meeting our clients' needs for innovative solutions, with the flexibility to easily and quickly change configuration to match their usage patterns. "We designed AMOS-17 specifically for the growing broadband, broadcast and communication markets served by Africa's and international operators, broadcasters, cellular companies as well as governments and other agencies," continues Shapiro.

With AMOS-17's beams efficiently serving rural regions, we are assisting businesses and governments to overcome the digital divide, in which earlier satellite-based connectivity was not viable. By enabling a wide range of services to be quickly and highly efficiently deployed to outlying populations, AMOS-17 helps create a new economic stimulus for bettering services to these populations."

Shapiro says sub Saharan Africa's biggest challenge remains providing accessible communications with proper infrastructure to low density population areas. A consequence of this major issue is how to improve reliable coverage and service to the continuously growing number of subscribers who utilise smartphones not only as their communication device but also as their entertainment and business centres. "With Africa's growing young population, smartphones are allowing people to navigate the world with apps," he says.. "A new generation of high-throughput, digital satellites offers easy and economically viable connectivity infrastructure, expanding terrestrial based networks' reach. With HTS, as in AMOS-17's C-band HTS capacity, governments and service providers can quickly establish reliable and economical communication services in low density population regions."

Spacecom, Shapiro says, Spacecom recognises that there are truly abundant

"With AMOS-17's beams efficiently serving rural regions, we are assisting businesses and governments to overcome the digital divide, in which earlier satellite-based connectivity was not viable"

opportunities for its business in sub Saharan Africa. With one of the world's fastest growing populations – forecast to reach 1.5 billion and continue rising, Africa is a huge market.



Pieter-Paul Mooijman,
vice president,
Africa,
ST Engineering
iDirect

As an enabler of exciting opportunities for business growth, education and healthcare advancement that have a positive and lasting impact on communities, satellite continues to have a key role to play in Africa. Its speed and ease of installation, as well as its ability to be deployed anywhere, makes it the perfect solution to connect even the most

remote communities, lifting barriers and bridging the digital divide. As we move into 2020, the African market is incredibly exciting due to its almost unrivalled potential for development. So, what can we expect to see from the region in the coming months?

With multiple African countries kick-starting digital divide programs in 2019, many of these government-driven social inclusion initiatives are using satellite to expand the reach of the Internet to rural areas and schools. This will ensure access to better services, bringing significant improvements in health, education and finance. Capacity and terminal prices are also becoming more affordable, and this is resulting in growing demand from small businesses and home offices. Traditional broadband connectivity for remote and underserved areas has always been a key component of our offering, but there is a growing shift towards enterprise applications within sectors such as the banking industry, where broadband connectivity is required for ATMs. With Internet connectivity now a basic need for any business, we see this as a key growth area with even small business in Africa now looking to get connected.

Consequently, 2020 will bring a massive increase in demand. In 2017, satellites only provided 5.9 Gbps of broadband access, in 2022 we expect this to increase to 162.99 Gbps. This is the same for enterprise broadband, which was only 10.76 Gbps in 2017, but we expect it to grow to 68.74 Gbps in 2022. Across the globe, this demand for connectivity is redefining how communication networks are designed and what they need to deliver. Today, networks must converge voice, data and video on one platform; support any application; reach any geography and provide unified global service plans.

Satellite can offer 100% comprehensive coverage which is entirely independent of terrestrial

“With multiple African countries kick-starting digital divide programs in 2019, many of these government-driven social inclusion initiatives are using satellite to expand the reach of the Internet to rural areas and schools”

infrastructure. In a continent as vast as Africa, removing the inconvenience of constructing terrestrial infrastructure is a huge advantage. It also offers a high level of resiliency and supplies secure, reliable mission-critical and high-value services for mobility, disaster recovery and business continuity. The technology provides immediate, seamless access and constant connectivity, enabling IP applications at a moment's notice in any geography. For growing businesses and communities across Africa, this allows for potential expansion when needed and ease of mobility.

Mobility is also increasingly popular with consumers, with the majority of people in Africa accessing the Internet via a mobile phone or tablet, rather than desktop computers or laptops. There are now more than 200 million devices with the ability to connect to the Internet through Wi-Fi in Africa. This figure is expected to grow to 500 million next year. As a result, Cellular Backhaul will be another key area of growth in Africa, with Mobile Network Operators (MNOs) continuously looking to expand their subscriber base into new regions.

Many operators are choosing to use satellite for cellular backhaul when delivering 2G, 3G and 4G services. The expansion of 5G will further increase the role satellite has to play in cellular backhaul, creating the need for the convergence of all access technologies into a unified force. Furthermore, Africa is set to be the fastest growing region for 5G mobile broadband uptake in the next six years. According to Ericsson's Mobility Report, mobile broadband users in Sub-Saharan Africa are expected to reach 50% by the end of 2025. As a result of this growth, 5G will play a crucial role in supporting this massive increase in demand, which means having the correct infrastructure in place is more important than ever before.

Throughout Africa, the emergence of new High Throughput Satellite (HTS), Low-Earth Orbit and Medium-Earth Orbit (MEO) constellations hold huge promise for the region

and will be crucial in making 5G a reality by bringing down cost-per-bit and lowering latency.

The increased availability of HTS technology is also bringing a shift towards multiservice solutions and platforms. This will enable operators to expand their service portfolios and move their offerings to wider, less-traditional markets.

We also expect to see an increase in the viability of community Wi-Fi solutions. The benefits this type of solution can provide aren't just in the education sector - they can also provide new business models, such as Internet provision on an access voucher basis or on an as-a-service basis sold by local shops. This not only benefits business owners who have a new revenue stream but also end-users, who can receive Internet access without the need for up-front investment in home VSAT equipment. While a satellite Wi-Fi hotspot solution is slightly more expensive to set-up, the large number of end-users it can reach means the Total Cost of Ownership (TCO) per user represents just a fraction of the cost when compared to a traditional-single user VSAT terminal.

Throughout all these trends, the importance of ground infrastructure technology that matches the innovations in the sky remains key. Our aim for Africa is to ensure people are connected, which is essential for the economic and educational development of the continent. Being connected to the Internet vastly improves the knowledge and skills base of users, providing advantages that previous generations may not have had. We want to be able to ensure that users in remote, rural areas have the same opportunities that are available in more developed regions and communities.



Nadine Fassbender,
marketing
manager,
AXESS EMEA

AXESS Networks (AXESS) provides end-to-end connectivity solutions to various industries across Africa. In 2019 AXESS supported gold miners in Sub-Saharan Africa with encompassing managed multi-orbit solutions, therewith enabling operational endurance and continuity on highest available levels.

Telecommunication operators, ISPs, Oil & Gas, Corporates and NGOs across the African continent benefit from AXESS connectivity and solutions. Depending on several variables, AXESS implements the best available technical and operational solutions. Factors, such as location, climate, applications, number of sites, throughput, availability, etc. determine communications solutions. The designed networks meet internal requirements in terms of security and layouts and claim to be future-

proof and scalable to adapt to any changes in a timely manner. In 2020 AXESS boasts its African operations with a presence in Johannesburg and a dedicated sales team. In November, AXESS Networks exhibits at the AfricaCom 2020.



Ayes Amewudah,
VP sales,
Talia

During 2019, Talia delivered several projects for the provision of VSAT communications services across the African continent, particularly providing reliable low-cost internet solutions through Ka-band and Ku-band to schools, enterprises, banks, NGO's and government agencies.

"We have completed successful projects in many countries across the whole of Africa where our VSAT services, capabilities and communications systems have helped governments meeting their social development goal to bring high-speed internet access to African communities that are hard to reach," says Ayes Amewudah, VP sales of Talia. These projects are slowly contributing to overcome barriers to the Africa's digital divide.

He adds that in a continent where less than a third of the population has access to the internet, connecting the 100 million people who live out of reach of traditional cellular mobile networks require substantial infrastructure investments, but also the adoption of new disruptive and sustainable technologies. "Our mission is to close the gap between connected and unconnected areas and to resolve a significant cause of economic and social inequality," Amewudah says.

The plan in 2020 is for Talia to continue on our mission to connect the unconnected in line with the latest World Bank Group's "Connecting Africa Through Broadband" report which has acknowledged its Quika platform as example of a sustainable business model to accelerate the use of internet connection in Africa. The platform aims to empower individuals through the educational, economic and social benefits that online connectivity brings.

"Our mission is to close the gap between connected and unconnected areas and to resolve a significant cause of economic and social inequality"

Amewudah believes new technologies and new orbits, such as LEO and MEO, are creating a buzz about space again. "Lower orbits have the potential to offer fibre-like connectivity and bandwidth at speed and costs that are comparable to fibre," he continues. "This renewed interest and increased investments in satellite communications show that people are starting to believe that satellite can compete with fibre and, in many cases, outperform it especially in those areas where fibre is not available."



Andrey Kirillovich,
director,
integration
services &
projects,
RSCC

For RSCC, 2019 in Africa was quite stable, says Andrey Kirillovich director of integration services and projects. Existing customers continued slow but steady growth of their networks. "Some projects have slipped to 2020, but some other, delayed from 2018, have been finally implemented by our customers in 2019," he says. "Data networks were increasing throughputs per remote site. Especially cellular backhaul customers, as there was an ongoing migration to 3G and even 4G. Also, we had some new add-ons to our customer base, with new countries and connectivity providers in west, central and east Africa joined our geographic service portfolio."

When asked about the highs, he says that during recent years, sub-Saharan Africa as a region has made a tremendous boost in RSCC revenues. Being almost zero five years ago, Africa now generates approximately 10% of its international revenue.

"Our customers' mix is a good balance between African and European service providers developing domestic in-region networks and Europe – Africa cross continent connectivity," he says. "Some of them build their business on the continent only on our satellites, as we provide good variety of C and Ku band coverage with wide and spot beams from 14W, 40E and 53E orbital locations on our Express-AM series satellites." Besides solid customer base, RSCC also has a good split between C and Ku networks, between the regions - eastern, central and west Africa and a plural mix of verticals: IP backbone connectivity, cellular backhaul, enterprise VSAT, maritime and mobility, as well as content distribution and even IoT.

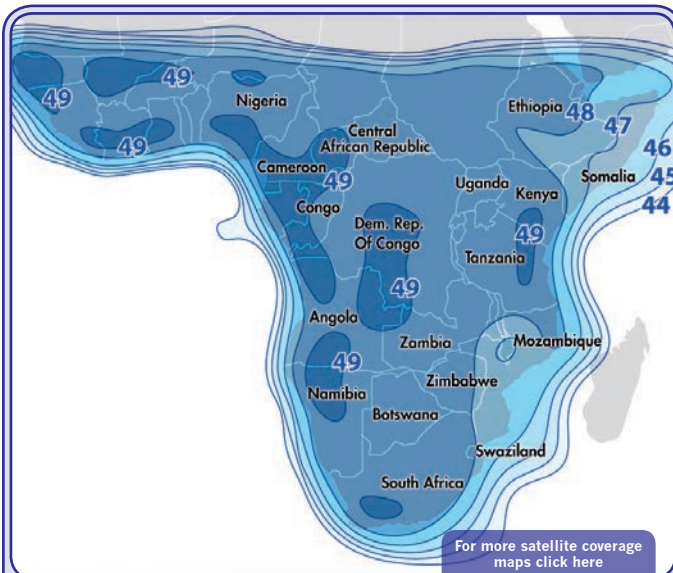
Besides payment collection, which is an ongoing and longtime issue in Africa, the other serious challenge RSCC faced is educating the customer on cost effective connectivity solutions. "Usually the customer in Africa is shopping for the lowest price on the market,"

Kirillovich adds. "And usually this is done at the expense of quality. Such approach has led to a very broad interpretation of the SLA in Africa, where the quality of service may vary from lower actual data rates to serious interruptions."

In the end, as a result, the end user is paying more, he adds, plus large potential in reducing the cost of connectivity for African users hides in more effective use of the existing hardware and satellite bandwidth. "So it is very important to educate the customer and assist him to find the roots and hidden paths to the cheapest solution without degradation in quality," he says. "How to achieve this? Working in alternative, not widely used frequencies. Professional mitigation of terrestrial interference with by installing filters and identifying the source. Initiate other actions aimed at raising the quality of service may include some not evident actions like installing the lightning rod for the antenna. These are the examples of our cooperation with the customers in Africa."

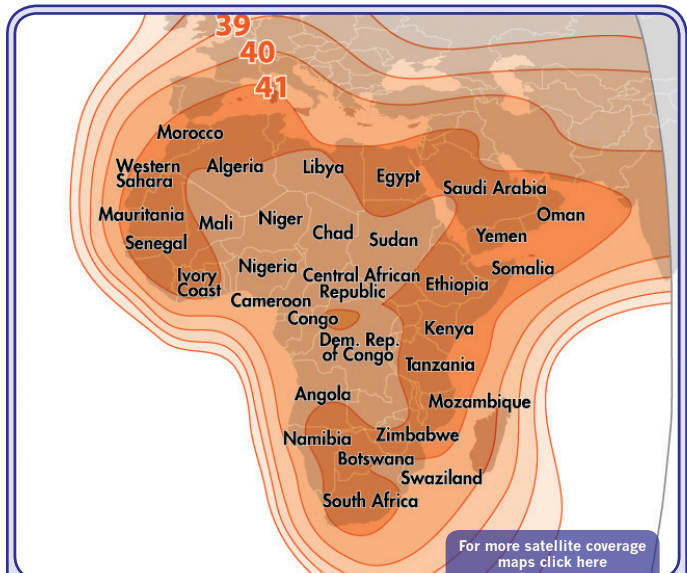
Throughout 2020, the company expects to see the customers expanding their networks. "RSCC in turn will try to maintain customers' expectations and help them to continue building a successful satellite connectivity business around our Express-AM satellite fleet," he says. "Our main goal for 2020 is to help our customers – African service providers to propose the best service in the area, so that they can gain new end users, including the ones migrating from their competitors." ■

"Usually the customer in Africa is shopping for the lowest price on the market, and usually this is done at the expense of quality. Such approach has led to a very broad interpretation of the SLA in Africa, where the quality of service may vary from lower actual data rates to serious interruptions"



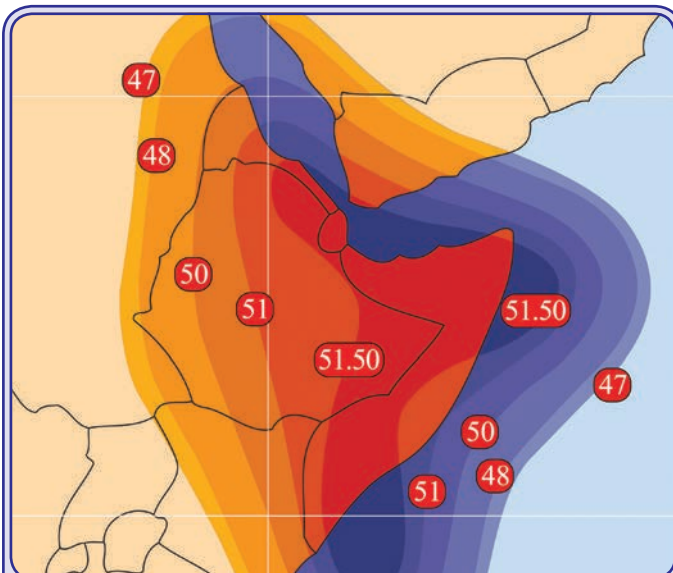
ABS-3A: 3°W – SAF Ku-band beam

Launch date:	August 2015
Launch vehicle:	SpaceX Falcon 9
Operational life:	15 years
Manufacturer:	Boeing 702SP
Coverage:	Americas, Europe, Africa, Middle East
Total transponders:	24 Ku-band 72MHz 24 C-band 72MHz



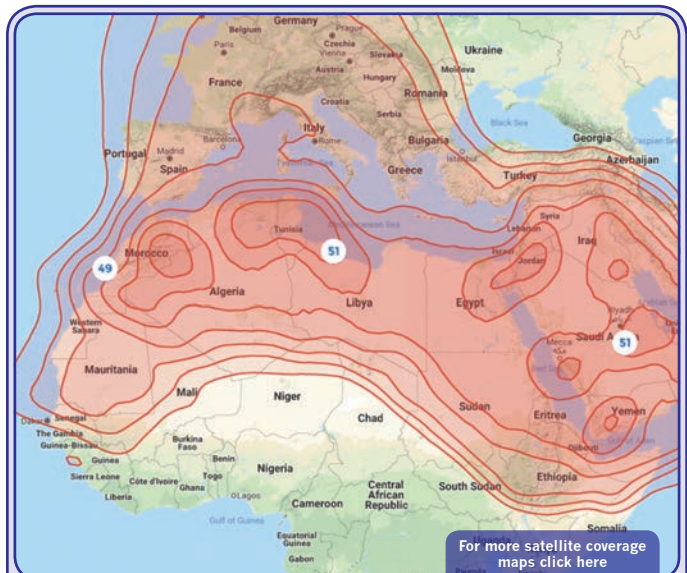
ABS-3A: 3°W – East Hemi C-band beam

Launch date:	August 2015
Launch vehicle:	SpaceX Falcon 9
Operational life:	15 years
Manufacturer:	Boeing 702SP
Coverage:	Americas, Europe, Africa, Middle East
Total transponders:	24 Ku-band 72MHz 24 C-band 72MHz



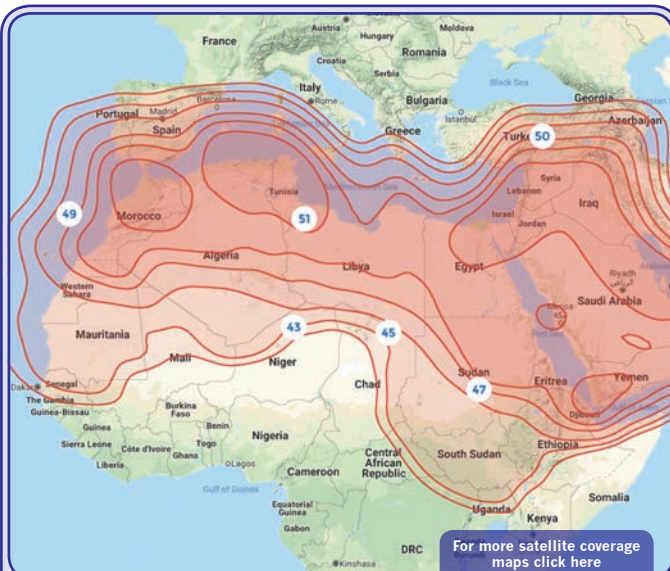
AMOS-4: 65°E

Launch date:	August 2013
Transponders:	4 x 216MHz Ka-band (steerable beam)
Band-1 uplink frequency range:	27.5 to 31.0GHz
Band-1 downlink centre frequencies:	19.875 or 20.125 or 20.375 or 20.625GHz
Band-2 uplink frequency range:	29.625 & 29.875GHz
Band-2 downlink centre frequencies:	18.325 & 18.575GHz
Uplink/downlink polarisation:	RHCP/LHCP
EIRP at beam peak (dBW):	51.4
G/T at beam peak (dB/K):	8.9 (Ka1); 9.9 (Ka2)
Saturated flux density (dBW/m2):	-72 (min) -92 (max) (Ka1); -75 (min) -96 (max) (Ka2)



Arabsat BADR-4: 26°E

Launch date:	November 2006
Transponders:	Ku-band/FSS – 16 LTWTAs for 12 active channels Ku-band/BSS – 20 TWTAs for 20 (BOL) or 16 (EOL)
Bandwidth:	Ku-band/FSS: 36MHz Ku-band/BSS: 34MHz
Frequencies:	Ku/FSS: 13.75 to 14.00GHz (uplink); 12.50 to 12.75GHz (downlink) Ku/BSS: 17.30 to 18.10GHz (uplink); 11.70 to 12.50GHz (downlink)
Polarisation:	Linear horizontal/vertical
Typical G/T:	Ku-band/FSS 6.2dBK; Ku-band/BSS 3.2dB/K
Typical EIRP:	Ku-band/FSS 51.8dBW Ku-band/BSS 51.8dBW



Arabsat BADR-5: 26°E

Launch date: June 2010

Frequencies: Ku-band/FSS MENA Uplink: 13.75-14.00GHz
Downlink: 12.50 to 12.75GHz
Ku-band/FSS Apx-30B MENA Uplink: 13.00 to 13.25GHz
Downlink: 10.70 to 10.95GHz

Polarisation: Linear horizontal/vertical

Transponders: Ku-band/FSS switchable to Ku-band FSS Apx-30B MENA 12x36MHz

Typical G/T: Ku-band/FSS switchable to Ku-band/FSS Apx-30B MENA 2.2dB/K

Typical EIRP: Ku-band/FSS switchable to Ku-band/FSS Apx-30B MENA 52.6dBW



Avanti Communications HYLAS 2: 31°E

Launch date: August 2012

Ka-band uplink: 27.5GHz (forward); 29.5GHz to 30GHz (return)

Active Ka-band forward transponders: 24

Forward channel bandwidth: 230MHz per beam

Ka-band downlink: 19.7GHz to 20.2GHz (forward);
17.7GHz to 19.7GHz (return)

Active Ka-band return transponders: 6

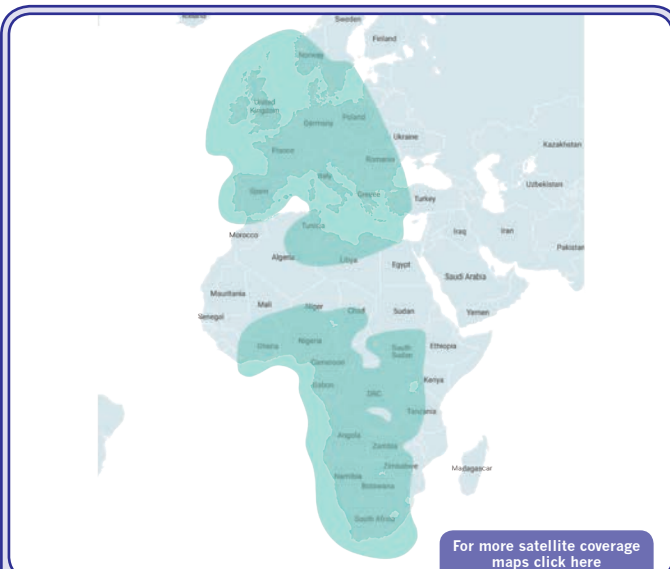
Return channel bandwidth: 220MHz per beam

Typical 'dry beam' EIRP (at edge of coverage): up to 58dBW

G/T (at edge of coverage): up to 11.5dB/K-1

Typical 'wet beam' EIRP (at edge of coverage): up to 61.5dBW

G/T (at edge of coverage): up to 14.0dB/K-1



Avanti Communications HYLAS 4: 33.5°W

Launch date: April 2018

Ka-band uplink: 27.5GHz to 29.5GHz (forward); 29.5GHz to 30GHz (return)

Active Ka-band forward transponders: 32

Forward channel bandwidth: 220MHz per beam, 64 beams

Ka-band downlink: 19.7GHz to 20.2GHz (forward); 17.7GHz to 19.7GHz (return)

Active Ka-band return transponders: 8

Return channel bandwidth: 220MHz per beam

Typical Ka-band fixed beam performance: EIRP (at edge of coverage): up to 61.5dBW

G/T (at edge of coverage): up to 14dB/K

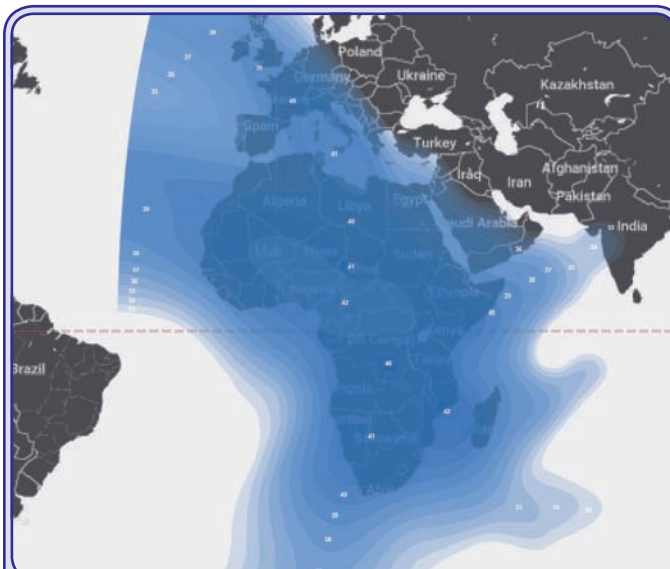
Bandwidth per steerable beam: Fwd: 2 x 230MHz; Rtn: 2 x 230MHz; 920MHz

Steerable beam frequencies:

Civilian bands – 29.5 to 30GHz (uplink); 19.7 to 20.2GHz (downlink)

Government bands – 30.0 -31.0 GHz (uplink); 20.2- 21.2 GHz (downlink)

Broadcast only – 21.4 to 21.9GHz (downlink)



Azerspace-1/Africasat-1a: 46°E – C-band Africa & Europe

Launch date: February 2013

Active transponders: 24 (36MHz each)

Uplink: 5925 to 6425MHz

Downlink: 3700 to 4200MHz

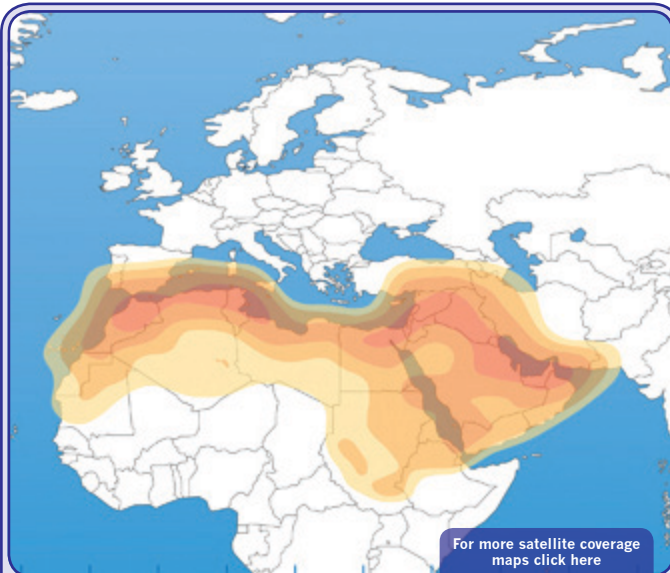
Beams: Central Asia & Europe beam,

Africa & Europe beam

Polarisation: RHCP/LHCP and V/H relatively

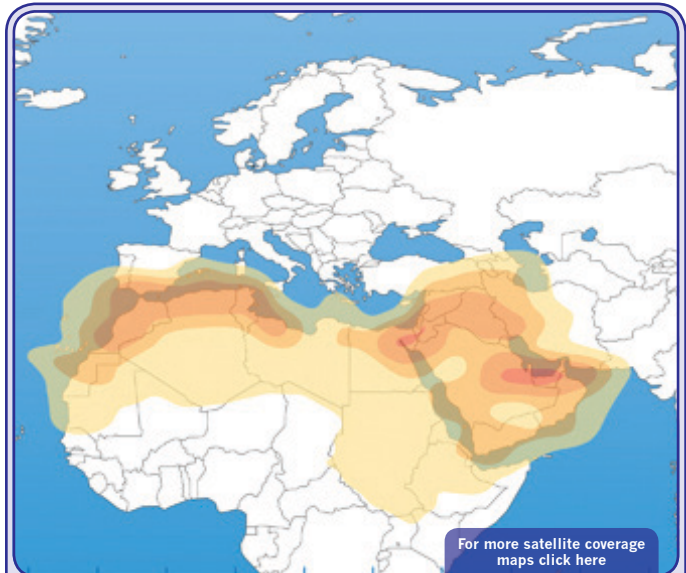
TWTA power: 65W

All uplink and downlink channels are 4-block channel cross strap switchable between Central Asia & Europe and Africa & Europe beam.



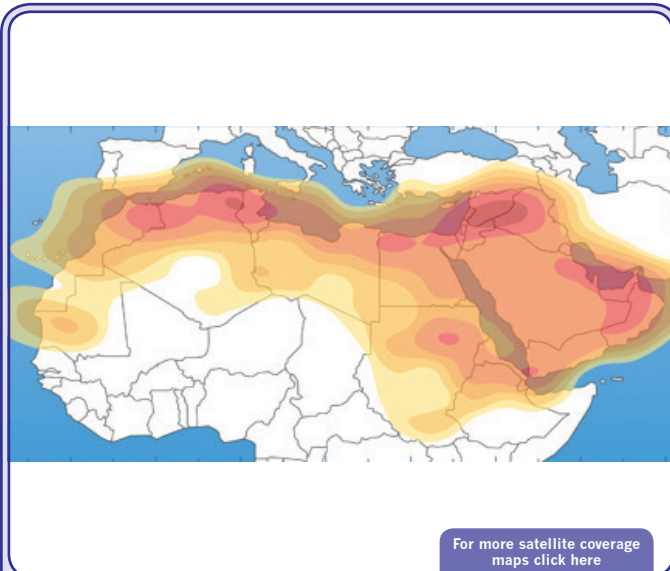
Es'hail-1 25°E Ku-band MENA

Launch date:	December 2013
Operational life:	15 years
Uplink coverage:	MENA
Downlink coverage:	MENA
Western uplink:	Yes
Number of transponder:	12+2
Transponder bandwidth:	33 to 50MHz
Transponder Mode:	FGM or ALC
Polarization:	Linear
Downlink Frequencies:	10.95 to 11.20GHz and 11.45 to 11.7GHz
EIRP (Peak) (dBW):	52



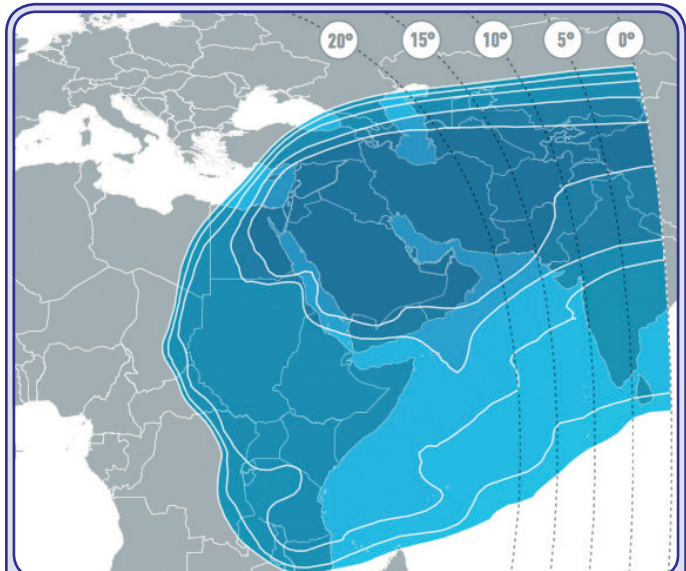
Es'hail-1 25°E Ka-band MENA

Launch date:	December 2013
Operational life:	15 years
Uplink coverage:	MENA
Downlink coverage:	MENA
Western uplink:	Yes
Number of transponder:	7
Transponder bandwidth:	33 to 50MHz
Transponder Mode:	FGM or ALC
Polarization:	Linear
Downlink Frequencies:	21.4 to 21.7GHz
EIRP (Peak) (dBW):	53



Es'hail-2 25.5°E/26°E Ku-band MENA

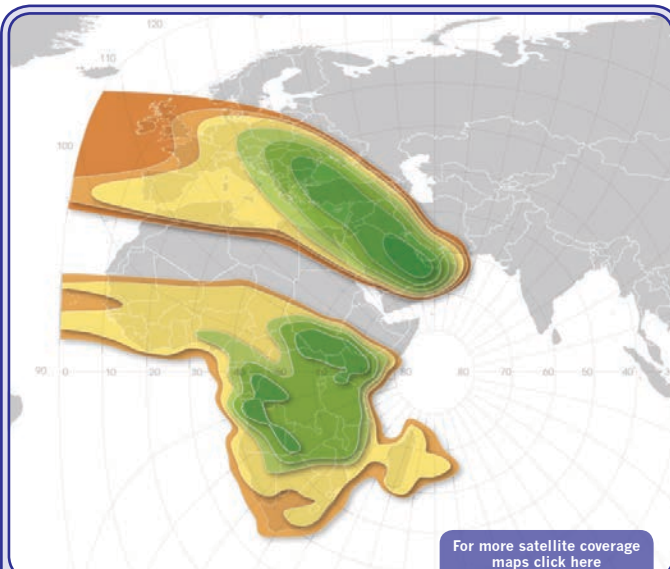
Launch date:	November 2018
Manufacturer:	Japan by MELCO (Mitsubishi Electric Corporation)
Uplink coverage:	MENA
Downlink coverage:	MENA
Number of transponder:	20
Transponder bandwidth:	36MHz
Transponder Mode:	FGM or ALC
Polarization:	Linear
Downlink Frequencies:	10.70 to 10.95GHz and 11.2 to 11.45GHz
EIRP (Peak) (dBW):	53



EUTELSAT 3B: 3°E Ku-band

A tri-band satellite for Europe, Africa, the Middle East, Central Asia and South America, EUTELSAT 3B offers resources in Ku-, C- and Ka-band connected to fixed and steerable antennas for flexibility. It enables users to select the most relevant frequency band. Eutelsat says the Ku- and C-band capacity is optimised for broadcast and data markets, while the high throughput Ka-band beams are ideal for bandwidth-demanding markets.

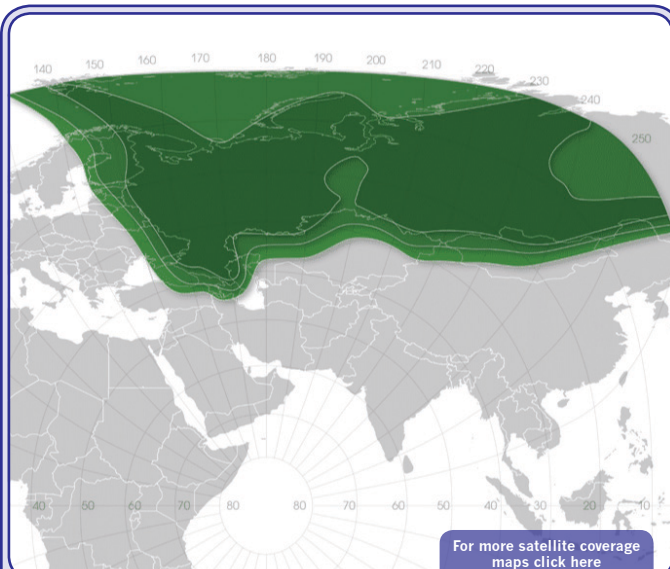
Launch date:	May 2014
Manufacturer:	Airbus Defence and Space
Operational life:	Over 15 years
Launch craft:	Sea Launch AG's Odyssey
Operational transponders:	Up to 51
Downlink polarisation:	Ku-, Ka- and C-bands



For more satellite coverage maps click here

Gazprom Yamal-402: 55°E Ku-band European and Southern Beams

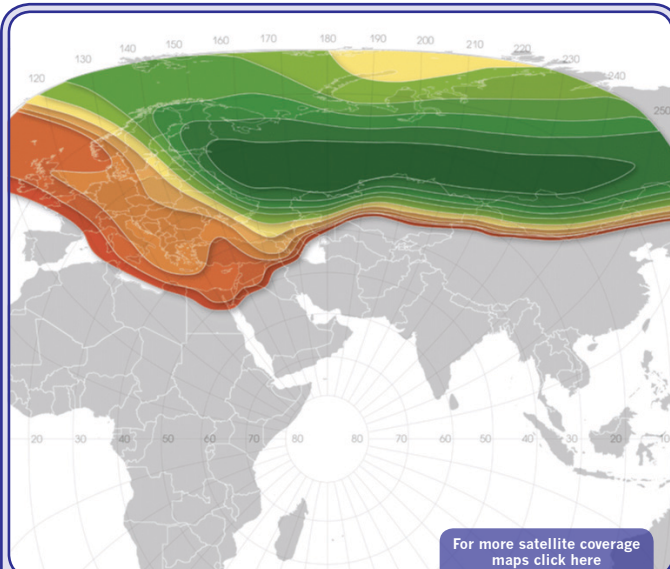
Launch date: December 2012
Frequency: Ku
Operational life: 15 years
Transponders: 12 x 72MHz; 18 x 36MHz; 16 x 54MHz
Transmitter output power: 120 to 150W
Beams: Four fixed: Russian, Northern, European, Southern, and one steerable. Eight 54MHz transponders are operating in a wide South beam that covers sub-Saharan Africa.
Payload power: 10,800W



For more satellite coverage maps click here

Gazprom Yamal-402: 55°E Ku-band Russian Beam

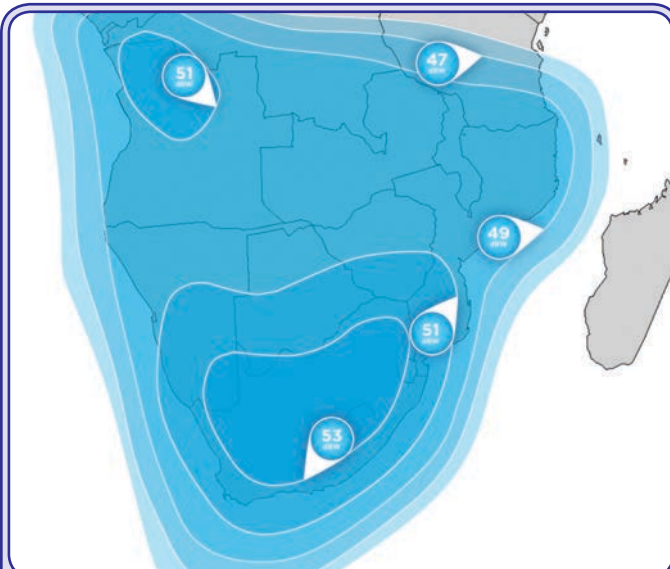
Launch date: December 2012
Frequency: Ku
Operational life: 15 years
Transponders: 12 x 72MHz; 18 x 36MHz; 16 x 54MHz
Transmitter output power: 120 to 150W
Beams: Four fixed: Russian, Northern, European, Southern, and one steerable. Eight 54MHz transponders are operating in a wide South beam that covers sub-Saharan Africa.
Payload power: 10,800W



For more satellite coverage maps click here

Gazprom Yamal-402: 55°E Ku-band Northern Beam

Launch date: December 2012
Frequency: Ku
Operational life: 15 years
Transponders: 12 x 72MHz; 18 x 36MHz; 16 x 54MHz
Transmitter output power: 120 to 150W
Beams: Four fixed: Russian, Northern, European, Southern, and one steerable. Eight 54MHz transponders are operating in a wide South beam that covers sub-Saharan Africa.
Payload power: 10,800W

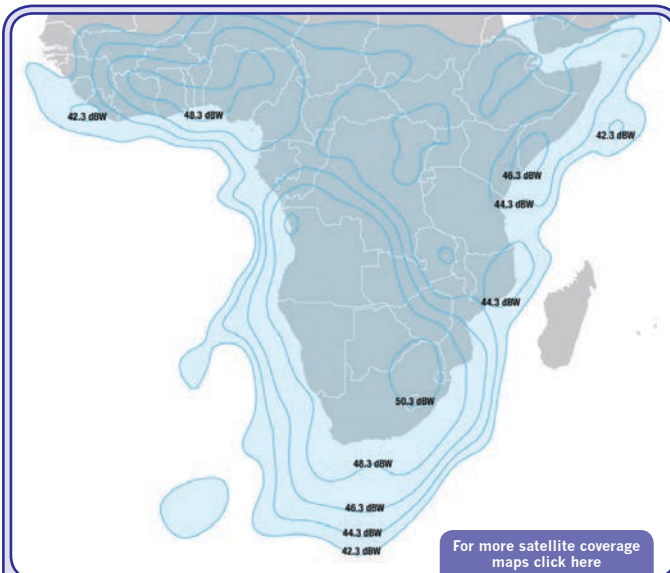


Hellas Sat 3: 39°E

Launch date: June 2017
Coverage: Europe, M.East and Southern Africa

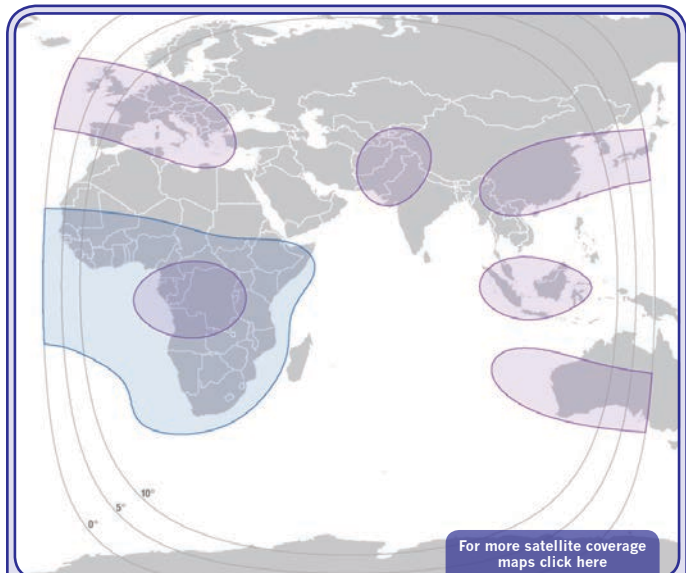
Southern Africa beam

Transponders: 12 x 36 MHz Ku-Band, 3 x 72 MHz Ku-band
Frequency: Std & Ext. Ku-band
EIRP(S. Africa): 53 dBW
G/T (S. Africa): +6 dB/K
Cross Strapping: Europe to S. African beam



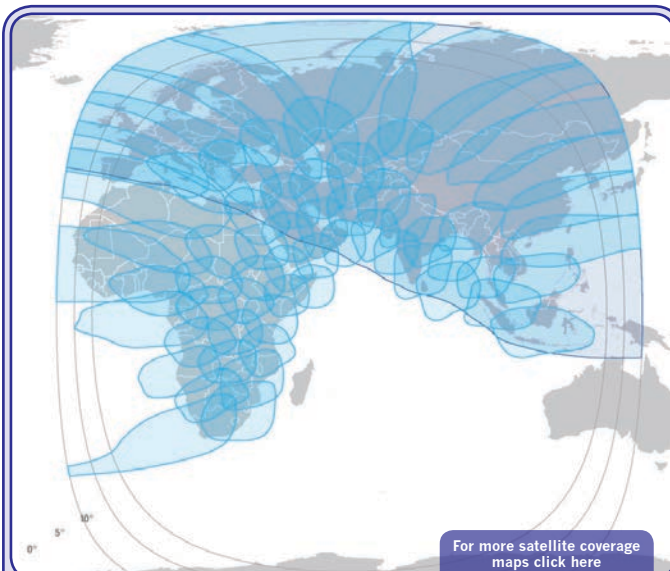
Intelsat 28: 33°E Ku-band

Configurable Capacity:	24 (in equivalent 36 MHz units)
Polarization:	Linear - Horizontal or Vertical
Downlink Frequency:	10.95 to 11.70GHz
Typical edge of coverage EIRP:	> 42.8 dBW
Uplink Frequency:	14.00 to 14.50GHz
Beam Peak G/T:	Up to 5.6 dB/K



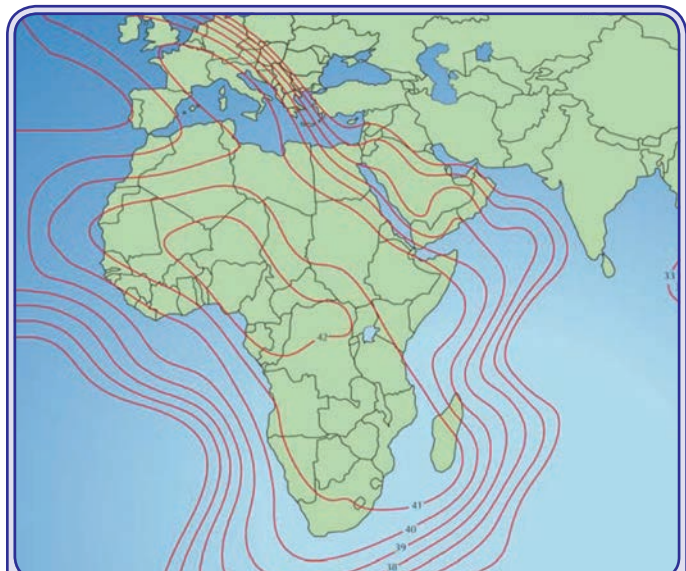
Intelsat 33e: 60°E C-band

Configurable Capacity:	79 (in equivalent 36 MHz units)
Polarization:	Linear - Horizontal or Vertical Circular - Right Hand or Left Hand
Typical edge of coverage EIRP:	46.7 up to 53.2 dBW
Typical G/T Range:	4.3 to 13.6 dB/K



Intelsat 33e: 60°E Ku-band

Configurable Capacity:	79 (in equivalent 36 MHz units)
Polarization:	Linear - Horizontal or Vertical Circular - Right Hand or Left Hand
Typical edge of coverage EIRP:	41.2 up to 43.4 dBW
Typical G/T Range:	-0.6 to 1.8 dB/K



MEASAT AFRICASAT-1A/AZERSPACE-1: 46°E

AFRICASAT-1a / Azerspace-1 is the result of a collaboration between Malaysia-based MEASAT Satellite Systems and the Azercosmos Joint Stock Company set up by the government of Azerbaijan. It provides high-powered services across Africa, central Asia and Europe. As well as C-band capacity across Africa with connectivity to Europe, the Middle East & South East Asia, Ku-band services are also offered across South East Asia.

Launch date: February 2013

C-band transponders (36MHz equivalent): up to 24

Typical EIRP beam coverage: 42dBW (max)

G/T (dB/oK): -1 (max)

TWTA power: 65W

Polarisation: linear



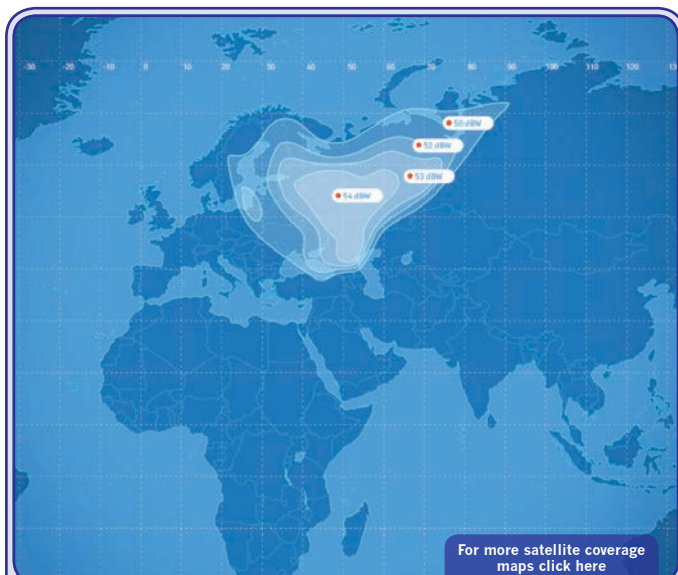
RSCC Express-AM8: 14°W – No1 C-band

Station keeping accuracy:	±0.05 (N&S / E&W)
Operational lifetime:	15 years
Stabilization:	Three axes
Payload electric power:	5880 W
Satellite mass:	2100 kg
Payload mass:	661 kg
Platform:	Express-1000H



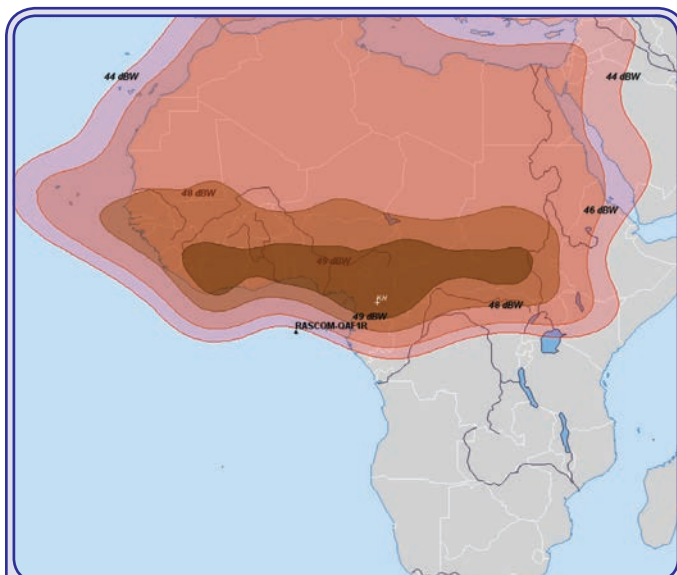
RSCC Express-AM8: 14°W – No2 C-band

Station keeping accuracy:	±0.05 (N&S / E&W)
Operational lifetime:	15 years
Stabilization:	Three axes
Payload electric power:	5880 W
Satellite mass:	2100 kg
Payload mass:	661 kg
Platform:	Express-1000H



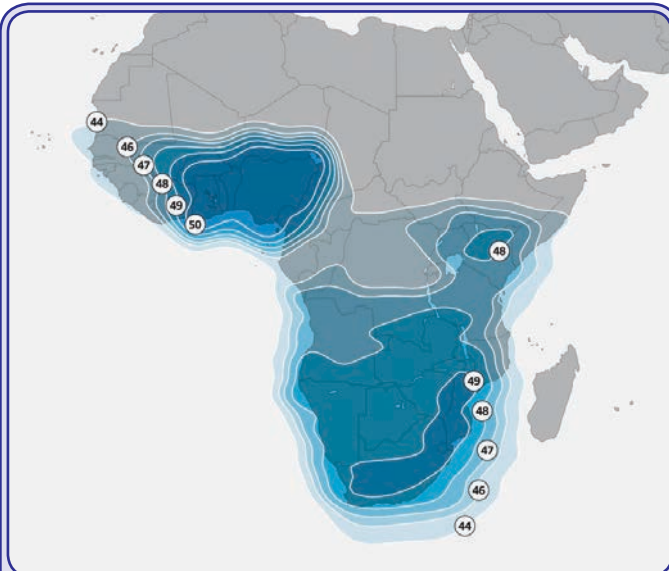
RSCC Express-AMU1: 36°E – No1 Ku-band

Express-AMU1, a high-tech satellite, was manufactured by Airbus Defence and Space (France) and outfitted with transponders in the Ku- and -bands and is intended to support the development of TV and radio broadcasting services, including DTH and broadband data, in the European part of the Russian Federation and in sub-Saharan Africa. Positioned on the geostationary orbit at 36°E, the Express-AMU1 satellite has a 15-year service life time. The AMU1 was launched into orbit on December 25, 2015 and has started commercial operation on February 10, 2016.



Rascomstar-Q1R: 2.9°E – Ku North beam EIRP

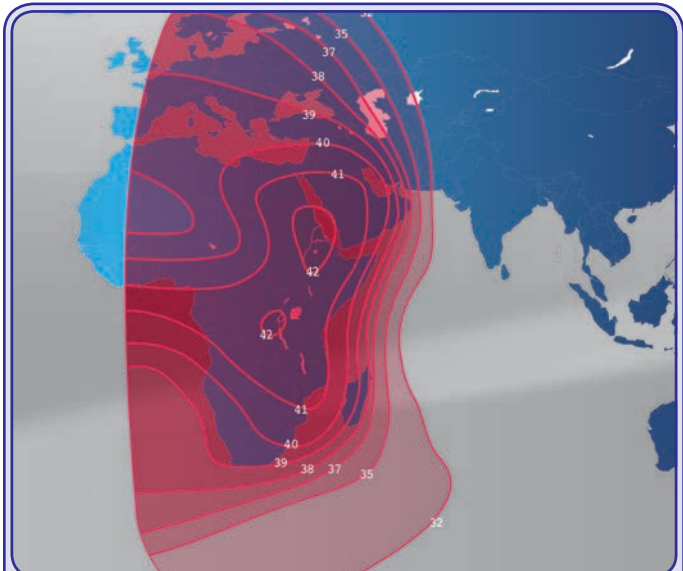
Launch date:	August 2010
Launch vehicle:	Ariane 5
Platform:	TAS Spacebus 4000B3
Bands:	C-band standard & planned; Ku-band planned
Ku-band North Beam peak EIRP(dBW):	49.4
Uplink (MHZ):	12750 to 13250
Downlink (MHZ):	10270 to 11450
Polarisation:	Linear



SES ASTRA 4A: 5°E

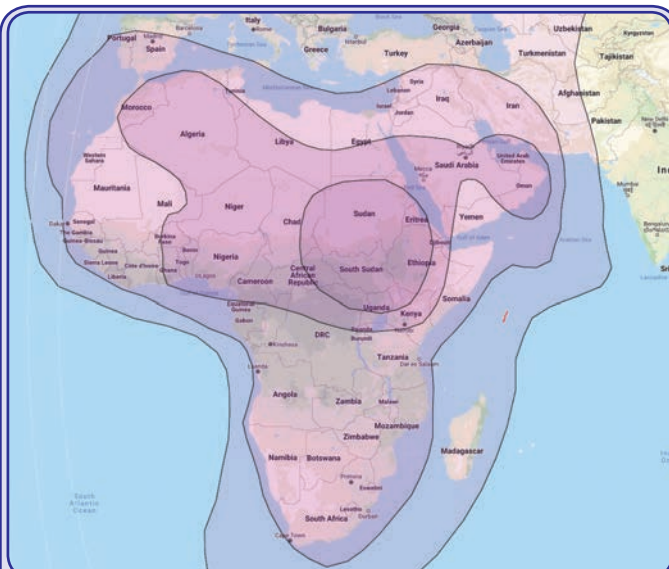
ASTRA 4A is a multi-mission Ku / Ka-band satellite that supports services for DTH broadcasting, cable TV feeds, occasional transmissions and broadband solutions to Europe and Africa.

Launch date:	November 2007
Launch vehicle:	Proton Breeze M
Operational life:	15 years
Manufacturer:	Lockheed Martin
Total transponders:	Ku-band: 54 Ka-band: 3



Singtel ST-3: 75°E – Africa C-band

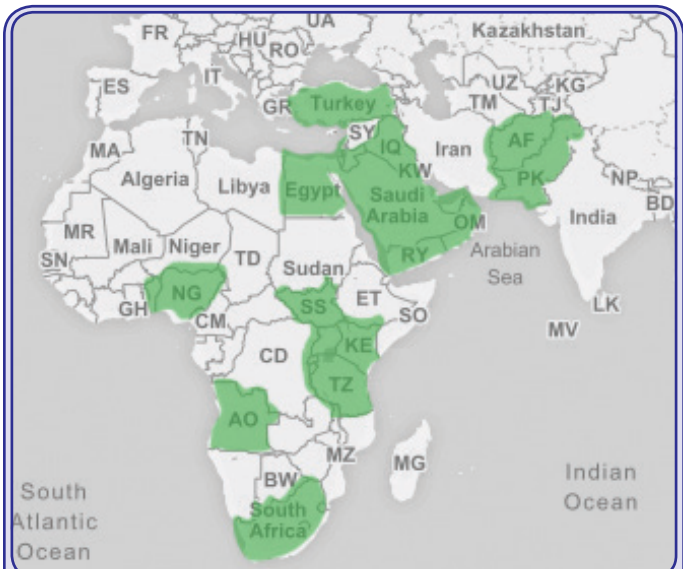
Launch date:	February 2014
C-band Payload:	13
Frequencies:	Uplink: 5.950 to 6.385GHz Downlink: 3.680 to 4.200GHz
Transponder bandwidth (MHz):	36 & 72
Polarisation:	Dual linear
Cross-polarisation separation (dB):	Better than 27
EIRP (peak value) (dBW):	45
TWTA size:	62W
TWTA redundancy:	34 for 26 primary TWTA
G/T (peak value) (dBK):	+6



Yahsat Al Yah 1 (Y1A): 52.5°E – C-band

Launched in April 2011, Al Yah 1 was the first satellite launched by Arianespace for the United Arab Emirates. It offers Ka-band for government solutions and Yahlive services, beaming high-quality free-to-air TV channels to a culturally diverse audience.

Launch date:	April 2011
Number of transponders:	C-band 8 x 36MHz plus 6 x 54MHz Ku-band BSS 25 x 33MHz Ka-band secure Military 21 x 54MHz
Payload power:	11.6KW



Yahsat Al Yah 2 (Y1B): 47.5°E

Al Yah 2, launched in 2012, offers YahClick services – providing high-performance satellite broadband for homes and businesses in the Middle East, Africa, Central and South West Asia. Its broadband coverage extends throughout rural and remote areas.

Launch date:	April 2012
Launcher:	ILS Proton
System Supply Contractor:	Airbus & Thales Alenia Space
Operational life:	15 years
Capacity:	Ka-band
Payload power:	9.7KW



عرب سات
ARABSAT

عالمنا... عالمكم.
Our world Your world

Our world.
Managed services.
Your world.



BROADBAND
SERVICES



ENTERPRISE
& GOVERNMENT



IP-TRUNKING



3G/4G BACKHAULING

chapter Broadband 6



Martha Suarez,
president,
DSA

Over the years, collaboration and regulatory changes have contributed to an increase in broadband access in South Africa, providing with it positive social and economic benefits to more people across the continent.

In South Africa, there is extensive 3G population coverage with only 3.5% lacking coverage, but 21.8% of the population live in areas without 4G/LTE coverage, according to the summary of network coverage gap analysis conducted by the Council for Scientific and Industrial Research (CSIR) in November 2018. Approximately two million people, out of the total population of 55.8 million, do not have coverage from a 3G or 4G network. The provinces with the largest coverage gaps are Eastern Cape (9.55%), Kwa-Zulu Natal (6.5%), Northern Cape (4%) and Limpopo (3.95%).

Market demand for broadband access has been on the rise and most recently internet traffic has risen by up to 15% due to a continued lockdown, according to SEACOM. As a result, spectrum has been recognised as a key resource and the Independent Communications Authority of South Africa (ICASA) has been considering special decisions to release more of this valuable resource. Now is the time to enable dynamic spectrum access to support the increasing demands of the country now and into the future after lockdown. The demand and need for internet access has never been more important as the economy, healthcare and education systems have increasingly grown to become dependent on it during a pandemic.

It is expected that Internet traffic will triple in South Africa between 2016 to 2021, making an annual growth rate of 26% according to the

latest 2021 Forecast Highlights by Cisco. As we reach 2021, this internet traffic will be 172 times the volume of the entire South African Internet in 2005. This rapid growth must be met with the same growth of broadband access across all regions of Africa in order to drive economic growth. The current health crisis has proven the importance of connectivity in all sectors of the economy. Now more than ever, sectors rely on efficient broadband to maintain healthcare systems, provide home education and working and sustain increased levels of data traffic to satisfy entertainment needs.

In terms of spectrum management, there needs to be better trade-offs between licensed and unlicensed spectrum access. While spectrum is a finite resource, there is much of it that can be shared more efficiently to maximise current broadband resources available to South Africa.

As we look ahead, connectivity is one of the most important pillars for the 4th Industrial Revolution and no one should be left behind. Currently, the government is engaged to address wireless connectivity demands and to provide access to critical information services to mitigate a health crisis. ICASA has played a key role to temporarily assign radio frequency bands to alleviate network challenges and ease congestion on the network to ensure broadband services can be accessed. ICASA has also turned to the innovative use of TV White Space (TVWS) to ensure rural and remote communities also have access to affordable broadband access. TVWS use will be able to help bridge the connectivity gap in those places where there is limited broadband connectivity.

The recent steps taken to enable dynamic spectrum access during this health crisis reflect the impact that innovative dynamic spectrum sharing solutions can have. South Africa should progress this action and even consider new ones to support its current broadband growth rate to provide more socio-economic benefits at

a sustainable level for the future economy.

There is significant potential for South Africa to continue benefitting from wider access to spectrum in underserved areas. In recent studies, it has been found that increased broadband access has led to a number of benefits such as increased efficiency in consumer markets with new markets and services becoming available for the economy. Greater access to health mobile applications also enabled more people to access affordable healthcare services in developing countries, according to the latest ITU report. The report also concluded that a 10% increase on fixed and mobile broadband contributes an increase in GDP. For mobile broadband this is 2.5% GDP increase and for fixed broadband this is 0.3%. With broadband contributing so much economic and social impact it is limiting to see the current broadband growth slowing down at a time where demand is increasing. Governments and regulators must step up to continue growing broadband access in order to match demand and see the benefits on the economy.

If broadband access does not grow, there will be a low throughput which will place more pressure on current broadband resources. It is important to open broadband access and provide coverage and high capacity in regions that are underserved and unconnected.

The management of spectrum has a huge impact on connectivity policies to ensure spectrum access is not a barrier, as it is right now in many cases across the world. The Dynamic Spectrum Alliance (DSA) promotes the efficient use of this natural and abundant resource. In most of the unserved or underserved communities, spectrum occupation is extremely low. New regulatory decisions could be made to change this by allowing local wireless internet service providers, or any other interested party, to deploy networks, to help reduce the barriers they currently face to access spectrum. South

Africa would also benefit from a much healthier competitive broadband market in which multiple companies such as large Internet Service Providers (ISPs) and smaller ISPs can operate.

Across Africa, the average cost for just 1GB data is 7.12% of the average monthly salary, according to the A4AI Affordability Report. In order to promote competition on the market, dynamic regulation must be adopted for affordable services to be offered. Policymakers and regulators must encourage new entrants into the market to achieve this.

A key barrier to broadband access in areas of South Africa is affordability. Traditional connectivity solutions have proven not to be cost effective in terms of coverage. It is time to allow local WISPs to access spectrum and connect those that today remain unconnected. Therefore, not only will competition provide wider access to spectrum, it will also enable more unconnected areas to be able to afford broadband.

Policymakers, governments, regulators and industries should also work together to encourage this competition of services as well as provide dynamic access to spectrum. For example, earlier this year the Dynamic Spectrum Alliance (DSA) collaborated with the United States Trade Development Agency (USTDA) to develop an economic strategy for deploying broadband to rural South Africans by using Television White Space (TVWS). TVWS technologies help maximise spectrum access as they utilize unassigned broadcast channels to extend wireless connectivity to areas where other technologies are not cost effective. The DSA has long championed the use of TVWS to transform communities and enable them to experience the benefits that broadband connection brings. The DSA welcomes this economic strategy as the success of projects like this really depends on industry stakeholders coming together to address and fully understand how to manage and utilize spectrum access.

The USTDA project will assess the feasibility

of placing TVWS connections within walking distance of citizens in rural communities across South Africa, with 1,600 base stations reaching 50,000 hot spots and servicing a potential 13 million rural citizens. This also offered a commercial opportunity for ISPs to connect to customers too. It is projects like these where multiple stakeholders come together from different companies that help to make significant progress towards dynamic spectrum access.

The DSA along with Policy Impact Partnership (PIP) also released in September last year a whitepaper proposing to enhance connectivity through spectrum sharing. This study explores how new forms of spectrum sharing could enable many more people to benefit from broadband connectivity and digital services. It considered the opportunities in Colombia, Malaysia and South Africa – large and populous economies in very different regions of the world.

Public sector and industry stakeholders in South Africa have also indicated they would support trials of new spectrum sharing technologies in IMT bands. Such trials would provide stakeholders with insights into the potential of tiered models for spectrum sharing and any related technological and regulatory issues that might arise. Within South Africa, technology trials would also help to raise awareness of the potential of new forms of spectrum sharing. It was found that the optimum way to implement technology trials would be through partnerships between the relevant industry players, authorized by the spectrum authorities and, in some cases, with the support of an independent entity, such as the Council for Scientific and Industrial Research (CSIR), which has already participated in TVWS spectrum sharing trials.

In South Africa, parts of the 2.3GHz, 2.6GHz and 3.5GHz bands have been assigned to mobile operators. The government looks set to license several IMT spectrum bands to the WOAN (wireless open access network) and other

licensees this year. This could involve auctions of frequencies in the 700MHz, 800MHz, 2.3GHz, 2.6GHz and 3.5GHz bands. However, if necessary, the 900MHz and 1800MHz bands could be employed for a near-term spectrum sharing technology trial in South Africa.

One of the conclusions of the study is that there is a clear consensus, across public and private sector stakeholders, that well-designed dynamic and other spectrum sharing models could expand access to mobile broadband, whilst ensuring incumbent applications are protected. Both governments and industry players recognize the clear need to make far more efficient use of the valuable resource of spectrum. That is an important step in the path of implementing flexible and innovative regulations.



Matthew Reed,
practice leader,
Omdia

The number of mobile broadband connections in Africa will continue to grow over the coming few years as service providers expand their mobile broadband networks and as data devices and services become more affordable (if not as affordable as is desirable).

There will be about 1.08 billion mobile broadband connections in Africa at end-2024, representing 78.9% of the 1.37 billion mobile connections on the continent, according to Omdia forecasts (see Figure 3). The number of W-CDMA connections in Africa will continue to increase through to 2024, in contrast with the global trend for the number of W-CDMA connections to decline. But the number of mobile LTE connections in Africa will increase at a more rapid rate, rising from 97.5 million at end-2019 to 335.6 million at end-2024.

The availability of affordable data devices is a key factor in African markets, where average incomes are typically low. Both MTN and Orange have recently introduced “smart feature

JANUARY 2019

Clear Blue Technologies International has been selected as the power service provider for BRCK, a hardware and services tech specialist based in Nairobi. BRCK says that because connectivity is too expensive for the average African to afford, the majority of citizens in developing markets rely heavily on Wi-Fi. The company has developed its free to consumer Moja platform of Wi-Fi hotspots but says powering them is crucial for success. In 2018, Clear Blue supplied its Smart Off-Grid technology to power Wi-Fi hotspots at 10 sites in Kenya. With the success of these installations, BRCK is now planning a wider

rollout. Clear Blue will provide its technology and service for a multi-year rollout of thousands of Wi-Fi hotspots across Africa, set to begin in 2019 and running through 2024. The company will manage, monitor and control the systems remotely from its service centre. According to Clear Blue, its Smart Off-Grid technology provides a low-cost, highly reliable off-grid power solution. It also features automated remote management and control, predictive weather forecasting, and the ability to optimise systems remotely. The vendor also claims that its “extensive” troubleshooting capabilities facilitate quick resolution of any issues, keeping systems

running with “unmatched reliability and long-lasting performance, while at the same time reducing installation and maintenance costs by up to 80 per cent”. Canada-headquartered Clear Blue will manage, monitor, and control the systems remotely from its cloud-based service centre.

Clear Blue says this latest alliance with BRCK adds to a wide variety of similar strategic partnerships with innovative, visionary organisations and investors. The firm says its technology and services are now bringing off-grid power through more than 500 projects in communities around the world. It adds that they are being sold into an array

phones” that use the Kai operating system and are priced at about \$20 as a means of encouraging wider take-up of data services.

Tecno, backed by Chinese company Transsion, has become one of the biggest mobile phone brands in Africa by offering affordable smartphones with features tailored to the African market, such as long-life batteries.

Although South Africa’s two biggest operators, MTN and Vodacom, have been preparing for 5G for some time, it was data-only service provider Rain that became the first in the country to launch commercial 5G services when in September 2019 it started to offer 5G fixed-wireless home broadband in some districts of Johannesburg and Pretoria, with plans to expand to Cape Town, Durban, and other cities.

MTN and Vodacom say their plans to launch 5G in South Africa have been held up because they do not have access to the spectrum that is required in the sub-1GHz bands, as well as in the 2.6GHz and 3.5GHz bands. In 2018, Vodacom launched what it said was Africa’s first commercial 5G service in Lesotho, using spectrum in the 3.5GHz band to which Vodacom has access in Lesotho but not in South Africa.

Although wireline broadband penetration is low in Africa, Omdia expects the number of FTTx subscriptions on the continent to grow strongly over the coming few years, from 1.28 million at end-2019 to 4.07 million at end-2024. At end-2024, South Africa will have 1.22 million FTTx subscriptions, making it the biggest FTTx market on the continent (by subscriptions), followed by Morocco, Algeria, Egypt, and Kenya, forecasts Omdia.

Wi-Fi networks are increasingly important for broadband connectivity in Africa. Facebook and Google both have Wi-Fi ventures on the continent: Facebook’s Express Wi-Fi operates in Ghana, Kenya, Nigeria, South Africa, and Tanzania; and the Google Station Wi-Fi service currently operates in Nigeria. Media reports say Google is planning to launch Google Station in South Africa.

There are prominent local Wi-Fi providers too. Kenya-based Moja Network offers free Wi-Fi access in matatus (informal buses) and other locations, subsidized by charging businesses to run surveys of Wi-Fi users. Moja’s parent company, BRCK, acquired the Surf Wi-Fi network in Kenya in February 2019 and said that the combination of Surf and Moja made it the largest public Wi-Fi network in East Africa, with close to 500,000 active users each month. BRCK also plans to use LTE to extend the coverage of the Moja network and service.

There are also efforts to improve connectivity in rural areas, using a range of technologies. MTN Group is working with the Facebook-backed Telecom Infra Project to test and deploy lower-cost wireless networks designed for rural areas. Loon, a subsidiary of Google’s parent company Alphabet, is to run a trial with Telkom Kenya of its plan to use giant helium balloons to bring wireless broadband connectivity to remote areas.

Until about ten years ago, Africa had very little cable connectivity to the rest of the world, which restricted the availability of internet access and raised its cost. However, Africa’s connectivity has been transformed over the past decade with the installation of multiple new undersea cables linking Africa to other parts of the globe, with further cables planned. During 2019, Google announced plans to lay out a new submarine cable, Equiano, which will run along the west coast of Africa from Portugal to South Africa, with branch lines to other African countries. A recent trend has been for cables connecting the west coast of Africa to South America, including SAIL, SACS, and the planned EllaLink.

International connectivity to Africa via undersea cables has increased greatly, but there are still gaps and bottlenecks in terrestrial cabling across the continent. However, steps are being taken to remedy this shortfall. In 2018, the UK’s development finance institution, CDC, said it would invest

\$180m in African fibre network operator Liquid Telecom to help Liquid to improve connectivity to some of the most underserved parts of the continent. In mid-2019, Liquid Telecom and South Sudan’s National Communication Authority agreed that Liquid would set up a 300km fibre backbone network in the country.

CSquared, a joint venture between Google, Mitsui, Convergence Partners, and the World Bank’s International Finance Corporation, aims to improve internet access in Africa by investing in and operating wholesale networks including fibre infrastructure. CSquared currently operates in Uganda, Ghana, Liberia, and Kenya.

Satellite systems continue to play an important role in Africa by connecting the continent’s many remote and underserved regions and markets. Significantly, satellite services now tend to be more competitively priced than in the past. Additionally, there are new satellite providers, such as Yahsat (backed by UAE sovereign wealth fund Mubadala), which in 2018 formed a joint venture with US-based Hughes Network Systems to provide satellite broadband services in Africa, the Middle East, and Southwest Asia. Yahsat has partnered with local operators in several African countries to sell internet access services. ■

Year in review: Africa broadband, the way forward

Mobile Broadband connections across Africa have increased significantly in recent years, but the pace of increase has largely been dependent on the potential returns on investment associated with the provision of what are expensive outlays on infrastructure. Africa must position itself for the future involvement in the fourth industrial revolution and part of this is investing in broadband access for its populations, for education, and for financial and commercial inclusion.

of high-growth segments which, according to research, will represent an estimated addressable market worth USD38bn by 2023.

FEBRUARY

Angola Cables and Broadband Infraco build upon their memorandum of understanding in which Broadband Infraco will extend internet connectivity in southern Africa. The potential to interconnect over 14,960 Km of African terrestrial network of optical fibre to Angolan international submarine cables. The additional data capacities provided, courtesy of the agreement, could help the South African firm to deliver on its undertaking to provide high-quality internet to the “Square

Kilometre Array” project antenna in South Africa.

Angola Cables has concentrated on the 15 member states of the South African Development Community, based upon its position as the main international telecoms provider to the Angolan market. Executive Chief Officer of Angola Cables stated the partnership would provide an opportunity to collectively fast track the continent’s connectivity. There is now the potential to link the BRIC nations of Brazil, Russia, India and China, via a high speed. Low latency connection.

MARCH

Fixed broadband subscriptions in sub-Saharan Africa (SSA) are tipped to multiply

three-fold to 17 million by 2023 from 6.6 million, according to a report released by Omdia, a London based technology research and consultancy firm and entitled Fixed-Wireless Access Broadband Development in sub-Saharan Africa. The author of the report, Julian Bright, senior analyst at Omdia, stated that SSA’s legacy of poor fixed-network coverage represents a significantly large and untapped market for broadband service providers. However, strong demand for broadband connectivity in SSA is not being adequately addressed by wireline technologies such as XDSL and fibre. Bright said, “Coupled with the speed of growth and

With an estimated third of the population of Africa not being able to access broadband, the proportion differing within each African region, it is going to require significant cash investment to achieve the universal, affordable and reliable internet access that Africa needs. At present Africa countries make up 21 of the 25 least connected countries in the world.

The report released at the Annual Meeting of the World Bank Group, called for urgent action to close the internet access gap, while also providing a roadmap for the achievement of this goal. They estimate that 1.1 billion more people need to be brought online. As they point out this will need a significant level of cooperation from interested groups, ranging from central governments to the private sector and civil society. With the reported increase to over 400 million broadband connections by the end of 2018, a figure of US\$100bn has been circulated as the cost to bring universal broadband access to Africa.

It cannot go without notice the levels of investment that China puts into the region and that some of this investment will be made available, often by means of loans to governments to improve IT infrastructure and internet access. The involvement of Huawei cannot be underestimated in their potential to enable the 'Broadband for all' agenda. Africa will require not only capital infrastructure investment but also the development of the skill base of its citizens to run universal broadband.

Namibia sets a strong target for broadband access

The Namibian Government has set itself a target for achieving a 95% broadband coverage by 2024. A new policy for broadband and an implementation action plan, was introduced into the National Assembly. The formulation of which was assisted by help from the International Telecommunications Union and with stakeholder consultative workshops input.

The Deputy Commissioner for Information and Communication Technology Engelbrecht Antiochus Nawatiseb stated that, "High speed internet access or broadband is critical to economic opportunities, job creation, education and civic engagement. But there are too many parts of this country where broadband is unavailable in both urban and rural areas." He also stated that, "Broadband is not just a basic structure but a fundamental structure in any given economy." The policy will work to a definition of broadband as being high-speed connection to the internet and sets a minimum download speed of 2Mbps.

The plan sets out to achieve affordable and reliable broadband access via the provision of infrastructure capable of achieving complete coverage of Namibia for universal access. It has a goal of achieving a 100% access to broadband for all Namibian primary and secondary schools to support learning. Less ambitious is the target to achieve access to 70% of health facilities in the country. A government steering committee was set up to monitor the implementation action plan. The National Broadband Steering Committee will investigate how the policy can be achieved.

The year saw a growth in Fibre To The Home (FTTH) and Fibre To The Business (FTTB) as a response to the need for infrastructure enhancement for broadband expansion in Africa that covers both domestic and business requirements. The historically slow growth in FTTH and FTTB across the continent of Africa is well noted and has been attributed to several causes. The cost benefit analysis between wireless networks and fibre networks favours wireless overall and especially when dealing with rural areas. Fibre has its market and cost per kilometre is dependent on whether it is suspended in air or if it must be buried under ground. The potential damage to fibre from construction work is significant in developing areas such as Africa and to damage from the actions of individuals, often

looking for tradeable copper cable.

In South Africa there is a significant increase in FTTH and FTTB connections in urban and city landscapes. Some countries have adopted a national strategy for fibre optic cable deployment, an exemplar being Mauritius, often viewed as a leader in telecoms improvement in the region and with the policy to make telecommunications a pillar of economic growth. The economic advancement in countries such as South Africa and the creation of a wealthier middle class moving to new housing developments gives a potential for fibre cabling as new towns and urban areas are developed. The FTTB market has increased as business enterprises have increased in number, although mainly in city areas and commercial and business parks.

The development of fibre optic networks is inhibited by the inability of governments in some regions of Africa to allocate financial resources to install cabling. They have to leave it to commercial organisations to fund the laying of cable and their priority is return on investment rather than any social aspect of improving access to education or health services via broadband. ■



Franck Simon,
President,
France-IX

Internet Exchange Points – aka IXPs or Internet hubs – are a part of the Internet's physical geography. They are usually hosted in datacentres where a large number of network operators have chosen to collocate. In these locations, carrier networks, CDNs, social networks, cloud, hosting, gaming and IT service providers can – in pursuit of the common interest – physically interconnect their networks using infrastructure provided by the IXP. They can then easily and rapidly exchange domestic IP data traffic with each other, which is known as 'peering'. As more networks arrive at a location,

appetite for new digital-media and internet-based services among consumers. Among businesses and the public sector, this calls for broadband solutions that are cost-effective and can be quickly deployed. Where the economics are favourable FWA provides an effective complement to or even a substitute for, fixed wireline connectivity. Further opportunities for FWA will continue to open up as operators and service providers in the region realise the benefits of LTE-based FWA."

FWA has emerged as one of the most significant growth drivers around the world, demonstrated by explosive user growth in

both developed markets like Japan, Germany and Italy and emerging countries like South Africa, Philippines and Mexico. There are claims that 5G FWA will have a significant impact on fixed broadband just as 2G had on fixed voice over 20-years-ago.

APRIL

A report issued in April indicated the rapid growth in fixed broadband connections in sub Saharan Africa, presently at 6.6 million. Omdia, a London based research company intimated that this market could triple by 2023. The Omdia report titled Fixed-Wireless

Access drives Broadband development in sub Saharan Africa, highlights the legacy of poor fixed network coverage and the opportunities for broadband service providers in the region.

The author of the report Julian Bright said, "Coupled with the speed of growth and the clear appetite for new digital-media and internet based services among consumers, among businesses and the public sector, this calls for broadband solutions that are cost-effective and can be quickly deployed. Where the economics are favourable, FWA provides an effective complement to or even substitute for, fixed wireline connectivity. Further

“On the Indian Ocean islands of Madagascar, Mauritius and La Réunion, ISPs face the same challenges of distance and cost when it comes to providing access to Internet content from around the world”

particularly those perceived as being critical commercial players such as content and service providers, a hub's attractiveness increases which in turn leads to even more network, IT and Internet related businesses joining.

IXPs play a vital role in the functioning of the Internet because they provide the shortest and fastest connection between peering members, allowing local Internet traffic to be directly exchanged under an agreement that is often free and is always cheaper than having to pay for international IP transit. A way to explain this is to think of the postal system. If you want to send a letter between locations in the same country, the UK for example, you wouldn't want it to be routed via Los Angeles as this would both slow down the delivery time and be very expensive. But this kind of routing is exactly what is happening in Africa as Internet traffic is routed over expensive international links simply to reach local country destinations. To add to the unfairness, this traffic must be paid for in foreign currency meaning local country ISPs must pay international rates for local delivery.

In addition to cutting out the need for expensive international transit costs, IXPs improve latency and increase bandwidth thanks

to the direct connection they provide between peers. Also, as many IXPs are hosted in local datacentres, content can also be downloaded faster (and more cost effectively) by local users. All this adds up to a better functioning and more reliable Internet, which is crucial in building a sustainable domestic Internet ecosystem and is a great accelerator of economic growth.

The African IXP Association currently lists 45 active IXPs located in 41 cities across 33 countries in Africa. This is a 50 percent increase since 2008 and traffic has more than doubled, with over 205Gbps of traffic exchanged across all these IXPs, up from approximately 100Gbps of traffic in 2013. The growing number of IXPs is good news but many more are needed to increase Internet penetration, which currently stands at under 10 percent, lower than the 20 percent considered to be the critical point for delivering economic benefits. One strategy is for ISPs to peer at IXPs in Europe.

On the Indian Ocean islands of Madagascar, Mauritius and La Réunion, ISPs face the same challenges of distance and cost when it comes to providing access to Internet content from around the world. They are also experiencing incredible growth in Internet traffic. We know this as two of La Réunion's ISPs, Zeop Reunicable and Parabole Reunion, and two of Madagascar's ISPs, Telma and Gulfsat Madagascar, as well as the main ISP on Mauritius, Mauritius Telecom, are peering members at the European IXP, France-IX, and we can see their internet traffic figures. In 2015, when only Zeop and Telma were peering members, their subscribed capacity totalled 4 Gbps. Compare this to 2018/19 (now including Parabole, Gulfsat and Mauritius Telecom) and we see an increase to 44 Gbps, which indicates an explosion in capacity with an increase of 925 percent. This growth is being driven by consumer demand for social media and streaming video with Netflix, Google, Youtube, and Facebook all top user destinations for Parabole, Zeop and Telma. In Madagascar, SSL and Bit Torrent are also important and

Akamai is in Zeop's top four content providers.

All five providers peer at France-IX for the reasons outlined above. Zeop, Parabole Réunion and Telma explain the benefits:

“We have various strategies for keeping up with increasing demand for Internet access,” says Martin Vigneau, Deputy General Manager at Zeop. “We work with CDN partners to deploy cache servers to have as much content as possible available locally and we have increased our capacity at our point-of-presence (PoP) at the France-IX Internet exchange point in Paris. Membership allows us to control costs and have a balance between transit and peering. As we are quite small, it's difficult for us to have affordable transit prices because it's around 30 to 50 cents in transit cost to reach Paris with our current providers.”

Richard Tchissambou Telecom and Network Manager at Parabole Réunion, says: “70 percent of our international traffic goes through France-IX and our gains in terms of latency are significant. The average annual growth of our IP traffic is currently 25 percent and we keep up with this increasing demand by proactively sizing our international connections accordingly, while adapting our local infrastructure with cache servers, placing the content geographically closer to the end-users, and so reducing latency and helping us make bandwidth savings.”

Lastly, Joël Randrianasolo, Deputy CEO/ Group CTO at Telma confirms the cost benefits of IXP membership: “We gain a reduction in the amount of traffic that must go by expensive transit providers and so reduce our costs and we also get an improvement in latency time.”

France-IX has a longstanding commitment to supporting the expansion of Internet connectivity across Africa by offering affordable, reliable, low-latency Internet peering services from France. African network members are either directly connected in Marseille or remotely connected through a reseller partner – AFR-IX, Angola Cables, BICS, Congo Telecom, Epsilon or Telecom Italia Sparkle. The most recent member is Congo Telecom, which joins Ooredoo Tunisia, Dolphin

opportunities for FWA will continue to open up as operators and service providers in the region realise the benefits of LTE-based FWA.”

JULY

Chinese tech firm Huawei said it wants Morocco to be the first country to launch 5G in Africa. The company outlined its goal for the north African country at the 9th annual North African suppliers conference in Skhirat, south of Rabat in July. “We are the [world] leaders in 5G, and we want to be the leader in Morocco,” said Chakib Achour, the marketing and strategy director of Huawei in Morocco. “We want the Kingdom to be the first

to launch 5G in Africa.” According to Achour, the company is now only waiting for the green light from the government. 5G is the new generation of mobile internet connectivity, which promises much faster data upload and download speeds, wider coverage and more stable connections. However, Huawei does face stiff competition in this space. In March 2019, competitor Ericsson organised a live 5G demonstration at Maroc Telecom headquarters in Rabat, showcasing the technology's capabilities. According to a recent report by the Moroccan National Telecommunications Regulations Agency (ANRT), access to the internet by Moroccan households has increased

three-fold over the last eight years. Some 74.2% of households now have internet access.

DECEMBER

December saw the number of mobile broadband connections of 3G and above become the majority for the first time in Africa. It indicates the shift in how consumers are using digital platforms in the region. The expansion of 3G and 4G networks has resulted in 3G covering 75% of the continent and 4G covering 46%. The reduction in the cost of 3G and 4G devices for consumers will be a further determinant of network subscriptions and usage.

Telecom, Ecoband, Guilab, Orange Senegal, Orange Cote d'Ivoire, AFR-IX, Angola Cables, Zeop Reunicable, Djibouti Telecom, Parabole Reunion, Liquid Telecom, WIOCC, Seacom, Mauritius Telecom, Telma, and Gulfsat Madagascar. France-IX also actively assists in the creation of local African-based IXPs by providing equipment, training and mentoring. To date, these include CAS-IX in Morocco, SEN-IX in Senegal and the most recent in Brazzaville, Republic of Congo – known as the Congo Internet Exchange (CGIX), managed by the Regulatory Agency of Posts and Electronic Communications (ARPECE).



Kyle Whitehill,
CEO,
Avanti

// Looking back on 2019, Avanti Communications has been on a journey of change and accomplishment. We have achieved a lot, from the successful launch of HYLAS 3 to sponsoring the fastest man in South African history – Akani Simbine to help him reach his full potential for the upcoming Tokyo 2020 Olympics. As well as partnering with Project Everyone and the

“Our objective is, and has always been, to bring highly secure and resilient connectivity to areas where it doesn’t exist, providing our communications industry partners with high-quality Ka-band coverage”

UNHCR to provide remote regions in Africa with internet access. As a company we delisted back in August as part of the wider transformation of the business, after refinancing earlier in April. From these events we have won great contracts with Turksat and Vox Telecom and are in a much stronger financial position than we were 12 months ago. Our objective is and has always been to bring connectivity to areas where it doesn’t exist, providing individuals, industries, critical public services with leading Ka-band HYLAS satellite technology to extend and guarantee coverage.

2020 has brought challenges to many and, like others, we have been faced with adapting our businesses in light of COVID-19. As the world seeks to stay connected from behind closed doors, satellite connectivity is playing an important role in guaranteeing secure and reliable communication for government bodies, first aid responders and health organisations. Using HYLAS 4 capacity, we are providing resilient and secure satellite connectivity and equipment to 10 government sites across the country, keeping lines of communication open for key government bodies in Niger.

Within our company we have also recognised that many are “switched on” and working additional hours while at home and so we initiated a four-day week throughout the month of May for all staff members across all our offices, covering nine countries – including UK, USA and Nigeria. This is the latest in a series of initiatives that we have introduced to support our employees through lockdown. As a company we also brokered a unique broadcasting partnership to create an “At Home With” mini-series for staff, which includes exclusive interviews with athletes and entertainers including professional boxer, Isaac Chamberlain and Scottish curling champion and NHS nurse, Vicky Wright.

As we start to come out of this pandemic we will be looking forward to continued advancements in satellite technology, working with industry and governments to build

relationships and grow our coverage capability to connect the unconnected.”

“Avanti Communications is the leading Ka-band high throughput satellite capacity partner to the communications industry in EMEA – extending and guaranteeing coverage for defence missions, enterprise solutions and critical public services.

Through the HYLAS satellite fleet and partners in 118 countries, Avanti provides dedicated fixed and flexible-beam satellite connectivity, with extensive coverage across Europe, the Middle East and Africa. The Group has invested \$1.2bn in a network that incorporates orbital slots in Ka-band spectrum, satellites, ground stations, datacentres and a fibre ring.”



Will Liu,
managing
director,
TP-Link UK

The wireless market in Africa is still significant as total, but diverse in different countries/regions. That’s the view of Will Liu, managing director of TP-Link UK. “For the relatively developed markets, 11AC, together with MiFi and LTE gateway, has become more and more popular in 2019 while there are still notable demand on 11N, including 11N xDSL in emerging markets,” he adds. “First of all, Internet penetration is still inadequate in some Africa countries. It is an incremental market with great potential. Secondly, MiFi and LTE Gateway may become an alternative besides PON technology for some regions.”

When it comes to big challenges, Liu says the capital construction, including the internet, needs to be faster as there are still areas without reliable access to the Internet. What about TP-Link’s big push for 2020?

“It depends,” he says. “Different push for different regions, based on the demand from the local market. From product lines to human resources, we will converge more on the Africa market in 2020.”

Nevertheless, Liu believes Africa’s Wi-Fi



Martha Suarez,
president,
DSA

The year ahead: Finally, it will be important in South Africa to think about the future of Wi-Fi and all the new wireless ecosystem that will be part of many 5G use cases. There is an ongoing movement in the USA, the UK and Europe to enable unlicensed access in the 6 GHz band for Wi-Fi and other wireless devices while protecting the incumbent users of the band.

Most recently, the US Federal Communications Commission (FCC) enabled unlicensed use of 1200 MHz of spectrum in the 6GHz band to advance connectivity for increasing bandwidth demands across industries, Internet of Things Applications and vital healthcare and education. The impact of this decision will also support wireless internet providers provide access to the 6GHz band in rural and remote areas of the US. By looking to other success stories of spectrum sharing, South Africa can find new innovative ways to ease the pressure of increasing bandwidth demands.

South Africa has a clear vision on how to move to the 4th industrial revolution and has been moving into implementing dynamic spectrum solutions, however the connectivity challenges are still significant and a way to overcome them is to strengthen collaboration with the industry and allow more stakeholders to access spectrum and provide broadband internet access all across the country. Regulations are necessary to establish a stable framework for investment into dynamic spectrum management and the clear rules for competition, that at the end will benefit all South Africa citizens.

“First of all, Internet penetration is still inadequate in some Africa countries. It is an incremental market with great potential”

market still has incredible potential in 2020, as lots of countries have already begun to increase their budget in upgrading their internet penetration and the speed of it. “It is a superb phenomenon,” he says. “The Internet cannot create wealth directly by itself, but more wealth can be generated with the help of the internet. This market needs various product lines to meet different requirements. N300 WiFi Router and ADSL modem may not drop next year in Africa. Entry-level of 11AC/AX Router, VDSL, LTE Gateway, and Smart Home is supposed to bring us some surprises next year.”

Liu says “new technology such as Mesh” may not so well be known and accepted compared with developed markets such as North America and Europe and it will take more time to get there. “The same situation applies to Smart Home,” he continues. “Pioneer markets such as South Africa has already given us positive feedback in the year 2019, and I believe more and more consumers in those markets will know and try new Wi-Fi technology in the coming years.”



Mario Di Mauro,
chief executive
officer,
Sparkle

Sparkle is TIM Group's fully owned global operator, first international service provider in Italy and among the top 10 worldwide, with a proprietary fibre backbone of around 530,000 km spanning from Europe to Africa, the Americas and Asia.

Services offered include a complete range of IP, Data, Cloud, Data Centre, Mobile Data and Voice solutions to meet the needs of ISPs, OTTs, Media and Content Players, Application Service Providers, Fixed and Mobile operators as well as Multinational Enterprises.

Sparkle has a major presence in Africa and is first Tier-1 backbone, with points of presence in Egypt, Tunisia, Nigeria, Tanzania and Djibouti and commercial relations for Voice traffic, Roaming and Mobile services, Internet and Bandwidth connectivity in almost all countries.

Sparkle's “technological heart and intelligence of network” is in Palermo,

Sicily, that is increasingly establishing itself as the main hub for Internet traffic in the Mediterranean. Sicily Hub is Sparkle's latest generation open data centre launched in 2015 and featuring state-of-the-art data security technologies. Thanks to its proximity to North Africa and the Middle East, to its connectivity to all the international cables landing in Sicily and to the integration with Sparkle's global Tier-1 IP transit network Seabone, Sicily Hub offers to content providers and international internet service providers an IP interconnection point with reduced latency, from 35 to 15 ms, and superior performance, from 50% to 80%, compared to any other European peering point.

The recent announcements of the investment in the BlueMed cable as well as the opening of a new Point of Presence (PoP) in Nigeria and the selection of Djibouti Data Centre as its IP hub for the expansion to East and South Africa, suggest the start of a new expansion phase for the global operator in Africa.

“Africa and the Middle East have always been a reference area for Sparkle and we will be even more so in the future: starting from north Africa, whose countries were the first areas on which Sparkle invested, to arrive to major projects that envisage a renewal of existing bilateral connections or the opening of new PoPs,” says Mario Di Mauro, Sparkle's chief executive officer. “In terms of capacity, Sparkle has sold and activated more than two terabyte of capacity in North Africa only, and this figure is set to increase year over year.”

The company was very active in 2019, too. “In the last year we have further expanded our African backbone opening a brand new PoP in Nigeria and selecting Djibouti Data Centre (DDC) as our IP hub for the expansion to east and South Africa, leveraging on DDC's direct access to all major international and regional cable systems connecting the European, Middle Eastern and Asian markets with Africa and thus delivering IP and capacity services with even higher performance than before,” Di Mauro continues. “During 2019 we have also announced several network investments in the Mediterranean aimed at enhancing Sparkle's backbone and consolidating our leadership in the Mediterranean basin.” I'm talking about BlueMed for example, our new proprietary submarine cable project that will cross the Tyrrhenian Sea connecting Sparkle's Sicily Hub open data centre in Palermo, which serves eighteen international cables, with Genoa's new open landing station, directly connected to Milan's rich digital ecosystem.”

He says BlueMed will also include multiple branches within the Tyrrhenian Sea and is set to support further extensions southbound of Sicily. The new cable, that Sparkle plan to put in service by 2021, will support capacity up

to 240 Tbps, providing advanced connectivity between Middle East, Africa, Asia and the European mainland hubs with up to 50% latency reduction than existing terrestrial cables connecting Sicily with Milan. “In addition, Sparkle's new open landing station in Genoa is set to become the alternative priority access for other upcoming submarine cables looking for a diversified entry way to Europe, thus strengthening Italy's role as digital gateway between Africa, Middle East, Asia and Europe,” adds Di Mauro.

He is also very optimistic about the coming year. “In 2020 Sparkle will further invest in the continent to drive digital transformation and connect African countries between themselves as well as with the rest of the world, relying also on its security service portfolio,” says Di Mauro. “We plan to open new PoPs, especially in those countries which do not have direct access to the sea and therefore do not have direct landing points for cables, and looking carefully at the data centre market to support local operators in offering global solutions to their enterprise customers.”

Mobile is another key area for Sparkle Di Mauro says the firm will set up new roaming interconnections with African mobile operators. ■

“In terms of capacity, Sparkle has sold and activated more than two terabyte of capacity in North Africa only, and this figure is set to increase year over year”

Satellite Capacity

55E HIGH QUALITY
Yamal-402 TRUNKING

AFRICA High Performance EUROPE

BACKHAUL SNG MOBILITY IOT

Ku BAND MIDDLE EAST DATA TRANSMISSION
EIRP 53dbW up to 300 Mbps



www.gazprom-spacesystems.ru



chapter 7

Fibre



Paul Hamilton,
director,
Hamilton
Research Ltd,
Africa Bandwidth
Maps

Africa's total inventory of operational fibre optic network reached the milestone of 1 million kilometres in the last year, increasing the number of people living within reach of a fibre optic node in Sub-Saharan Africa to 584 million people. More broadband customers, with more bandwidth per customer, continues to drive Africa's international Internet

bandwidth growth along an exponential curve, reaching 10.962 Tbps by December 2018.

Terrestrial Fibre Networks Reach 1.025 Million Route-Km

According to the eleventh annual edition of the Africa Telecom Transmission Map published by Hamilton Research for 2019/20, the inventory of operational fibre optic network reached 1,025,441-km by June 2019 compared to 936,102-km in 2018, 820,397-km in 2017, 762,167-km in 2016, 622,930-km in 2015, and 564,091-km in 2014. Ten years ago in June 2009, the total fibre inventory was 278,056-km (see chart 1 below). In the twelve months since June 2018, an additional 88,339-km of fibre optic network has entered service, an average of 244-km of new fibre optic network entering service per day. In addition, there was in June 2019 a further 132,088-km of fibre optic network under construction, 89,610-km planned, and 50,159-km proposed.

The eleventh edition of the Africa Transmission Map shows the networks which are operational, under construction, planned and proposed for a total of 317 network operators and 65 submarine cable

Chart 1: Route-Kms of Terrestrial Transmission Network, Africa 2009 - 2019

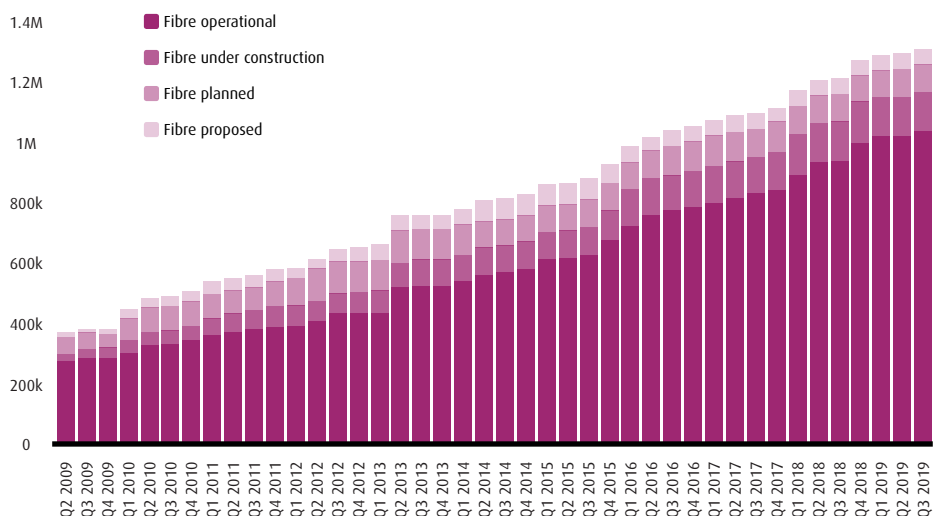
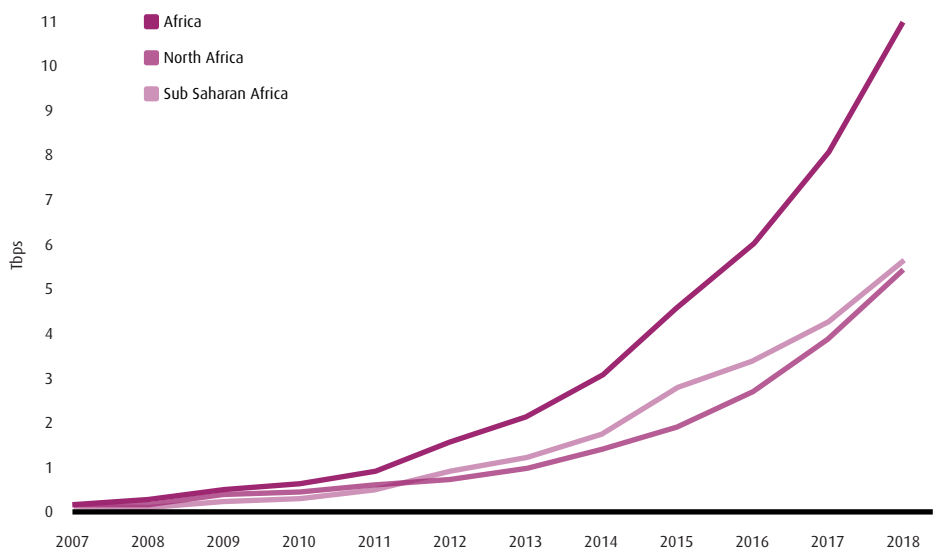


Chart 1: Route-Kms of Terrestrial Transmission Network, Africa 2009 - 2019



systems. Africa's total inventory of terrestrial transmission networks increased to 1,474,983-km by June 2019, compared to 1,389,475-km by June 2018, 1,254,413-km in 2017,

1,179,010-km in 2016, 1,019,649-km in 2015, and 958,901-km in 2014. Ten years ago in June 2009, the total inventory of terrestrial transmission networks was 465,659-km.

FIBRE: INTRODUCTION

Fibre Networks Reach Increases To 55.2% Of Sub-Saharan Africa

The expansion of terrestrial transmission networks continues to bring additional countries, regions, cities and towns within reach of fibre networks for the first time. In June 2019, 584 million people lived within a 25-km range of an operational fibre optic network node, compared to 556 million in June 2018 and 259 million in June 2010.

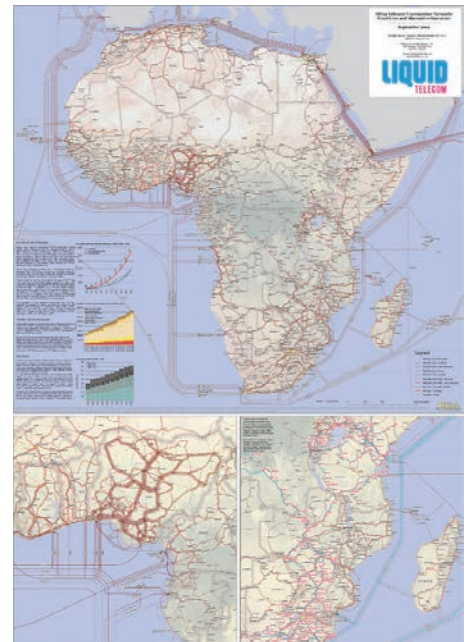
In June 2019, 55.2% of the population in Sub-Saharan Africa (584 million) lived within a 25-km range of an operational fibre optic network node. This compared to 54.2% (556 million) in 2018, 52.1% (522 million) in 2017, 48.1% (469 million) in 2016, 45.8% (436 million) in 2015, 44% (410 million) in 2014, 41.8% (371 million) in 2013, (345 million) in 2012, 36.3% (313 million) in 2011, and 30.8% (259 million) in 2010. Once the fibre network which is currently under construction enters service, the fibre reach of Sub-Saharan Africa will increase to 56.4% (597 million), and once the network which is planned or proposed enters service it will increase to 61.0% (646 million).

Since 2010, network expansion has brought more than 325 million more people within access to high capacity national and international back-bone networks. In the last year an additional 28 million people were brought within 25-km range of an operational fibre node. This included an additional 3.404 million people in Guinea, 3.156 million in Nigeria, 3.026 million in Uganda, 2.068 million in DRC, 1.927 million in Benin, 1.620 million in Kenya, 1.135 million in Madagascar, 1.165 million in Ethiopia, 1.189 million in South Africa, and 1.008 million in Senegal.

Africa's International Bandwidth Reaches 10.962 Tbps

Africa's total inbound international Internet bandwidth reached 10.962 Tbps by December 2018. This compared to 8.013 Tbps in 2017, 5.934 Tbps in 2016, 4,506 Tbps in 2015, and 2.982 Tbps in 2014 (see also Africa: Africa's International Bandwidth Reaches 7.939 Tbps in 2017). Ten years ago in December 2008, Africa's total bandwidth was just 115 Gbps.

The chart below shows that the total



2019/20 Africa Telecom Transmission Map

international bandwidth of 10.962 Tbps was split between Sub-Saharan Africa, which increased by 32% to reach 5.568 Tbps, and North Africa

JANUARY 2019

Telecom Egypt is claimed to have doubled the capacity on its Delta Region DWDM backbone network. Commercial deployment of its new high-speed service started earlier last year and is said to represent the first 200G long distance, single carrier transmission service in Africa. The operator's MD and CEO Ahmed El-Beheiry says: "Doubling capacity on our existing backbone allows us to offer high-speed broadband and LTE services in addition to 100GE services for mobile operators, while reducing costs." With growth in demand for mobile video and ultra broadband services, Telecom Egypt worked closely with Nokia to enhance its current backbone network. It's claimed that by upgrading its existing Nokia Photonic Service Switch (PSS) 1830 switches with the vendor's Photonic Service Engine (PSE) technology, the operator has not only doubled its capacity but has also reduced its operating costs. The deployment includes Nokia's 500G DWDM muxponder, a programmable card that is said to provide wavelength capacities from 50G to 250G per line port. Based on Nokia's PSE coherent digital signal processor, this programmability is designed to allow Telecom Egypt to provision and tune wavelength capacity per optical route to ensure that its network is operated at peak performance, capacity and lowest cost-per-gigabit. "This is exactly what we had in mind when we designed the 1830 PSS platform," says Nokia's MEA head Amr El-Leithy. "Its flexibility and

easy upgradability will allow [Telecom Egypt] to proactively manage the data explosion and develop new revenue streams – all the while improving the experience for their customers."

FEBRUARY

MainOne has entered into a partnership with Facebook to roll out a metro fibre infrastructure project in two states of Nigeria. The infrastructure collaboration is part of Facebook's efforts to connect more people to broadband internet. As part of this project, MainOne is building and operating approximately 750km terrestrial fibre infrastructure in Edo and Ogun States, two of Nigeria's fastest-growing states, with a combined population of seven million.

MARCH

March saw the opening of Dark Fibre Africa (DFA) of its office in Harare, marking its expansion into African markets outside of its home base in South Africa.

DFA an open-access fibre telecommunications firm announced that its new Harare hub will be headed up by Simon Chimutsoto, who has "extensive experience" in rolling out telecoms infrastructure in Zimbabwe, Zambia and South Africa.

DFA said it plans to roll out a high speed fibre network in Zimbabwe, which will be made available on a wholesale open-access basis.

"We have rolled out network infrastructure in all of the major South African metropolitan areas and have extended our footprint to large

and small towns, amounting to over 13,000km of ducting space, said DFA executive for strategy, mergers, acquisitions and innovation Vinno Govender. "Our entry into Zimbabwe is in line with our strategic intent of expanding into sub Saharan and other African markets.

APRIL

Telecom Egypt signed a landing party agreement worth USD45m with Pakistan and East Africa Connecting Europe (PEACE) Cable International Network and PCCW Global, the international operating division of HKT, the Hong Kong telecom service provider. PEACE is a 12,000 km long cable system with landings in Pakistan, Djibouti, Egypt, Kenya and France and provides open, flexible and carrier-neutral services for its customer base. "The PEACE cable will cross Egypt through new diversified terrestrial routes between the Zafarana and AbouTalat cable landing stations, where Telecom Egypt will provide PEACE with brand new state of the art landing facilities," said the Egyptian firm. Telecom Egypt's managing director and chief executive officer Adel Hamed said that the deal marks the addition of another cable system to Telecom Egypt's vast network of submarine cables, "exhibiting clearly that Egypt is the ideal digital route and partner of choice" for international traffic from the east to the west.

"Telecom Egypt boasts several differentiation factors in the submarine cable industry that will enable it to realise its vision of becoming a regional and African digital hub for content providers," Hamed added. Headquartered in the

which increased by 42% to reach 5.394 Tbps. Excluding Kenya, which reached 1.142 Tbps in 2018 (source: CA), the total bandwidth for other countries in Sub-Saharan Africa increased by 34% to reach 4.426 Tbps in December 2018.

All of Africa's international bandwidth is supplied by submarine cables, terrestrial networks connected to submarine cables, or satellite. Of the total bandwidth of 5.568 Tbps in Sub-Saharan Africa by December 2018, 5.077 Tbps (91.2%) was supplied directly by submarine cable, and 479 Gbps (8.6%) was supplied by terrestrial cross-border networks connected to submarine cables. Ten years ago in December 2008, the amount of international bandwidth supplied by submarine cable was 102Gbps. ■

Year in review

Fibre optic deployment in Africa during 2019, was underpinned by the need for secure and high-speed connection to boost African economic growth. It is beyond argument that there is a demand in Africa for fibre to improve broadband connection. It has been estimated

that the continent needs an additional half million kilometers of fibre cable just to provide a reasonable level of connectivity. At present it is estimated that Africa has just over 1 million kilometers of fibre optic networks installed. This comes at a financial cost when cable installation can exceed US\$30,000 per kilometre or US\$15bn for additional 500,000 Km.

Silicon Valley eyes African cable deployment

2019 was a good year for African cable deployments and was boosted by the involvement of both Facebook and Google, both of whom tentatively disclosed their respective undersea cable investment intentions.

Google adopting a sensitive approach to Africa, (bearing in mind America's last major involvement in Africa) has named their cable project Oludah Equiano.

Facebook has gone for a more Disney orientated approach calling their project Simba, the Swahili for lion. But in all seriousness, this could be the way forward for interconnection for

Africa. Large corporations such as Microsoft, Google and Facebook are awash with cash and diversification into future profit bearing areas is a sensible business strategy for them.

It can only be a win-win scenario for Africa, with potential billion US dollar cable investments and those cable deployments being made with state-of-the-art cable giving high speed, high capacity ability to cover Africa's needs for a few years. Given the size and wealth of these American enterprises it is possible that they may also exhibit a social responsibility aspect and provide funding for social projects for the poorer nations of Africa.

Land based Fibre spreads across the continent

Several developments in 2019 have seen inter region connectivity increase in Africa.

Orange accelerated its development of connectivity in Africa with a new secure international network to connect eight West African Countries. The announcement by Orange that it was constructing a new international backbone network in West Africa was welcomed at the AfricaCom congress

capital Cairo, Telecom Egypt has 17 subsidiaries operating across British Islands, western Europe, northern Africa and the Middle East.

MAY

Telecom Egypt signs agreement for PEACE cable system. A landing agreement was signed with a value of US\$45m. The agreement was between Pakistan and East Africa connecting Europe (PEACE) Cable International Network and PCCW Global, the international operating division of HKT, the Hong Kong telecom service provider.

The company clarified that PEACE is a 12,000Km long cable system with landings in Pakistan, Djibouti, Egypt, Kenya and France that provides open, flexible and carrier-neutral services for its customer base. "The PEACE cable will cross Egypt through new diversified terrestrial routes between the Zafarana and Abou Talat cable landing stations, where Telecom Egypt will provide PEACE with brand new state of the art landing facilities," said the Egyptian firm.

Telecom Egypt's managing director and chief executive officer Adel Hamed said that the deal marks the addition of another cable system to Telecom Egypt's vast network of submarine cables, "exhibiting clearly that Egypt is the ideal digital route and partner of choice" for international traffic from east to the west.

JUNE

In June Paratus rolled out its fibre infrastructure in Gobabis, Namibia. Paratus is offering capped and uncapped packages starting from N\$620

for 100Mbps and N\$785 for 10Mbps.

Paratus has completed a national fibre project, connecting from the WACS landing station in Swakopmund eastward to the border of Botswana. Andrew Hall, managing director at Paratus Namibia said it was a natural progression for the company to start connecting towns en-route of the first privately owned national backhaul fibre network through Namibia. Andrew Hall expressed his appreciation to Gobabis city councilor Liberius Kalili and the Gobabis team, who were very approachable on the idea of moving ahead with installing fibre infrastructure and its subsequent operational roll-out.

JULY

Google unveiled plans for a new private subsea cable system to connect Africa and Europe and sought partners to help link it with various countries along its proposed route.

Named Equiano it will start in western Europe and run along the west coast of Africa, between Portugal and South Africa.

It will also incorporate branching units along its route, which can be used to extend connectivity to several African countries. The first branch will land in Nigeria.

Fully funded by Google, it is the internet Giant's third private international cable after Dunant, which connects the US to France and Curie, which connects Los Angeles, California with Valparaiso, Chile.

Equiano is named after the Nigerian born writer and abolitionist Oludah Equiano, who

was enslaved when a child. Its infrastructure is based on space-division multiplexing (SDM) technology, which Google stated means more than 20 times network capacity compared with the last cable employed to serve the region.

Phase one of the project, which will incorporate optical switching at the fibre-pair level, connecting Portugal to South Africa is scheduled for completion in 2021.

AUGUST

Frogfoot Networks, an open access fibre network provider, rolled out fibre network infrastructure in Protea Glen, Soweto, in a phased approach, with up to 20,000 homes and businesses to benefit from access to affordable, reliable broadband connectivity.

"Providing world-class connectivity has been the main driver behind this project, and we are excited to be the first fibre to the home (FTTH) provider in this area. Increased access to the internet can help improve economic growth in the region," said Shane Chorley, head of sales at Frogfoot.

The areas being covered as part of the infrastructure rollout are Protea Glen East and West, with work starting in the West. This region will be divided into 10 zones, while Protea Glen East will comprise 11 zones. It was expected that the first zone covering 1,000 houses would be completed by the end of September.

SEPTEMBER

Broadbased Communications, an open access metropolitan fiber optic network operator, has

in Cape Town. The network will be constructed around a land based fibre optic network linked to submarine cables that will benefit from centralized monitoring. It will link the West African cities of Dakar, Bamako, Abidjan, Accra and Lagos. Orange stated that the network was designed to provide large-scale international capacity and consequently, will help support the development of a digital ecosystem and meet needs in Africa.

In November Liquid Telecom announced its land based fibre link that will connect east to west Africa via the Democratic Republic of Congo (DRC). It comes as a progression from its 2,600 kilometre deployment across the DRC, which links the DRC to Liquid's One Africa, broadband network. The One Africa network enables connectivity of African states with each other and with the rest of the world. The One Africa network spans some 70,000 km and is increasing as Liquid Telecom continues its strategy to a more connected Africa. As Nick Rudnick Group CEO stated, "By linking the DRC to Liquid Telecom's rapidly expanding pan-African fibre network and the rest of the world the transformative infrastructure is creating a foundation for digital growth. Fast reliable broadband connectivity will advance society, fuel innovation and help champion pan-African trade."

The DARE1 submarine cable was completed in 2019. The system will have four landing stations expanding connectivity for Eastern Africa, to include Djibouti, Bosaso and Mogadishu in Somalia and Mombasa in Kenya. The cable has a length of nearly 5,000 Kilometres with three branching units and 41 dual stage repeaters.

The landings were chosen to be in port cities and to facilitate interconnection with other cable networks around the globe.

The Director General of Djibouti Telecom, Mohamed Assoweh Bouth, stated, "we are very pleased that the DARE1 system is progressing on schedule and will be available for service in 2020. We understand the importance of bringing connectivity to eastern Africa and couldn't imagine a better company to partner with to achieve this mission other than SubCom." ■



Virginie Hollebecque,
managing
director,
western Europe
and Middle East,
Ciena

For Ciena in 2019, 5G was a key driver that predominantly came in the form of making sure our customers' backend infrastructure was ready to cope with the increased capacity, higher speeds and lower latency that 5G promises.

"To support this, we announced several new products last year," says Virginie Hollebecque, managing director for Western Europe and Middle East at Ciena.

"To specifically address network scale, cost and efficiency challenges from edge to core, we launched our WaveLogic 5 innovations, which deliver vastly improved network economics, reach, cost, power and footprint through WaveLogic 5 Extreme (WL5e) and WaveLogic 5 Nano (WL5n). We also invested in our market-leading automa-

tion software, Blue Planet with the launch of our Proactive Network Operations (PNO) solution to prevent up to 95 percent of network outages."

Indeed, Ciena also announced its Adaptive IP strategy that eliminates obsolete protocols from modern IP networks to help reduce storage, compute, complexity, and operating costs. The firm's packet and software solutions provide the building blocks needed to create a complete solution that offers closed-loop automation that delivers optimal IP connectivity, from access to metro networks, and enables network operators to simplify and expand IP connectivity closer to the network edge.

"We continue to grow as a business and last year acquired Centina, a leading provider of service assurance analytics and network performance management solutions, which we will integrate into our Blue Planet software to provide closed-loop, intelligent automation solutions that help our communications service provider customers improve operational agility," adds Hollebecque.

"There is a surge of activity on new submarine cables, some of which are close to finalising add/drop locations and designs"

penned a memorandum of understanding (MoU) with Dolphin Telecom, the operator of the African Coast to Europe submarine cable landing station in Nigeria. Under the terms of the deal, Broadbased will provide last mile metropolitan fibre optic network connectivity on a wholesale basis to Dolphin Telecom's clients including mobile telecom operators and internet service providers (ISPs) in Nigeria, a statement said. The ACE submarine cable system managed by a consortium of 19 telecom operators from Africa and Europe is being upgraded to 100G technology, which would increase its design capacity from 5.12 Tbps to 12.8 Tbps. It is supported by wavelength division multiplexing technology to accommodate future ultrabroadband networks. Broadbased operates a non-competitive, non-discriminatory, open access Metropolitan fibre optic network spanning over 3,500km of transmission, distribution and in-premise, in all the major business districts in Nigeria's largest city, Lagos. The company's managing director and chief executive officer Henry Iseghohi said that the MoU was a testament to the

company's dedication to the open access, non-competitive model, robust network architecture and the dedication of his staff.

OCTOBER

Seacom's submarine cable system suffered an outage in October, which affected services. Seacom was the company to launch Africa's first broadband submarine cable along Africa's eastern and southern coasts. It announced the outage in a series of tweets, commencing with the news it was experiencing a service-affecting outage, between Mombasa in Kenya and Zafarana in Egypt. It affected all linear traffic between the east coast of Africa, to and from Europe. Seacom announced the outage on October 22, noting that customers with IP or other managed network services terminating between Dar es Salaam and South Africa would remain unaffected. The network was up and running the following day.

NOVEMBER

India's Sterlite Technologies (STL), announced a partnership with South Africa's Frogfoot to provide Fibre To The Home (FTTH)

infrastructure in Soweto, Johannesburg. Frogfoot will use STL's Air-blown FTTH solution. It is claimed it will bring lower costs and faster time to market as well as providing affordable fibre connectivity to 20,000 homes in Soweto.

DECEMBER

Algeria and Mauritania in Fibre Optic link up as Algeria completes a 75km cross border fibre-optic link to Mauritania.

The deployment of the section was announced by Algeria's minister of post, telecommunications, technology and digitalisation, Houda Imane Faraoun.

Algeria is progressively forging links with other markets, having recently completed a 440km terrestrial fibre route over its southern border into Niger. Following extensive delays, Africa's largest country by land mass is also now connected to Spain via the 770km Oran Valencia (ORVAL) submarine cable, a partnership between Algérie Telecom, IlaLink and ASN.

Originally scheduled to launch in Mid-2017, the cable can be upgraded to a capacity of 40Tbps and will offer Algeria more diverse international routes.

The African networking landscape is difficult to define in a single, overarching statement about the continent, says Hollebecque, who adds that mobile telephony is by far the dominant telecom service across Africa, accounting for more than 90% of all telephone lines on the continent - but how this relates on an individual market level is much more complex.

"There is a surge of activity on new submarine cables, some of which are close to finalising add/drop locations and designs. With the designs and locations being finalised, the focus will move onto the backhaul network to carry the traffic which will carry unprecedented bandwidth within the region," says Hollebecque. "Having said that, Terabit level demand is not yet developed in most terrestrial networks, so it may take some time to make it a reality. The requirements of Internet Content Providers are driving the demands in Africa, with some announcing new data centres within the region. Several are involved in funding these new submarine cables and they will have a need to move large amounts of data from the submarine cable landing stations to their data centres. Understanding and patience are key for this continent as it will take several years for the submarine cables to be built."

Hollebecque says 2020 will continue to be driven by 5G and the new applications and services which come to market. She says it's going to be an interesting year and one which is dominated by network infrastructure innovation. "We are already seeing 5G start its journey in Africa, and this will continue to be rolled out over the next couple of years," she adds. "Recently we also added several new products and capabilities to our 5G network solutions, fuelling the next wave of mobile connectivity." This includes Ciena's new open and programmable 5168, 5166 and 5164 Routers which enable soft and hard slicing with Segment Routing and FlexE switching for converged 4G and 5G xHaul over a common wireline infrastructure.



Jacques Visser,
head of wireless,
Vox

Seacom has been continuing to upgrade and improve its international backbone, particularly by lighting more capacity on its subsea cable which it owns and operates.

As far as the industry is concerned, Jacques Visser, head of wireless at Vox says 2019 saw the quality of wireless

services improve tremendously with cost deflation driven by the availability of fibre backhaul, redundancy and improvement of wireless technology.

"The quality of wireless services improved tremendously with cost deflation driven by the availability of fibre backhaul, redundancy

"The quality of wireless services improved tremendously with cost deflation driven by the availability of fibre backhaul, redundancy and improvement of wireless technology."

and improvement of wireless technology," says Visser. "LTE-A made a substantial contribution in the expectation to drive GSM data cost down in limited coverage areas. An unrealistic expectation was created about 5G, while the allocation of 4G and 5G spectrum to the industry failed. IoT solutions started to mature in commercial structures as networks, applications and devices were developing."

With regards to Vox, Visser says partnerships expanded the coverage of its satellite services to more geographical areas, including the Northern Cape locally, giving it for the first time coverage on Ka-band across the entire South Africa, as well as into much of sub-Saharan Africa.

"We introduced highly attractive uncapped data and voice satellite service plans at a price point that competes with LTE-A. These plans provide cost-effective connectivity to under-served regions in South Africa," he says.

Vox's biggest challenge, he says, was to position its wireless portfolio strategically to

grow revenue and profits while fibre networks erected rapidly at a low price point. He says from a consumer point of view the quality and price deflation in fixed wireless "was significant".

Looking toward a new decade, Visser makes some bold predictions. "More efficient use and management of available spectrum, this includes white spaces, 5G rollout in the areas where fibre backhaul is available, backhauling of 5G networks by means of Low Earth Orbit (LEO) satellites and smart cars, planes and vessels connected through LEO satellites," Visser says.



David Eurin,
chief strategy
officer,
Liquid Telecom

// Last year was another busy year for Liquid Telecom during which we saw our multi-award-winning fibre network reach 70,000km, the expansion of our data centres and an increase in our customer base across all sectors – consumer, enterprises and wholesale," says David Eurin, chief strategy officer at Liquid Telecom, the pan-African giant.

He says that during 2019, the company saw two big trends. The first was that global players continued their investment across the world investing billions in undersea cables to lower bandwidth costs and strengthen their global links. The second was that infrastructure investors have been investing massively in data centres in Africa. Eurin says that for Liquid Telecom as a well-established infrastructure player, data centres are a natural evolution for the company with synergies across the business.

"There is significant long-term growth in the market," he continues. "However, players who



Paul Hamilton,
director,
Hamilton
Research Ltd,
Africa Bandwidth
Maps

The year ahead: There is plenty of room for future growth: this figure of 5.077 Tbps is still less than 3% of the total design capacity of at least 226.5 Tbps that is potentially now available on the 26 submarine cables serving the region in December 2018. This total design capacity has increased from 134.5 Tbps on 23 operational cables in 2017, 94.4 Tbps on 20 cables in 2016, 70.4 Tbps on 18 cables in 2015, and 60.3 Tbps on 18 cables in 2014. The increase of 92 Tbps seen during 2018 was with the entry into service of the G2A (20 Tbps), SAIL (32 Tbps), and SACS (40 Tbps) submarine cables. By the

end of 2018 nearly a third of the total design capacity on cables (72 Tbps) landing in sub-Saharan Africa (230.5 Tbps) will connect directly to the Americas rather than Europe or Asia. The amount of bandwidth capacity which is activated (equipped) and sold is increased by increments in line with demand. The completion of new terrestrial cross-border links, and the expansion of capacity on others, has seen the volume of intra-regional traffic backhauled to submarine cable landing points increase by 37% in the last year to reach 479 Gbps in December 2018. This compares to 350 Gbps in 2017, 242 Gbps in 2016, 136 Gbps in 2015, and 103 Gbps in 2014. Ten years ago in December 2008 the amount of international bandwidth supplied by terrestrial cross-border networks connected to submarine cables was just 4 Gbps.

lack scale (geographically or across a diverse customer base) may struggle to develop their business. Liquid Telecom is thriving because we have operations across Africa, serving wholesale, enterprise, government, and retail customers.”

When it comes to highlights in 2019, Eurin says there were many, but there were three most significant ones when it comes to Africa.

“East-West African Fibre Connectivity,” he says. “In November 2019 we launched the fastest direct land-based fibre link connecting East to West Africa. This breakthrough coast-to-coast digital corridor followed the completion of our new high-capacity fibre link running 2,600km across the DRC and connecting the country to neighbouring Tanzania and Zambia with onward connectivity to our pan-African fibre network.”

Another was in South Sudan. “We also announced that we have built and now operate South Sudan’s first underground fibre broadband network which will make reliable and affordable internet connectivity available for the first time – and will ultimately create a foundation for digital growth, innovation and prosperity in this young country,” Eurin adds. “5G. We have 56 MHz worth of spectrum in the 3.5 GHz band, which we used to launch South Africa’s first wholesale 5G network.”

As far as 2020 is concerned, Liquid will be opening new data centres to complement our existing ones in Nairobi, Cape Town and Johannesburg. “We will also be investing more in our digital services product portfolio and IoT,” adds Eurin.

“People are optimistic about Africa’s growth in general and so we will see more and more international capital coming into Africa. On the industry side I think that we will see cloud services providers launching services in new countries with more local hosting. For Liquid Telecom, we will continue our mission of building Africa’s Digital Future as we believe that everyone has the right to be connected.”



Byron Clatterbuck,
CEO,
SEACOM

As Africa’s largest international network provider, 2019 proved to be an eventful year for SEACOM. It celebrated its tenth birthday and its sights were set on market consolidation, says Byron Clatterbuck, the company’s CEO. “We spent the year driving capacity and network diversity through investments, accelerating growth with targeted acquisitions, expanding our enterprise services into well-known markets and increasing scale with lit fibre deployment,” he adds. All this to empower African businesses to go further – SEACOM’s steadfast vision that inspires everything we do.”

Clatterbuck explains how 2019 saw a wave of change across the continent, with key players like Amazon, Google, Microsoft and Netflix building larger footprints in Africa and increasing their computing, caching and storage capabilities. “As such, we continued to upgrade and improve our international backbone, particularly by lighting more capacity on our SEACOM Subsea Cable,” he continues. “In doing so, we developed a three-way, internationally meshed network connecting Europe to Africa – enabling more cloud computing and content companies to deliver more resilient service offerings. And, in turn, driving improvements across the entire data communications ecosystem.”

As part of SEACOM’S greater growth strategy, it recently concluded several ISP acquisitions, including MarcoLan and SAI. It added FibreCo to its list, “affording us with long-haul capabilities” to connect the East Coast of South Africa to the West Coast. “Meaning that bandwidth-starved cities and towns along our new fibre routes would finally enjoy affordable, high-speed Internet connectivity and cloud services,” says Clatterbuck. “By owning more fibre assets, we can easily move to higher-speed technology, allowing us to exponentially increase the capacity throughout our fibre network.”

SEACOM extended its presence in its brand-new data centre in Mombasa, Kenya and announced similar plans for the rest of Africa. With the addition of eight new Points of Presence (PoPs), more businesses can connect to cloud facilities globally. The firm also partnered with Raxio Uganda to launch the country’s first carrier-neutral, enterprise-grade data centre in the first quarter of 2020.

Another achievement in the east African region – where the company was awarded a grant from the US Trade and Development Agency (USTDA) to initiate a feasibility study of the market potential for fibre services in Kenya, Uganda, Rwanda and Tanzania.

A second strategic partnership that helped it expand its African network was with Vodacom Business Africa, significantly augmenting the geographic reach for SEACOM Business clients across the continent.

“In line with our growth and evolving value proposition, we also revealed a refreshed brand identity,” continues Clatterbuck. “Our bold new identity, featuring a vibrant colour palette and luminous accents, reinvigorates the SEACOM brand and personifies the digital revolution taking place in Africa.”

Talking of 2020, Clatterbuck says South Africa “is one of our biggest markets” and it will continue to see a lot of our investment, interest and efforts. SEACOM’S next main market is Kenya – where the business will continue to push,

grow and widen its network capabilities in the country. Clatterbuck says the company is also planning to launch SEACOM Business further into east Africa, in markets such as Uganda.

“SEACOM is excited about where Africa is heading. We know that the service we provide is crucial to driving development across the board by ensuring that there is reliable Internet connectivity to businesses and consumers,” he adds. Cloud computing powerhouses and other major players can now come to the continent and deliver reliable services. SEACOM is the underlying data backbone that helps support African businesses to grow and, consequently, create more opportunities.” The company is “therefore, optimistic about Africa” and will continue to invest and expand in its chosen markets.



Sami Yousif Mohamed,
CEO and Group
President,
Sudatel Telecom
Group

2019 is over! We are now looking to the future – and planning how we can best serve our customers across Northern Africa. Telecom operators across Africa share common challenges and issues that we all have to deal with to sustain and grow our business. How we adjust to the ongoing digital disruption and constantly changing technology stack are challenging issues for everyone involved in this industry but they also come with a set of promising opportunities if we get it right.

One challenge for us – and other operators in our region – is recruiting the specialist talent we need. Internally, I am always pro-actively engaging with the Sudatel team across North Africa as I recognise that their hard work and commitment will be essential in helping us to grow.

After the historical political change that took place in Sudan in 2019, everyone at Sudatel is looking forward to living in a region that is more stable and ready to embrace the technology that can help improve all of our lives.

For me, of course, becoming CEO and Group President of Sudatel Telecom Group in 2019 was a career high and I hit the ground running preparing our strategy to spearhead further expansion and growth across our footprint.

As well as Sudan, we are currently providing both mobile and fixed (voice and data) services to businesses, residents and ISPs in Mauritania and Senegal, as well as the provision of wholesale services to international carriers.

Sudan, Mauritania and Senegal are countries with very different cultural, social and economic situations. However, moving towards a digital life is a desire that is shared by the people and businesses of all three countries.

We will be investing in our activities across

the ecosystem. The expansion of our fibre network is vital in delivering reliable and speedy connectivity and providing a platform to roll out innovative digital partnerships to deliver rich infotainment and smart cloud-based services to our customers.

Network coverage will continue to grow across the whole continent; more people will get online; we will finally find a commercial and sustainable business model to Connect the Unconnected.

In addition, we will see different digital trends pick up across multiple segments. For consumers, we believe that Fintech services and digital entertainment content such as gaming, video, music, and education will start to flourish – and we are actively evolving our product portfolio to meet future demand.

For the Government segment, e-Government and Smart City services are of interest as they directly impact on the performance of the Government and make interaction with residents easier. Sudatel – as the largest infrastructure provider in Sudan – is expected to play a pivotal role in supporting the Government achieve its digital goals.

SMEs and large businesses will be demanding more cloud services and some of the IoT vertical services. We will continue to invest in our award-winning Data Centre which has been a cornerstone in the company's transformation into a full ICT player.

Finally, digital start-ups are a very interesting segment and we feel a great responsibility toward enabling them to grow and materialize their promising ideas. We are actively engaged with some of the key incubation and start-ups hubs and looking forward to adding value to this community.



Katie Hill,
sustainable
infrastructure,
technology
and renewable
energy expert,
global director,
business
operations,
Africa Data
Centres

As the 4th Industrial Revolution takes shape, Africa can harness new technologies to both support sustainable development and capitalise on new market opportunities.

With Africa particularly vulnerable to the impacts of climate change, most African governments have committed to global efforts to mitigate climate change. At the same time, the continent has a burgeoning young population and an urgent need to drive economic growth. Clearly, African economic and

industrial development should not exacerbate climate change and further threaten vulnerable communities across the continent.

The solutions to this conundrum lie in

renewable energies, sustainable water management, smart new infrastructure and agriculture models, and advanced technologies that optimise every resource.

Katie Hill, a sustainable infrastructure, technology and renewable energy expert and Global Director of Business Operations at Africa Data Centres, says sustainable growth is a concern for both public and private sector in Africa.

"All stakeholders recognise that we do need to be proactive to mitigate climate change. But Africa remains a small part of global emissions today, so it's a fine balance between mitigating climate risk, while alleviating poverty and stimulating economic growth," she says.

"There is a mix of focus from the private sector – most large multinational companies are concerned about environmental impact and sustainability, while many smaller homegrown businesses are not as environmentally aware. But we see a lot of interesting development in renewable energy, waste management and environmentally-friendly transport systems, for example, which both boost economic development and mitigate climate change."

Power is fundamental to Africa's development, but at the same time electricity and fuel are the biggest drivers of carbon in the world: "Africa is still struggling with huge energy deficit and even those on the grid have unstable access. So, capacity must be increased without increasing carbon consumption."

It is achievable. Some countries, like Kenya, have increased their use of renewable power resources to around 90%. Other East African countries, such as Ethiopia, also have very high renewable energy penetration. "This has become a huge asset for them, as international investors are drawn to clean, stable economies," she says.

Civil society is also putting pressure on private and public sector to become more environmentally friendly; and advances in technologies are helping make clean technologies more cost effective. "In energy, for example, renewable resources like solar and wind are not available 24/7, so storage is required, which has proved expensive in the past. But progress has been made in bringing down the cost of storage, so we are at a stage now where we can deploy large amounts of renewables onto the grid," says Katie.

Despite emerging market cost sensitivities and the upfront investment needed for renewable energy, many renewable energy sources are more affordable in the long term. Africa Data Centres, part of the Liquid Telecom Group, are proving this through harnessing advanced, clean technologies, including solar power generation at its data centres in Nairobi, Cape Town and Johannesburg.

Data centres are expected to account for a growing share of global energy, with some

researchers predicting that by the year 2025, data centres will use 20% of the world's energy.

"All our data centres are supported by clean energy and carbon neutral technologies. Another focus for us is water, which will increasingly become a challenge as it's a finite resource. In our Cape Town data centre, we innovated around the water requirement for our cooling systems, using an atmospheric water generator (AWG), a water-from-air technology. We generate up to 1,000 litres of water a day for our own use and we are also able to distribute the excess water generated to low income schools in the community," says Katie.

"There is so much companies can do if they simply think responsibly and creatively about how they operate. Environmental responsibility is also good for business, with many opportunities to save money, although sometimes it does require some headspace to find a business case."

To find out more about how the Fourth Industrial Revolution is impacting Africa, read Liquid Telecom's latest report: www.liquidtelecom.com ■

"Africa is still struggling with huge energy deficit and even those on the grid have unstable access. So, capacity must be increased without increasing carbon consumption"

Willcom (Pty) Ltd

**Innovative Performance
Assurance Solutions Experts
New 5G end to end
conformance and assurance
testing, as well as backhaul
provisioning**



WILLCOM
INNOVATIVE SOLUTIONS PROVIDER

**We are passionate experts in providing
precision Test, Measurement solutions.**

We are the most innovative leader in the continuous live performance assurance on Optical Transport networks, Mobile backhaul, Service Providers as well as Fixed line service providers across South Africa, Sub Sahara and the Middle East. We represent various leading OEM's in the performance Assurance domain who are experts in transport and optical equipment such as DWDM and SDN and SDWAN solutions. Our Expertise, passion, dedication and strong partnerships, made out of this team a strong, reliable, knowledgeable team in the Telecommunications industry.

We are committed to deliver to our customers and partners the best options and alternatives with innovative techniques.



Experience Performance

COMPLETE NETWORK PERFORMANCE VISIBILITY. DELIVERED.



SCALABLE
Billions of KPIs per day



GRANULAR
Fastest sampling rates in the industry



REAL-TIME
Sub-second visibility



COMPLETE
All layers QoS & QoE



PROVEN
Used by 18 of the world's top 20 mobile networks



SDN & BIG DATA
SDN & big data integration

End-to-end, real-time performance visibility empowers network operators and enterprises with control to deliver the best user experience and provides end-to-end network performance visibility for service providers and enterprises.

Network performance: Active monitoring? Passive monitoring? How about both?!



Experience. Outcomes.

Ciena (NYSE: CIEN) is a network strategy and technology company. We translate best-in-class technology into value through a high-touch, consultative business model

– with a relentless drive to create exceptional experiences measured by outcomes. For updates on Ciena, follow us on Twitter @Ciena, LinkedIn, the Ciena Insights blog, or visit www.ciena.com.



**Assurance, conformance and
performance testing**

This segment consists of the Mobility Infrastructure, Customer Experience

Management, Service Assurance and Automation Platform Technologies lines of business.

This segment's solutions enable the measurement of network performance and customer experience periodically and the rapid diagnosis of detected or reported network performance and customer experience problems.

Its purpose is to provide active testing and analytics in the operational network, with a focus on wireless service providers. Active test assurance helps customers stay ahead by reducing operating costs while maintaining the quality of service and user experience. It enables the real-time assessment of the network, allowing faster fault fixing and giving insight into the users' experience.



FIELD TEST SOLUTIONS

Network performance depends on proving overall synchronization quality and probing its underlying packet-layer and physical layer mechanisms. Calnex test equipment has all the measurements you need for field deployment and troubleshooting Ethernet backhaul synchronization.

PRODUCT COMPARISON

No matter what synchronization technologies or network topology you are testing, we have it covered. To help you evaluate our various products, simply choose your application - either sync or impairments from the main menu - and see how each model compares.



Blanco software ensures 100% secure and complete erasure & accurate diagnostics for

smartphones, laptops, loose drives, servers and more. This software ensures compliance with POPIA and GDPR.

chapter 8

Critical Communications



Ken Rehbehn,
mobile
communications
analyst,
IHS Markit

Now is a time of change for critical communications. From simple voice-oriented field communications to sophisticated control room situational awareness systems, the capabilities of our critical communications systems are growing along with expanding adoption across the blue light services. Looking

forward to the future, the IHS Markit Critical Communications research team believes that voice communications will remain a foundation component of mission-critical communications even as richer applications arrive to make mobile broadband a valuable operational asset.

Future critical communications will continue to center around voice transmissions thanks to two characteristics: immediacy and ubiquity. During mission operations, the ability to rapidly communicate status and commands with a short, simple voice transmission to fellow group members is essential. Law enforcement and fire service operations entail heads-up, hands-engaged activities that do not make use of keyboards practical. A simple push-to-talk button that opens a simple broadcast voice communication path to all team members remains an ideal user interface during times-of-crisis.

Voice, however, is an inefficient communication method when a large volume of information must be transmitted. For example, a complete description of what an officer sees will take many words, tying up a valuable voice channel. The future of critical communications depends on a world where law enforcement and fire service teams can augment voice communications with graphical images and videos. Control rooms, as well, will use the future functionality to transmit pictures

and videos contributed by citizens calling into 1-1-2 with incident information. Getting this valuable information to and from the field is the job of mission-critical broadband systems.

Early experience with LTE-based deployments for mission-critical broadband support, such as FirstNet in the United States and SafeNet in Korea, points to the value these systems offer. Mobile data terminals, handheld smartphones, and tablets serve as potent tools for delivering dispatch information and speeding the business processes that underpin law enforcement, fire operations, and emergency medical response.

While LTE-based mobile broadband provides vital data transmission resources for demanding public safety mission operations today, more capability is on the horizon, as 5G standards progress continues. New techniques, such as ultra-reliable, low-latency networking, network slicing, and edge computing, enable new wireless-enabled tools that can increase responder safety and mission effectiveness.

Ultimately, these advances translate into lives saved and property preserved. Yet, as valuable as LTE-based mobile broadband and future 5G functionality are, the simple voice transmission will remain the essential critical communications tool for mission operations.



Mladen Vratonjic,
chairman of the
board,
TCCA

A broad look at the African market shows a scattered technology environment – this is a continent where generalisation is impossible. There is combination and parallel usage of analogue systems, TETRA, DMR, PDT, limited 3G and 4G, and some proprietary systems.

As in many other parts of the world, increasing security threats and political

instability in some regions generates demand for the modernisation and transformation of public safety and defence networks, and this drives favourable conditions for growth in the African critical communications market.

According to the latest research from analysts IHS Markit, the TETRA market is showing steady if not spectacular growth, with peaks of demand across the verticals. Nigeria for example is predicted to increase its use of TETRA in transportation by a compound annual growth rate of more than 13% for the five years to 2023.

Ramya Balakrishnan, Senior Research Analyst at IHS Markit Technology, sums up the general viewpoint thus: “Secure mission critical voice communications coupled with push to talk capabilities through multiple mediums including smartphones, tablets and desktop computers have become the need of the hour for effective public safety and emergency services. Having said that, TETRA has definitely become one of the most dominant technologies in the public safety domain, with massive refreshes emerging in mature markets. TETRA is also gaining momentum in other business verticals, including transportation and utilities with its new first of the kind deployments in the emerging and developing nations.”

Several African countries are looking to complement their public safety narrowband systems with broadband capabilities. As always, TCCA as a leading advocate for open standards, would state that it is crucial for African public safety agencies and the wider critical communications market on the continent to implement 3GPP-based technology. This is the baseline adopted globally for transforming legacy mission critical communications.

Mission critical broadband has huge room to grow, however there can be long project cycles due to funding difficulties, spectrum availability and sometimes multiagency interlock delays. 3G mobile broadband

coverage is patchy across the continent, especially in remote areas, and 4G is in the early stages, mainly in urban areas.

Sustained growth and therefore productivity relies on having the basics in place, and these include adequate telecommunications, utilities and transport infrastructure. While many areas of Africa have limited financial resources with which to develop their communications infrastructure, according to the African Development Bank, Africa's economic growth continues to strengthen, reaching an estimated 3.5% in 2018 and predicted to accelerate to 4% in 2019 and 4.1% in 2020. This growth is set to be higher than that of other emerging and developing countries, with the exception of India and China.

There is growing interest in the region from mobile network operators who are increasingly looking at public safety/emergency use cases to generate new revenue streams by providing mission critical connectivity. These networks are unlikely to be country-wide due to cost limitation, rather they will be built where the operators can achieve a reasonable return on their investment.

And yet despite the well-documented financial and political issues that Africa has to negotiate, the continent has successfully launched 5G services. A limited number of users are on networks in Johannesburg and Tshwane in South Africa, and in Lesotho, while Nigeria and Gabon are holding trials. So from the established TETRA networks to the emerging promise of 5G, Africa is embracing the potential of critical communications across both narrowband and broadband options.

There are many TCCA members active in the region, helping to build and operate critical networks that contribute towards the safety of citizens and communities. It is the ongoing work of TCCA and its members that has

created the strong and stable TETRA market of today, and the same principles are being implemented to ensure that critical broadband and its users benefit from the same success.

We are currently celebrating TCCA's 25th anniversary year, and our core principle of open standards – the foundation for the success of TETRA – has remained unshakeable since we were originally founded as the TETRA MoU Association in 1994. The success of TETRA is built on the unique Interoperability (IOP) Testing & Certification Process, developed and led by TCCA's Technical Forum (TF). The first IOP certificates were published in November 1999. 20 years later the TETRA IOP process continues to lead the world in independent certification for critical communications.

TCCA's IOP process was developed to enable a truly open multi-vendor market for TETRA equipment and systems. This approach gives users clear benefits in terms of a wide portfolio of compatible equipment, competitive pricing and rapid development of new product models. The IOP process also benefits industry by creating a wider accessible market, faster market take-up and greater potential for investment in new developments. TCCA's IOP testing is witnessed by an independent body, currently by ISCOM, part of the Italian Ministry of Communications. ■

Year in review

Critical communications in Africa are developing at a steady pace. The demands from air, rail, road, utilities, mining, oil, gas, police, military, first responders and emergency services for reliable, secure and robust communication systems, that can work in harsh and varied environments is always present and within those demands are ones

related to cost and affordability.

Each service provider has unique requirements on top of the universal ones covered by communications devices. TETRA, LTE, P25, Land Mobile Radios, DMR (Digital Mobile Radio) etc. are the back bones of critical communications. Terrestrial Trunked Radio (TETRA) is a standard for the needs of public safety and security, such as police forces. LTE (Long Term Evolution) provides the standard for high volume data transmission over 4G that the narrowband technology of TETRA and P25 can't. P25 is the standard derived from public safety organisations in the USA. Within Africa critical communication providers need to address the needs for enhanced voice services, data applications and capability for integrated incident management. The future capability of a 5G network to provide the critical communication system comprising sensor, camera, video streaming and command and control centre link with low latency data flow is the goal. Being able to monitor environmental conditions such as air quality, gas leaks etc. combined with the use of drones will be a bonus.

Botswana sees a clearer picture with CCTV

Huawei completes its safer city project in Francistown Botswana. Francistown is the second largest city in Botswana and was facing growing crime rates, but its local council and the Botswana Police Service took the decision to employ the Chinese company to install a network of Closed Circuit Television Cameras (CCTV) in Francistown. The company completed the installation of the network, infrastructure and hardware to enable a more intensive surveillance of the city for the

JANUARY-APRIL

GCF certifies LTE devices for critical communications. The Global Certification Forum (GCF) extends its certification scheme to critical communications devices. In response to demand from public safety authorities for access to secure wireless broadband communications, 3GPP begins to develop specifications to deliver a variety of mission critical capabilities over LTE networks. MCPTT provides enhanced voice-based PTT communication based on the 3GPP Evolved Packet System. It leverages Group Communication System Enablers and Proximity-based Services, and is part of Release 13 of the 3GPP specifications. Mission Critical Video over LTE and Mission Critical Data over LTE have already been standardised within Release 14, while further enhancements are being developed for Release 15.

MAY-AUGUST

Siemens works with critical comms specialist DAMM to successfully implement and test an open and interoperable TETRA packet data solution which complies with the demands for ETCS L2 (European Train Control System Level 2). The tests mainly focus on bandwidth requirements and the reliability of data delivery. The scenario was implemented so that the only main change was to replace the GSM-R hardware with TETRA equipment. The test results showed that data transmission quality in both directions was always above the requirements of the standard and that TETRA delivered equal or even better results than a GSM-R system.

SEPTEMBER-DECEMBER

Hytera launches its new ACCESSNET-T IP for partners and promises it's an "infinitely

scalable" IP TETRA radio system that offers high performance and versatility, along with an "intuitive and user-friendly" web-based network management system (NMS). The system fully links TETRA radios from Hytera and Sepura to ensure what's claimed to be smooth voice communication, high availability, and efficient data transmission. It also integrates PTT over Cellular(PoC), LTE and Wi-Fi. Available in both indoor and outdoor versions, Hytera says the ACCESSNET-T offers "unlimited" TETRA functionality and "virtually limitless" connection possibilities for external applications, thanks to its diverse configuration options and modular hardware design which means components can be easily exchanged or added to during ongoing operation.

purposes of crime prevention and reduction. There is also the additional advantage in that not only is the system designed to make citizens and their work environments safer it also encourages potential foreign investment if cities in Botswana are not only safer but seen to be safer.

Critical Communications are they ready for an African emergency?

At the tail end of 2019 Coronavirus hit an unexpected world. It was first reported by China, the home of Huawei and ZTE, two major players in the communications world. It hit production of telecoms equipment as workers were struck down with illness. China responded by constructing hospitals, taking 10 days from commission to completion, though they were of a modular design and suffered water leaks. It progressed to the rest of the world causing concerns for Centres for Disease Control and Prevention.

It wasn't long before Africa was hit with its first cases of Coronavirus. As country after country subjected themselves to lock down, controlling both movement within their national borders and into them, the strain on maintaining communications systems started and that pressure increased.

Across Africa there is a disparity in the level of telecommunication infrastructure in place and it is at times of emergency, as Coronavirus has certainly caused, that critical communications systems become of paramount importance to first responders, emergency services, health services, police and the military. There is no one size fits all proprietary critical communications system that fits all African Nation's requirements and fits all environmental conditions. It is self-evident that a secure, robust and adaptable emergency communications system is the backbone of a country's security and provision of safety for its peoples. As the workforce is denuded due to infection, so will the numbers of skilled persons responsible for the operation and maintenance of critical communications dwindle. There are of course the infection

control requirements needed for handsets and mobile systems to prevent cross contamination. The use of satellite communications that are controllable and maintainable via countries that have the virus under control, give satellite critical communications an edge over fixed land line, and fibre optic communications requiring maintenance within the country. The maintenance of towers and provision of their power source is a potential problem if a work force is not available to refuel generators on remote tower and base station sites or if the grid goes down cutting off power. Solar battery powered towers, suddenly gain an advantage in this situation. ■



Uwe Niske,
senior director,
sales, SSA & UN,
Motorola

// It would be hard to specifically point at a single challenge that's both relevant for the whole continent and also specific for 2019," says Uwe Niske, senior director of sales, SSA & UN at Motorola. "As in all the markets we serve there are different challenges we face - in some countries it's around government budget challenges,

in others it could be frequent government leadership changes. But one thing is for sure, and that's that our public safety customers, like anywhere else continue to see changes in the kind of challenges they face every day - and we work hard to ensure our technologies and sales teams align to help find the right solution.

Niske says the world of radio communication continues to shift globally from analogue to digital and the company is definitely seeing a growth in demand for its digital LMR systems across the continent. "The African continent continues to show a great deal of interest in our mission-critical P25 systems - notable success stories are a new ASTRO 25 system we've deployed for a police agency in east Africa and we have also recently concluded our second largest sale ever on the continent, for the supply of a new ASTRO P25 system into

As in all the markets we serve there are different challenges we face - in some countries it's around government budget challenges, in others it could be frequent government leadership changes

Southern Africa," he adds.

Now in 2020, Niske says the company's core radio business, especially in the developing countries, will naturally remain firmly in its focus as it continues to compete in this space for public safety and commercial LMR.

"However, in the past couple of years, we've been working hard to build our video and software solutions portfolio to a point where we have an impressive ecosystem of public safety solutions, so one of the biggest drives will be expanding our footprint in video, video analytics, and software in Africa," he adds. "Another area we are working hard on is our WAVE or PTT applications in the public safety and commercial LMR segments where we see good user requirements and growth opportunities."

Learning from conversations with customers, Niske thinks 2020 will see a rapid increase in the adoption of new technologies by customers. He predicts a spike in mission-critical video penetration, whether it's body-worn, vehicular or fixed cameras. "We will see more agencies and organizations benefiting not only from the extra eyes they provide but also the power of AI and analytics that goes hand in hand with video, all integrating into an effective command & control system couples to our Tetra or P25 radio networks," says Niske.



Mladen Vratonjic,
chairman of the
board,
TCCA

The year ahead: For mobile broadband, TCCA together with a number of our members and other stakeholders who are active in 3GPP, have succeeded in getting critical broadband features included in 3GPP standards for 4G, and that work is ongoing to include 5G. TCCA is the 3GPP Market Representation Partner (MRP) for critical communications, and has worked with other

industry partners to drive the inclusion of standardised features such as the MCX series (Mission Critical Push to Talk, Mission Critical Video and Mission Critical Data) in 3GPP Releases. The implementation of these and other standards relevant to critical communications gives the sector a solid platform for the long-term transition between narrowband and broadband.

As Africa moves towards mobile broadband, deployments will need to be done in a way that demonstrates all the benefits of standards, such as interoperability, economies of scale and multisourcing. This

will give user organisations and operators confidence to enter the market. TCCA is now working with partners such as GCF (Global Certification Forum) to develop and implement a global MCX interoperability and conformance certification regime.

There is a huge amount of work that goes on behind the scenes to ensure that critical users in Africa - and all around the world - benefit from technology and services that they can trust, and we look forward to continuing to support the critical communications market as it develops into the next decade.



Peter Hudson,
products director,
Sepura

The African critical communications market is one that traditionally experiences peaks and troughs and it is notoriously hard to predict future demand. The limited availability of budget and appropriate communications infrastructure has often restricted investment in security systems, despite massive investment in infrastructure and commercial operations across utilities and industry.

Growth areas in demand for critical communications systems are in a number of markets, primarily transport, utilities and mining. Here the traditional strengths of TETRA systems are shown to their best advantage: tough, reliable terminals; secure networks and encrypted communications; clear audio and excellent coverage. These practical capabilities allow for improved security.

The increasing availability of 4G and broadband networks is enabling organisations to further enhance their critical communications platform with data and other services, enabling them to improve efficiencies within their operations. By connecting, people, devices and systems, organisations can have a better understanding of the resources at their control, and as a result have improved efficiencies, security controls and response to urgent situations.

In the last 18 months Sepura solutions have been sold to organisations with critical communications requirements across transport and utilities in South Africa, Nigeria, Senegal, Morocco, Algeria and Egypt, with numerous projects in the pipeline for the next 18 months in these and other regions.

“The limited availability of budget and appropriate communications infrastructure has often restricted investment in security systems, despite massive investment in infrastructure and commercial operations across utilities and industry”



Gerald Zhang,
deputy general
manager,
Hytera overseas
sales central dept.

In general, for Hytera the African market in 2019 presented both challenges and opportunities. We made a large human resource input to the professional communications market in Africa.

With an increase in sales promotion, we found that the professional wireless communication resources of African public security departments were very scarce and that there were many opportunities for us. The market had obvious demands for private network communication products. Users had a certain understanding of the data, voice and comprehensive applications in the private network industry.

The southern Africa region for Hytera has seen significant progress over 2019 and Hytera achieved many important opportunities in public safety, utility, transportation and mining etc. Our unified communication solution and convergence solution received much interest and favourable views on many occasions and at conferences held by Hytera. I believe the future of the PMR industry will be about the unification and integration of various technologies and solutions into one large network.

The gradual acceptance of narrowband (NB) and broadband (BB) convergence was a high point for us. The argument existed for a long time between which technology, LTE, TETRA or DMR is more suitable for mission critical users and this caused confusion for customers.

Since Hytera launched its NB/BB convergence solution in 2017, customers have more and more realised the migration from NB to BB won't happen overnight, due to the heavy investment and infrastructure needed for deploying a pure private LTE network, especially for covering the same areas with NN standards. The benefits and ease of satisfying the need for critical voice and broadband data and applications are more revealing and obvious. One project implemented in Africa for a public safety customer showed them the path and how to realise migration based on their budget and capability.

What's more, through the establishment of local branches and recruitment of local staff, our ability to serve customers has been further enhanced. Hytera's brand and products have been widely recognised by users, especially government users.



Hytera has many successful cases in Africa, such as Angola Police, oil projects in Algeria and Gabon railway. The economic situation was tough, currency depreciation, national debt, power shortages and drought made business even more difficult, which affected us to some extent. Many expected projects were delayed.

Resolution to address public security issues and fighting crime have been emphasised in a number of countries in order to create a safe and stable environment for foreign and domestic investors. We see this as creating a lot of demand and opportunities for the use of PMR solutions such as NB and BB convergence solutions, body worn cameras, unified communications and satellite solutions etc.





Also, Hytera will balance the needs of public security customers and the basic conditions of the strategy, to achieve instant construction and use, and to maximise the benefits of user's investment.




With Hytera's 7 main product portfolios, we are confident that Hytera is going to make good progress by providing the right solution for a customer's various needs. ■

“The economic situation was tough, currency depreciation, national debt, power shortages and drought made business even more difficult, which affected us to some extent. Many expected projects were delayed”





Company location, country, website	Network Technologies	Network Build & Management															Network Applications																				
	Cellular	Fixed wireless access	Critical communications	Satellite	Fibre	Other (TVWS, mesh, etc)	RAN	Backhaul	Microwave systems	In-building systems (DAS, femtocells, etc)	HotNets & small cells	BTS/masts/towers	Antennas	Power/power efficiency	Fibre systems	Cables & cabling accessories	OSS/BSS	Security	Test & measurement	Network monitoring & optimisation	Network analysis & Big Data	User devices & modules	Broadband/internet	Internet of Things/smart cities/M2M	Remote & rural connectivity	Cloud (VNF/SDN/XaaS)	Data centre services, IPXs	Enterprise network services	Mobile financial services	VAS (mHealth, mCommerce, mLearning, etc)	Messaging & voice services	OTT	Broadcast/DTH				
A1 Telekom Austria AG Lassallestrasse 9 1020 Vienna, AUSTRIA wholesale@a1.group www.a1.group/wholesale +43 50 664-0 	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓						✓	✓		✓	✓		✓	✓	✓		✓	✓						
The A1 Telekom Austria Group Wholesale is Austria's leading provider of telecommunication services. It is an integrated, convergent provider of intelligent information and communications services and a leader in CEE.		expert know-how, flexible and tailor-made solutions and prompt troubleshooting for Roaming, Signaling Solutions, GRX/IPX Service and Fraud Detection.															More information at https://www.a1.group/en/wholesale																				
The portfolio covers voice, data, IP services, global satellite communications and mobile solutions. The A1 Group also provides long-time		It offers a global infrastructure for Signaling, the smartest SIM Box Detection Service and a state-of-the-art IPX Service.															The A1 Group is currently operating in seven countries in CEE: in Austria (A1 Austria), Slovenia (A1 Slovenia), Croatia (A1 Croatia), the Republics of Serbia (Vip mobile) and Macedonia (one.Vip), Bulgaria (A1 Bulgaria) and Belarus (Velcom).																				
...and more																																					
ABS Blk B, Suite B01B, 1st Floor The Ambridge Office Park Vrede Road, Bryanston Johannesburg SOUTH AFRICA info@absatellite.com www.absatellite.com +27 10 594 4621 							✓																✓			✓											
Founded in 1976 by the 21 Member-States of the Arab League, Arabsat has been serving the growing needs of the Arab world for over 40 years, operating from its headquarters in Riyadh, Kingdom of Saudi Arabia and two satellite control stations in Riyadh and Tunis.		within the industry as it highly believes in human capital. Working as a team, Arabsat's management thrives to achieve one goal the satisfaction of its valued customers under the mission assigned by its shareholders.															These latest technology birds are equipped to provide not only the highest downlink power over the widest coverage area than any other satellite fleets, but also services in the most recent bands including Ka-band for innovative interactive services, a purely MENA beam, or highly sophisticatedly designed Market-Specific Spot beams.(North Western Africa, West Africa, South Africa, East MENA and Central Asia)																				
Today Arabsat is one of the world's top satellite operators and by far the leading satellite services provider in the Arab world. It transports over 650 TV channels, 200 radio stations, pay TV networks and more than 210 HD channels that reach 170 million viewers in more than 80 countries across the Middle East, Africa and Europe at 26°E.		The Arabsat Satellite Fleet: Arabsat owns and operates seven satellites at three orbital positions, namely, 20°, 26°, 30.5° East: Arabsat-5C (20°E), BADR-4, BADR-5, BADR-6 and BADR-7 (26°E), Arabsat-5A and Arabsat-6A (30.5°E). These state-of-the-art satellites (now the youngest regional fleet over the MENA region) make Arabsat the only satellite operator based in the region offering the full spectrum of broadcast, telecommunications and broadband services.															Arabsat offers the most secure, reliable and versatile fleet with 'hot' in-orbit back-up and guaranteed long-term expansion space capacity.																				
Arabsat currently employs an elite workforce																																					
...and more																																					





BUYER'S GUIDE

Company location, country, website	Network Technologies						Network Build & Management														Network Applications														
	Cellular	Fixed wireless access	Critical communications	Satellite	Fibre	Other (TVWS, mesh, etc)	RAN	Backhaul	Microwave systems	In-building systems (DAS, femtocells, etc)	HetNets & small cells	BSTs/masts/towers	Antennas	Power/power efficiency	Fibre systems	Cables & cabling accessories	OSS/BSS	Security	Test & measurement	Network monitoring & optimisation	Network analysis & Big Data	User devices & modules	Broadband/internet	Internet of Things/smart cities/M2M	Remote & rural connectivity	Cloud (VNF/SDN/XaaS)	Data centre services, IPXs	Enterprise network services	Mobile financial services	VAS (mHealth, mCommerce, mLearning, etc)	Messaging & voice services	OTT	Broadcast/DTH		
Avanti Communications Ltd Cobham House 20 Black Friars Lane London EC4V 6EB, UK contact@avantiplc.com www.avantiplc.com +44 207 749 1600  Avanti Communications is the leading Ka-band high throughput satellite capacity partner to the communications industry in EMEA - extending and guaranteeing coverage for defence missions, enterprise solutions and critical public services. Through the HYLAS satellite fleet and partners in 118 countries, Avanti provides dedicated fixed and flexible-beam satellite connectivity, with extensive coverage across Europe, the Middle East and Africa. The Group has invested \$1.2bn in a network that incorporates orbital slots in Ka-band spectrum, satellites, ground stations, datacentres and a fibre ring.		✓	✓				✓										✓						✓	✓	✓			✓							
																																			...and more
AXESS Networks Falkenweg 1 53809 Ruppichterth GERMANY marketing@axessnet.com www.axessnet.com +49 2295 908 78 0 +49 2295 908 78 22 	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓		✓			✓	✓		
Belintersat Minsk, BELARUS www.belintersat.com			✓	✓			✓						✓										✓		✓								✓		
Cradlepoint EMEA Cedar House, Apex Court Campmill Road, West Byfleet Surrey KT14 6SQ UK sasales@cradlepoint.com www.cradlepoint.com +44 (0)1932 548410 	✓	✓	✓			✓												✓		✓		✓	✓	✓	✓	✓		✓							
DEV Systemtechnik GmbH Grüner Weg 4A D-61169 Friedberg/Hessen GERMANY info@dev-systemtechnik.com www.dev-systemtechnik.com +49 6031 6975 100 +49 6031 6975 114  Part of the axing Group			✓	✓				✓							✓	✓																			

Company location, country, website	Network Technologies							Network Build & Management														Network Applications												
	Cellular	Fixed wireless access	Critical communications	Satellite	Fibre	Other (TVWS, mesh, etc)	RAN	Backhaul	Microwave systems	In-building systems (DAS, femtocells, etc)	HetNets & small cells	BSTs /masts/towers	Antennas	Power/power efficiency	Fibre systems	Cables & cabling accessories	OSS/BSS	Security	Test & measurement	Network monitoring & optimisation	Network analysis & Big Data	User devices & modules	Broadband/internet	Internet of Things/smart cities/M2M	Remote & rural connectivity	Cloud (VNF/SDN/XaaS)	Data centre services, IaaS	Enterprise network services	Mobile financial services	VAS (mHealth, mCommerce, mLearning, etc)	Messaging & voice services	OTT	Broadcast/DTH	
Trans Africa International Telecommunication SA (Pty) Ltd T/a Emcom Wireless 1-5 Adrain Road Stamford Hill Durban KZN 4001 PO Box 3985 Durban KZN 4000 SOUTH AFRICA sales@emcom.co.za www.emcom.co.za +27 31 312 9288 +27 31 312 9296 	✓	✓	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓			✓		✓	✓		✓										
<p>EMCOM wireless is a level 2 BBBEE innovative African wireless communications integrator, an industry leader in professional mission-critical radio communication solutions. We support different technologies in the Radio communications space to include Analogue, P25, DMR (Tier II and Tier III) and Tetra. Our capabilities cover CCTV, Satellite Communications, Microwave Radio, Data Modems and Command and Control Centres and Technology for secure bespoke mesh networks.</p> <p>Established in 1968, the company has grown significantly over the years the head office being in Durban with solutions deployed in over 30 African countries. Our products can be seen in operations covering Policing, Public Safety, Defence & Peacekeeping, Mining, Oil & Gas, Transportation (road, rail and air), Utilities (water & electricity), Agriculture and Wildlife Conservation. Our success results from long-term customer relationships and technology partners which ensures a customized fit for purpose deployments.</p> <p>Reliability, commitment, flexibility and excellence are some of the key values that define us, your partner of choice, in the radio communication industry. We lead the way in empowering our customers with the skills and knowledge required to make the correct decisions on their choice of two-way radio communication solutions.</p>																																	...and more	
Es'hailSat Qatar Satellite Company Property No.414 Al Markiya Street No.380 Area No.31, Umm Lakhba PO Box 10653 Doha, QATAR info@eshailsat.qa www.eshailsat.qa +974 44 993 535 +974 44 993 504 			✓					✓																					✓					
<p>Es'hailSat, the Qatar Satellite Company, is a communications satellite operator headquartered in Doha, Qatar. Es'hailSat was established in 2010 to deliver services to broadcasters, enterprises and governments in the MENA (Middle East and North Africa) region and beyond.</p> <p>With the goal to become a world class satellite operator and the foremost satellite services provider in the MENA region, Es'hailSat launched its first satellite, Es'hail-1 in 2013 and positioned it at 25.5 E orbital spot. Es'hail-1 started</p> <p>commercial operations with the region's best known and premier media networks, beIN Sports and Al Jazeera Media Network. Es'hail-2, the company's second satellite was launched in 2018 and entered commercial operations in early 2019 and is located at 26 E orbital position.</p> <p>Having both Ku-band and Ka-band payload on satellites co-located at 25.5 E / 26 E broadcast hotspot enables Es'hailSat to provide the region with the most advanced and sophisticated services including broadcast, telecommunications</p> <p>and broadband. Es'hailSat's expansion plan will continue with newer state-of-the-art satellites in other prime orbital locations around the globe, offering customers the most flexible and reliable services. Es'hailSat is adopting the concept of "world-wide footprints" through partnerships with leading regional and international satellite operators around the globe.</p> <p>Contact: sales@eshailsat.qa or info@eshailsat.qa</p>																																	...and more	
Fujian Belfone Communications Technology Co. Ltd Luojiang, CHINA www.belfone.com						✓	✓																✓											
																																	...and more	
Gazprom Space Systems 77B Moscow Street Shchelkovo, Moscow Region 141112 RUSSIA info@gazprom-spacesystems.ru www.gazprom-spacesystems.ru +7 495 504 29 06 +7 495 504 29 11 		✓																					✓	✓			✓							
<p>Founded in 1992, Gazprom Space Systems (GSS) is one of the two Russian national satellite operators. GSS operates the Yamal Satellite Communications System based on which the company provides high-quality satellite capacity and services.</p> <p>GSS operates five satellites, namely Yamal-202, Yamal-300K, Yama-401, Yamal-402 and Yamal-601 operating at a significant geostationary orbit arc segment (from 49°E to 183°E), with the service zone covering the most part of the eastern hemisphere and reaching the western part of the North American continent.</p> <p>-band payload of Yamal-202 (163.5E) has a wide coverage over Far East, North Pacific Ocean and West coast of Northern America. The satellite is perfect for point-to-point connections and maritime solutions. Yamal-300K(183E) brought GSS into the markets of the western hemisphere. The satellite's</p> <p>wide contour fixed beams cover the eastern territory of Russia, the western parts of North America and north of the Pacific Ocean where air and maritime traffic is exceedingly busy. The coverage zone makes the beam perfect for aeronautic and maritime connectivity.</p> <p>Yamal-401 (90E) is dedicated mainly for the Russian market. The satellite is equipped with C- and Ku-band payloads.</p> <p>Yamal-402 (55E) has 4 fixed Ku-band beams covering Russia, Europe, Sub-Saharan Africa. Customers can operate within the African footprint (the Southern beam) and use the interbeam connection between Europe and Africa.</p> <p>Yamal-601 (49E) was designed to replace it's prede essor Yamal-202 and therefore to take up the existing customer base in C-band. The -band</p> <p>payload of Yamal-601 has a wide coverage over the Eurasian continent, and in particular over the Middle East and North Africa. The multi-beam service area in Ka-band covers the most populated part of the territory of Russia.</p> <p>The wide coverage areas of Yamal satellites enable communication services delivery to different parts of the world for the purposes of Oil & Gas, Government, Aviation, Maritime, Education and Emergency segments. Yamal Satellite capacity is successfully used for communication links and data transmission, TV distribution, occasional use, trunking, backhaul, inflight and maritime connectivity.</p>																																	...and more	

BUYER'S GUIDE

Company location, country, website	Network Technologies	Network Build & Management													Network Applications																						
	Cellular	Fixed wireless access	Critical communications	Satellite	Fibre	Other (TVWS, mesh, etc)	RAN	Backhaul	Microwave systems	In-building systems (DAS, femtocells, etc)	HetNets & small cells	BSTs/masts/towers	Antennas	Power/power efficiency	Fibre systems	Cables & cabling accessories	OSS/BSS	Security	Test & measurement	Network monitoring & optimisation	Network analysis & Big Data	User devices & modules	Broadband/internet	Internet of Things/smart cities/M2M	Remote & rural connectivity	Cloud (VNF/SDN/XaaS)	Data centre services, IaaS	Enterprise network services	Mobile financial services	VAS (mHealth, mCommerce, mLearning, etc)	Messaging & voice services	OTT	Broadcast/DTH				
Hughes 11717 Exploration Lane Germantown MD 20876, USA internationalsales@hughes.com www.hughes.com +1 301 428 5500 +1 301 428 7012 	✓	✓	✓				✓	✓					✓				✓	✓		✓	✓		✓	✓	✓			✓									
<p>Hughes Network Systems, LLC (HUGHES) is the global leader in broadband satellite technology and services for home and office. Its flagship high-speed satellite Internet service is HughesNet®, the world's largest satellite network with over 1.5 million residential and business customers across the Americas. For large enterprises and governments, the company's HughesON™ managed network services provide complete connectivity solutions employing an optimized mix of satellite and terrestrial technologies.</p> <p>The JUPITER™ System is the world's most widely deployed High-Throughput Satellite (HTS) platform, operating on more than 40 satellites by leading service providers, delivering a wide range of broadband enterprise, mobility and cellular backhaul applications.</p> <p>To date, Hughes has shipped more than 7 million terminals to customers in over 100 countries, representing approximately 50 percent market share, and its technology is powering broadband services to aircraft around the world.</p> <p>Headquartered outside Washington, D.C., in Germantown, Maryland, USA, Hughes operates sales and support offices worldwide, and is a wholly owned subsidiary of EchoStar Corporation (NASDAQ: SATS), a premier global provider of satellite operations.</p> <p>For additional information about Hughes, please visit www.hughes.com and follow @HughesConnects on Twitter.</p>																																					
Kirisun Communication Co. Ltd Shenzhen, CHINA www.kirisun.com		✓					✓																											...and more			
KOHLER-SDMO 270 rue de Kerervern 29490 Guipavas FRANCE laurent.berthouloux@sdmo.com kohler-sdmo.com +33 2 98 41 41 41 		✓				✓								✓													✓							...and more			
<p>From offshore drilling platforms to extreme desert conditions, from building sites to the most demanding industries, KOHLER-SDMO diesel generating sets are proving their reliability and performance. They have made the company one of the top global manufacturers, consolidating its leadership every day through the structure of an international group.</p> <p>Focusing exclusively on generating sets, KOHLER-SDMO now offers the widest range on the market, from 1 kVA to 4500 kVA.</p> <p>The local service provided by its distribution network means it can supply power to anyone, anytime, anywhere. In addition to its role as an industrial manufacturer of generating sets, KOHLER-SDMO is now positioning itself as a serious energy supplier.</p>																																					
MiRO 9 Landmarks Avenue Kosmosdal Ext 11 Samrand 0157 SOUTH AFRICA sales@miro.co.za www.miro.co.za +27 12 657 0960 	✓			✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓			✓					...and more			
<p>MiRO is a leading value-added distributor of broadband wireless, Wi-Fi, networking, VoIP, SD-WAN, IoT, security and IP video solutions. MiRO empowers technology integrators, service providers and resellers to successfully connect both business and residential customers with their best-of-breed solutions.</p> <p>To further support their customers, MiRO has a strong geographical presence in the major urban centres of South Africa, combined with a fast-growing distribution footprint in Sub-Saharan Africa and Kenya, enabling you to deliver cutting-edge converged IP solutions to your customers - when they need it, where they need it.</p> <p>Their team of experts can assist you with technology information, pre-sales solutions planning, finance solutions, training and after-sales support.</p>																																					
Mobile Mark Europe Ltd 8 Miras Business Park Hednesford Staffordshire, UK enquiries@mobilemark.co.uk www.mobilemark.co.uk +44 1543 459 555 +44 1543 459 545 	✓	✓	✓				✓	✓					✓		✓									✓	✓									...and more			
<p>Mobile Mark is a leading supplier of innovative, high-performance antennas to wireless companies across the globe. They have been in the wireless industry for over 36 years and have roots in the early Cellular trials.</p> <p>The company design and manufacture antennas from 138 MHz-6.0 GHz. Applications include public transit, commercial trains, smart highways, mining, utilities, remote monitoring, machine-to-machine (M2M) and the Internet of Things (IoT).</p> <p>Antenna styles include omni-directional and directional infrastructure antennas for network rollout; multiband mobile antennas for fleet management; low-profile and embedded antennas for M2M/IOT applications.</p> <p>Mobile Mark antennas are manufactured in the USA and UK. Their responsive manufacturing capabilities and production controls ensure that antennas are delivered on time and to spec.</p> <p>Their experienced engineering design group can take a project from initial concept through to final production. They also offer in-house engineering design and RF testing facilities for custom designs.</p>																																					

Company location, country, website	Network Technologies							Network Build & Management														Network Applications												
	Cellular	Fixed wireless access	Critical communications	Satellite	Fibre	Other (TWSS, mesh, etc)	RAN	Backhaul	Microwave systems	In-building systems (DAS, femtocells, etc)	HotNets & small cells	BTS/masts/towers	Antennas	Power/power efficiency	Fibre systems	Cables & cabling accessories	OSS/BSS	Security	Test & measurement	Network monitoring & optimisation	Network analysis & Big Data	User devices & modules	Broadband/internet	Internet of Things/smart cities/M2M	Remote & rural connectivity	Cloud (VNF/SDN/XaaS)	Data centre services, IaaS	Enterprise network services	Mobile financial services	VAS (mHealth, mCommerce, mLearning, etc)	Messaging & voice services	OTT	Broadcast/DTH	
Parallel Wireless 100 Innovative Way Suite #3410 Nashua, NH 03062 USA info@parallelwireless.com http://www.parallelwireless.com +1 603 589 9937 	✓	✓	✓				✓			✓	✓	✓								✓	✓		✓	✓	✓			✓						
<p>Parallel Wireless is on a mission to connect the 4 billion unconnected people worldwide by reimagining the cellular network.</p> <p>We empower global Service Providers to be profitable despite margin pressure – through the world's first ALL G software that consolidates, and abstracts RAN and core network functions</p> <p>and fully orchestrates networks resulting in network programmability, agility, future proof and optimal network performance for all use cases: low density/high density, in-building coverage or public safety 4G (LTE).</p> <p>The only US-based end-to-end telecom vendor is deployed on six continents and was nominated</p> <p>by Vodafone at the Facebook TIP Summit as the best performing vendor. Parallel Wireless' innovation and excellence has been recognized with 55+ industry awards. Connect with Parallel Wireless on LinkedIn and Twitter.</p> <p>www.parallelwireless.com</p>																												...and more						
Rajant Corporation 200 Chesterfield Parkway Malvern, PA 19355 USA info@rajant.com https://www.rajant.com +1 484 595 0233 +1 484 595 0244 	✓	✓				✓	✓	✓			✓	✓	✓							✓	✓	✓	✓	✓	✓	✓	✓							
<p>Rajant Corporation is the exclusive provider of private wireless networks powered by the patented Kinetic Mesh® network, BreadCrumb® wireless nodes, and InstaMesh® networking software.</p> <p>With Rajant, customers can rapidly deploy a highly adaptable and scalable network that leverages the power of real-time data to deliver on-demand, mission-critical business intelligence. A low-latency, high-throughput and secure solution for a variety of data, voice, video, and</p> <p>autonomous applications, Rajant's Kinetic Mesh networks provide industrial customers with full mobility, allowing them to take their private network applications and data anywhere.</p> <p>With successful deployments in more than 60 countries for customers in military, mining, ports, rail, oil and gas, petrochemical plants, municipalities, agriculture, heavy construction, utilities, industrial security, public safety and autonomy & robotics, Rajant is headquartered in</p> <p>Malvern, Pennsylvania with additional facilities and offices in Arizona, Kentucky, and Alabama.</p> <p>For more information, visit www.rajant.com or follow Rajant on LinkedIn and Twitter.</p>																												...and more						
Russian Satellite Communications Company 3A, bld.1 Nikoloyamyskiy pereulok Moscow 109289, RUSSIA pmorozova@rscs.ru www.rscs.com +7 (495) 730-0450 +7 (495) 730-0383 		✓				✓	✓	✓												✓	✓		✓	✓	✓			✓						
<p>Russian Satellite Communication Company (RSCC) is the Russian GEO satellite operator with global coverage. RSCC is one of the ten largest world satellite operators in terms of satellites and orbital slots.</p> <p>RSCC satellites are positioned along the geostationary orbital arc from 14 ° W up to 140 ° E, covering the entire territory of Russia, CIS,</p> <p>Europe, Middle East, Africa, Asian-Pacific region, North and South America, and Australia.</p> <p>RSCC provides a full range of communications and broadcasting services via its own terrestrial telecom facilities and satellite constellation, which consist of modern Express-AM, Express-AT, Express-A type satellites; e.g. video distribution and contribution, DTH, DSNG,</p> <p>broadband Internet access, IP trunking and cellular backhaul, maritime mobility, SCADA, enterprise networks connectivity and other.</p> <p>The company operates various regional satellite TV distribution networks and corporate VSAT networks for fixed and mobility customers throughout Africa and in other parts of the world.</p>																												...and more						
SatADSL Chaussée de Wavre 1505 1160 Bruxelles BELGIUM info@satadsl.net www.satadsl.net +32 2 351 33 74 		✓					✓	✓									✓	✓					✓	✓			✓							
<p>SatADSL is an innovative Satellite Service Provider offering satellite networking solutions to banks, microfinances, broadcasters, NGOs, Governments, ISPs, telecom operators and other companies active in Africa and Middle East, Latin America, Europe & Central Asia in remote areas or where terrestrial infrastructures are not reliable.</p> <p>SatADSL provides VSAT networking solutions directly to the most demanding End Users. Founded in 2010, SatADSL has already installed more than 3,000 VSAT networks in more than 45 countries.</p> <p>Through its carrier-grade in the Cloud Service Delivery Platform (C-SDP), which integrates the most advanced technologies, SatADSL provides custom-made networking solutions, tailor-made service plans and value-added services, including</p> <p>hierarchical service control and monitoring, traffic prioritization and online billing and payments, for any frequency band (Ku-, Ka- and C-Band) and any access technology (Newtec, iDirect, ...).</p> <p>As a complete OSS/BSS, carrier-grade, fully redundant platform, the C-SDP enables, for the first time, via the cloud, satellite services bringing significant advantages including a considerable cost reduction; the C-SDP offers fast time to market, with quick implementation, no upfront investment and reduced operational expenditure (opex).</p>																												...and more						

98

Thanks to...

We are indebted to the following individuals and organisations for their support and assistance in producing this year's edition of the African Wireless Communications Yearbook:

Ahmad Sayed, Nexign
Aji Ed, Nokia
Albrecht von der Recke, fonYou
Alexander Mueller-Gastell, ND Satcom Communications
Alp Uysal, Ericsson
Andrey Kirillovich, RSCC
Anil Krishnan, Comviva Technologies
Ayes Amewudah, Talia
Biju Nair, Hyla Mobile
Brian Jakins, Intelsat
Byron Clatterbuck, SEACOM
Christoph Fitih, Parallel Wireles
Derrick Chikanga, Africa Analysis
David Sumi, Siklu
Eran Shapiro, Spaceom
Eric Mujera, Syniverse
Femi Oshiga, CommScope
Franck Simon, President, France-IX
Gerald Zhang, Hytera
Hugh Muller, Openet SA
Jacques Visser, Vox
Jennifer Mbaluto, Clifford Chance
Joe Barrett, GSA
Johann, Analysys Mason
Justin Farnell, WiFiontheMove
Juvo
Ken Rehbehn, IHS Markit
Keith White, SellApp
Kostas Kastanis, Upstream
Kyle Whitehill, Avanti
Landry Signé, Brookings Institution
Lehlohonolo Mokenela, Africa Analysis

Mahmoud Oubraham, EXFO
Mario Di Mauro, Sparkle
Martha Suárez, DSA
Martin Jarrold, GVF
Matthew Reed, Omdia
Miriam Tuerk, Clear Blue Technologies
Mladen Vratonjic, TCCA
Nadine Fassbender, AXESS
Nicolas Blixell, Ericsson
Padma Ravichander, Tecnotree
Paul Hamilton, Hamilton Research
Peter Hudson, Sepura
Pieter de Villiers, Clickatell
Pieter-Paul Mooijman, ST Engineering iDirect
Ramesh Ramaswamy, Hughes Network Systems
Robert Schena, Rajant
Sabelo Dlamini, IDC
Salman Tariq, Optiva
Samantha Naidoo, SAP
Sami Yousif Mohamed, Sudatel Telecom Group
Sean McCormick, Globalstar Africa
Sebastien Codeville, KaiOS Technologies
Shanks Kulam, x-Mobility
Shantanu Kularni, Sterlite Technologies
Simon Pearson, World Telecom Labs
Stuart Kelly, Bladon Micro Turbine
Uwe Niske, Motorola
Virginie Hollebecque, Ciena
Will Liu, TP-Link UK
Wu Jianjun, ZTE Corporation

AFRICAN WIRELESS COMMUNICATIONS YEARBOOK 2020

Editor:
Robert Shepherd

Designer:
Sean McNamara

Staff writer:
Gerry Moynihan

Editorial enquiries:
roberts@kadiumpublishing.com

Advertisement sales:
Kathy Moynihan

Production/circulation:
Suzanne Thomas

Publishing director:
Kathy Moynihan

Telephone:
+44 (0) 1932 886537

South African office:
Kadium Publishing (Pty) Ltd,
28-30 3rd Street,
Elsies River Industrial,
Cape Town, 7480, South Africa

Although great care has been taken to ensure the accuracy and completeness of the contents of the African Wireless Communications Yearbook 2020, neither Kadium Ltd or Kadium Publishing (Pty) Ltd, or its agents, accept any legal responsibility for the information and the opinions expressed in this publication. The Publishers will not accept liabilities for any losses incurred, direct or otherwise, as a result of using the data in this publication for any purpose whatsoever. Use of the material in this publication is done so at your own risk.

2020 Kadium Ltd. All rights reserved.
The content of this publication may not be reproduced in part or in whole, including photocopying, scanning and/or recording, or transmitted in any other form by any means including electronic, digital or mechanical, or stored in any form of data storage, archival or retrieval system, without the prior written permission of the publisher and copyright holders. All enquires should be sent to Kadium Ltd, Unit 2, 1 Annett Road, Walton-on-Thames, Surrey, KT12 2JR, UK.

The views expressed in this publication are not necessarily those shared by the publisher or the editor. E&OE.

ISSN 2052-7381



KADIUM

Published by Kadium Limited

Head office:

Unit 2, 1 Annett Road,
Walton-on-Thames,
Surrey, KT12 2JR,
United Kingdom

South African office:

Kadium Publishing (Pty) Ltd,
28-30 3rd Street,
Elsies River Industrial,
Cape Town, 7480,
South Africa

www.kadiumpublishing.com