

AFRICAN WIRELESS COMMUNICATIONS YEARBOOK 2019



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AFRICAN WIRELESS COMMUNICATIONS YEARBOOK 2019

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.

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NEC XON is the gateway to Africa's tried and tested reliance on NEC microwave gear

Growing LTE and 5G adoption means mobile service providers must rapidly deploy high-speed, flexible, scalable, and reliable backhaul networks for the lowest total cost of ownership (TCO) while optimising performance. Only field-proven wireless backhaul solutions from NEC have reliably served the African market since 1962.

NEC XON is NEC's systems integrator across Africa with the knowledge and skills and the equity partnership from NEC that delivers the global best-of-breed technologies at the forefront of the industry.

NEC technology installed at Ethio Telecom in Ethiopia in 1962 is still operational. We have supplied operators in 53 of 54 African countries. NEC has supplied more than 3,1 million transmitter and receivers of microwave and millimetre-wave radio in 166 countries worldwide.

NEC has been at the forefront of the development of microwave technology worldwide. As a result, we were the first in Africa to go from analogue to digital and the first to move from PDH to SDH, the new standard for synchronised network gear.

Willem Wentzel, networking business development manager at NEC XON, says NEC's ongoing global technology development since 1899 provides it with the resources to sustain a top portfolio of both indoor and outdoor equipment that is among the best in the industry sought after by African customers familiar with its heritage.

NEC XON today has the lowest latency microwave equipment on the market. That's important for a future filled with the high speed promise of LTE and 5G. Equipment with higher latencies is effective for only a hop or maybe two but after that it doesn't synchronise with the linear timecode (LTC) anymore.

"We've tested the NEC microwave equipment in an operational environment in South Africa that was still synchronising after 11 hops. We only stopped at 11 because we ran out of country," says Willem Wentzel, networking business development manager at NEC XON.

Wentzel says NEC XON's microwave solutions support frequencies from 4,5GHz to 80GHz and, "...we can currently push 20Gbps on the 80GHz radios. That's double the throughput of our nearest rival who can only do 10Gbps. In addition, our equipment is still easy to install, easy to maintain, and easy to use."

"We have the longest mean time before failure in the world, calculated to be 154 years. Our failure rate is the lowest in the industry and that includes equipment that's been incorrectly configured by third-party personnel.

"Our platform can also perform exceptionally high frequency modulations, which means it is very efficient, and the new models we launched contain layer 3 capabilities so you don't need routers to get layer 3 functionality anymore."

A unique feature of NEC XON's equipment from NEC is the upward and backward compatibility designed into it.

"The two main types of equipment, the split type and the zero footprint type, are generally not compatible in that the type that receives must match the type that transmits," says Wentzel. "That's not the case for us. We can transmit from a zero footprint setup and receive on a split type setup, or vice versa, and can still aggregate up to 12 directions at a nodal site. Another benefit of this arrangement is that you can use the same software you always used to monitor your environment."

In addition, both microwave and millimetre-wave solutions can be deployed simultaneously to enhance link availability. Higher capacity solutions rely on millimetre-wave solutions for the primary link and, if the weather closes in, microwave, which is more immune to poor weather, can take over the link.

Short range, high capacity E-band radios are suited to large, dense deployments, a unique characteristic that perfectly matches security and disaster control situations, which makes them key social infrastructure.

"We are currently installing a critical solution for a major government customer in South Africa and we have implemented critical solutions for a number of Africa's biggest carriers, such as Bharti Airtel, we supplied MTN for more than a decade, Zambia Telecommunications, and many others."

Additionally, it is essential to manage a mix of heterogeneous network devices for 5G environments. NEC XON supplies, supports, and maintains NEC's NMS platform that streamlines network design, operation, and management. It intelligently uses available network resources. It enables traffic load balancing across multiple paths. It self-heals after links or nodes go down.

NEC XON provides the advanced systems integration African businesses need, along with the world's top NEC technologies that are field-tested in African environments, for highly dependable and intelligent, converged solutions that meet the current and future needs of carriers across the continent.

5G, or not 5G, that is the question



**Robert Shepherd,
editor,
The African
Wireless
Communications
Yearbook 2019**

Welcome to the African Wireless Communications Yearbook 2019. In June 2016, the United Nations declared that internet access is now a human right. However, if we look at the current state of connectivity in Africa – or lack thereof – it would seem to be a somewhat fanciful statement. Just read the comments made by industry luminaries in the various chapters of this book and you will get the picture.

Now in 2019, it is no secret that 5G technology is being rolled out worldwide, with the promise of exponentially faster mobile internet speeds. According to experts, it will primarily have two major applications of deployment. One of them is mobile connectivity by smartphones and 5G mobile modems. The other will see it used for fixed-wireless access (FWA) to provide homes and businesses with broadband internet instead of wired ADSL or optic fibre.

Brands such as Huawei, Samsung and LG have already released devices that support 5G, while Apple has pencilled in 2020 before it launches its own version. Needless to say, its big business.

However, with a large number of Africans still unable to access the internet and the majority of those that can still only able to do so via 2G and 3G, just how realistic is it for the continent to embrace 5G in the near future?

One country that appears to be showing some leg is South Africa. In February 2019, the data-only network operator Rain partnered with Nokia to launch the 5G service in Johannesburg by using 3.6GHz spectrum already licensed to the company. Vodacom says it is ready to implement 5G and is just waiting for spectrum to be released. MTN says likewise, having partnered with Ericsson to trial 5G indoors in January 2018, achieving a throughput of more than 20gb/s, with less than 5ms latency in the process. MTN and Huawei followed this up by successfully launching the first live outdoor 5G trial in Africa. The field trial demonstrated a 5G fixed-wireless access use case, with Huawei's 5G 28GHz mmWave customer premises equipment (CPE) and attained speeds of 520mb/s downlink and 77mb/s uplink. That is positive, even if MTN chief executive officer Rob Shuter concedes that South Africa will not be ready for 5G for some five years.

Having said all that, the speed at which carriers adopt this technology will most likely be determined by the market in which they operate. The more developed nations like South Africa, Kenya and Nigeria do at least experience decent 4G coverage. In stark contrast, Zimbabwe and Zambia are still grappling with basic connectivity.

So, while some areas of the continent are trying their best to catch up with the more developed world, their efforts are offset by the majority. What is more, meeting the spectrum requirements is key to any advanced technology rollout and most of the required spectrum in Africa is still unused.

Over time, ultralow latency will be pivotal for IoT-enabled applications and autonomous vehicles. Maybe not in the next couple of years, but sometime in the not too distant future, Africa will catch up with the developed world. For now, it is all well and good promising exponentially faster mobile speeds, but you need connectivity to begin with.

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chapter 1

State of the market



**John OMO,
secretary
general,
ATU**

convenes the world radiocommunications conferences (WRCs) every three to four years to review and revise the Radio Regulations which is the international treaty governing the use of the spectrum and satellite orbits.

The next WRC will be held, for the first time since ITU was formed, in Africa (Egypt) in November 2018. The ATU focus relating to this matter has been the African preparations via among others, technical studies and convening of the African Preparatory Meetings (for WRC-19), the last of which was held in Egypt in September 2018. At this third preparatory meeting, Africa managed to reach common African preliminary position on about 87 per cent, which was remarkable.

Other focus areas have been capacity building of the policy makers and spectrum planning, licensing, and monitoring personnel, as well as, harmonisation of spectrum usage in Africa with focus on high impact areas such as the Digital Dividend.

On standardisation matters: focused on policies for emerging issues at the workshop held on OTT and IoT, cybersecurity and other technologies.

Wireless communications in Africa mostly mobile communications reached in early 2019 the threshold of 83 per cent of the population connected in Africa, which is estimated at 35 per cent of the total population against 34 per cent in early 2018.

This shows a significant annual increase

of one per cent. It should also be noted that the mobile internet generates a turnover approximately three times higher than the turnover of the fixed internet.

The wireless communications, including satellite communications combined with an appropriate tariff regime that could provide affordable connectivity services to populations in Africa particularly in rural areas, is a key factor to increase the telecommunications networks coverage and accelerate the connectivity for all.

There are numerous challenges for Africa over the next 12 months, such as:

- Accelerating the deployment of mobile broadband networks.
- Developing and diversifying mobile applications including mobile payment to promote financial inclusion.
- Implementing harmonised roaming tariffs at regional level to facilitate mobile communications/transactions within the region.
- Harmonising region regulation frameworks.
- Developing innovative mobile services such as IoT for agriculture, to address local needs and increase ICT impact and income.

As regards the spectrum affairs, ATU will focus on finalising the African preparations for WRC-19, by among other things, convening the 4th and final African preparatory meeting in July 2019 in South Africa. Some of the priorities for Africa at WRC-19 include additional spectrum for mobile broadband communications, high-altitude platforms to spur rural ICT coverage as well as additional spectrum for satellite systems.

With regard to the standardisation sector, the focus will be on the preparations towards the WTSA-20 where we have already constituted working groups to deal with the issues on the Assembly agenda. Will carry out a study on migration from IPv4 to IPv6 and a study on e-Waste management.

Connectivity in Africa has grown exponentially



**Duncan Ellis,
director EMEA,
Wave2Wave
Solution**

Africa has come a long way in terms of telecommunications connectivity. In 2006, only 1.3 per cent of the population in Africa (see p8) were subscribers to an Internet Service Provider and less than two per cent of the world's fixed telephone lines were located in Africa. While fixed telephone line use hasn't

changed much at all in the last decade, mobile phone use in Africa has skyrocketed, from 129 million subscriptions in 2006 to 781 million in 2018, and mobile broadband subscriptions have increased over 2000 per cent in the period from 2010 to 2018 (see figure 1 p9).

Current internet connectivity

Today, internet usage in Africa is over 10,000 per cent higher than it was in 2000, currently boasting over 470 million internet users (see figure 2 p9). However, with an estimated population of 1.32 billion in 2019, this means a penetration rate of only 35.9 per cent. By way of comparison, Europe and North America have internet penetration rates of 82.9 and 89 per cent, respectively.

Given the lack of existing fixed-line infrastructure, copper or fibre, in Africa, fixed broadband is neither prevalent nor widely available. Consequently, between 90 to 98 per cent of internet connections are made via mobile networks, and mobile networks operators (MNOs) are the dominant provider of internet access in Africa. Facebook reports that in 2018, it had 139 million users a month in Africa, and 98 per cent of those users

STATE OF THE MARKET: INTRODUCTION

connected via mobile device. In many rural areas, wireless communication via mobile phone and mobile data are often the only means of connectivity and communication.

While fixed broadband is often unavailable, 3G and 4G mobile services are. Mobile broadband is commonly viewed as a more convenient and accessible option for internet access. Thus, in Africa, those who access the internet frequently do so via mobile phones. Smartphone users prefer to make internet calls because mobile phone call costs are high. Africans also use their smartphones as "mobile money" to transfer funds. The World Bank's Global Findex Database survey found that 21 per cent of adults in sub-Saharan Africa have a mobile money account, which is nearly twice the amount as in 2014 and far and away the highest of any region in the world. Mobile money continues to gain footholds, with M-Pesa, Kenya's mobile-money service announcing its partnerships with PayPal and Western Union last year, and two of the largest cellular operators in Africa, MTN and Orange, announcing a joint venture for a mobile wallet that functions across both networks.

In Africa, mobile broadband subscriptions have grown from 14 million in 2010 to 305 million in 2018, while fixed broadband has changed only modestly over the same period – from one million to six million.

This is not surprising, since implementing fibre and copper technologies is time-consuming and labour intensive, as well as expensive. One popular alternative to fixed broadband is fixed wireless access (FWA), sometimes called WTTx (wireless to the x).

With FWA, a mobile telecommunication base station or wireless access point is connected to the user premises wirelessly, using customer

premises equipment (CPE). The CPE is often an outdoor high gain antenna, mounted on the rooftop of the premises, and is "plug and play" for customers gaming, streaming videos, using VoIP or powering enterprise networks. FWA is an attractive option in Africa because it doesn't require digging and installation over large areas, and operators can deploy quickly, using existing 2G, 3G or 4G base stations. FWA can enlarge coverage beyond urban areas without needing to establish a physical connection to each home or business premises. Research by Ovum reports that FWA is already providing much of sub-Saharan Africa's fixed broadband capacity and is leveraging broadband LTE, or 4G communications standard, services.

Communication satellite is another means of internet connectivity used in Africa that doesn't require fibre or copper implementation. However, because broadband via satellite remains more expensive compared to fibre broadband and FWA, it has not been widely adopted.

Where connectivity in Africa is heading

Africa is not homogenous when it comes to internet connectivity, and although there is robust internet access in South Africa, Morocco, Egypt, Mauritius and the Seychelles, internet connectivity in sub-Saharan Africa has, thus far, been limited by a number of factors, such as a lack of necessary infrastructure, access to and reliability of power and the high cost of internet access. According to a study by the Alliance for Affordable Internet, countries in Africa have the most expensive internet access in the world.

Despite these obstacles, Africa has the

fastest growing internet connectivity in the world and wireless connectivity has rapidly evolved in recent years with additional spectrum being allocated, new networks and operators on the scene and improved and emerging technologies. Internet connectivity has been vital to economic growth in Africa, impacting commerce, job creation and talent cultivation, and to social, political, and cultural change and development.

Africa is increasingly viewing internet connectivity not as a luxury or an extra, but as a necessity. As more people in Africa take up internet services, not only does demand for bandwidth go up but expectations of the quality of service increase as well. Demand for mobile apps, video, social media and cloud applications is growing apace, and internet connectivity impacts all parts of today's Africa, from communications, health and education to commerce and politics. Taking into account this growing demand, research firm Ovum predicts that fixed broadband subscriptions in sub-Saharan Africa will increase from 6.6 million in 2018 to 17 million in 2023, but LTE, a 4G standard, will remain the dominant technology over the next five years and have the fastest growth rate between 2018 and 2023, compared to FTTx.

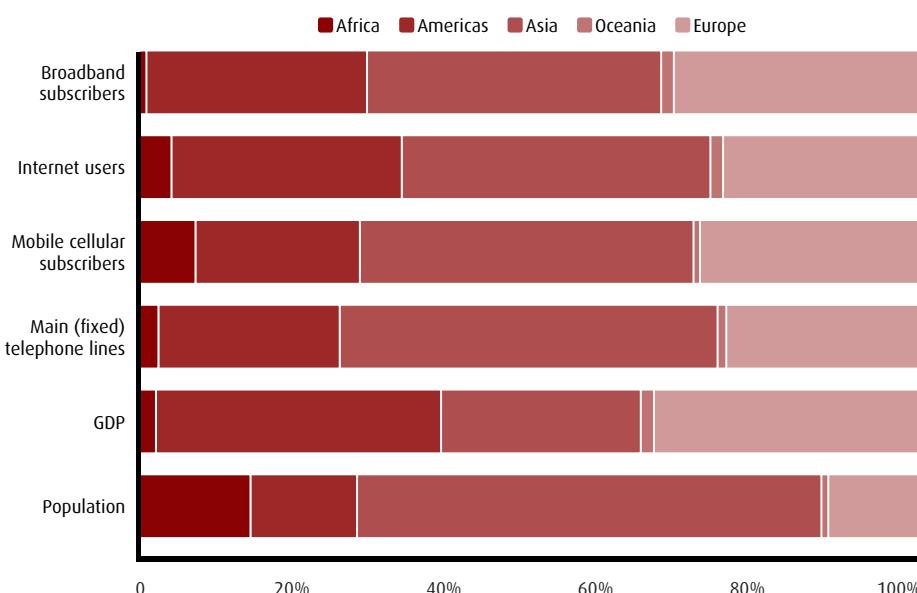
5G mobile services will also have an effect on connectivity in Africa. 5G is expected to be launched in South Africa, Kenya, Namibia and Mauritius by 2022. Estimations are that 5G use in Africa will initially be modest, with 5.9 million mobile 5G connections by the end of 2023, but continued increases in 3G and 4G subscriptions will drive mobile broadband growth over the next few years. Mobile 3G connections are projected to increase from 456.6 million at the end of 2018 to 697.6 million at the end of 2023, and mobile 4G connections will increase fivefold, from 50.5 million to 271.6 million. 5G will likely also impact FWA, as FWA will be able to leapfrog existing fixed broadband technologies and leverage 5G base stations, boosting capacity and achieving higher internet speeds than ever before, in places where service has never before been available.

Importance of automation to internet resiliency in Africa

Even though initial estimates of 5G deployment in Africa are modest, 5G is coming, and it will drive a momentous increase in data on the network - two to three orders of magnitude - which can only be delivered via fibre connectivity between cell sites and on the backhaul. Coupled with the increase in data, there will be a significant proliferation of cell sites, which will necessitate more fibre, and higher throughputs,

Regional overview of main indicators (World – 2006)

SOURCE: ITU TELECOMMUNICATION/ICT MARKETS AND TRENDS IN AFRICA 2007



STATE OF THE MARKET: INTRODUCTION

or processing rates, on all fibre.

Expanded wireless coverage and increased take-up of FWA have already meant an upsurge in cell sites and fibre, and 5G will mean even greater increase, which will have important implications on telecoms infrastructure. Microwave and radio links can be weather sensitive, and rain storms and airborne dust can have a significant impact on throughput, even losing the link in extreme conditions. Consequently, operators should prioritise extending fibre deeper into the network, providing additional capacity and resilience for FWA and 5G.

Further, in disaster recovery scenarios, traffic will need to be rerouted to respond to cell failures, regional power losses and fibre cuts. Rather than deploy active equipment, which requires a much higher port count, more power and more footprint, 5G infrastructure will need to move towards automated fibre switching methods, such as robotic fibre switching, that can divert traffic to new routes, using less power, and deliver new services and technology seamlessly much more cost effectively.

Internet reliability is vital, and shutdowns are both damaging and costly. Mauritania, on the west coast of Africa, was offline for 48 hours last year after a submarine internet cable was sabotaged. A total of seven countries in the region were affected, and the Brookings Institution estimates USD320m in revenue was lost due to the shutdown. Consequently, automation of critical network functions is essential to building a flexible, robust network. Networks rely on Software Defined Networking (SDN) and Network Function Virtualisation (NFV) for central control, faster service, and the ability to reconfigure remotely whilst allowing for optimisation of network configurations across layers one, two and three.

Much of Africa doesn't have the national infrastructure required to deliver reliable internet access throughout their countries, but this affords countries without legacy infrastructure to build automation into their nascent networks from the ground up, rather than face costly upgrades to an existing one.

Automation at the fibre optic layer has been a notable barrier to a fully automated networking infrastructure. Currently, an engineer must manually add a new network connection or remove an obsolete one. The engineer must manually interlink fibres on a patch panel in order to create the new layout, which is a slow process that often involves a considerable delay between the reconfiguration request and an engineer arriving on site. The size and accessibility challenges of the region contribute to these delays, with trained engineers required to travel great distances to troubleshoot or reconfigure networks.

Figure 1: Global ICT developments (2001-2018)

SOURCE: ITU WORLD TELECOMMUNICATION/ICT INDICATORS DATABASE

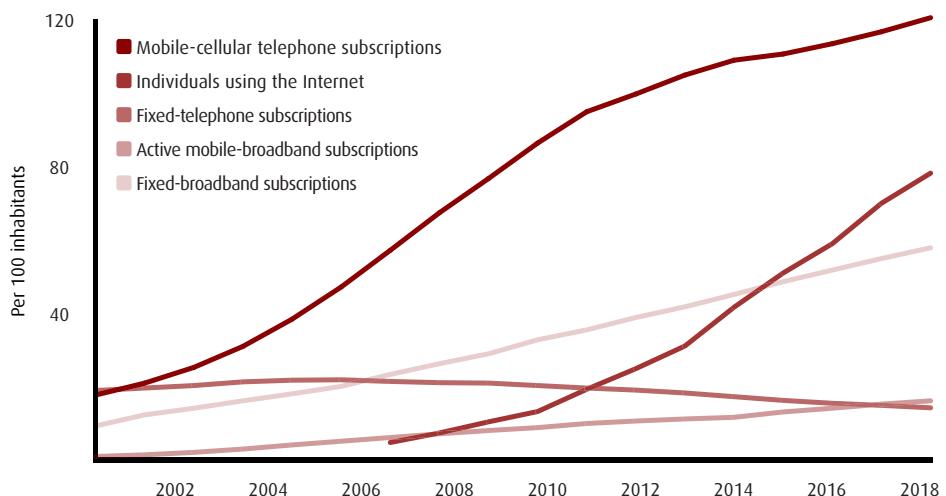
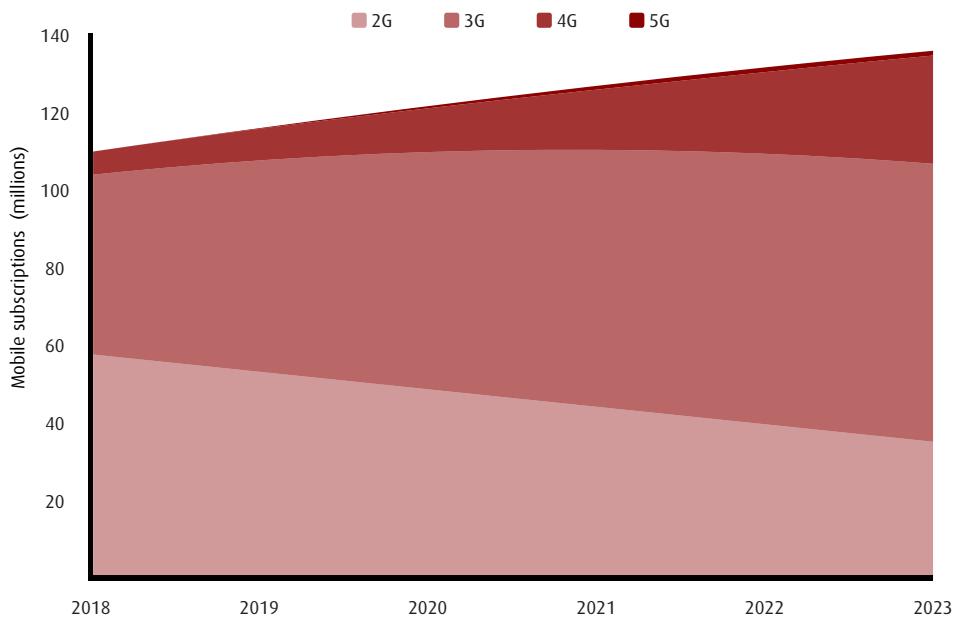


Figure 2: Africa mobile subscriptions forecast by technology (2018-23)

SOURCE: OVUM FORECASTER



Because patch panels are often a mess of tangled cables, the process is prone to human error. It's easy for an engineer to inadvertently disturb adjacent cords during reconfiguration, negatively impacting other services. Changes to the network configuration are extremely difficult to track because updates must be manually recorded on a spreadsheet, which frequently results in inaccurate records and confusion as to what services are connected to which fibres – severely impacting the time it takes to restore services. In the event of a fibre cut, when restoration of internet services is urgent, long delays and potentially imprecise fixes are a significant problem.

As sub-Saharan countries in Africa build their internet infrastructures, one of the best options for maximising resiliency is automating the physical, or fibre optic, layer. Robotic

optical networking automates the changes in network connections. Reconfiguring fibre optic connections robotically significantly improves accuracy and performance, ultimately reducing cost – an important consideration for the region. A system that maintains an accurate record of cross-connects and can be remotely reconfigured and patched means a more secure internet infrastructure with improved utilisation and reduced restoration times.

Africa is at a pivotal point in its digital development and investing in automation from the start will go a long way to ensuring that internet access in Africa is reliable, resilient and affordable. Africa will undoubtedly leverage the inroads it has made in wireless communication systems, as well as apply new technologies to close the digital divide and ensure robust connectivity in Africa – now and in the future.

STATE OF THE MARKET: REVIEW

Predicted growth

A healthy future was forecast as the mobile industry signed up its five billionth unique mobile subscriber in 2017 and predictions were made that there will be another billion by 2025, according to GSMA Intelligence.

In its Mobile Economy report published in February 2018, the association's research arm said there will be 5.9 billion subscribers over the next seven years, which is equivalent to 71 per cent of the world's expected population by that point. Even better news came when the GSMA said it believes growth will be driven by developing countries, particularly Bangladesh, China, India, Indonesia and Pakistan, as well as markets across sub-Saharan Africa and Latin America.

According to GSMA Intelligence, the mobile ecosystem accounted for 4.5 per cent of global GDP in 2017, a contribution equivalent to USD3.6tn in economic value added. It said this contribution is forecast to reach USD4.6tn or five per cent of GDP by 2022 as countries around the world increasingly benefit from the improvements in productivity and efficiency brought about by increased take-up of mobile services and M2M/IoT solutions.

Later in the year, another report from the GSMA predicted that more than half the population of sub-Saharan Africa will be subscribed to a mobile service by 2025.

In *The Mobile Economy: Sub-Saharan Africa 2018* report published in mid-July, the association forecasts that there will be 634 million unique mobile subscribers across the region in the next seven years. It says this is equivalent to 52 per cent of the population and is an increase from 44 per cent (44 million subscribers) at the end of 2017.

However, there was a note of warning that while sub-Saharan Africa (SSA) had been the world's fastest-growing mobile region in recent years, the GSMA said that growth is slowing as the industry faces the challenges of affordability and a youthful population. This is tempered by the fact that the region's current mobile penetration rate of 44 per cent is "significantly" below the global average of 66 per cent.

Despite the challenges, the report revealed that smartphone adoption was continuing to increase rapidly thanks to lower device costs, leading to accelerated migration to 3G/4G mobile broadband networks and services.

The report predicted that mobile broadband will account for 87 per cent of mobile connections in SSA by 2025, up from 38 per cent in 2017. Moreover, nearly 300 million new subscribers are expected to use their devices to access mobile internet services over the next seven years.

The report also calculated that the mobile ecosystem will add more than USD150bn in value to SSA's economy by 2022 which equates

to 7.9 per cent of regional GDP. To put this into perspective, in 2017 mobile technologies and services accounted for 7.1 per cent of GDP across SSA, a contribution that amounted to USD110bn of economic value added.

Specific segments were also shown to have upcoming growth, including critical communications. IHS Markit predicted that total critical communications revenues associated with transport will be worth more than USD3bn by the end of 2020.

The analyst said public safety and security organisations represent the largest adopters of critical communications globally, accounting for around 38 per cent of PMR deployments in 2017.

The Asia Pacific region is forecast to experience the largest growth of critical comms technologies, followed by the Americas and Europe and the Middle East. IHS said that it believed the market was being fuelled by the need to promote security, ensure personal safety, and create business efficiencies.

The global push-to-talk over cellular market (PTToC) was also predicted to grow, at a CAGR of 8.5 per cent from 2018 to 2026, claimed Persistence Market Research (PMR).

In its Push-to-Talk Over Cellular Market – Global Industry Analysis 2013-2017 and Market Forecast 2018-2026 report published in early August last year, the researcher said the PTToC market was worth USD2,741.4m in 2017 and predicted this will "grow significantly" to reach USD5,658m by 2026.

PMR put this down to a worldwide increase in demand for next-generation LTE networks.

It also said that the increasing penetration of IoT devices in various industry verticals was encouraging mobile device manufacturers to integrate PTToC software into their hardware. As a result, PMR said the software sub-segment in its study is projected to register more than 30 per cent of global market share at the end of 2018.

For IoT, the total number of connected sensors and devices is set to exceed 50 billion by 2022, up from an estimated 21 billion in 2018, according to Juniper Research.

Juniper's *The Internet of Things: Consumer, Industrial & Public Services 2018-2023* report said that the firm predicted that a substantial proportion of the estimated 46 billion industrial and enterprise devices connected in 2023 will rely on edge computing.

Juniper also forecasted that consortium-run blockchains or similar distributed ledger technologies, such as IOTA, will play an important role in delivering future IoT events or payment transaction management.

Investment was also fuelling growth in Africa. Digital money transfer service WorldRemit raised USD40m to support its plan to serve 10 million customers connected to emerging markets by 2020.

The company said this latest funding would be used to expand its service into new markets, deliver innovative products and services, and scale the technology that underpins its mobile-first, digital model.

Elsewhere, Helios Towers raised USD100m term loan facility for its future expansion plans. HTA, a wholly-owned subsidiary of independent tower company Helios Towers Ltd., signed a USD100m term loan facility agreement with Standard Bank of South Africa, Barclays Bank Mauritius and Mauritius Commercial Bank. The facility will be used for future expansion and general corporate purposes and will be drawn as required.

International support for Africa came as the UK's Department for International Trade (DIT) said it could facilitate billions of pounds in lending and guarantees to help African countries deal with a chronic lack of basic infrastructure.

The DIT in Africa has a presence in 21 countries across the continent and can enable the provision of these facilities through its export credit agency arm, UK Export Finance (UKEF). Loans could be extended in the local currencies of nine African countries for projects ranging from transportation, mining and general construction. For example, UKEF has the ability to support infrastructure projects in South Africa (up to GBP4bn), Kenya (up to GBP1bn) and Nigeria (up to GBP750m). All projects will have to include at least 20 per cent UK content as well as meeting all other lending criteria.

Africa is said to be the second-fastest urbanising region in the world behind Asia, with estimates showing that more than half of its projected 2.2 billion people will live in cities in the next 30 years. However, according to data compiled by the US-based Brookings Institution, 319 million people across sub-Saharan Africa have no access to reliable drinking water, 620 million have no access to electricity, while only 34 per cent of Africa's people have adequate road access. The World Bank estimates the chronic infrastructure backlog to be about USD93bn a year in the sub-Saharan region alone.

"There is enormous scope for Africa to boost its exports to the UK and indeed other parts of the world if it can address its infrastructure backlog," said Emma Wade-Smith, the UK's trade commissioner for Africa. "Research shows that in the long term, trade is better than aid, and without adequate infrastructure it will be very difficult for Africa to boost its ability to buy and sell with the rest of the world."

In what could be seen as too much of a good thing, satellite communications also saw multiple deals being signed leading to increased capacity. For example, German satellite services company Chronosat signed for more capacity with RSCC (Russian Satellite Communications Company)

INVESTMENTS, MERGERS & ACQUISITIONS IN 2018/19

Date	Buyer	Seller	Item	Price	Notes
16/3/18	Nokia	Unium	Company	NA	Nokia has now completed its acquisition of Seattle-based Unium. The firm's specialist software is claimed to provide operators with an intelligent mesh Wi-Fi solution that constantly optimises in-home Wi-Fi connections through self-learning & self-healing capabilities.
26/4/18	Yahsat	Thuraya	Majority stake	NA	Size of stake & transaction value not disclosed. Thuraya's two satellites, which are said to serve more than 140 countries, will join the Yahsat fleet, expanding its constellation to five. It can now offer C-, Ka-, Ku- and L-band services to Africa, Middle East, Asia, Europe & South America.
27/4/18	Orange Digital Ventures	Africa Talking	Investment funding	USD8.6m	Nairobi-based Africa's Talking specialises in providing access to operators' communication & payment APIs for developers. Working alongside the IFC World Bank & Social Capital, Orange Digital Ventures has helped the company raise the funding needed to support its clients' expansion strategies. Beyond Kenya, the firm has started working in Uganda, Rwanda, Tanzania, Malawi, Nigeria & Ethiopia.
30/5/18	Telecom Egypt	Chinese financial institutions	Long-term financing	USD200m	Huawei facilitated providing competitive financing conditions to Telecom Egypt to finance the rollout of 4G, & the deployment of transmission & core networks. Facility is for 48 months with a grace period of 24 months. Financial institutions include Bank of China, & China Export & Credit Insurance Corporation (Sinosure).
31/5/18	Ericsson	European Investment Bank	Credit facility	EUR250m	Agreement will support R&D activities for 5G & is in line with Ericsson's focused business strategy. The disbursement can be made in any currency that is widely traded on forex markets, & the credit facility will mature five years after disbursement.
6/7/18	Sterlite Tec	Metallurgica Bresciana	Company	EUR48.7m	Metallurgica designs & manufactures precision optical fibre & specialised copper cables. Sterlite hopes its all cash acquisition of the Italian firm will "significantly" expand its European market presence.
23/7/18	G+D	Various financial institutions	Bonded loan	EUR200m	This is the first time Giesecke+Devrient has placed a bonded loan. The issue was placed with a greater number of savings banks & co-operative institutions as well as the German commercial banks, and comprises terms of between five & 10 years. Proceeds will be used for general business financing as well as supporting operational growth in the areas of payment, connectivity, identities, & digital security.
23/7/18	Infinera	Coriant	Company	USD430m	Infinera will pay around \$150m in cash at closing, plus estimated additional amounts of \$25m in two quarters post-closing, & \$55m over a period of years. It will issue around 21 million shares, which when combined with the cash consideration, results in total transaction consideration of around \$430m. Infinera says proposed acquisition positions it to capitalise on the next wave of global network spending as operators transform their networks to transition from 4G to 5G, from OTN to packet, & from closed to open architectures.
9/8/18	Es'hailSat	Eutelsat	Stake in EUTELSAT 25B	EUR135m	Eutelsat & Qatar's Es'hailSat jointly launched EUTELSAT 25B/Es'hailSat 1 in August 2013 to serve users across MENA & and Central Asia. Eutelsat says its share of the satellite generated FY2018 revenues of c.€16m in video application, adding that the sale has no impact on its revenue objectives.
27/8/18	Nokia	European Investment Bank	Loan	EUR500m	Nokia will use financing to further accelerate its R&D into 5G. Loan has an average maturity of approximately five years after disbursement, which can take place at any time during the next 18 months. The EIB transaction is supported by the European Fund for Strategic Investments (EFSI), a key element of the EU's Investment Plan for Europe (also known as the Juncker Plan).
7/9/18	Various investors	Yoco	Series B funding	NA	Yoco launched in 2015 as a specialist company providing mobile points of sale in South Africa, enabling merchants to accept card payments using a smartphone or tablet. It has now raised a total of \$23m following this latest round of funding. Investors include Partech, FMO, Quona Capital, Velocity Capital & Orange Digital Ventures.
2/10/18	Vista Equity Partners	Fortissimo Capital	Starhome Mach	Financial details withheld	Vista will merge Starhome with its existing portfolio company, interconnect business optimisation specialist Telarix. It's claimed the merger will create the "first & only" end-to-end technology solution provider enabling telcos to "optimise global connectivity in the digital transformation era". Combined company will be headquartered in USA & led by current Telarix CEO Marco Limena. Starhome Mach CEO, Itai Margalit, will become president of roaming & clearing services.
2/10/18	CSG International	Forte Payment Systems	Acquisition	NA	CSG says the purchase of Forte adds to its expanding portfolio of public cloud offerings & grows its footprint in new verticals in the increasingly complex payments world. It also claims the acquisition "uniquely positions it to help clients create a convenient & differentiated customer experience, resulting in increased loyalty & share of wallet".
31/10/18	HTA Group (Helios Towers)	Standard Bank of South Africa, Barclays Bank Mauritius, & Mauritius Commercial Bank	Loan	USD100m	Helios Towers CFO Tom Greenwood: "The term loan facility will provide us with additional flexibility to support our long-term growth initiatives. This facility will not only enable us to continue investing in tower infrastructure in our current markets but will also support our intentions to seek opportunities in new markets across Africa." Company adds that loan will be drawn as required.
28/11/18	NA	Qualcomm	Ventures AI Fund	USD100m	Qualcomm will use its recently launched Ventures AI Fund to invest up to an aggregate of \$100m in startups that aim to transform artificial intelligence. The company says the fund will focus on startups that share the vision of on-device AI becoming more powerful and widespread, with an emphasis on those developing new technology for autonomous cars, robotics and machine learning platforms.
3/12/18	Nokia	Nordic Investment Bank	Financing	EUR250m	Nokia says the loan, which has an average maturity of approximately five years after disbursement, will finance its "extensive" R&D programme focused on 5G activities in Europe in 2018-2020. In particular, the investment will focus on developing new 5G-related end-to-end product offerings for different business areas.
11/12/18	Liquid Telecom	CDC Group	Investment	USD180m	Owned & managed by the UK government, CDC Group supports companies that help poor countries grow. Liquid says the \$180m will enable it to expand its high-speed broadband connectivity to some of the most underserved communities across Africa, including supporting the continent's thriving tech start-up ecosystem with high-speed internet & cloud-based services.
14/1/19	Bharti Airtel	Helios Investment Partners	Telkom Kenya	NA	MPs have raised concerns regarding the proposed deal so it may not go ahead
22/3/19	Maroc Telecom	Millicom	Tigo Chad	NA	The acquisition forms part of Maroc Telecom's strategy to expand operations in north and central Africa, while Millicom focuses its efforts on Latin America

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in a bid to expand its presence in Africa and the Middle East. Under a strategic agreement worth more than USD14m, Chronosat will increase its use of capacity on RSCC's Express-AM7 satellite which was launched in 2015.

Avanti Communications signed two separate contracts for the distribution of services using its HYLAS 4 high-throughput satellite in Africa. In early August 2018, the operator announced a "Master Distribution Agreement" (MDA) with iWayAfrica to provide satellite broadband services across the sub-Saharan region. Under the agreement, iWayAfrica said it would provide "affordable" high-speed satellite broadband to connect homes, SMEs, schools and enterprises, especially in rural and remote locations where terrestrial networks are limited.

Another deal saw a new partnership between SatADSL, iSAT Africa and APT Satellite promise to offer affordable broadband across Africa.

Under the deal, VSAT services provider SatADSL would provide its Cloud-based Service Delivery Platform (C-SDP) to enable iSAT to offer new products including voucher services, VNOFlex and congestion-based services.

APT would provide capacity via APSTAR-7 located at 76.50E. This covers Africa and the Middle East with C- and Ku-band services, and also includes Asia, Europe, Australia and China in its footprints.

The outcome of all this extra capacity is that prices continued to fall, which is great for customers and more of a challenge for operators. According to Northern Sky Research (NSR), in its *Satellite Capacity Pricing Index, 4th Edition (Q1 2018)* report released in mid-March 2018, satellite capacity prices have fallen for a third straight year. On average, capacity price declines for 2016-2018 ranged from 32 to 57 per cent across various applications and regions. According to the research firm, the road ahead "appears unclear as greater supply enters the scene, demand lags in some markets, and competition intensifies".

NSR stated that while operators are now deploying strategies such as vertical specific market entry partnerships and framework agreements on discounts, these haven't stopped the impact of the widening gap in supply-demand economics. It added that this trend is exacerbated by competitive sales positioning by operators in each region. NSR reckons that despite expecting to see smaller price decreases during 2019, the industry must wait longer for them to bottom out.

Target and acquire

Strategic mergers and acquisitions are always on the cards in an industry as hotly contested as the mobile communications market in Africa.

Last year saw the Canadian Volaris Group buying all the shares of Sicap, including its

international branch entities. The value of the transaction was not disclosed. Sicap would be allowed to continue to operate its own brand and serve its international customers from its current offices in Europe and India.

Volaris is an operating unit of parent holding company Constellation Software which is listed on the Toronto Stock Exchange. The company said that it believed Sicap offered a "great opportunity" for it to expand its presence in the communications vertical, reinforce a strong position in the mobile market globally, and to acquire competency and experience in secure and scalable mobile applications. David Nyland, portfolio leader and president, media and communications vertical at Volaris, said: "The acquisition of Sicap enables us to capture the full market opportunity of future high growth market trends including e-SIM, IoT, and 5G networks, which require many more devices and increase the complexity for our operator customers to support these devices."

For Sicap – which originally began as a subsidiary of Swisscom – the acquisition will mean a creation of growth opportunities in innovation areas such as AI and the IoT, as well as an easier access to investment capital.

The company's CEO at the time, Markus Doetsch, retained his position, and all of Sicap's employees have been taken over. Since then Doetsch has moved on, to be replaced by Richard Choi.

The deal saw Sicap becoming a part of the Volaris Communications Vertical business portfolio which includes technology brands such as Incognito Software, Netadmin Systems, Active Broadband OSS, Tarantula Global Holdings, Telepin Software, and WDS Mobile.

The beginning of 2018 saw Airtel in charge of Millicom's Tigo branded operations in Rwanda, following a deal in December 2017 to sell them on.

The total consideration of the transaction was approximately six times 2017 adjusted EBITDA, payable over two years, consisting of a mix of cash, vendor loan note and earn out.

Millicom CEO Mauricio Ramos explained: "The sale of our business in Rwanda is in line with our strategy to focus on providing advanced fixed and mobile data services in Latin America." Zambia also saw a buy-out in the shape of Liquid Telecom completing its acquisition of CEC Liquid Telecom in Zambia. It claimed the move will "further strengthen" its operations in Southern Africa.

CEC (Copperbelt Energy Corporation) is a Zambian power transmission, distributing and generating company. In 2011, it formed a joint venture with Liquid Telecom to build new fibre links in the country. CEC already operated a fibre network that spans more than 5,000km and is said to be Zambia's first fully-redundant network.

Under the original JV, Liquid owned 50 per cent of CEC. The deal saw it purchasing

the remaining half for a reported USD32m. Liquid said this would enable it to focus on growing its wholesale, enterprise, and retail offering across Zambia. This includes cloud-based services such as Microsoft Office 365 and Azure Stack, which would now be hosted locally in Zambia for the first time. The company has also launched an LTE network in all of Zambia's 10 provinces. In addition, the buy-out meant Liquid could now invest further in its fibre network in the country and connect it to its One Africa broadband network that stretches from Cape Town to Cairo.

A more nebulous announcement came that the Convergence Partners and 4Di Group had acquired a "significant" minority stake in ESET's Southern African distributor. However, the two companies did not disclose the size of the share or how much they have invested.

To put this into perspective, ESET is a global provider of internet and endpoint security software. At the time of the deal Cape Town-headquartered 4Di had represented and operated the brand in the region for 15 years as ESET Southern Africa, and among its other interests, it had distributed ESET's range security software in South Africa and Namibia.

Convergence Partners also acquired a stake in ESRO Ltd, ESET's official brand operator and distributor in the sub-Saharan Africa and broader East African region, which covers 17 countries including Kenya with an operational office in Nairobi.

Teaming up

Partnering up was also still making waves across Africa with some big names having big plans, along with the spread of new technology.

Brands don't come much bigger than Coca-Cola, which announced it would be working with Intelsat to bring satellite-enabled Wi-Fi services to remote communities across Africa. The partners said that their collaboration would support both their individual future business plans as well as their mutual efforts to promote sustainable development, especially in underserved communities.

Under their partnership, the two companies planned to establish Wi-Fi access at certain retail facilities in rural areas, enabling personal and commercial connectivity for citizens.

Coca-Cola's global director Eric Welsh said: "We're partnering with public and private sector organisations to address social issues, bringing basic necessities to millions of people through our sustainability-related programmes.

"The internet is a tremendous, undisputed force for economic growth and social change, and with the reach of Intelsat's satellite broadband services, we plan to deliver the benefits of connectivity to even more

communities across Africa."

Coca-Cola said it was already working in developing communities around the world to foster sustainable development activity like supporting clean water and sanitation services as well as economic empowerment for women.

Intelsat said it believed that satellite connectivity was the easiest way to deliver internet services to the most people in the shortest possible timeframe in infrastructure-poor rural and remote areas. "The work Coca-Cola is doing in local communities around the world fits perfectly with our vision to remove the digital divide often found in remote areas", said Jean-Philippe Gillet, Intelsat's VP and GM of broadband.

"With the inherent advantages that satellite provides in terms of reach and scalability, we provide a solution in delivering the benefits of internet access to hundreds of communities around the world in a quick, cost-efficient manner."

Another global brand, Facebook, announced it was helping to build a backhaul network in northwest Uganda. When completed, the 770km fibre system will provide connectivity to support more than three million people and also enable future cross-border connectivity to neighbouring countries.

According to Facebook, the new backhaul capacity created will reduce costs for mobile operators as well as increase capacity. It said this would help improve performance and support upgrades to 3G and 4G in areas where operators are bandwidth-constrained.

As part of its mission to connect the world, Facebook claimed it is always exploring new ways to collaborate with operators and other partners. In a separate announcement made earlier in 2018, it said: "We believe one of the most-effective ways to scale efforts in infrastructure, such as fibre, is to first engage with operators to understand their priorities. Many operators have told us they need more capacity when it comes to shared backhaul infrastructure."

The company is working with Airtel Uganda and Bandwidth & Cloud Services Group (BCS), a wholesale bandwidth provider focused on deploying infrastructure in east Africa. Facebook said its investments were focused on addressing shared backhaul capacity so multiple service providers can benefit from the infrastructure. "This is why we're working with multiple operators and welcome others to join us through an open access and shared infrastructure framework," it said.

The company added that based on the learnings and results from its work in Uganda, it planned to engage with other operators in other countries to scale the model, with the ultimate goal of helping local operators provide "robust" network coverage.

Extending network coverage was also top of the menu for China Telecom and Liquid Telecom

in an "historic" deal. In what was hailed as a "landmark partnership", China Telecom Global (CTG) and Liquid Telecom announced they would work together to provide Africa and Asia with what they said would be "industry-leading" network solutions and services. The companies said their "historic" strategic agreement would enable them to serve their respective enterprise and wholesale customers with extended network coverage across some of the fastest-growing economies in the two regions.

CTG began by establishing a PoP at Liquid's East Africa Data Centre (EADC) in Nairobi. In a separate announcement made in April 2018, Liquid said it had opened a new floor at the centre to provide an additional 500m² of rack space. The EADC could now offer a total of 2,000m² of secured space over four floors, and is interconnected with Africa Data

Centres' other carrier-neutral facilities in South Africa and Zimbabwe. CTG plans were to then establish further PoPs at the company's facilities in Johannesburg and Cape Town.

Changshi Liu, MD of China Telecom (MEA), said Africa is very important to his company and describes it as the "booming new market" with the highest development rate after Asia. He said: "This collaboration will enable both CTG and Liquid Telecom to better serve our customers and explore untapped business potential for further development."

Improved network links were also the subject of a partnership between Liquid Telecom and Huawei who claimed their new partnership deal signed in South Africa would have pan-continental ramifications.

Under the agreement, Huawei would deploy its DWDM technology to Liquid's fibre network in South

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Africa, enabling it to support 100G wavelengths.

The first phase of the project would see Liquid use the vendor's OptiX OSN solution along 1,200km of its long-haul network connecting Johannesburg and Cape Town. Liquid said the 100G link would support growing demand for cloud-based services and provide customers with high-speed access to its data centres in Johannesburg and Cape Town which were already undergoing major expansions at the time of the announcement in order to meet the needs of global cloud players and enterprise customers.

In the second and third phases of the project, the DWDM core network would be extended to the north-west then north-east regions of the country.

In addition, the network upgrades would support Liquid's new CloudConnect for Microsoft Azure ExpressRoute service. The company claims this enables customers to create private, predictable, high performance, SLA-based connections between Azure data centres and infrastructure on their premises or in a colo environment.

According to the company, the agreement would open up opportunities not only for South Africa, but across the continent as well. Liquid said it would provide cloud services for a "simplified and secure" environment, leveraging its pan-African fibre network which stretches over 50,000km and claims to connect more African countries on a single network than any other fibre network.

"Higher networks speeds and bandwidth will play an integral role in supporting the rise of the African cloud," said Nic Rudnick, group CEO, Liquid Telecom. "Through our partnership with Huawei, Liquid is ensuring that its network is ready to meet the increasing demand from businesses for cloud-based services."

IoT saw a boost when MTN and Cisco Jasper partnered to enable their business customers throughout South Africa to deliver IoT services worldwide.

While the companies said that they would initially only roll out their services in South Africa, plans were in place to expand connectivity by leveraging MTN's data centres across its 22 PoPs across the continent.

The announcement meant that MTN would be the first mobile operator in the country to deploy Control Centre, Cisco Jasper's automated IoT connectivity management platform. The partnership also represents the vendor's initial expansion into South Africa.

The operator said its business customers in nearly every industry are looking to innovate and transform their businesses by offering connected services. It reckons there is significant demand for the Control Center platform across all markets, particularly for telematics and vehicle

diagnostics, vehicle tracking, building security and automation, and logistics.

"Over the past three years we have invested substantially in our network and have forged strategic partnerships with leading global players in the IoT space," said Mariana Kruger, GM for ICT solutions, MTN Business. Kruger went on to claim that the partnership with Cisco Jasper had several synergies. She reckoned both companies have the "capacity and expertise" to provide NB-IoT services to enterprise customers. "In addition, the technologies that we have invested in give MTN the ability to provide cutting-edge and tailored propositions to our clients, while delivering a secure and fool-proof connection," concluded Kruger.

Operators were also going to benefit from a joint test lab planned to be set up by Rohde & Schwarz (R&S) and fabless semiconductor company Unigroup Spreadtrum & RDA. An MoU signed in February 2018 said that the new lab would be built in China.

The two companies said they would focus on wireless communications and test concepts to better serve their common customers, including the three Chinese network operators and other global operators that Rohde & Schwarz has been serving for many years.

R&S will provide technical consultancy and product support in the test lab. It will then collaborate with Unigroup Spreadtrum & RDA on testing for network operators around the world. The partners said their common goal is to enable chipset solutions that better fit global operators' requirements.

Unigroup Spreadtrum & RDA had already been working with R&S for 2G, 3G, and 4G. R&S will now support Unigroup in 5G sub-6GHz and mmWave chipset design and development. The companies said this would ultimately accelerate 5G chip prototyping, and would further optimise 5G manufacturing and hasten the technology's time to market.

Challenging times

The year wasn't all smooth sailing though, with several large legal battles raging. The beginning of 2018 saw the continuation of the ongoing dispute between Hytera Communications and Motorola Solutions.

In a complaint submitted to a US federal district court in New Jersey on 4 December 2017, Hytera alleged that Motorola Solutions was preventing it from competing in the US marketplace with its critical communications products. Hytera said: "Motorola Solutions is engaging in anti-competitive practices that are unlawful under the Sherman and Clayton Acts by deliberately and actively foreclosing competition in LMR communications systems, in order to reap billions of dollars on sales at inflated prices to US customers."

The Chinese company, together with its

subsidiaries that include US-based PowerTrunk and UK firm Sepura, alleged that by "foreclosing" competition from Hytera's DMR and TETRA solutions, Motorola Solutions was able to maintain "inflated" pricing in the US on its products that use P25, the standard for public safety communications that is widely used in the country. According to Hytera, TETRA offers similar functionality and features to P25 equipment, and can be "significantly less expensive".

Hytera went on to accuse Motorola Solutions of engaging in a series of "sham" litigation and regulatory actions. It said this included suing Hytera for patent infringement on a set of standard essential technologies that industry users have agreed to license on fair, reasonable, and non-discriminatory terms, and for which Hytera has already been paying Motorola Solutions to license.

On 3 July, the US International Trade Commission (ITC) announced that Hytera Communications had infringed four of Motorola Solutions' patents.

The ITC's Notice of Initial Determination followed its lengthy investigation of the patent infringement complaint filed by Motorola on 29 March 2017 against Hytera.

In the complaint, Motorola alleged that Hytera is unlawfully importing and selling two-way radio equipment and systems and related software and components that infringe four of its patents.

As part of the ruling, administrative law judge Mary Joan McNamara found that all four of Motorola's patents are valid, Hytera has infringed them, and that Motorola met the legal requirement of showing a "technical domestic industry" on three of the four patents (US patent numbers 7,369,869, 7,729,701 and 8,279,991).

The judge recommended an exclusion order preventing Hytera from importing "certain infringing products" into the US, and a cease-and-desist order preventing further sale and marketing of such products. Although this was over-ruled in the ITC's Final Determination which was issued in November, leading to Hytera's products being made available and the firm launching a suit against Motorola under the Sherman Anti-Trust Act.

The US Government was also fighting with China when it banned companies and individuals in the country from exporting products to Chinese telecoms giant Zhongxing Telecommunications Equipment Corporation, better known as ZTE.

On 16 April 2018, the Department of Commerce's Bureau of Industry and Security (BIS) imposed a denial of export privileges in response to what it claimed was ZTE's "repeated false statements". The order prohibits any business or individual in the US to participate in any type of export transaction with the company.

ZTE reportedly spent more than USD2.3bn on imports from around 200 US companies in 2017, which included vital components for its equipment.

According to the Department of Commerce,

in March 2017 ZTE agreed to a combined civil and criminal penalty and forfeiture of USD1.19bn after “illegally shipping telecommunications equipment to Iran and North Korea, making false statements, and obstructing justice including through preventing disclosure to and affirmatively misleading the US Government”.

In addition to these monetary penalties, it said ZTE also agreed a seven-year suspended denial of export privileges, which could be activated if any aspect of the agreement was not met and/or if the company committed additional violations of the Export Administration Regulations (EAR).

It was only a comparatively short-lived ban, however, with the US Department of Commerce lifting the trade ban on July 13. Secretary of commerce Wilbur Ross announced that the Chinese company had placed USD400m in escrow at a US bank. Shortly after the deposit, the department lifted the denial order on ZTE pursuant to a June settlement agreement that included the harshest penalties and strictest compliance measures ever imposed in such a case. The escrow funds are in addition to the USD1bn penalty that ZTE paid to the US Treasury in June.

Despite lifting the ban, Ross stressed how the US would keep a close eye on ZTE. “While we lifted the ban on ZTE, the department will remain vigilant as we closely monitor ZTE’s actions to ensure compliance with all US laws and regulations,” said Ross.

Also during the year, US president Donald Trump personally intervened in the war of words that had been raging between semiconductor device makers Qualcomm and Singapore’s Broadcom. Their dispute followed a proposed takeover bid from Broadcom that was originally announced in 2017 and would have become the biggest merger ever in the technology sector.

In early November 2017, Broadcom proposed to acquire Qualcomm in a transaction valued at USD130bn. Under the proposal, Qualcomm stockholders would receive USD70 per share consisting of USD60 in cash and USD10 per share in Broadcom stock.

Qualcomm rejected the offer and that was then followed up with Broadcom notifying Qualcomm of its intention to nominate 11 independent individuals for election to Qualcomm’s board. This was seen as an obvious take-over bid by Qualcomm.

Despite an improved proposal in early February 2018, where Broadcom offered USD82 per share consisting of USD60 in cash and the remainder in shares, Qualcomm still rejected the deal.

However, in mid-March the White House stepped into the row and ordered Qualcomm to immediately and permanently abandon the proposed takeover saying that it could threaten US national security. According to reports, US

officials also fear that the takeover could result in Chinese companies such as Huawei gaining a global lead in 5G development.

5G also hit the news when Rethink Technology Research said it would take operators ten years to achieve full virtualisation of the RAN once they began the process, possibly leading to a delay in launching 5G services.

In its cloud RAN (C-RAN) deployment forecast 2017-2025, the analyst said that the move to a fully virtualised, cloud-based radio access network is being held back mostly by the lack of interoperable standards. “This is one of the main things preventing C-RAN from happening earlier, and most shipments will not start until this has been ironed out, a process that could take another three years before shipments break the three million a year barrier,” stated Rethink. As a result, the company predicted centralised and virtualised macrocells and microcells would be deployed at a CAGR of 23 per cent between 2017 and 2025. And although these will overtake new deployments of conventional cells in 2019, it said most of these deployments will still be centralised rather than fully virtualised. Once operators start to deploy RAN VNFs, usually conforming to ETSI NFV specifications, Rethink reckoned there would be a sharp acceleration of growth in the number of C-RAN sites, adding that full C-RANs will remain rare until mid-2020.

“There is now a major dilemma for operators between simply using centralised RAN or going for a fully virtualised RAN,” said the firm. “The former is simpler and delivers some efficiencies; the latter is very difficult and disruptive to implement, but we believe will revolutionise cellular economics.”

According to Rethink, the two key barriers have been availability of fibre and the vendor “stranglehold” on the CPRI (common public radio interface). It said that this has meant most early C-RANs have had to be very localised.

“It is essential that new emerging standards, preferably from the IEEE, take hold to open up the ecosystem and accelerate adoption,” said the analyst. “Operators which support full C-RAN will have a far easier, cheaper task to implement 5G. However, the process of virtualising the RAN may delay 5G upgrades.”

Further worries for operators came from IDC with the news that smartphone shipments had actually dropped in Q1 2018. In mid-June, the market-watcher said the total value of smartphone sales across the region was USD29.967bn while unit volume was 86.523 million.

IDC said that as well as continuing to contract in Western Europe, the smartphone market is also “surprisingly” shrinking in Africa. Here, it said that the continent was down 4.4 per cent while the Western European smartphone total dropped to 29.213 million in the quarter, 8.2 per cent lower than the year

before. But the firm added that the Middle East and Central Europe markets were both up at 1.5 and 5.6 per cent, respectively.

“Overall mobile phone shipments in EMEA declined year-on-year in unit terms, and it may well be that the market is beyond the peak levels registered in 2017,” said Simon Baker, programme director, mobile devices, IDC CEMA. “This is because the resurgence in feature phones in emerging markets, mainly in Africa, seen from the second half of 2016, is now beginning to ebb. The 1Q18 feature phone market was the smallest in six quarters.”

The trend was only further confirmed later in the year when Q3 showed a 2.1 per cent drop in sales with feature phones dropping 2.7 per cent QoQ and smartphones by 1.3 per cent. Nigeria suffered a heavy 11.6 per cent QoQ decline in mobile phone shipments which George Mbuthia, a research analyst at IDC, explained as occurring because: “The decline in Nigeria stemmed from a slowdown in government spending, ongoing warfare in the country’s northern states, and market uncertainty in the lead up to elections.”

Connectivity

Those who are looking to the 2019 African Wireless Communications Yearbook to get an update on the ICT Development Index, will be disappointed. The index, which is published by the ITU and provides a benchmark of ICT development in its 176 member states, wasn’t compiled for 2018.

“In 2017, ITU Member States agreed to a revised and expanded set of indicators for the ICT Development Index (IDI),” explained the ITU. “The new IDI, based on the new indicators, promises to deliver an even better understanding of developments, opportunities and challenges within ITU Member States and the ICT industry at large. In order to smoothen the transition for Member States in terms of data collection, the IDI, which is normally included in the Measuring the Information Society Report, will only be launched in 2019.” So next year’s Yearbook will have the 2019 ICT Development Index figures.

Opportunity for mobile subscriptions

Ericsson’s Mobility Report Update for Q4 2018 showed Africa as not only as a region experiencing great growth, but also with great potential for the future. On a global scale, the total number of mobile subscriptions was around 7.9 billion, having gained 43 million subscriptions during the quarter. China had the most net additions during the quarter (+20 million), followed by Indonesia (+7 million), and the United States (+3 million).

The subscription penetration reached 104

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per cent and the monthly mobile data traffic rose almost 88 per cent from Q4 2017 to Q4 2018. The report said that this was the highest growth rate seen since Q2 2013 and similarly it was mainly down to the increased traffic per smartphone in China.

The regional breakdowns were enlightening, showing Africa as only slightly behind India in terms of mobile subscriptions. However, where India saw a drop of 16 million subscriptions, posited to be the result of shutting off inactive subscriptions, Africa saw an increase of 12 million. The two regions are of particular interest because they are the only two which still have less than 100 per cent penetration: India 85 per cent and Africa 82 per cent. This implies Africa has plenty of opportunity for expansion, compared to those regions which are suffering from over-saturation, for example central and eastern Europe where the penetration rate is 142 per cent.

The report also had predictions for how the technology driving those connections was going to change and indeed the amount of data which that infrastructure was going to have to be able to handle. Forecast for 2024 showed how GSM/EDGE-only and WCDMA/HSPA were going to decline, from 2 billion to 470 million and 2.37 billion to 1.48 billion respectively, leading to a drop of around 2.3 billion subscriptions. This is predicted to be more than made up for with an increase in LTE connections and the launch of 5G, with an increase from around 3.6 billion to 5.4 billion LTE users and a new 1.5 billion 5G subscriptions.

In Ericsson's *Mobility Report for Middle East and Africa (MEA)*, released in February 2019, the forecast was for 5G to reach 30 million subscriptions for enhanced mobile broadband in MEA by the end of 2024, representing 2 per cent of total mobile subscriptions. "This will make 5G the fastest generation of cellular technology to be rolled out on a global scale," said the report.

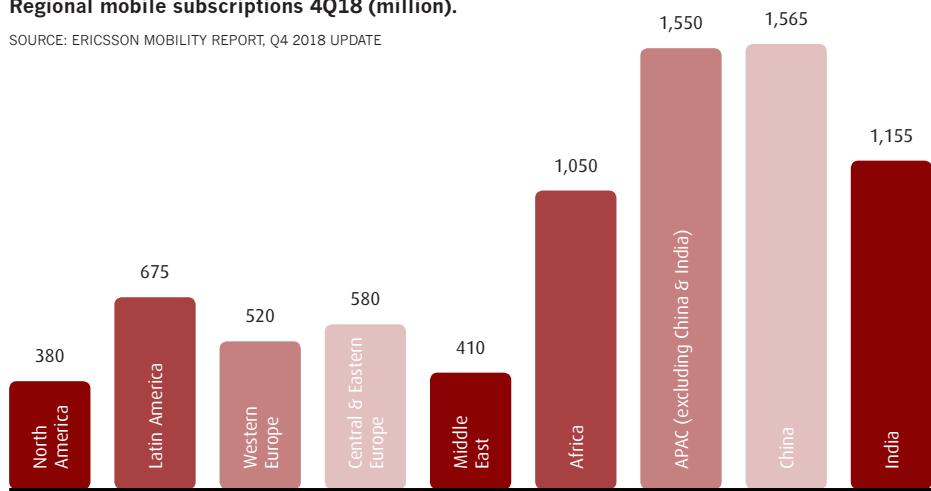
The data challenge

The challenge for Africa will be how to handle the increase in data. Ericsson suggested that from a mobile data traffic point of view, the region will see the highest data expansion with nine times growth forecast, 1.8 to 15.4 EB/month from 2018 to 2024. This will come with only a doubling of mobile broadband subscriptions, 860 to 1,630 million from 2018 to 2024.

There was no specific breakdown per region as to how this data increase would hit, but on a global scale the report predicted doubling for data consumption like downloads, messaging, and app traffic. Audio streaming is predicted to quadruple over the next six years. The real pressure will come from video streaming which already uses more than 55 per cent more data than all of the other types combined.

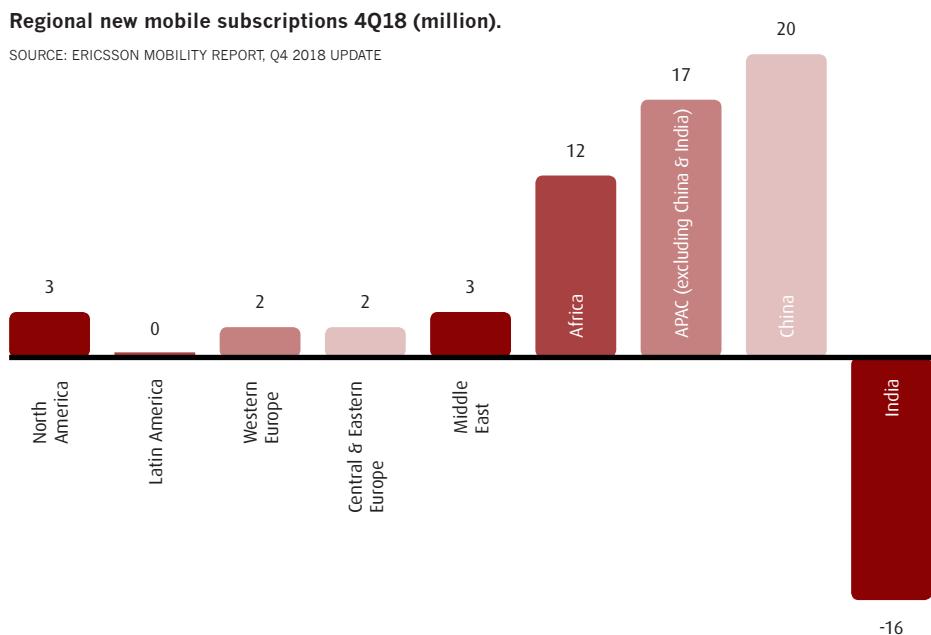
Regional mobile subscriptions 4Q18 (million).

SOURCE: ERICSSON MOBILITY REPORT, Q4 2018 UPDATE



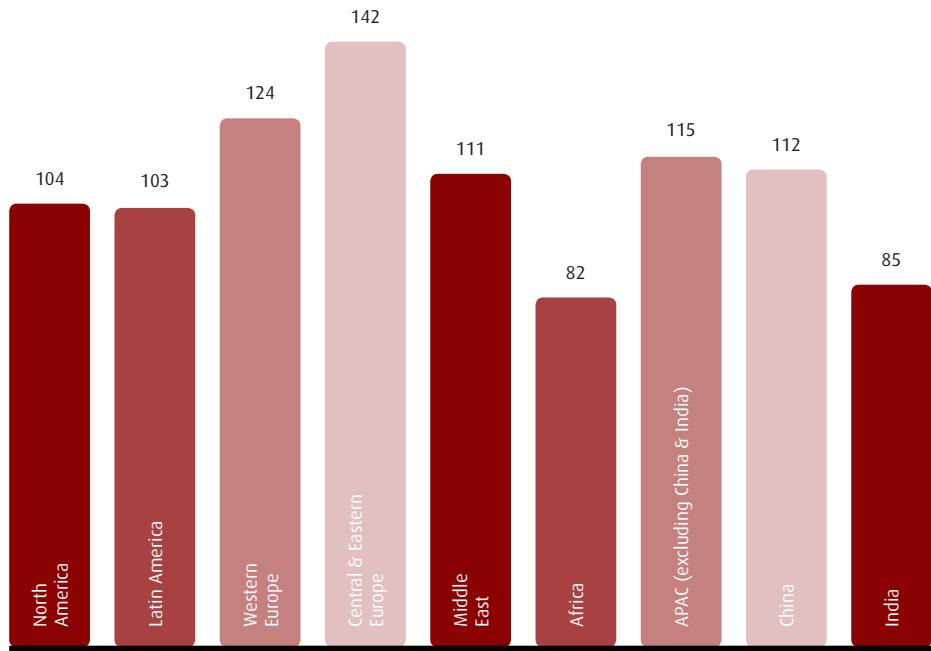
Regional new mobile subscriptions 4Q18 (million).

SOURCE: ERICSSON MOBILITY REPORT, Q4 2018 UPDATE



Regional subscription penetration 4Q18 (per cent).

SOURCE: ERICSSON MOBILITY REPORT, Q4 2018 UPDATE



(see "Forecast of average smartphone user's data consumption"). The forecast is for video to expand from 3.4GB/month for the average smartphone user to 16.3GB/month, an increase of almost 480 per cent. Overall that means an increase of the monthly data consumption per user from 5.6GB to 20.9GB, almost quadrupling the data load for networks.

The solution to this data increase will be a shift towards new technologies and, whilst it might be tempting to assume that take-up of these new solutions might be slow, the Mobility Report for Middle East and Africa predicts a healthy future for new tech. By 2024 the majority of subscriptions in the Middle East and Africa will be WCDMA/HSPA and LTE. "At the end of 2018, WCDMA/HSPA connections represented almost half of all subscriptions in the Middle East and Africa, rising only slightly until 2024," said the report. "On the other hand, GSM/EDGE subscriptions are expected to decrease significantly from 41 per cent of the total subscriptions in 2018 to 10 per cent in 2024. LTE subscriptions are forecast to have the highest growth at 23 per cent Compound Annual Growth Rate (CAGR) between 2018 and 2024." The driving factors for this are likely to be increased mobile communications service provider investment in 4G networks, as well as the rising usage of data-intensive mobile services in the region.

In sub-Saharan Africa the highest growth is forecast to be in LTE subscriptions, 34 per cent between 2018 and 2024. Although older technology will still be relevant with GSM/EDGE subscriptions comprising 13 per cent of the total subscriptions in 2024. The report says that the increase in smartphone penetration will continue to drive service providers' investment towards mobile broadband technologies, as well as WCDMA/HSPA and LTE networks.

"High urbanization rates in the Middle East and increasing urbanization in Africa are encouraging service providers to migrate previous GSM/EDGE-only connections to WCDMA/HSPA and LTE," says Ericsson. "Rural network expansion also remains high on the service provider agenda, especially in sub-Saharan Africa. In 2018, several 5G trials commenced in the Middle East, while spectrum challenges continue to be discussed among regulators."

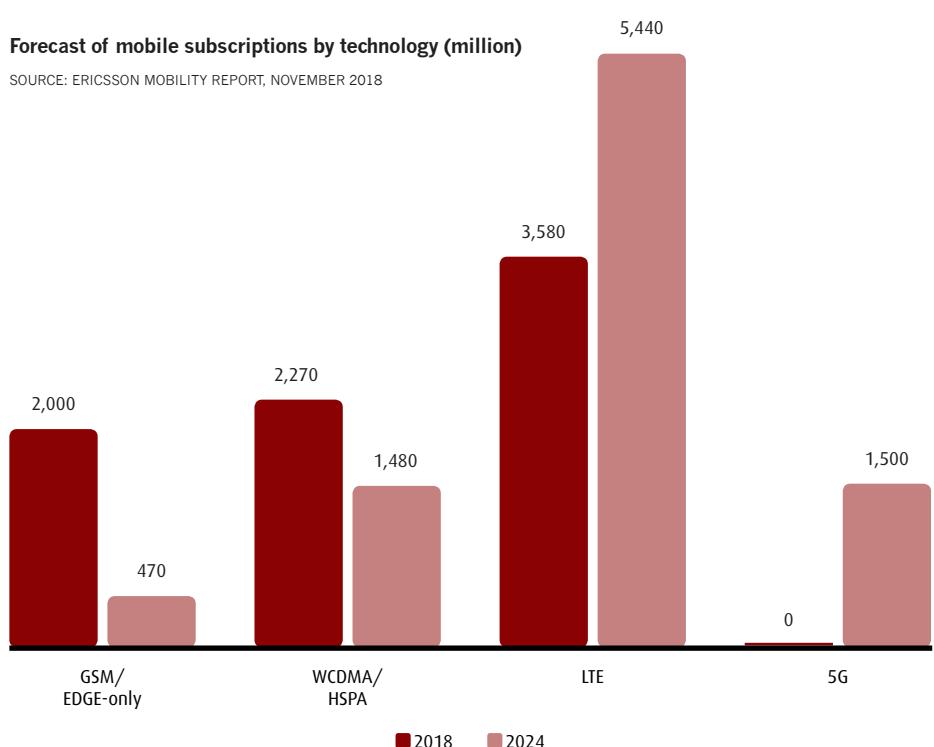
The sub-Saharan disconnect

Sub-Saharan Africa (SSA) continues to be the largest non-internet population in the world, according to GSMA Intelligence's *Global Trends 2018* report. The Indian subcontinent is next but the figures show that is changing quickly.

SSA is lagging behind because rural coverage is still a major challenge, claims the report, but internet access isn't just a developing world challenge. "In the US and Europe, 300 million people are non internet users even though they

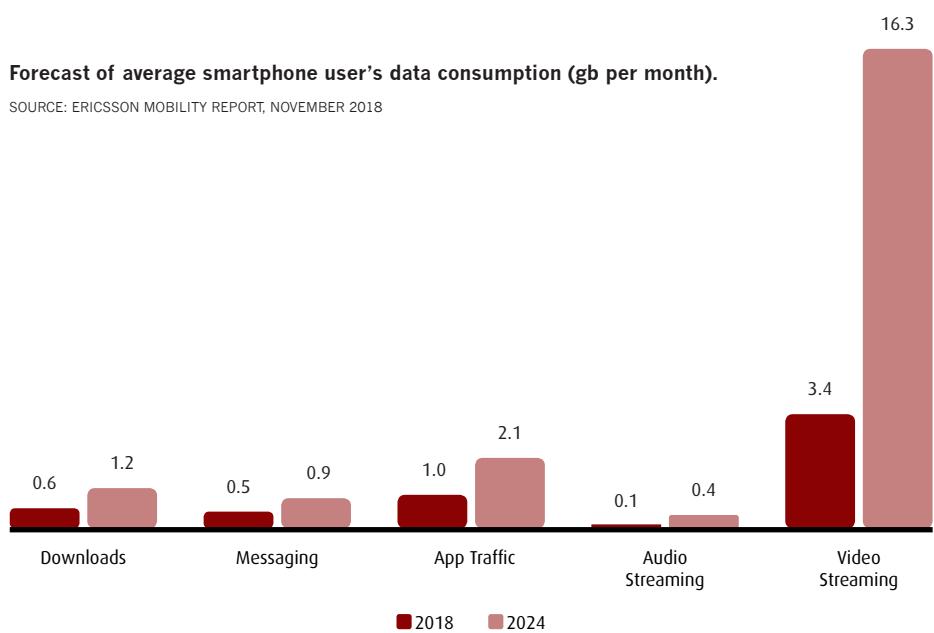
Forecast of mobile subscriptions by technology (million)

SOURCE: ERICSSON MOBILITY REPORT, NOVEMBER 2018



Forecast of average smartphone user's data consumption (gb per month).

SOURCE: ERICSSON MOBILITY REPORT, NOVEMBER 2018



live within range of a 3G or 4G mobile network. Stripping out the very young and old, this would appear mostly to come from low-income segments, constraining anything from basic information access to social mobility," says GSMA Intelligence.

However, it's definitely SSA that's having the hardest time connecting users to the mobile internet. Only 21 per cent are connected to the mobile internet, with the next least-connected region being south Asia with almost 28 per cent and then MENA at 38 per cent. Coverage is clearly the issue with south Asia having only just under 16 per cent and MENA just under 15 per cent of potential subscribers not covered by at least 3G. SSA, however, has 40 per cent of its population not covered by mobile internet technologies.

The *Global Trends* report suggests that this isn't necessarily going to improve much as the

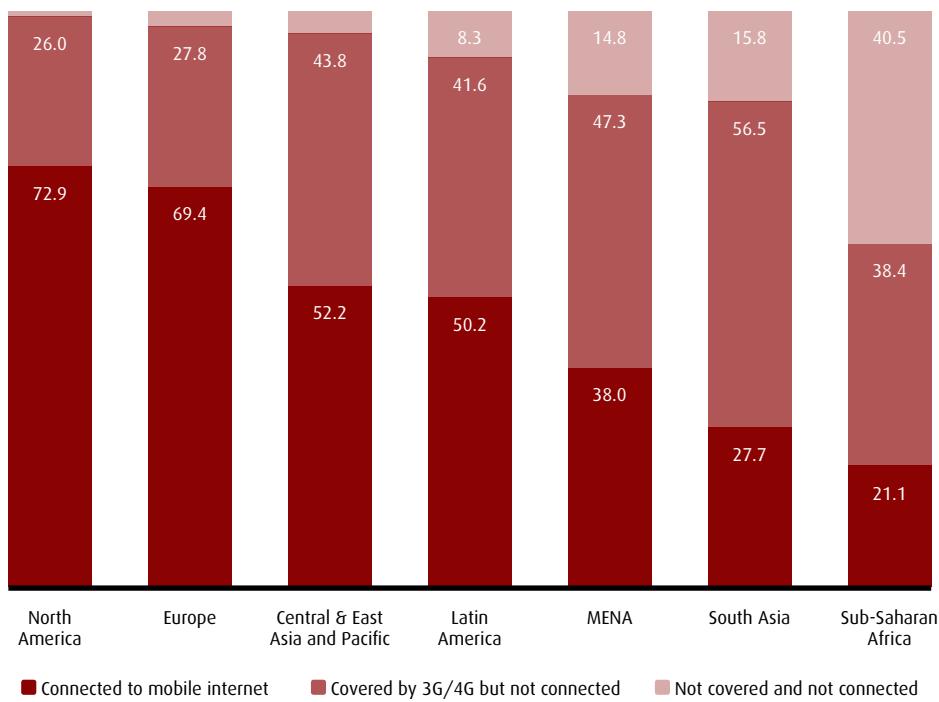
figures for mobile subscriber growth is now in single digits and predicted to fall below 5 per cent between 2020 and 2025 (see "Connected, covered, and unconnected population" p18). That being said, that kind of rate is still about twice that of the global growth expected over the same period.

Operators will need to target the right kind of customer and GSMA Intelligence suggests that this will be the around 40 per cent of the population who are 14 years and under - a demographic which tends to have a significantly lower level of mobile phone ownership compared to the rest of the population. The forecast is that future growth will be driven by that segment, with a "considerable opportunity" for services which can appeal to young consumers. The other challenge will be to try to

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Connected, covered and unconnected population (per cent)

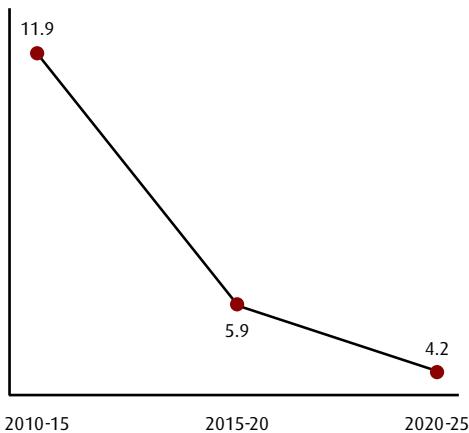
SOURCE: GSMA INTELLIGENCE GLOBAL TRENDS 2018



■ Connected to mobile internet ■ Covered by 3G/4G but not connected ■ Not covered and not connected

Mobile subscriber growth in SSA (per cent)

SOURCE: GSMA INTELLIGENCE GLOBAL TRENDS 2018



increase the coverage for mobile broadband out into rural areas where more than half of the population live.

Other challenges in the region include the adoption of smartphones being hampered by hardware prices, although there has been a growth in the number of entry-level devices at affordable prices, says the GSMA's *The Mobile Economy sub-Saharan Africa 2018 report*. This has driven an increase in demand for data. For example, Vodacom in Q1 2018 reported a 65 per cent year-on-year growth in data traffic across its international operations in the region. Operators have much to gain as demonstrated by MTN which reported a 56 per cent increase in data traffic, leading to a 27 per cent increase in data revenues.

SSA is behind not only the global figures for smartphone adoption, but also those for

developing markets. The global figure was 59 per cent in 2017, with developing markets at 55 per cent, and SSA with only 34 per cent. By 2025, SSA will have closed the gap. Global figures are predicted to be 79 per cent, developing markets at 78 per cent, and SSA only 11 per cent behind other developing markets at 67 per cent (as opposed to 21 per cent in 2017).

Regional economies

GSMA Intelligence released its usual trio of Mobile Economy reports, for the Middle East and North Africa, sub-Saharan Africa, and West Africa.

In the Middle East and Northern Africa (MENA) by mid-2018, there were 381 million unique subscribers across the region, accounting for 64 per cent of the population. Despite annual subscriber growth of four per cent on average over the last four years, MENA remains the second least penetrated region in the world. According to the report, between 2017 and 2025, the MENA region will see the fastest subscriber growth rate of any region except sub-Saharan Africa, growing above the global average at a CAGR of 2.5 per cent to reach 459 million. By this time, 69 per cent of the population will be mobile subscribers, only slightly behind the global average of 71 per cent.

The importance of mobile communications in Africa was also underscored with it being responsible for 4 per cent of GDP in the MENA region in 2017. This equates to around USD165bn of economic value which is forecast to rise to around USD200bn by 2022, largely as countries take advantage of the improvements

in productivity and efficiency brought about by increased take-up of mobile services.

"Subscribers in the MENA region are increasingly migrating to mobile broadband services," said the GSMA. "Mobile will play a crucial role in providing internet access given the general lack of fixed broadband infrastructure. By mid-2018, mobile broadband connections (3G and above) accounted for just under two-thirds of total connections, with 3G overtaking 2G to become the leading technology across the region. By 2025, 90 per cent of mobile connections will run on mobile broadband networks."

In sub-Saharan Africa, said the GSMA's second report, subscriber growth has slowed in recent years as the industry confronts the challenges of affordability and a youthful population. Growth rates in the region have fallen well below the double-digit annual rates seen in the first half of the decade, and the compound annual growth rate (CAGR) for the next five years is predicted to be around half the level recorded over the preceding five years.

"Future growth opportunities will increasingly be concentrated in rural and low-ARPU markets, as well as younger demographic groups. World Bank data indicates that around 40 per cent of the population in the region are under the age of 16, a demographic segment that has significantly lower levels of mobile ownership than the population as a whole," said the GSMA.

The report quoted unique mobile subscriber penetration in sub-Saharan Africa as standing at 44 per cent at the end of 2017, well below the global average of 66 per cent. The subscriber base in the region was said to be 444 million, equivalent to around 9 per cent of subscribers globally. The penetration rate is forecast to reach the 50 per cent level by the end of 2023, and 52 per cent by 2025.

"For many consumers across the region, mobiles are not just a communication device but also the primary channel for getting online and a vital tool to access life-enhancing services. This is particularly true in rural areas, where around half the population live and where the provision of these services by conventional means is constrained by acute funding, skills and infrastructure gaps," said the GSMA report. "Mobile network assets and services, such as APIs, cellular IoT, mobile money and billing platforms, are enabling sustainable business models for key services across verticals in the region."

The report showed how the number of mobile internet subscribers in the region had quadrupled since the start of this decade. This is set to rise further with another nearly 300 million coming online between now and 2025. The prediction is that the majority of them will be connecting via high-speed mobile broadband networks. Mobile money

services were highlighted as it's a key player in extending financial services to people with limited access to traditional financial institutions. This is particularly problematic for those living in rural areas and for women. The GSMA said that there were 135 live mobile money services across the region at the end of 2017, with 122 million active accounts.

In west Africa mobile adoption has grown rapidly in recent years, helped by the expansion of mobile networks to underserved communities and the increasing affordability of services and device costs. The GSMA reported that by the end of 2017, there were 176 million unique subscribers across the West Africa sub-region - defined as comprising the 15 member states of the Economic Community of west African States (ECOWAS).

"Overall subscriber penetration reached 47 per cent in 2017, up from 28 per cent at the start of this decade," said the report. "Despite the remarkable subscriber growth in the sub-region in recent years, and indeed across sub-Saharan Africa, more than half of the region's population do not yet subscribe to a mobile service. Subscriber growth will be driven by a demographic shift in the coming years, as many young adults take out a mobile subscription."

The GSMA has forecast that around 72 million new mobile subscribers will be added in West Africa, taking subscriber penetration to 54 per cent over the period to 2025. Figures had shown that the transition to mobile broadband was gaining momentum across West Africa. 3G has remained the dominant mobile broadband technology, but 4G adoption is rising rapidly from network expansion and greater availability of 4G devices. The move to more sophisticated, bandwidth-hungry devices is also a strong trend with the number of smartphone connections more than doubling over the last two years to reach 112 million, accounting for 35 per cent of total connections by the end of 2017.

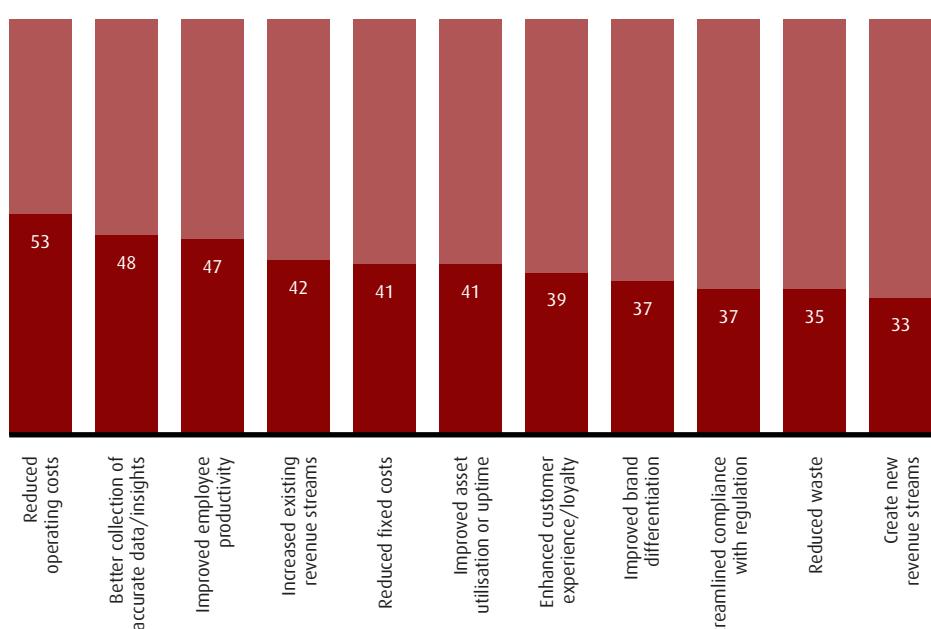
The Internet of Things

The IoT has been showing signs of shifting from a new technology into being an established one. For example, according to Vodafone, the number of companies using IoT has risen to 34 per cent, up from 29 per cent a year ago, and the scale and importance of the projects has grown too.

The operator's sixth *IoT Barometer Report* published in February 2019 said that this increase had been driven by a range of factors, but the key had been the breaking down of the barriers to entry. The company surveyed 1,430 key decision-makers across a selection of regions, company sizes, and job roles. This year Vodafone added a further 328 IoT

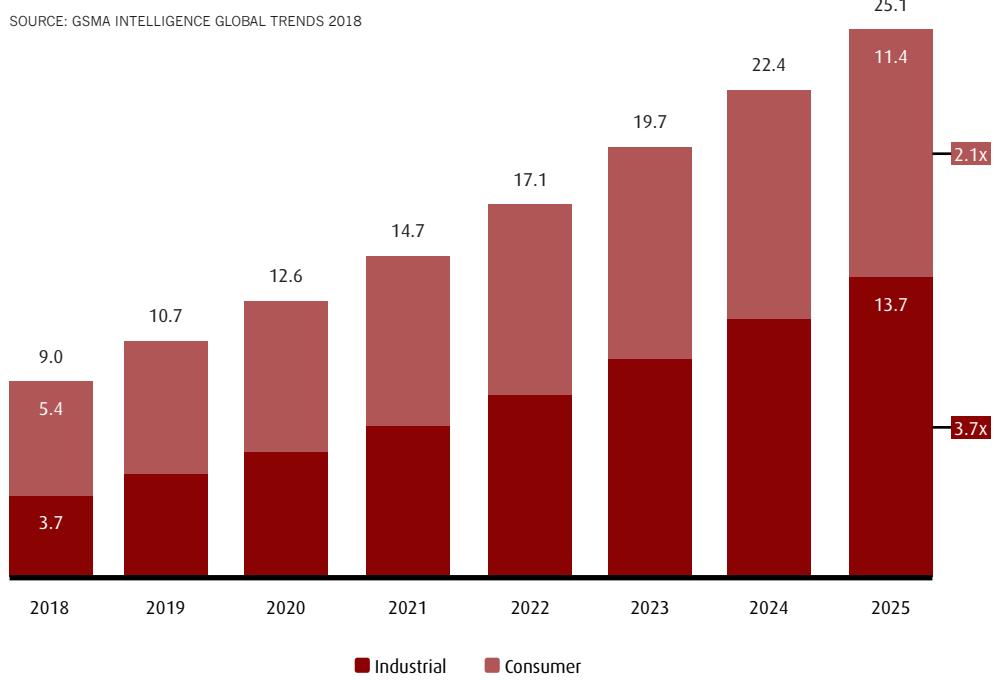
The benefits which adopters of IoT are reporting seeing (per cent)

SOURCE: VODAFONE IOT BAROMETER REPORT



Rise in global IoT volumes – connected objects (billion)

SOURCE: GSMA INTELLIGENCE GLOBAL TRENDS 2018



adopters, to give specific insight into how adopters had been fairing and the benefits that the technology had brought them.

The report found that the most important development was that instead of companies being forced to develop their own IoT solutions that many firms become adopters when they upgrade or replace systems. For example, when updating a heating, ventilation, and air conditioning system or to updating a fleet-tracking solution, the options will now often include IoT functionality by default. Vodafone also said that organisations are starting with off-the-shelf solutions, particularly smaller businesses with less IT resources. "IoT enablement platforms and high-performance connectivity

options like Narrowband-IoT (NB-IoT) are making implementation easier, and 5G will soon drive even greater adoption," claims the operator.

Ericsson, in its *Mobility Report for Middle East and Africa*, said that the early problems of battery life and network bandwidth had been addressed but more importantly cellular connectivity using both 2G and LTE has become the dominant solution for IoT because it solved coverage problems in cities and nations, roaming across borders, and ensured secure end-to-end connectivity.

The limitations of 4G, things like device cost, battery life, and cost of connectivity, were solved with the introduction of NB-IoT

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and Cat-M1 technologies. These increased the power efficiency of IoT devices, leading to fewer replacement batteries having to be changed out, sometimes every few months. New chipsets have also reduced the bandwidth required by the devices, to 20-100kb/s, thereby reducing data costs.

These cheaper, off-the-shelf solutions are driving IoT says Vodafone, particularly in transport and logistics (which rose from 27 to 42 per cent) and manufacturing and industrials (30 to 39 per cent).

The *IoT Barometer Report* claims that the benefits can be realised quickly, with 95 per cent of adopters having already seen “measureable benefits” from their IoT projects. “Over half (52 per cent) have realised significant returns on their investment. Even organisations that have just implemented their first IoT projects report benefits,” says the report.

Adopters are seeing benefits such as improved collection of accurate data (48 per cent), increased employee productivity (47 per cent), better asset utilisation (41 per cent), and enhanced customer loyalty (39 per cent). For the full list of benefits see “The benefits which adopters of IoT are reporting seeing”.

The overall message from the report is clear: IoT can’t be ignored. Over half (55 per cent) of adopters said that IoT had already completely disrupted their industry. As Stefano Gastaut, CEO Vodafone IoT, puts it, “the future of IoT is very exciting, but it isn’t just a technology for uber-innovative startups. Most IoT projects aren’t about creating headlines; they’re about delivering bottom-line results. I believe that we’ve already passed the tipping point and IoT has entered the mainstream. 74 per cent of adopters believe that within five years companies that haven’t adopted IoT will have fallen behind. For many companies, it’s no longer a case of whether or not to implement IoT, but how.”

GSMA Intelligence’s *Global Trends 2018* report gives some idea of the scale of the take-up we might expect over the coming years. The global volumes of IoT devices is predicted to rise from nine billion in 2018 to over 25 billion in 2025. The other shift we are likely to see is that the proportion of devices will tend away from being consumer-aimed (5.4 billion consumer to 3.7 billion industrial in 2018) to being industrial (11.4 billion to 13.7 in 2025). The expansion is only forecast to be 2.1 times for consumer IoT devices whereas the industrial sector can expect an expansion of 3.7 times.

The report suggests that the majority of IoT devices, typically in indoor environment, will be connected by unlicensed radio technologies, designed for short-range connectivity such as Wi-Fi, Z-Wave, and Zigbee. “As the size of the IoT market grows and the ecosystem matures, the business

case for IoT is shifting from just connecting devices to addressing specific problems or needs with solutions,” says GSMA Intelligence.

Satellite

Reaching remote areas in Africa has always relied on the ultimate flexibility of satellite communications, but it has often come at a cost. Q1 2018 saw Northern Sky Research (NSR) reporting on how prices were continuing to fall, for the third year running.

The *Satellite Capacity Pricing Index 4th Edition* said how capacity price declines over 2016-2018 ranged between 32 and 57 per cent on average, across various applications and regions. The report goes on to say that despite innovative strategies from operators to halt this decline “the road ahead appears unclear as greater supply enters the scene, demand lags in some markets and competition intensifies.”

Strategies to stop the impact of the supply-demand price drops include trying to set up vertical-specific market entry partnerships and framework agreements on discounts. However, NSR’s pricing forecast suggests 2019 will still see price decreases, although smaller than in previous years, and that the industry will need to wait longer for prices to bottom out.

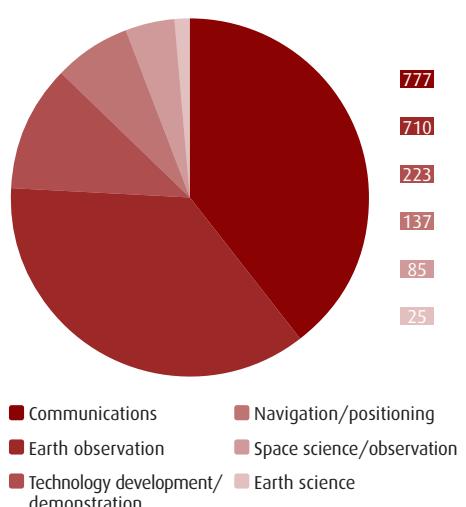
“With Video Hotspots facing pressure from both global pricing declines and OTT opportunities for non-streaming content, along with Consumer Broadband over Ka-band HTS consistently in the USD150/mb/s/Month range - the chances of recovery remain uncertain. However, with CAPEX/gb/s for new satellites marking new lows, declining lease prices come as a blessing to Service Providers in Data and Mobility, so they can fund expansion of their businesses and create mini telco businesses backed by satellite in the scaling process,” stated Gagan Agrawal, NSR Analyst and report author. “The satellite operator segment also increasingly looks to jump on this downstream opportunity where managed services are expected to represent 15-25 per cent of the entire business portfolio in the next 3-4 years.”

NSR predicts that the trend for pure-play MHz leasing to divert towards mb/s leasing deals, fuelled by innovation in ground equipment and increasing spectral efficiencies, might lead to mergers and acquisitions for satellite operators who are struggling with their revenue streams.

It’s not all bad news, however, NSR’s *Wireless Backhaul via Satellite 12th Edition* report, released in April 2018, forecast annual satellite capacity revenues would reach USD4 billion by 2027, serving over 3tb/s of demand. The market researchers suggested mobile backhaul would provide the greatest opportunities, as satellite usage increases

Satellite usage as of November 2018

SOURCE: UNION OF CONCERNED SCIENTISTS



among MNOs and becomes a widespread solution. There has been a revival in trunking due to these lower prices, bringing with it demand from previously un-addressable markets. The report also showed that IP Content Distribution is continuing to make solid progress with thousands of sites now active in this segment.

“Price degradation is making it hard for satellite operators to grow revenues. However, we are approaching a trigger point at which price elasticity will help demand to take off. The topology of deployments is changing radically, from serving tens of USO-driven sites to being a mainstream solution with thousands of units per network,” stated Lluc Palerm, NSR senior analyst and report author. “If MNOs take a pragmatic approach to network deployment, and do the math, they will realize the possibilities of satellite backhaul. However, awareness and perceptions are still holding growth back”.

Advice for operators included making sure that satcoms could find a way to fuse with ground networks, particularly with 5G as it starts to appear. The other major target should be in making the ground equipment solutions easy to adopt for MNOs, a segment where revenues from 2017 to 2027 are predicted to surpass \$2.6 billion, which would then lead to a proliferation of end-to-end services.

Communications is still the key market area for satellite services (777 satellites), closely followed by Earth observation (710), according to an update released by the Union of Concerned Scientists in November 2018. Although satellite numbers are up to 4,987 at the beginning of 2019, a rise of 2.68 per cent from April 2018 according to the Index of Objects Launched into Outer Space, the usage statistics from the Union of Concerned Scientists shows that only 1,957 are currently active - which is actually a 1.16 per cent drop from the previous April.

This is all predicted to change, however, with

the rise of the small satellite market. NSR is predicting 6,500 smallsats will launch between the end of the 2018 and 2027. This is despite a 30 per cent decline in launch rates of small satellites in 2018. The firm's Small Satellite Markets 5th Edition forecasts that the market for smallsats will regain its growth and yield USD37 billion in cumulative revenues from manufacturing and service launches by 2027.

It's predicted that constellations will be the dominating factor of this growth, making up over 70 per cent of the total market. Similarly to the current usage pattern, it's anticipated that communications will drive the largest share of revenues, with some of the largest constellations planned in this segment. Although NSR is forecasting growth for all applications of smallsats.

"New business models are opening new revenue streams and opportunities in the small satellite market", said NSR's senior analyst, Carolyn Belle. "The relative simplicity, and the associated low-cost architecture, are enabling easier access to the space industry. By lowering the barriers to entry, this market is not only impacting the commercial industry, but it's becoming a critical element of STEM education."

The fly in the ointment is that, despite the demand, funding could be a problem for the small satellite market. NSR believes this comes down to investors being cautious of the durability of smallsat solutions. "While a growing market, the small satellite industry does present highly challenging business cases. From LEO constellations to dedicated launchers, long-term sustainability remains one of the biggest concerns," said Shagun Sachdeva, NSR analyst and co-author. "As the technology develops and small satellites grow in applicability, there will be a shift towards hybrid architectures – either through M&As or strategic alliances."

Another potential growth area for operators to concentrate on is that of the Non-Geostationary Satellite Orbit (NGSO) market. NSR's Global Satellite Capacity Supply and Demand 15th Edition predicts that the NGSO annual revenues will "skyrocket" to USD4 billion by 2027. Customers will be offered networking with low latency, full-mesh connectivity, or high bandwidth per terminal, leading to new opportunities and applications for remote areas of Africa.

However, the report also points out the risks, in particular the CAPEX exposure. New revenues might not be enough to pay back the initial investments that are required to get these NGSO networks off the ground. The knock-on consequence of that could be that new players might have to dump capacity, thereby causing a price disruption for the industry at large, at a time where prices are already dropping.

NSR is saying that constellations are approaching their moment of truth. "According to their schedule, LEOs need to start offering concrete examples of progress, but results are still mixed," said Lluc Palerm, NSR senior analyst and report author. "Funding is still far from resolved and even the ones that have already attracted billions in investment still do not have a clear path to service. Delays and cost overruns plague many programs. Regulatory challenges are coming to light with first denials of access to key markets. Technology wise, there are still many questions to answer, beginning with user terminals. On the other side, progress continues in the form of testing satellites, new rounds of funding and establishment of baseband networks."

So far, according to the report, the early progress for NGSO satellites has been dominated by the development of the technology. The challenge now is to move beyond this as constellations are approaching entrance into service and focus on the commercialization of these new networks. NSR recommends that operators that can build a stronger position in key markets, both regionally and vertically speaking, will have a higher chance of success.

It also appears that partnerships between traditional GEO-focused firms and new constellations are also proliferating. "This creates a symbiotic relationship where GEOS can access new markets developed by NGSOs, while the new actors can leverage the long-standing customer heritage and sales channels of established operators," said NSR.

The State of LTE in Africa



Joe Barrett,
president,
GSA

According to the latest LTE and 5G statistics from the Networks, Technologies and Spectrum Database published by GSA (Global mobile Suppliers Association), there are 832 operators worldwide investing in LTE including pre-commercial trials. Of those, 717 operators in 214 countries have commercially launched either LTE or LTE-Advanced (LTE-A) networks.

Africa represents a small but growing and increasingly important part of this ecosystem. In North Africa, 15 operators have launched LTE (either offering fully mobile or fixed wireless broadband services) and of these, seven have launched LTE-A with two operators in a testing phase. In the larger sub-Saharan Africa region, 148 operators are investing in LTE, with 120 networks launched; 23 of these have deployed LTE-A, and a further four plan

to deploy LTE-A or are testing the technology.

Globally, the African region as a whole now accounts for 19.8 per cent of the total number of operators investing in LTE and 18.8 per cent of all the commercially deployed networks.

Africa has also seen a number of operators deploy LTE-TDD technology mode in unpaired spectrum. Twenty-eight operators have now launched commercial mobile or fixed wireless broadband services based on TD-LTE (27 of them in sub-Saharan Africa).

Generally, Africa has been keen to adopt the 3GPP standards and LTE technology, although most of the countries globally that are currently without LTE are either on the continent or islands in the Pacific and Atlantic Oceans. In total, there are 43 countries around the world that have not yet deployed LTE for at least one mobile or fixed wireless broadband network. Twelve of these are in Africa, equating to 28 per cent of the total. They are Cabo Verde, Central African Republic, Djibouti, Equatorial Guinea, Eritrea, French Southern Ocean Territories, Guinea, Mauritania, Niger, São Tomé and Príncipe, South Sudan, and Western Sahara.

Even so, Africa has increased its share of LTE networks and operators investing in the technology during the past two years. LTE was first launched in Angola in 2012 and Africa has benefited from an established ecosystem of infrastructure and devices. Growth was initially slow, but in the past two years dozens of operators have launched commercial services.

LTE-Advanced Pro is also gaining traction. Networks supporting 3GPP release 13/14 have been launched by Ooredoo in Tunisia and by Vodacom in Lesotho and South Africa. At least four other operators are planning to deploy or are deploying LTE-A Pro networks.

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 twelve African networks, with eight 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.

African subscriptions

According to Ovum, the number of mobile subscriptions in Africa totalled 1.047 billion by December 2018. In absolute terms 3G was by far the fastest growing mobile technology in Africa. The number of new 3G subscribers increased at a robust pace (up in 2018 from 380 million to 465 million). GSM technology

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was in decline last year, but was still the biggest mobile technology on the continent with nearly 511 million subscribers by the end of 2018.

LTE is however, gaining a foothold in Africa, especially in the sub-Saharan region. LTE subscriptions reached 67.5 million by the end of 2018, up nearly 70 per cent from 39.8 million at the end of 2017. As it becomes the preferred technology, eventually delivering a Gigabit service, GSA expects a migration from 3G to 4G/LTE and then eventually, 5G.

Spectrum

In Northern Africa, the predominant LTE spectrum used is in band 3 (1800MHz) and band 20 (800MHz), with band 3 known to

be utilised for LTE by more than 60 per cent of operators. In sub-Saharan Africa there is a much wider spread of spectrum bands in use. Around 30 per cent of operators are understood to be using band 3 in their commercial networks. The next most used band is band 20 (nearly one fifth of networks). TDD band 40 (2300MHz) and FDD band 7 are also well used.

5G for Africa

Network vendors and operators are currently testing and deploying 5G in multiple locations around the world and GSA reports on these trials and the spectrum that is being used. Whilst they are not yet ready to

launch commercial 5G services en masse, African operators have been investing in 5G. 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. Comsol and MTN have both launched test 5G fixed wireless access networks and Rain has turned on 5G base stations at its headquarters in South Africa. Meanwhile operators in Algeria, Morocco, Nigeria and Réunion are known to be testing or trialling or have announced plans to deploy 5G networks. Early 5G trials and deployments in Africa have used spectrum at 3.5 GHz, 3.6 GHz and 28 GHz. ■

The following forms part of a larger report produced by Julian Bright, senior analyst at Ovum, called *Fixed-Wireless Access Drives Broadband Development in sub-Saharan Africa*
Read more from the report and about FWA on pages 49–54.

Evolution of LTE

The ongoing evolution of LTE associated with LTE-A and LTE-A Pro is enabling typical download speeds for FWA of up to – or even in excess of – 50mb/s, and the use of technologies such as space division multiplexing means that today's LTE-based FWA systems are many times more spectrally efficient than a comparable mobile broadband network.

As the technical capabilities of fixed-wireless systems evolve in line with advances in LTE technology, so they can deliver the greater spectral efficiency and improved levels of performance also seen in mobile networks, along with the economic advantages associated with the mature LTE ecosystem such as reduced price per bit and overall deployment costs. FWA systems additionally benefit from a relative lack of complexity, consistent and guaranteed quality of service, and rapid deployment.

The evolution of LTE and decreasing price per bit of the base station (put by one estimate at 100 times in the past 10 years) are giving operators the confidence to expand the use of FWA in their networks (see Table).

The business context

All of the major MNOs and ISPs in South Africa are rolling out FWA. Ovum estimates FWA subscriptions to be 1.3 million in South Africa in 3Q18, representing 65 per

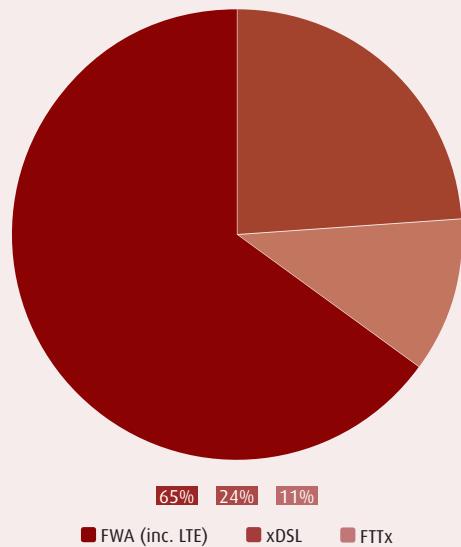
cent of the total fixed broadband market and having grown from just 22 per cent of fixed broadband subscriptions a year earlier (see Figure 1). The number is forecast to grow to nearly three million by 2023. This high level of FWA market growth, which can be attributed in part to factors such as the expansion of LTE network coverage and the introduction of flexible tariff options for FWA services (including prepaid), is forecast to continue.

Price flexibility is key

Home broadband networks, whether fiber, DSL, or FWA, are subject to the same limiting factors: population density, subscriber take rates, ARPU, CPE device cost and availability, network contention or oversubscription rates, and labour costs. ■

Figure 1: South Africa fixed broadband usage by technology (3Q18)

SOURCE: OVUM



RELATIVE ADVANCES IN SPECTRUM EFFICIENCY

Downlink/uplink	Condition	Spectrum efficiency (bps/Hz)
Downlink	GSM (with HR + VAMOS)	0.22
	UMTS (with 2x2 MIMO +64QAM)	1.2
	LTE (with 2x2 MIMO +64QAM)	1.7
	FWA LTE-evolution 64T64R (with 8x8 MIMO + 256QAM)	13
Uplink	GSM (with HR + VAMOS)	0.08
	UMTS (with 1x2 MIMO + 16QAM)	0.6
	LTE (with 1x2 MIMO + 16QAM)	1
	FWA LTE-evolution 64T64R (with 8x8MIMO + 64QAM outdoor CPE)	6

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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.

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Moving Wireless Forward

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. We have grown and evolved over the years, along with the industry.

Today, we benefit from enhanced design capabilities and expanded production capacity – along with a greater understanding of new and emerging markets – all of which have allowed us to become one of the best antenna developers in our field.

Our customers have been our partners throughout the years. We believe in taking the time to understand our customers' individual needs. Through close consultation with clients, we are able to deliver innovative, tailored solutions that meet specific antenna requirements.

Rapid prototyping capabilities allow us to take our designs from concept to reality in an extremely short time span, and to verify the performance of the antenna. A variety of network analyzers and an anechoic chamber enable us to conduct measurements up to 13 GHz, and ensure that the antennas designed meet or exceed customer requirements.

We have onsite injection molding equipment and a fully equipped modeling shop staffed with skilled model makers to assist in the design phase and help us come up with a superior product – an antenna that not only meets the customer's electrical specifications, but is also very attractively packaged.

Mobile Mark antennas are used in many sectors of the wireless industry. Here are just a few examples:

Asset Tracking & RFID

Managing and tracking important assets can be a challenge in the field, and both RFID and WiFi offer effective wireless solutions. RFID / WiFi technology allows us to identify, monitor and track items ranging from medicine to fruit to parcels to people. Since each application has its own challenges, Mobile Mark offers a range of antennas so network developers can choose the right mix.



**We are now looking for
distributors throughout Africa**

Commercial Fleet Management

Mobile Mark has consistently lead the industry with the most extensive and innovative range of antenna solutions that combine multiple wireless technologies: from simple GPS & Cellular antennas to complex 6-cable antennas combining LTE MIMO, WiFi MIMO, DSRC and GNSS in the same antenna housing. This combination of wireless technologies allows fleet owners to track and/or redirect their fleets of cars and trucks for optimum efficiencies. Mobile Mark antennas are rugged enough to handle tough environments and efficient enough to maintain reliable connections.

Public Transit & Bus Management

From monitoring the location of the bus to monitoring the condition of its tires, wireless has become an essential part of professional bus management. Mobile Mark's multiband antennas allow the system to capture that information and transmit it back to a central monitoring station with real-time connectivity. For an added touch, real-time WiFi service can also be added for the passengers. That's why companies like INIT have selected Mobile Mark antenna to complete their product offerings. And they have made the following endorsement:

"INIT GmbH – as a worldwide leading supplier of integrated planning, dispatching, telematics and ticketing systems for buses and trains – uses Mobile Mark bus antennas in public transportation projects all over the globe.

For example: INIT has installed Mobile Mark antennas in projects located in Abu Dhabi, Hertfordshire UK, Turku Finland, Oslo Norway, Montreal Canada, Luxembourg, as well as several German projects.

In 2017, a fleet of more than 1,500 buses will have Mobile Mark Antennas installed in one of INIT's

current major projects for National Express, West Midlands, UK."

Remote Monitoring & Surveillance

Surveillance plays an important role in maintaining secure settings. Network deployments need to be low maintenance and weather resistant. Broadband surface mounts offer flexibility for multi-frequency coverage and are rugged and dependable. YAGI antennas provide practical point-to-point coverage. Our antenna solutions are designed to handle tough conditions while providing the reliable wireless connection you would expect from a Mobile Mark antenna.

Mining & 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.

Smart Cities & Smart Highway

For cities and highways, the lynchpin of a successful "Smart" system will be dependable wireless connections. Companies like Kapsch understand this, and have worked with Mobile Mark to find ideal antenna solutions. Wireless networks must reach seamlessly into hard-to-cover corners of city intersections and along vast expanses of highways. They must be carefully embedded in city lighting and electrical meters. Mobile Mark offers both small network infrastructure as well as embedded antenna elements to help network designers tie all the pieces together.

Let us know how we can help

We understand the RF wireless world and are ready to help you evaluate your options. Contact us by email, phone or fax and let us know how we can help.

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chapter 2

Cellular networks



**Alan Hadden,
mobilecomms
consultant,
Hadden Telecoms
Limited**

The arrival of 2019 brings much excitement for the industry, politicians and all stakeholders as the year of accelerating 5G network deployments and anticipating development of new device ecosystems. Last year 13 network operators launched 5G networks including in Africa. Last August Vodacom announced that it had launched Africa's first standards-based commercial 5G network in Lesotho, which uses 3.5GHz spectrum. The company launched fixed-wireless service delivering 700mp/s, and at the time announced connection of the first enterprise customers. In 2019 another 40-50 operators worldwide, maybe more, are expected to launch 5G – including in South Africa.

The first 5G user devices are in the market (CPEs/gateways and mobile hotspots/mifi) and the first 5G smartphones have been officially launched, some in a new "foldable" form factor. The newly emerging 5G devices in most cases will be fully compatible with 4G/LTE and earlier generations of cellular technology. In this first phase 5G primarily will mean the opportunity for operators to deliver enhanced mobile broadband services - "eMBB" which represents the continuation and development of mature 4G business models. 5G operators will depend heavily on legacy 4G/LTE networks – especially in the early years of limited network coverage using the new technology. Finnish operator DNA recently announced the company will continue to improve its 4G network in parallel to the 5G investments, saying "in our view, 4G will remain the primary mobile communication network technology for a long time still". Deutsche Telekom, a leading 5G proponent in Europe, recently confirmed the company will raise the number of mobile base stations in Germany from 29,000 currently

to 36,000 in 2021. The LTE expansion will help Deutsche Telekom fill coverage gaps in mobile communications and increase bandwidths. Population coverage is set to increase to 98 per cent this year and DT said "this expansion is an important component for the future 5G network".

Operators in Africa continue to fully embrace 4G/LTE and LTE-Advanced technologies though availability of adequate spectrum remains a challenge in many markets. Increasing use of carrier aggregation in some cases combined with new modulation schemes (256QAM on the downlink) and new antenna configurations (4x4 MIMO) ensures more capacity and enhance performance, however in the longer term more spectrum is needed. Considering future evolution to 5G, all African nations should strongly support measures to secure much-needed new spectrum for 5G services, which will be decided later this year at ITU WRC 19. Harmonised frequency arrangements are key. 5G needs spectrum below and above 6 GHz. The European 5G "pioneer bands" to be sought at WRC-19 are 700 MHz (broad reliable coverage), 3.6 GHz (urban mobile data speeds for towns and cities) and 26 GHz (maximum hot spot data speeds).

While 5G grabs the headlines it's clear the important role that 4G/LTE has in a developing 5G world. Investments in 4G/LTE are future-proof and worthwhile for many years to come. The LTE success story is strong and is growing in all regions. My recent research for my company confirmed:

T729 operators in 220 countries/territories have commercially launched 4G services on LTE or LTE-Advanced systems. 61 operators launched 4G/LTE services in the past 12 months, representing 9.1 per cent annual growth

1800 MHz is easily the most widely used band for 4G/LTE deployments and is in commercial service today by 377 LTE operators, i.e. 52 per cent of all LTE operators. Next come EU 800 MHz (band 20) and 2600 MHz (band 7). One or more of these bands are also often used in Africa.

Reframing of other 2G and 3G bands for LTE-LTE-Advanced deployments is a significant trend (e.g. 2100 MHz band 1, and 900 MHz band 8).

159 operators in 80 countries are using TDD spectrum either exclusively or within a converged FDD-TDD network build strategy, 284 operators, i.e. almost 40 per cent commercially launched LTE-Advanced or LTE-Advanced Pro/4.5G systems.

One third of LTE operators are making VoLTE-related investments of which 182 LTE operators (1 in 4) have launched VoLTE voice calling in 86 countries (including 11 African markets). 19 operators have introduced EVS (Enhanced Voice Services) superwideband speech audio coding in 14 countries, 98 LTE operators offer VoWiFi (voice calling using a WiFi network) in 52 countries.

The market for the Cellular Internet of Things (CIoT) segment is developing quickly in all regions thanks especially to strong industry traction for globally standardised LTE-based solutions Cat-M1 and NB-IoT. The current market status is:

- * 79 operators have commercially launched NB-IoT networks in 45 countries
- * 35 operators have launched Cat-M1 networks in 25 countries
- * 23 operators (included in the above) have deployed both technologies in 20 countries.

"Considering future evolution to 5G, all African nations should strongly support measures to secure much-needed new spectrum for 5G services"

CELLULAR NETWORKS: YEAR IN REVIEW

The push for 5G

Having made great leaps with 4G in 2017, 2018 saw operators preparing for the inevitable move to 5G. MTN and Ericsson claimed a first in Africa with the trial of 5G technology and applications.

The demonstration took place at MTN's headquarters in Johannesburg in January 2018 following a MoU signed between the two companies at AfricaCom in the preceding November.

The trial was based on 5G prototype radios and commercially available baseband hardware, with 5G mobility supported. According to Ericsson, it saw throughput rates of more than 20gb/s with less than 5ms latency which was claimed to be the highest achieved on an African mobile network.

The vendor added that MTN had been assessing a range of 5G use cases and applications in its test lab proof of concept which was expected to then lead to commercial deployment. The two companies also said that they were continuing to collaborate on identifying further use cases and applications for the digital transformation of industries such as mining, transportation, agriculture, manufacturing and utilities.

MTN SA CTIO Giovanni Chiarelli said that 5G offers a whole new world of potential for South Africa and the continent: "With 5G, remote healthcare through connected robots could offer world-class surgery in the most remote parts of



During the demo, the driver's windscreen was obscured and he had to rely on a VR headset fed by a real-time 5G signal to navigate

the continent and the world. Self-driving cars could change the face of road safety, along with smart agriculture, smart mining, and smart cities."

Chiarelli added that while the technology will offer higher speeds and lower latencies, greater capacity is needed to achieve this. "Thus, once again we call on the government to urgently release the much-needed spectrum that is required in South Africa, to lower the cost of data and drive growth and development for all South Africans."

Later in the year, Ericsson and MTN teamed up again to claim another first in Africa by demonstrating 5G mobility in a moving vehicle.

Towards the end of June 2018, the two partners announced they had "validated the technological prowess" of 5G wireless technology in a trial that involved a live feed from a car on a skid pan at the Gerotek testing facility in Pretoria.

The setup comprised four radio units, baseband equipment, a prototype of 5G user equipment with an external antenna installed in an SUV, a 4K video camera, and a VR headset.

All the hardware was connected to a live 5G network using 100MHz TDD spectrum in the 28GHz band. Spectators were able to view the driver's surroundings whilst moving around the track, allowing them to experience what the driver was seeing in real-time.

Ericsson said the demonstration was then taken further by fully obscuring the driver's windscreen, leaving him to navigate the track by using just his VR headset and the live feed from a 4K video camera.

The company said this was possible due to a throughput of more than 1.6gb/s and less than 5ms latency on the connection, and claiming this had set a new record of mobile 5G performance in Africa.

"Using pilots like this, we are not only assessing and preparing our network to roll out 5G in the future, but we are also future-

proofing our infrastructure to enrich customer experience and take industries to the next level," says Wanda Matandela, chief business enterprise officer, MTN SA.

New technology

It wasn't just 5G that was improving matters for African operators. There were other technological advances, such as a rapid deployment solution for base stations from Webb Industries. The firm developed a telecoms mast which it claimed did not require concrete or any excavation, whilst offering a very low environmental impact.

The South Africa-based RF ancillary equipment specialist said that its Rapid Deployment Solution (RDS) has a load capacity of 8m² over the top 10m which would make it possible for multi-customer use, and that it could be reused, relocated, and erected on almost any site, both urban and rural.

Webb engineer Mike Kruger said that while a standard greenfield site can take 21 days or more to complete, an RDS mast that is, for example, 36m in height, can be fully deployed in three days, resulting in a significant price and 'time to market' advantage.

The RDS includes a 7.2m x 7.2m base substructure, tower, fencing, universal equipment cabinet, all underground ducting, full-site earthing and an aircraft warning light system. "In essence, all that has to be done is to bring power to the site, draw the cable through the ducting sleeve, and the system is ready to go," said Kruger.

Webb says its solution saves on rigging and installation costs due to short time spent on site, and that erection is quick and easy without the need for a crane. There are also further cost advantages because there is no concrete used in the structure's foundation

JANUARY 2018

Flexenclosure has completed the deployment of a second set of its eSite hybrid power systems in Morocco. They have been installed at sites for an unnamed telco across Morocco where they are now fully operational. The deployment includes hybrid systems that are powered by diesel-battery as well as solar, as required by each base station location. Flexenclosure worked with Telcabo in-country, with Telcabo delivering all site-related services. "In hard-to-reach off grid areas, eSite enables us to simplify and streamline our ongoing operational responsibilities," says César Mesquita, CEO, Telcabo Maroc.

FEBRUARY

Conference calling FreeConferenceCall.com has launched its free conference calling

services in Malawi. It's claimed the country now has "instant and limitless access to the best possible high-definition audio, video and screen sharing experience". Malawi joins Tanzania, Kenya, Nigeria and South Africa on a growing list of countries in sub-Saharan Africa with free international conferencing. US-based FreeConferenceCall.com says it delivers a cloud-based technology that focuses on simplifying collaboration between users and without any fees. The firm says its revenue-sharing model boosts traffic and rapidly builds minute volume.

MARCH

A deal is announced that's claimed to be one of the largest LTE rollouts in Africa. Nokia will modernise around 11,000 radio sites for Orange in Egypt, Côte d'Ivoire, Cameroon, Senegal, Mali,

Guinea-Bissau and Niger. Under the three-year programme, Orange will use the vendor's Single RAN and network management technologies to support existing 2G and 3G subscribers while enhancing speeds and coverage as it launches 4G. To facilitate the deployment, Nokia has set up a dedicated West and Central Africa Support Centre for the operator.

APRIL

African firm Mara Corporation is promising to launch a unique and high-quality smartphone across the continent in the next few months. The Mara X will be launched as part of Google's Android One portfolio and will run the company's latest OS, Android 8.0 Oreo. It promises to be "extremely affordable" and feature a "carefully curated" set of preinstalled



Left: Webb says this site with a 36m mast was fully deployed in three days. Right: the foundation consists of a steel platform base that is filled with suitable compactable material. No concrete is used

the bandwidth; quantum security, so that we have a hybrid classical-quantum link."

Cheng added that while existing FSO systems are able to comfortably sustain gigabit connection speeds over multi-kilometre distances, with further research and development into advanced digital signal processing and coding schemes, this may be increased "dramatically with relatively little expense".

The Wits team are concentrating on connecting communities with FSO links which they describe as a network of communication channels through air, much like Wi-Fi but much faster and with a longer reach. They are working towards a multi-hop FSO link that will cover tens of kilometres.

"Light holds tremendous promise for fast connections across medium distances," said Forbes. "Even Google, Facebook and SpaceX have exotic proposals for Africa that include drones and other aerial vehicles delivering connections in a blanket manner. We are working on point-to-point solutions with sustainable photonics that are home-grown."

Not all of the improvements were out of view of subscribers. Vodacom South Africa partnered with device manufacturers to introduce Super High Definition (SHD) voice,

also known as HD Voice+, in a live commercial network. Subscribers using a compatible handset on the Vodacom network, thanks to the upgrade, could now experience improved voice clarity made possible by the Enhanced Voice Services (EVS) codec.

Vodacom launched Voice Over LTE (VoLTE), which is necessary for SHD voice, three years ago and said it was now going to pioneer the evolution of this technology in South Africa with EVS being the successor to the current HD Voice codec called AMR-WB (adaptive multi-rate wideband).

EVS is designed to offer up to 20kHz of audio bandwidth, and is claimed to be able to deliver speech quality that matches hi-fi audio sources. In addition, Vodacom said the codec had been shown to provide coverage gains for users at the network edge. It said this will translate in better voice quality performance in conditions where cell coverage might not be optimal.

The company continued by saying that without EVS, VoLTE offers more than double the bandwidth available over 2G voice, and is similar to the 3G WB AMR codec (23.85). But with the addition of EVS, bandwidth is again increased, further improving speech quality when using EVS-SWB (Super Wideband).

Improvements for subscribers

Subscribers competing in Africa always have to be on the look-out for what might be the next feature to attract customers. Zamtel stepped up by offering what it claimed was the network with widest coverage in Zambia.

The state-owned Zambian operator commissioned the first ever tower in Dundumwezi in Kalomo, Southern Province. More than 20,000 people in the area are now finally to be connected to the world via telecoms.

Speaking at the launch event in early May

which consists of a steel platform base that is filled with suitable compactable material.

Increased pressure on the backhaul segments of operators' networks saw a potential breakthrough thanks to a team of international researchers at the University of the Witwatersrand in Johannesburg (Wits) who are using free space optics (FSO) to address the problem of bridging Africa's digital divide.

While FSO is not new technology, the Wits team announced that they believed innovations in 'sustainable' photonics technologies such as FSO links and solar-powered equipment would provide developing countries with new cost-effective opportunities for deploying future-proof telecoms networks.

The new research would be coordinated by Professor Andrew Forbes from the School of Physics and Professor Ling Cheng of the Electrical and Information Engineering department.

Forbes said: "What we are doing is to incorporate two aspects not traditionally part of FSO: mode division multiplexing using several 'patterns' of light at once to increase

apps. The Mara Group began as a small IT business in Uganda and has since expanded to become a multisector investment company that now employs over 14,000 people across 25 African countries and three continents.

MAY

Orange DRC to roll out LTE. Orange DRC has obtained a license to offer 4G services in the DRC. It will be the country's first celco to offer the technology. With the announcement of the news in May, Orange said its subscribers in the DRC were set to "experience a revolution" in their internet use. It said the acquisition of the license will enable it to contribute to economic and social development in the republic thanks to the opportunities offered in e-commerce, e-health and e-education.

Additionally, Orange said it also planned to extend its 3G+ coverage to 100 per cent of its network in the DRC "shortly".

JUNE

South African MNO Cell C has taken legal action after the country's regulator gave operators just one month to comply with an amended version of the End-User and Subscriber Service Charter Regulations (ESSCR). On 7 May 2018, the Independent Communications Authority of South Africa (ICASA) published its amendments to the regulations and said they would come into force on 8 June 2018. According to ICASA, the ESSCR of 2016 needed to be amended because of general concerns about the unfair business rules imposed by licensees in the provision of data services to consumers.

"In particular, the regulations seek to grant consumers relief against expiry of data, bill shock occasioned by lack of transparency on out-of-bundle charges and other rules which are prejudicial to consumers," said the authority.

JULY

MTN was the most complained about mobile operator in Nigeria for 1Q18, according to the Nigerian Communications Commission's (NCC) latest consumer complaints report. The NCC said it received a total of 13,880 complaints during the quarter from subscribers using its specially set up toll-free number, web portal and various social media channels. This is a 20 per cent decrease from the 17,247 complaints received during Q417. Forty-four per cent of the complaints were about MTN followed by Airtel

CELLULAR NETWORKS: YEAR IN REVIEW



A prototype of the device that could connect remote places to fast, reliable internet is tested by the team at Wits University

PHOTO: WITS UNIVERSITY

2018, Zamtel CEO Sydney Mupeta revealed that the Southern Province will receive a total of 98 sites out of which eight are already on air at various schools in the region.

He said: "This is an inclusive project that is connecting more and more places that never dreamt of having any network coverage at all."

The deployment in Mubanga Secondary School in Dundumwezi followed another tower having been commissioned in early May at Kafumbwe Boarding School in Katete, Eastern Province. Mupeta said the launch would foster national development and was significant for Katete which is an agricultural and transit town for traffic heading to Malawi in the east and Mozambique in the south. The plans included 113 towers to be deployed across the Eastern Province.

The launches were part of the 1,009 new towers that are being built under phase two of Zamtel's USD280m tower project.

At the beginning of the year in Eswatini, Swazi Mobile, the country's recently launched second mobile operator, announced it could now provide a complete range of voice and data roaming services to its subscribers with the help of BICS.

The Belgium-based specialist provider of global mobile connectivity and interoperability services said it was now enabling the cellco's end-users to benefit from international voice and data services, SMS, signalling, IPX and data clearing services.

at 23 per cent (see charts right). Billing issues accounted for the highest number of complaints received during the quarter at 51 per cent.

AUGUST

The Independent Communications Authority of South Africa (ICASA) will consider future regulations for certain priority markets following an inquiry which is part of its aim to cut the high cost of communications for consumers. They include the retail market for mobile services and the wholesale supply of mobile network services, including relevant facilities, upstream infrastructure markets

BICS said there were around 250,000 inbound roammers in Eswatini at the time, with around 98 per cent travelling from neighbouring South Africa and Mozambique. The firm added that both incoming visitors to and outgoing roammers could now take advantage of its wide portfolio of worldwide partnerships across a 4G network.

Swazi Mobile CEO Wandile Mtshali said: "The immediate access to over 800 of BICS' partners will give our customers the ability to roam like never before, and BICS' PoP in Johannesburg will provide us with a competitive differentiator through service quality."

BICS said that its South African PoP meant regional traffic would be managed and switched locally, thereby providing "outstanding quality" by reducing latency which is critical for 4G. It added that mobile users in the region would now be able to benefit from its "one-stop-shop" roaming solution.

Roaming was also at the forefront of Kirusa's smartphone app, which was announced at Mobile World Congress in Barcelona in February 2018. The app, called InstaVoice ReachMe, was claimed to be easily and seamlessly integrated with a mobile carrier's existing infrastructure to circumvent current roaming infrastructure completely.

The company promised that a significant benefit of its InstaVoice ReachMe technology lay in eliminating "exorbitant payouts" to roaming partners and passing this advantage to frequent travellers. It reckoned this would enable African carriers to offer low-cost roaming packages and plans to their subscribers.

According to Kirusa founder and CEO, Dr. Inderpal Singh Mumick, Africa was on the brink of a telecoms revolution, driven by data. He said that while subscribers are migrating to OTT services such as WhatsApp while they travel, apps like ReachMe are launched in partnership with carriers and are the "perfect" antidote to this problem.

"Roaming teams at mobile carriers have been experiencing a severe decline in revenue as well

incorporating national transmission services and metropolitan connectivity, and the wholesale fixed access market.

SEPTEMBER

Kenya is among five new countries that have joined Sigfox's global network. The IoT service provider will partner with Liquid Telecom to deploy and operate its network in the country. Sigfox says that by expanding the network infrastructure to provide national coverage and accelerating adoption through working with startups and students, Liquid will play a key role in the development of Kenya's IoT industry. The

as attach rates over the years," said Mumick. "Expensive underlying roaming arrangements have resulted in pricing strategies that have [not appealed] to the masses. InstaVoice ReachMe disrupts this arrangement by leveraging cloud, to the benefit of operators and their subscribers."

The path to the future

Progress can often be a challenge and 2018 had its share of challenges but there were positive indicators. For example, the Kenyan regulator reported a positive look for ICT in the country.

The total revenue earned by mobile service providers in Kenya increased by 8.5 per cent to KES252.3bn (USD2.47bn) in the twelve months to June 2018, according to the country's Communications Authority (CA).

In its ICT sector statistic report released in mid-October, the regulator said voice is still the dominant revenue generator at 41.7 per cent. But it also pointed out that research predicts data and mobile money services are more promising revenue streams for the mobile services providers in the future. As of 30 June 2018, the number of active mobile money transfer subscriptions and agents stood at 29.6m and 206,940 respectively, while the value of goods and services transacted over mobile platforms amounted to KES1.4tn.

The number of mobile subscribers in Kenya stood at 45.5 million, a 13.2 per cent rise when compared to the 40.2 million recorded in June



Southern Province minister Edify Hamukale (centre) and local MP Edgar Sing'ombe (left) were among the attendees at the ceremonial commissioning of the tower in Dundumwezi

addition of Kenya along with Austria, Lichtenstein, Romania and Norway bring the total number of countries currently in Sigfox's partnership to 50. In Africa, they also include partners in Mauritius, Reunion, South Africa and Tunisia.

OCTOBER

Parallel Wireless and Telesol are collaborating to connect citizens and businesses in Ghana with 4G wireless services. Parallel will deploy an Open RAN solution which it claims offers low cost, a small footprint and virtualised multi-technology solution to make deployments "easy and affordable" to install.

2017, a 9.1 per cent increase in penetration. The CA found that satellite subscriptions had also increased significantly since the last fiscal year. The authority attributed this to its USF School Broadband Connectivity project which partially requires satellite technology and saw more than 800 public secondary schools connected during 2017/18.

The number of broadband subscriptions rose by three per cent to 20.5 million, up from 19.9 million recorded in 3Q18. The CA said this is due to increased 4G network rollouts as well as expansion of last mile fibre networks. By the end of June 2018, broadband penetration was at 43.9 per 100 inhabitants.

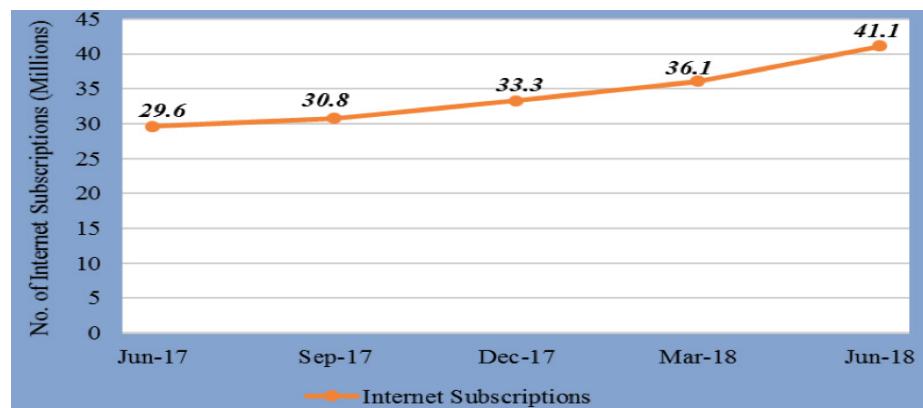
"2017/18 was a year marked with growth in all areas indicating a [prosperous] sector," said the CA. "With the growing appetite for internet in the country, the horizon is bright considering the available international bandwidth capacity of 3,277.720gb/s and the underutilisation of the same to date." The report showed that at the end of the year on 30 June 2018, only 931.370gb/s was in use, leaving plenty of spare capacity.

In Ghana, the government was forging greater links with the mobile industry to support social and economic progress in the country, believing that more public-private collaboration was the way forward.

This all came from a high-level roundtable meeting held in Accra in October 2017, where representatives from the Ghana Chamber of Telecommunications, the United Nations Development Programme (UNDP), the UK government, and the GSMA examined the transformative opportunities presented by mobile-enabled digital services in the country.

Participants signed a commitment to maximise opportunities for mobile to support the UN's SDGs (sustainable development goals) in a range of areas including agriculture, gender equality, financial service access, innovation and entrepreneurship.

However, while Ghana's economy is growing fast and has made progress on many fronts,



All Kenya's ICT indicators are on the up, including increased internet usage

a subsequent report published by the GSMA in partnership with the UK's Department for International Development noted that "significant" challenges remain. For example, it says there is a gender gap in Ghana of around 16 per cent in mobile phone ownership and 17 per cent in the use of mobile money services. There is an even higher gap of 56 per cent when it comes to internet use, with 2.5 million fewer women online than men.

The roundtable emphasised the need for the public and private sectors to work in close cooperation, as well as across many different government agencies that may not typically consider mobile as a tool that can be used to achieve development targets.

In South Africa, ICASA (the Independent Communications Authority of South Africa) was finding itself under fire from operators whilst trying to improve the competitiveness of the market.

ICASA called for all stakeholders to participate in its consultation process about the new draft call termination rates (CTR). The proposed regulations were seeking to further reduce mobile termination rates, because it felt that the wholesale call termination market still remains "ineffectively competitive".

However, South Africa's incumbent Telkom reckons the draft CTRs would see it "continue to effectively subsidise" South Africa's larger MNOs. Group CEO Sipho Maseko said: "ICASA's decision

to reduce fixed termination rates at a faster pace than the reduction in mobile termination rates would entrench the duopoly of the largest mobile operators and reduce competition. It is also out of kilter with convergence in technology."

According to the operator, ICASA has proposed that fixed termination rates (FTRs) should fall by 70 per cent compared to a reduction of only 31 per cent in base mobile termination rates (MTRs). Maseko said this "small" reduction in MTRs represents a "missed opportunity" to cut the cost to communicate for the large majority of consumers in South Africa and "disproportionately targets" Telkom.

The firm also said: "The proposed FTRs require cost reductions that are not feasible within a three-year time frame without significant job losses and do not recognise that the telecoms landscape has changed to such an extent that there is one converged voice market, rather than separate fixed and mobile markets."

Tough enforcement needed

African operators have always suffered from losses due to criminal activity and 2018 saw further pushes to reduce this. In Kenya, the country's ICT cabinet secretary Joe Mucheru called for tough measures on the enforcement of SIM card registration within the East African Community

NOVEMBER

MTN plans to use network technologies developed as part of the Facebook-backed Telecom Infra Project (TIP) to connect users in ultra-rural areas. Companies such as Open Cellular, Parallel Wireless, Fairwaves, among others, have developed equipment based on TIP specifications. These have been designed to be more cost effective than traditional networking technologies. Once MTN has selected its first TIP RAN suppliers, it will reportedly conduct two trials in Nigeria and in Zambia, with 60 cell sites in each trial. Technical evaluation will be made before the new networks are commercially launched.

DECEMBER

Mozambique spectrum sale. Mozambique's government is hoping to raise more than USD220m following a spectrum sale that was due to be held in late October as we went to press. The communications regulatory authority (INCM) was allocating licenses to use frequencies in the 800MHz, 1800MHz and 2.6GHz bands. Up for sale were: five lots of 2 x 5MHz in the 800MHz spectrum with each lot starting at USD15m; six lots of 2 x 5MHz in 1800MHz spectrum for USD30m each; and nine lots of 2 x 5MHz in the 2.6GHz band at USD15m.

According to the vendor, its platform offers unique advantages. It features a carrier-grade Converged Wireless System (CWS) base station which, says the firm, connects to any backhaul technology available today or tomorrow. It reckons the all-in-one compact CWS maximises data and voice coverage for "superior" quality of experience for Telesol's 4G customers. It adds that the CWS can be easily installed and maintained. Parallel says this enables much more cost-effective networks for places where business models are challenging and allows faster return on the network investment for operators.

CELLULAR NETWORKS: YEAR IN REVIEW

(EAC) as part of efforts to promote the safe use of ICT infrastructure across the region.

Speaking during the East African Communications Organisation Assemblies held in Nairobi in June, he said ICT infrastructure, including unregistered SIMs, was increasingly being used for criminal activities such as terrorism and kidnappings.

Muchera said MNOs must strictly adhere to SIM registrations to help law enforcement agencies within the EAC Organisation to track down criminals. He warned: "If some countries or mobile operators do not enforce SIM card registration to the letter, criminal elements shall continue misusing unregistered SIM cards from neighbouring countries to perpetrate criminal activities across our borders."

The secretary also advised EAC member states to work together in dealing with what he described as the "menace" of counterfeit devices. He said the use of fake phones was on the rise across the region, and that they are hard to track down. He added that while counterfeit devices are denied service in one country, they can still find their way onto the networks of neighbouring countries.

Muchera's concerns came barely two weeks after the Communications Authority of Kenya (CA) directed all mobile operators to deactivate all unregistered or partially unregistered SIM cards within their networks.

Pressure was also being applied in South Africa when on 7 May 2018, the Independent Communications Authority of South Africa (ICASA) published its amendments to the regulations and said they would come into force on 8 June 2018.

South African MNO Cell C took legal action because the new regulations only gave operators one month to comply with an amended version of the End-User and Subscriber Service Charter Regulations (ESSCR).

According to ICASA, the ESSCR of 2016 needed to be amended because of general concerns about the unfair business rules imposed

by licensees in the provision of data services to consumers. "In particular, the regulations seek to grant consumers relief against expiry of data, bill shock occasioned by lack of transparency on out-of-bundle charges and other rules which are prejudicial to consumers," said the authority.

Cell C said that while it is "fully committed" to complying with the new regulations, prior to the amendments being published it advised ICASA that it was "technically impossible" to meet the proposed timeline. In a press statement released on its website on 7 June, the operator said: "Cell C's billing and other technical platforms are highly complex and rely on one another to operate effectively which means that a change in one system often results in changes being required in other systems. Furthermore, changes to the billing system require a cycle of development to ensure rigorous governance and control measures are met."

The statement added that at least six months would be needed to properly comply with the new regulations, and without disrupting customers and causing unforeseen consequences.

In Rwanda it was the public which needed to be brought on board about the dangers of criminal activity. The Rwanda Utilities Regulatory Authority (RURA) launched a campaign to increase public awareness about crimes related to mobile security and telecoms fraud.

The authority said it has teamed up with mobile operators, security agencies, local



ICT cabinet secretary Joe Muchera said cellcos "must strictly adhere" to SIM registrations to help law enforcement agencies track down criminals.

PHOTO: WMUCHERU – OWN WORK/CC BY-SA 4.0, COMMONS.

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administrators, and consumer associations to "sensitise" telecom agents on various types of mobile fraud, the associated punishments, and preventive measures that can be taken to protect themselves and consumers at large.

The campaign kicked off in Kigali towards the end of October 2018 at an event staged at the city's Petit Stade. RURA said it had attracted more than 1,000 telecom agents who came to hear how all citizens can be engaged in anti-fraud activities, and how quality of service can be increased and maintained in the telecoms sector.

Addressing the audience at the event, James Musinguzi, director of technology development and services at RURA, said: "We decided to come and speak to you because we have noted that there are people misusing [telecoms] services and deceiving consumers by installing illegal networks which result [in money loses] on both consumer and operator sides."

Authority officials warned about an increase in criminal groups that are misleading consumers by tricking them into calling back high cost international numbers from unknown sources.

RURA advised mobile and telecom agents to take precautions and follow state regulations that govern SIM card registration to avoid being implicated in the fraudsters' activities and other potential harms. ■



RURA director James Musinguzi tells an audience at the Kigali Petit Stade not to be deceived by criminals.



**Alan Hadden,
mobilecomms
consultant,
Hadden Telecoms
Limited**

The year ahead: As the global 5G industry and ecosystem takes its first steps towards maturity, pioneered in markets such as the China, South Korea and the US, it is important to monitor developments at the global level, carefully analyse the results, and determine the most promising feasible use cases. The industry is perhaps some way off resolving all the challenges associated with bringing true Ultra Reliable Low Latency Communications to the market enabling new use cases such as autonomous

vehicles and remote surgery. Therefore 5G in its initial phase will be enhanced MBB for mobile and fixed wireless services, which themselves are an evolution of the commercial success of 4G/LTE and its evolution. In the next few years it will be more efficient for most, if not all, operators in Africa to strongly invest in their 4G/LTE platforms to expand geographical reach and user footprint and exploit the most competitive devices ecosystem for voice and data, upgrading later to bring in the 5G NR (New Radio) air interface at the appropriate time in the company's business cycle.

Deploying LTE-Advanced technologies, particularly carrier aggregation gives operators the opportunity to deploy the most advanced

and efficient technologies for data and voice (LTE, VOLTE, etc.) and make the best use of current spectrum assets. Deploying LTE-Advanced Pro technologies in the network including 256QAM and 4x4 MIMO further enhance the user experience thanks to improved performance and capacity. Cellular IoT enabled by LTE-Advanced Pro MTC standardized low power wireless access (LPWA) technologies comprising NB-IoT and LTE-M open up new market segments, use cases and revenue streams.

Last but not least, continue to seek more spectrum for mobile deployments for current and foreseen market needs - and support global industry efforts to secure more new spectrum for 5G deployments at the upcoming WRC-19.



**Andries Delport,
CTO,
Vodacom Group**

While some may argue that it is too soon to be talking about 5G in Africa, one of the continent's leading operators begs to differ. Speaking at a press briefing at AfricaCom in Cape Town last November, Vodacom Group CTO Andries Delport said that being asked if 5G is real and what will

happen gives him a sense of déjà vu.

"I've been here for a long time and saw the movie around 3G when they also asked if that was real. The first time I got a call from our CEO in Europe who said we're launching 3G in December I said what? It is impossible! There is no business case for launching 3G! We know all of that is history."

"And when it came around to 4G, even our organisation spent quite some time where we debated do we go? Don't we go? Is there a business case? This was in 2012. Again, that is history and I think we are standing at the same position with 5G."

"I think the questions around 5G are principally not if it's going to happen, it's when it is going to happen? When is it going to gain momentum and when is it going to become big?"

Delport partially answers his own question and said that 5G is already here as he mentions the live 5G network that Vodacom Lesotho deployed in 2018.

Here "There is a lot of hype around 5G as well as a lot of optimism and scepticism. If you look at some of the forecasts, in eight years time there will be at least three to five billion 5G connections worldwide. Personally, I don't think we will see massive network rollouts [with operators saying] let's do 2,000, 3,000, 4,000 sites in a year. It will be very targeted and driven by the use cases that we define."

"[For example] if we look at fixed line penetration in Africa and South Africa, it is very, very poor. Yes, we are rolling out fibre-to-the-home/business, but the number of households we are targeting is relatively small compared to the total number of households in the country. So fixed wireless access is certainly one of the use cases that we are considering."

As well as 5G, the future of mobile is also predicated on the IoT. And here, Delport believes Vodacom is ahead of the curve. For instance in South Africa, he claimed the company is already covering 99.9 per cent of the population via 2G, 99.8 per cent via 3G, and around 83-84 per cent via 4G.

"That doesn't necessarily mean to say that what we have is IoT-ready, but the infrastructure is there. One of the most difficult things in rolling out a network is high sites, masts, etc., and we think we are in a good position to provide IoT services."

"We have been in the IoT/machine-to-machine space for a long time. Today, we have four million devices. These are predominantly SIMs and that's how we provide the technology. But the point is how do we take this further using current technologies?"

Delport said 4G already supports connectivity to devices, and that following the roll out of Narrowband-IoT (NB-IoT) on its LTE network, Vodacom now has between 1,500 and 2,000 sites that use the technology in South Africa.

When it comes to other LPWAN technologies, was Vodacom's decision to use NB-IoT already made because parent company Vodafone was already using it? Or did Delport and his team also consider alternatives, such as Weightless or Sigfox, for example?

"Certainly. You can't have a discussion about narrowband or IoT without having a discussion

about these things. And narrowband IoT came a bit later than LoRA, Sigfox, etc., so of course then you have to think hard and say do I back something that's already been around for six or 12 months, or do I back NB-IoT? So of course we had those discussions."

"But a 3GPP standards-based network prefers a 3GPP standard, and so we decided that we are going to go to narrowband IoT. There are quite a number of technical differences, and our view is that there are things in NB-IoT that are certainly better than in Sigfox, LoRA, etc."

"You must also remember that you have other 3GPP standards that run off the same network – NB-IoT, Cat-M/LTE-M, etc. – and all of these have different performance characteristics. If you put a table together to look at the performance characteristics of each of those, comparing the battery life, throughput, etc.,

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CELLULAR NETWORKS: INTERVIEWS

narrowband IoT Cat-M stacks up very well.

"One of the other things is that our technology is in regulated spectrum. We prefer that as it means we control that spectrum, its interference [etc.]. LoRA/Sigfox is not like that, and many of these technologies are in ISM bands and those type of things. But it was a tough decision for us because enterprise owners want to resell stuff, they want to sell IoT, and we told them that they had to wait six months because we were waiting for a better technology."



Karanvir Singh,
CEO,
Yego

Yebo was formed in 1995, specialising in homeland security solutions that enabled governments to process millions of events that were happening in real-time. The company's technology is developed in India and it has an international sales office in Singapore which is where CEO Karanvir Singh is based.

He explained that Yego (which apparently means 'yes' in Kenya and Rwanda) has now begun to make its presence felt in Africa's smart cities market, as his company has the skills required for IoT deployments where many hundreds and thousands of devices are required to send information back simultaneously.

"We happened to come to Kigali in 2015 for a conference called Transform Africa and the government there reached out to us for some smart city solutions. So we asked, what do you need?"

According to Singh, in 2014, Rwanda's then inspector general of police banned the use of motorcycle taxis as they were not only deemed to be responsible for many accidents and road fatalities, they were also used for criminal activities.

"I think the ban lasted maybe just over a week when the president stepped in and said you can't preclude the youth from having a source of employment. If you look at Africa, which has 1.2 billion people with a median age of 19, the easiest way to get a job is to learn how to ride a bike and to set up a motorcycle taxi. So the president wanted to control the industry but by using technology."

After conducting an in-depth survey, Yego found that Kigali has 700 buses, 900 car taxis, and 20,000 motorcycle taxis in the city of Kigali.

"What were the problems we were trying to solve? First, there was safety and security. Eighty per cent of [traffic] accidents in Rwanda involves a motorcycle taxi, and 90 per cent of the fatalities are in motorcycle taxis.

"Second, you had the challenge of not knowing about speeding or driving behaviour. Then, you also had a problem with identities where there are a number of people who are undocumented. So you didn't know who the

driver was or whether they had valid insurance, and you didn't know who owned the bike or if it was stolen. All of that information was missing.

"Another challenge was that because there was no concept of having a standardised tariff, there was a lot of time wasted in negotiating a fare on the roadside prior to a trip. Plus, it was a 100 per cent cash business, so the government saw nothing of it in terms of how much money was going through the system.

"They also had the challenge that if you come to Kigali, the currency notes are quite big, 5000, 2000 francs, for example. But a typical taxi ride could be 300, 400, 600 francs. Where do you find change? You reach your destination and then you're standing by the side of road until the driver can flag down someone and get change.

"So there were all of these challenges. We came up with the concept of an IoT device, a smart intelligent meter connected to each and every motorcycle taxi. It sends up data every 30 seconds, and you can collect a lot of valuable big data from it.

"When we installed the devices, the first thing we did was give the government data about the kind of money that is paid for different trips; we carried out 6,000 trips and had measured the distance and fare negotiated. Based upon this data, we recommended a fare structure which the government adopted.

"Then we said we will also give you visibility so that you can see all of your drivers moving around. You can look at each driver in real-time to see where he is, how he is driving, and how much money he earns. We also installed a system showing each and every driver, owner, and all their documents and identities listed in real-time, enabling the authorities to check their status."

From the outset, Karanvir said he knew that the government did not have any budget for the project. His company therefore offered its platform for free and all the equipment was also given free of charge to the motorcycle taxi drivers.

"We then went back to the government and said this is our business model so you decide on what would be a fair amount that we should earn to recoup our investment. They did their calculations and came back with a percentage, and we said fair enough, we will go ahead."

Yego launched its system in Kigali in 2017, adding car taxis to the platform in August 2018.

Singh says its IoT meters use GSM technology rather than the LoRaWAN system that is being used in the smart city project that was unveiled in Rwanda in May 2017 and is being led by Inmarsat.

"Part of the field survey that we did revealed holes in the network and blackspots where there is no signal. When we made the system, it is not only real-time but also supports digital payments. We link back to mobile money and have NFC stickers so passengers can tap and

pay. Now imagine you have entered a ride and there is no mobile connectivity. We have therefore built into the platform the ability to be able to have a secondary service on the backhaul network using encrypted SMS. So you can complete the transaction even if there is no data connectivity."

Singh goes on to explain that unlike an Uber-style service, Yego's system doesn't require users to have a smartphone, data, internet access, or even airtime as it's a toll-free call. The company has developed an app but doesn't believe it is going to create a large customer base as it is estimated less than five per cent of the market will use it.

"Most people who ride around on taxis don't have a smartphone or the ones that do, don't have data. So any phone user can call a shortcode (9191), say where they are and where they want to go, hang up, and a minute later they get a text with the driver's name, plate number and phone number. The agent basically has a screen looking at all the drivers and can find the one closest to you.

"It's a huge boon for passengers, because the way taxis worked in Rwanda is that they were parked at stands and you had to have the taxi driver's number in order to call it, otherwise you could not access that taxi or go to the stand for pick-up."

So what about safety – what's stopping a driver from lending his bike to an unknown driver or from removing the box? Singh reckons Yego has looked at this issue very seriously.

"The device that we give them is locked to particular plate number of a vehicle. Any driver on our system can login using an ID card which is NFC-enabled. So they have to tap the card and then enter a four digit number to log onto the platform. That's the only way of doing it."

What's more, any driver that works without logging on means his meter is switched-off. The system detects this in real-time and alerts the enforcement authorities with fines of around RWF200,000 (around USD224) for drivers who are not using their meters, with heavier penalties for those also caught carrying passengers.

In an unexpected development, Singh said that because Yego has more data than the government, the country's transport regulator is now also taking advantage of the system as a basis for authorising owners to use their motorbikes as taxis. And there's more.

"Imagine if I know how much time you work every day, how much you drive, and how much you earn. After a few months, I have got a credit score for you which you can take to a bank. Seven heads of banks have come to us and said that they will be happy to loan these drivers money. I have been urging these guys to take the money, exit the motorcycle taxi industry, and start a different business. While the number of passengers remain constant,

the number of new people entering the motorcycle taxi business makes it unviable."

So Singh hopes the introduction of IoT technology like Yego's smart taxi meter will ultimately have wider socio-economic implications. Giving people financial inclusivity and the means to change the way they earn their livelihoods could also mean less polluting motorcycles on the streets of Kigali as well as less congestion.



**Shakil Ahmed,
sales director
mobile network
testing, MEA,
Rohde & Schwarz**

Looking back over 2017, Shakil Ahmed said that German-based test equipment specialist Rohde & Schwarz (R&S) has built-up a "strong base" in South Africa over the last seven years, and that the company will continue to grow that. As an example, he describes a very significant group wide benchmarking project for MTN that R&S won in 2017 and finished last year.

"It covered 17 countries across Africa and is the first time such a project has been undertaken and completed within a seven-month period. The project was all about making sure MTN gets standardised performance scoring.

"Historically, the markets have been focused on customised reports and delivery in very enclosed environments where reports have been provisioned for QoS for the operators. But unfortunately, no backing materials have ever been there from a standards perspective. As a result, an organisation had nothing to relate to in terms of being able to report actually how good or how bad its network was and why it was such.

"R&S is the first company to bring forward the ETSI-based network performance score. We have got a whole deliverable in terms of QoS benchmarking where we are actually able to rank quality of experience and quality of service from a subscriber perspective. We can show what is really making a difference, including leading features such as VoLTE as well as testing applications such as Facebook."

When it comes to some of the other headlines for R&S in Africa over the last 12 months, Ahmed claims the company has seen "huge success" with regulators as they license new spectrum for 4G to 5G migrations as well as new radios coming through to support 5G technologies.

"One of the areas that we are focused on today is our scanner product which is all about what the real deliverable is in terms of spectrum frequency from a 5G remit. Our first initial trials are happening in South Africa. We can't mention too much detail at this stage and there are NDAs signed, but right now we are predominantly looking at hotspots in South Africa.

"We have also started a big campaign in the Middle East which will hopefully come through

into Africa because some of the holding companies we are working with have actually got partnerships in Africa as well."

In December 2017, the Independent Communications Authority of South Africa (ICASA) and the Autoridade Reguladora Das Comunicações (INCM) jointly conducted a measurements exercise to see if any RF was leaking from one country into the other. Were R&S involved in that?

"So what we call the interference hunting and spectrum cleaning activity was indeed undertaken by us," said Ahmed. "One of the areas that we focus on is the field installation equipment where we do a type of PIM testing. When operators migrate old radios to new radios, the infrastructure builders tend to leave the old connectors, cables, etc. These cause a huge amount of interference especially when the migration between 3G and 4G has occurred. I am sure that is only going to increase when the migration from 4G to 5G happens. So yes, we were involved in terms of the interference hunting part of it."

ICASA and INCM released the findings of their joint investigation in January 2018. It said that no RF spillage had been detected on either sides of the border alongside Kosi bay and Lebombo Border Posts. However, two South African operators were found to have RF spillage in the eastern Mozambique coastal town of Ponta Malongane which is around 30km north of the border with South Africa. The regulators did not name any of the operators involved, and neither has since revealed any remedial plan of action.

With Africa no longer being the greenfield site it once was in terms of new network infrastructure, is Ahmed concerned that there is now less need for the types of traditional testing solutions R&S is best known for?

"Our portfolio today is very much focused on the operational needs of MNOs, regulators and network equipment manufacturers. For example, the regulator is the policing body that is there to make sure that the quality and cleanliness of spectrum is right; the MNO is operating under huge amounts of capex and opex limitations; and the manufacturer is being squeezed on the margins.

"So our focus has been to, firstly, automate most of these testing processes through the usage of our equipment; secondly, standardise and ensure that we have an open environment in terms of either ETSI or ITU standards rather than being a proprietary closed environment; and thirdly, to introduce new concepts of testing which actually enhance the current operational networks. Part and parcel of that is old equipment in the network infrastructure which will cause a lot of issues on the new technology and on the new spectrum which is actually being released in the 5G remit."

"One of the areas that we have looked at quite recently is the business model in Africa changing. I think gone are the days when capex was the only form of spend. A lot of the operators have become very intelligent in terms of how they are investing in their solutions and their services. This year, Rohde & Schwarz engineering services has realised the ability to do network performance and then benchmarking services rather than purely supplying capex goods into the market."

With all the current talk surrounding 5G and IoT, do these represent the biggest opportunities for R&S in Africa over the next 12 months?

"What we are seeing is a real focus in terms of 4G improvements in most countries. We are looking to see an increased amount of activity in terms of data subscriptions and OTT applications which are occurring across the region, and we're also looking very much at an improved quality of spectrum which is likely to be utilised by the operators for the release of new technologies coming through.

"As things improve and spectrum is there and technology moves on, we have a strong strategy on narrowband-IoT in terms of active mobility testing. We've got a huge focus on 5G and are the first company with commercially released products for 5G testing, both in the lab and in the field environment, available today."



**Nora Wahby,
head of west
Africa,
Ericsson**

Nora Wahby has been head of Ericsson's west Africa division since June 2018 where she is currently responsible for supporting operator customers in 24 countries across the region. With wide-ranging experience that includes leading large teams on various projects for diverse customers in Algeria, Egypt, Morocco and South Africa, Wahby considers the continent to be a "market of opportunity".

"The number of inhabitants are growing, the youth population is growing and hungry for connectivity, and GDP is growing with three per cent annual increases projected for the next five years. So, Africa is a land of opportunity. Some economies are currently struggling because of the lack of hard currency and policies to allow that growth, but the need is still there."

She goes on to talk about how telecoms and mobile connectivity act as enablers for that growth. Of course, the empowering nature of communications is something that has been well documented for decades now, so this is nothing new. However, in the last 12 to 18 months, Ericsson has been increasingly talking about 5G, IoT, cloud connectivity, etc. How relevant is all this for a continent where there are still people who don't have 3G or even 2G as yet?

CELLULAR NETWORKS: INTERVIEWS

"Let me reiterate the importance of mobile broadband connectivity. Be it 3G, 4G or 5G, the type of mobile technology deployed will be dependent on the use case. We are talking about a market that is hungry for connectivity. The quality of network and mobile broadband connectivity will continue to play a major role in that. It is not the time for 5G fully as yet, but we are paving the way for it."

"Technologically, 4G is more or less ready for evolution; any hardware that we put in the networks today is ready for the evolution to 5G. Use cases will be mostly industry dependent, and we're working with many of our major focused customers to develop the right use case and partnering with the right industry to create value from a 5G/IoT perspective."

But in the meantime, does Wahby agree that there is still a lot of work to be done in bridging the digital divide and connecting people from a basic connectivity perspective?

"Absolutely. 2G will continue to exist, 3G will be the prime platform for mobile broadband and there will be a transition from now until 2023 into 4G, and selected applications, especially fixed wireless access, will happen for 5G."

"Since I started, there is a growth and there is demand for network modernisation, network quality improvement, extensive rollout of 3G and 4G. We have seen more operators acquiring 4G licenses, applying many traffic steering techniques to move LTE capable terminals into 4G, ensuring data happens on 3G, and maintaining lower type of equipment on 2G. This is a model that most of our biggest clients in Africa are adopting now. I think that is smart."

"Ericsson is also helping and supporting them with programmes like capex investment. So we take live network data that we analyse, and recommend where operators should put 3G and where they should put 4G. I think there is a long way to go when it comes to network and build for 3G and 4G."

At the time of interviewing Wahby in November 2018, she said that Ericsson had just signed a big contract with a major customer in one of the largest West African countries. She was unable to name the company, but said that the deal involved fully modernising the operator's 3G and 4G nationwide network with implementations in carrier aggregation, spectrum re-farming, along with some 5G readiness.

So, what about managed services? This used to be an important part of Ericsson's offering in Africa. Is that still the case?

"Managed services had been struggling because of the many contracts that we had where we were not getting the right value out of. So, we had to re-focus the business with managed services, and we have exited some bad contracts in Africa."

Wahby does not name any names here, but claims that Ericsson is now back to profitability in managed services. "While we were re-visiting our market position, we were investing highly in

technology leadership with automation, AI, and machine learning. This will allow us to continue to be profitable in managed services. So we're fully committed to managed services, and we believe this is one of the cornerstones to execute our strategy. We have a regional NOC in Ivory Coast, a large scale of competence within Africa, and we are committed to the market."

Ericsson has always been known for its wireless technologies. But with more fibre now coming into and across the continent, is the company interested in investing in cables as an enabler of the opportunities Wahby referred to at the start?

"Fibre is important for the backhaul. We will always need fibre, but we believe that there could be some substitution for fibre in particular situations where you cannot dig. There are microwave solutions, and we are re-investing in our microwave technology, and there is also fixed wireless access that can substitute the last mile of the connectivity."

So what about the year ahead – what are the challenges for the continent from Ericsson's perspective? Wahby believes the obstacles are primarily related to legislation, regulations, frequency band allocations, and topics that need to be addressed by governments. She then returns to the topic of 5G, one of the key areas Ericsson is currently pinning its future hopes on.

"We are in this exploration phase. 5G, which is more about industries rather than consumers, is going to transform the way we do business in the majority of industries, be it mining, agriculture, transport, health, [etc.]. This means that if operators want to grab the value of 5G, they need to start thinking about what works in their home countries. They need to start immediately experimenting with selected industries on business models – how 5G will work, the value it will bring which is not entirely clear because the ecosystem is not mature yet. And they cannot experiment alone. They need to open-up for partnering. If they don't, they lose the value."

"The transformation of industry is a revolution and I believe it will happen sooner or later. We do not want operators to miss out on this value because the connectivity will happen, and if they do not play a role, it will go to other players that will emerge, like what happened with voice and data with the over the top providers."



Dany Rahal,
sales director,
MATRIXX
Software

Matrixx Software began its engagement in Africa in early 2018, "when it was clear" that many African telco companies were ready to begin building and delivering truly digital customer experiences.

The company has been working with operators in South Africa, Nigeria and Kenya, while a significant

part of our Matrixx's efforts includes helping educate the market about both monetisation and the digital customer experience, as well as sharing information about key market trends such as 5G and the Internet of Things (IoT).

"Working with African telcos over the last year, we've learned much about the market," says Dany Rahal, sales director, Matrixx. "For example, digital transformation is a worldwide phenomenon. It is just as prevalent in Africa as it is in other parts of the world. Over the last 12 months, we have seen that operators relying on DATA/OTT consumers, millennials and those active on social media require a digital customer experience. That experience is made possible by enabling CSPs to be agile and cost-effective using three main pillars: always-on, 100 per cent precision and instant business agility."

In Rahal's words, Matrixx enables its customers to achieve "a truly digital customer experience" through its Matrixx Digital Commerce Platform. Built entirely from scratch, it enables what Matrixx claims to be a digital-first reinvention of telco BSS. "It brings together traditionally separate network and IT functions into a single platform, including product design and lifecycle management, customer engagement, service delivery and monetization," he adds. "Built for digital, the Matrixx Digital Commerce Platform offers operators the agility and seamless scalability required to compete and win now and in the future."

Rahal says the firm is currently in discussions with a number of group operators for a deployment plan in several countries in Africa and is looking forward to making progress with them over the coming months.

As far as the last 12 months are concerned, Matrixx is seeing tremendous changes and evolving trends in Africa toward digital transformations. These changes include 5G trials and a focus on cloud deployments and investment, especially in South Africa. "We're also seeing a high-level of interest in IoT and other related, non-traditional contextual use cases, in direct correlation to the significant increase of DATA consumers and social players," Rahal says.

"We have also noticed a fundamental shift in the way senior telco leaders are working to achieve world class status as digital providers, which can only be done with a ground up "to be digital, start digital" approach. The African executive teams recognise that the status quo will no longer work. They have to cross the chasm of digital re-invention and bring their organization with them."

With regards to the next 12 months, Rahal highlights two main challenges and the first is ARPU. Of course, operators still need to continue boosting ARPU figures and voice revenues are falling, so Rahal says the onus is on the sector to enable the download speeds required to greatly boost data consumption.

"This challenge is pushing operators even further down the road of providing alternative services and encouraging data consumption," he adds. "The second challenge is preparing for 5G. Although 4G capability is still only available to the minority, many in the industry are becoming increasingly interested in 5G. The new wireless standard will provide benefits that are as useful in Africa as elsewhere: much higher device-to-device speeds; higher densities of mobile broadband users; and lower power consumption which provides longer battery life. In addition, wireless sensors will be able to access many more simultaneous connections, a prerequisite for IoT."



**Ahmad Sayed,
regional director,
MEA,
Nexign**

Since the start of 2018, Nexign, the Russian-based business support system (BSS) provider for telecommunication, has actively been expanding its market presence and growing regional workforces in the Middle East, Africa and southeast Asia regions (following the company rebranding).

Ahmad Sayed, regional director MEA says the company has successfully completed the rollout of its business support systems with one of the fastest growing network operators in North Africa. "Nexign is currently participating in some very large BSS opportunities in Africa and has witnessed interest by major players in our products," he says. "Africa has seen significant activity in recent years. This presents Nexign with opportunities in the coming years, which includes extending our footprint in the region and establishing strong local sales and technical teams. Nexign will also build regional partnerships to grow our customer base here."

Africa has seen significant activity in the last 12 months with major telecommunications operators working to modernise their networks and IT systems such as BSS. Sayed says expectations from consumers on the continent are very high as they want the best services, state-of-the-art technology, and at a low cost. "Even though this is a global challenge, African operators are really focusing on meeting customer demands," he adds. "The only serious 5G engagement/trial was done by MTN South Africa with Ericsson, and the actual 5G deployment project will come in a couple of years."

In Sayed's opinion, the African market "is quite similar" to the markets Nexign already operates in that it's a heavy prepaid market moving more to postpaid). "We see digital transformation happening along with people working with reasonably low average revenue per user and that is the environment we are accustomed to," he continues.

Sayed says that as the global BSS market

evolves, it's no longer enough for BSS providers to differentiate themselves on product functionality alone. Instead, they need "to compete on non-functional business aspects" and drive better customer experiences in order to stay competitive. "Africa is no exception - it has also demonstrated significant activity in recent years," he says.

Telecommunication infrastructure remains a challenge, with the vast majority of people on the African continent continuing to live their lives without internet access. Sayed's view is that it can be solved through better regulations and investment to help rollout internet connectivity faster. "Most of the African countries/operators are still in the process of implementing 3G networks and only few have implemented 4G networks," he says. "Operators who recently implemented 4G networks are suffering from the huge investments made to rollout those networks (CAPEX for license and equipment acquisition).

There is a lower expected return on investment for 4G (when looking at a short time frame) compared to that of 2G implementation, hence operators have fears of starting new major projects."

Today, there is a huge cost pressure by all operators in the region and even major groups are looking closely at their costs and reducing their investments massively, with most of the operators/major groups now being driven by a financial/procurement background instead of a technical background.

Sayed says most of the African continent is lacking basic educational infrastructure therefore a serious focus on digital literacy education is required. He points to the current "serious shortage" of digital skills amongst youth and adults, plus the cost problem pertaining to handsets and 5G ready equipment. "Legacy handsets still represent the major part of the handset park in Africa (even in Tunisia we still have almost 50 per cent legacy phones and only less than 25 per cent are 4G capable handsets)," he continues. "Although data usage and data revenue is actually massively growing in almost all African countries, rollout of 5G networks will take some time as operators and surrounding environments are still not ready for this new technology."

For Nexign at least, the future looks bright. In Africa it is attracting "great interest from telecom operators in the BSS segment" and the plan is to secure a number of large groups to give it a strong presence in the next five years.

"We believe that the African continent offers huge potential for Nexign," Sayed says. "We have just entered into this market and countries like South Africa & Nigeria have significant importance. At the same time, we are also focusing on some key opportunities in north Africa."

Initially, Nexign would like to collaborate with local ICT and system implementation companies to develop a strong partnership. For

the implementation of BSS systems, it would like to use local talent and Sayed knows this can only be achieved through good partnerships with local SI companies. "We strongly believe that local technical resources can play a significant role in the success of our projects in Africa," he says. "We are also planning to build a strong local team in Africa and are currently engaging with professionals with a right mix of technical knowledge and industry relationships."



**Clémentine
Fournier,
regional vice
president Africa,
BICS**

Africa has a population of around 1.3 billion, which means that just over 16 per cent of the world's inhabitants live on this diverse continent. That's a lot of potential subscribers, a great many entrepreneurs looking to enter the IoT and a sizable market at risk from telecom fraud and cyber security breaches.

At the heart of Africa's telecom and digital landscape is mobile. With many regions freed from the restrictions, cost and complexities of having to update and upgrade legacy wired infrastructure, cellular communication has flourished. It's not only person-to-person communication which has taken off; the mobile handset has also allowed more people to access services like banking and healthcare. Digitalisation in these sectors – and with services available via smartphone apps – has helped to address the lack of physical banking and healthcare infrastructure in more remote, rural areas.

BICS has had a presence in Africa for many years, and currently has 150 partners in the region, enabling voice, SMS, data and IoT connectivity for consumers and businesses across the continent. As such, we've witnessed some exciting shifts in Africa's communications industry and, ahead of AfricaCom 2019, we outline just two of the many trends influencing its future course.

IoT spending in the Middle East and Africa is forecast to exceed USD12bn in 2021, as organisations leverage developments in cellular infrastructure and take advantage of the proliferation of connected things. Subscriber growth in sub-Saharan Africa has slowed in recent years, however, the development of the IoT – and M2M connectivity in particular – offers a major new opportunity for operators.

Growth within the IoT is expected in vertical sectors like agriculture, utilities management and healthcare. In utilities, sensors can be used to monitor water pipes, for instance, identifying maintenance issues and leaks, and manage customer billing. This saves on both the cost and time taken for someone to travel to often remote locations, and taking readings and payments manually. Crucially, it helps to

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preserve an essential resource.

However, when it comes to the development of Africa's IoT more specifically, the lack of affordable roaming is holding the continent back. The IoT will be a mobile IoT, meaning many use cases (such as logistics) require reliable, always-on, cross-border connectivity which supports potentially hundreds of thousands of end-points. At present, the high tariffs imposed on data roaming in Africa mean that a cross-continent, mobile IoT is unfeasible in the immediate term.

In many ways, operators are already well-positioned to make a move into the IoT enterprise market and unlock new revenue streams; they have established consumer businesses, and the required telecom infrastructure. Enterprises looking to launch an IoT proposition, meanwhile, may have some of the tools to deploy this, but lack the expertise to manage the connectivity.

They'll require dedicated platforms to manage whole fleets of connected 'things', including roaming relationships with other operators and customer billing. Management must be automated and integrated with the backend IT systems of the enterprise, with platforms hosted in the cloud to minimise initial outlay and operating costs. Providing a SIM card is no longer enough: operators must take an active role in the IoT, and offer their enterprise customers the tools to grow this connected ecosystem.

For many living on the African continent, the mobile handset and cellular connectivity have provided access to a multitude of new and existing services, from healthcare and online banking, to salary management and taxation. In addition to improving quality of life (especially for those living in rural areas), this has also encouraged business growth and provided a nurturing environment for start-ups.

In 2017, 87 million people in sub-Saharan Africa were active monthly users of mobile payments technology, for example, while collaborations and convergence are resulting in the launch of innovative new services. Safaricom's Bonga platform, for instance, combines mobile payments with instant messaging and social networking. Diversifying its service offering in this way should allow the operator to attract new subscribers and increase its market share, while widening financial inclusion.

The growth of Africa's mobile-driven digital economy does have a drawback, though. The increase in transactions and sensitive data exchanged via mobile handsets (and on cellular networks), is accompanied by a greater risk of hackers accessing accounts, fraudulent transactions, and personal data being stolen and sold on the dark web. Cybersecurity issues cost Africa an estimated USD3.5bn in 2017, while criminals continue to target subscribers with scams such as SIM swapping; an issue of particular concern in Kenya.

It's now relatively easy and cost-effective for developers to create and launch mobile-based services, but this should not come at the expense of adequate security measures. These include A2P SMS, where a service provider, such as a bank, sends a one-time passcode via SMS to their customer, who can then use this to access their account or authorise a transaction. Both A2P SMS traffic and revenues have increased in recent years in Africa, with continued growth forecast until at least 2022.

Mobile penetration rates exceeded half of the populations of both west and sub-Saharan Africa in 2017. This equates to a large proportion of the continent's residents who have a mobile phone number – a unique identifier which can be used to provide secure access to mobile-based services. Verifying that the holder of the mobile number is who they say they are will require coordination and partnerships between traditional players (who hold a wealth of subscriber data) and digital service providers (which need access to it). This will result in solutions which tap into real-time behavioural, phone and user analytics, and ensure that online businesses really understand who their customers are, reducing the risk of money-laundering, fraud and data theft.

The right kind of tools, a revisit of roaming regulations and enhanced security are all required to ensure Africa's digital economy and mobile IoT are both sustainable and successful. However, it is collaboration – between enterprise and MVNOs, digital and telecom, regulators and industry players – that will make all the difference. The region has seen tremendous transformation over the past decade, and parties from all sectors and regions must continue to work together to improve cellular infrastructure, security, and services.

The increase in smartphone adoption and the falling cost of mobile data has set Africa on a trajectory for digital growth. However, change is gradual, 5G is still a long way off, and there remain challenges (which vary dramatically across the country) to be overcome. The past decade has been an exciting time for communications on the African continent and further innovation and developments are yet to come.



**Michael Milligan,
account manager,
FG Wilson**

FG Wilson have been around for more than 50 years, manufacturing electricity generating sets. Since 1990, as far back as its computer records go, the company says it has installed more than 640,000 generator sets worldwide, 150,000 in Africa. In the 1980s, FG Wilson was among the first to bring mass-scale production to generator sets, launching self-contained generator sets which were simple to buy and operate and were easy to install.

"In recent years, we've seen a continuing upward evolution of customer expectations in terms of power quality," says Michael Milligan, FG Wilson account manager. "In the past, say 10 or more years ago, if electric power was lost, many businesses could still function offline, at least for a short time. Now it's almost impossible. The big advantage of a generator set is that, for many people, when it comes to guaranteeing standby or emergency electrical power, in terms of cost, flexibility and responsiveness, it's the best option."

Milligan says that with businesses not prepared to take the risk of even short interruptions of electric power, that means much greater scrutiny of the generator set and how it's supported. Furthermore, that's even more critical for telecoms networks or data centres. "These brands win and lose based on service uptime and their customers demand 100 per cent," he adds. "So, it's about stability of power."

So, what does that mean for FG Wilson? Product reliability in service is a big priority: every new design is thoroughly validated through the company's UK facility, including 500 hours of testing at full load power rating, covering maximum cold load step and hot load step and further testing for vibration, engine/alternator cooling, electromagnetic compatibility, noise, water ingress and rating/transient performance.

As far as Africa in the next 12 months is concerned, Milligan says the company is seeing customers becoming much more interested in operating costs and efficiency. "This can be both a challenge and an opportunity if you can meet those needs," Milligan adds.

"Diesel engines are the most common prime mover for generator sets and the reasons have always been practical: compared with other engines, they are more economical to run, typically easier to service and maintain, fuel is safer to store and transport than petrol or gas fuel and engines are durable."

Milligan states that because the engines operate at relatively low RPM in power generation applications, they can expect a long working life, if looked after and in countries where usage is high, examples of generator sets with 30,000 operating hours are not uncommon.

"The basic technology in a generator set today remains very similar to what it has always been: we have a seventy-year-old 50 kVA generator set on display in one of our factories which wouldn't look out of place on a customer site today," he says. "However, what has changed is the efficiency of the generator sets you see now. The 70-year-old 50 kVA generator set is about the same size as a 250 – 300 kVA generator set today."

That big reduction in size has meant a corresponding reduction in fuel consumption and in emissions from generator sets, with emissions further reduced by new engine technology. "FG Wilson engines are sourced

from UK-based manufacturer Perkins, designed in the UK and among the most modern and fuel-efficient engines available," says Milligan. "All meet or surpass emissions standards wherever the engines are being used."

Milligan says for FG Wilson products today, "the watchwords" its design engineers live by are "customer operational efficiency" and "keeping customer operating costs low". That means long service intervals, up to 1,000 hours on some of the popular small models with fewer parts consumed and fewer maintenance calls. On the popular 6.8 – 25 kVA range there's a choice of three sizes of fuel tank, with the largest 2,000 litre tank capable of fuelling the 11 kVA unit for up to 185 days for four hours a day at 75 per cent load. "A choice of sound attenuated enclosures means customers can fit their needs to their budgets," adds Milligan.

"Rightly, there's growing interest in renewable sources of energy. We're seeing this in many applications where a generator set may be running for four or five hours a day and customers are seeking to reduce operating costs by adding a renewable element. Today we're working with some telecoms networks and supplying hybrid generator sets with solar panels as part of the package."



**Josh Gosliner,
product
marketing
director, Juvo**

There's been much talk this year about affordable smart phones for "the unbanked" in Africa. However, one would be forgiven for asking why it has taken until 2019 for it to become a priority. Shouldn't device manufacturers have started addressing this years ago?

"Having been at Mobile World Congress in February, I think there is a very serious lack of awareness as to what's going on in developing markets and this wireless industry in general," says Josh Gosliner, director of product marketing at Juvo, a mobile financial identity provider.

"Much of the talk was on 5G, IoT, on foldable phones. On all kinds of IoT in cutting edge technology but there wasn't a lot of perception. There wasn't much on developing markets and how the mobile industry can adapt itself to make itself relevant. So, I think more than anything, it's a lack of awareness or lack of interest on the part of the device manufacturers."

James Muriithi, head of Africa at Juvo concurs, but says in order to fully understand, "we need to take a step back and see where Africa is coming from" when it comes to smartphone distribution.

"First and foremost, when everybody was embracing 3G, Africa was still between 2G and

2.5G, he says. "Today most networks are still only starting to roll out 4G networks. Now obviously the roll out of this network has an impact on what the network can support, this correlates with what the devices can handle, there's no need to purchase smartphones until the network catches up."

He gives an example of how timing is key: "The timing element of it, is what it is," Muriithi adds. "When the network was ready to support smartphones, deliver data, build data and build data products around the new investment, they did this around the roll out of 3G and 4G."

What's more, he believes Africa finds itself to be in an interesting scenario because it doesn't have to go through a lot of the pain the developed markets went through.

"So there has been a roll out of 4G and now those who want to embrace 5G find they do not have to go through all the same problems," says Muriithi. "The challenge then becomes about educating them – more of a status move than anything else – in terms of them saying I've got a smart phone. I no longer have a phone that just sends and receives messages."

Muriithi laments the fact that while mobile phones are aspirational in Africa, it is not utilising all the features. "That's not because they are not on the network, but it's because the network cannot support them," he says. "They have not been educated properly about the power of the devices they hold in their hands. There are some OEM devices that cost USD100 or USD200 and they are pretty good devices."

There has also been a lot of movement with KaiOS of late, says Gosliner, who adds that lots of the Chinese manufacturers have made in-roads in Africa especially.

"I think there's a much greater level of awareness in that space," he says. "Still, if device manufacturers want to get into developing markets they need to think about a different strategy. For the most part they have managed to grow device sales in the developed world. But now that we've really reached a saturation point with device sales it's a question of what's the next level of opportunity? And the only way the manufacturers will have a chance to be successful is thinking about new strategies that are really designed for the developing world."

It's understandable that each continent, indeed each nation, often operates differently to its neighbour. However, Gosliner says many international companies possess a degree of

"hesitance" when it comes to doing business in Africa, for different reasons.

"I think there are concerns about corruption, but I think more than anything else, it's just that it's a different place to do business and it inherently drives fear into people – and it's not a justly found fear," he says. "When you're doing business in developing markets around the world, it doesn't matter where it is, you have to have a willingness to

hire local people and adjust your mindset to that local region and what scares people off is lack of willingness to do those things. That ends up in a place where there are fewer foreign entrants."

Muriithi says "it wouldn't be absolutely accurate to say there's not been instances of corruption in everything" but instead of pointing the finger, it would be prudent to take a step back to understand what informs this corruption.

"In the early days there were those who had the foresight to see GSM licences were the most valuable things to have," he adds. "So, the leaders and powerful business owners at the time were able to either secure those licenses or if not secure them create difficulties which one would have to navigate in order to get them."

Then, of course, there's ownership. The way the market is structured today, there's a lot of government ownership as required by regulation that is informed by the previous regulations around landlines. In Muriithi's view, that opened up a lot of avenues for corrupt practices to evolve. "Coming into the era of GSM, Africa took to it like a fish to water," he says. "Corporates investing in this business found a high traffic business with evolving regulation and control and it became a huge business."

Anyone who knows Africa well will be aware that alongside the oil sector, the telecom industry houses some of the most efficiently run businesses in Africa on the continent. However, Muriithi warns that when it comes to the technical elements, a number of people fall short.

"I'm just being as candid as I can be," he says. "The point being when you take a measure, big players that have invested in them cannot then be seen to be flouting regulations. The structure has to be regulated the whole way down the chain from the Global HQ to the operations in Africa."

So, why has Asia – a continent with an abundance of emerging markets – made a smoother transition when it comes to international investment and partnerships?

"Asia has benefitted from a greater mix of wealthy nations – which means more capital flows into the developing economies in that region," says Gosliner. "The cultural difference between those countries is smaller. Whereas major capital markets on the edges of the African continent are culturally quite different and so there's a greater sense of hesitancy to go into the market."

For Muriithi, it's mainly down to the power of India, China and Japan. "There's a lot of influence coming in from those particular countries and so it becomes a different comparison," he says. "Africa is a rich continent very ready for the business we are in. The beauty of Africa is we don't have to go through an entire product evolution cycle. A lot of businesses take advantage of that through adoption of emerging technology, fitting it in very quickly and innovating / adapting around it." ■



**James Muriithi,
head of Africa,
Juvo**



Multi-play 4G, VoLTE, VoIP, GSM, CDMA, HSPA+, Content, CATV, IPTV, ISP, WIMAX, M2M, CIBER, TAP, Data, FTTH, FTTB Fixed, Wireline and Long Distance BSS / OSS, CRM, POS & Mediation. SOC 1-SSAE 16 Type II and Business Processes Frame Work (eTOM) levels 1 – 3 compliant.



Convergent Billing

Unlimited universal services catalogs, discounts, bill detail, languages & messages.



360° View CRM

Order fulfillment & both direct and self-help customer relation and issue management.



Point of Sale

Sales, inventory, exchanges, returns, purchasing & POS hardware integration



Sales Lead-to-Cash

Telemarketing, lead & sales tracking appointments, quotes, agent access & commissions.



Terms Management

Post-pay, prepay, credit card & direct-debit terms management. AR & automated treatment.



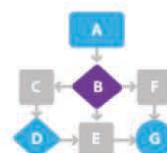
Client Contact

Unlimited contact data, promotions, messages & follow-ups. Paper, e-mail & SMS



Trouble Ticketing

Open, schedule, track merge, auto-escalate. Manage truck rolls. Auto-text status updates.



Automated Workflows

User-configurable process flows, assignments, priority statuses, escalations & follow-ups.



Operational Support

70,000 features. 250+ 3rd-party interfaces, including content & multi-play switch mediation.

chapter 3

Value-added services



Mariam Abdullahi,
telecommunications
industry lead,
Africa,
SAP

By now, we have seen and experienced many digital disruptions that industries are going through as a result of the technological advances and changing consumer needs. It is also undeniable that the telecom industry is undergoing massive disruptions. In fact, I'd argue mobile operators are some of the most disrupted businesses in the world, mostly thanks to the smart and very convenient over-the-top (OTT) services that disrupt and even replace incumbent offerings. Operators' traditional revenue streams have been cannibalised by the OTT players, from voice (WhatsApp, Skype) and messaging (Facebook Messenger, WeChat) to new services in the television (Netflix, ShowMax), music (Spotify, Apple Play), travel (Uber, Taxify) and many more.

Traditional revenues are declining, while operators struggle with a constant stream of new technological innovations that disrupt their business models. As a result, operators must look for new ways to drive additional revenues whilst also modernising to become more operationally efficient and taking advantage of the technology trends.

For African operators, this breakneck pace of change is forcing a fundamental rethink of their traditional business models. We've all heard the reports: Africa is a mobile continent. According to independent analyst and consultancy firm Ovum, mobile subscriptions in Africa reached one billion toward the end of 2017 and showed slight growth in 2018 to reach a penetration rate of 82 per cent.

However, by the end of June 2018, only 43.5 per cent of mobile subscriptions on the

continent were based on mobile broadband connections - well below the global average of 70.7 per cent. The continent is still playing catch-up to other regions. Its legacy of infrastructural underdevelopment has created an environment where telco operators could introduce non-traditional products and services. For example, only 7.3 per cent of households on the continent have access to fixed broadband connectivity, while 80 per cent of adults in sub-Saharan Africa don't use any formal or informal banking services.

Getting smart mobile devices into the hands of consumers and delivering services to them via their devices is good news for the bottom line. But that is true that real uptake and stickiness only occurs if such services are relevant & attractive to consumers. The more smart mobile devices in the market, the larger the opportunity is for value-added services (VAS). The economies of scale this creates could push down the price of VAS and drive up adoption.

Let's use an example: as a telco operator you could introduce and offer an mHealthcare VAS but only 10 per cent of the population can access it. Due to a smaller pool of potential users, your prices for accessing the VAS have to be pushed up to maintain profitability. However, if 70 per cent of the population had access, you could lower the price and remove barriers to adoption. Similar opportunities exist in eCommerce, education, entertainment and more.

I once heard it said at an industry event that in Africa you either have oil companies or telcos. The licences fees and taxes bring in sizeable revenues to nations. However, nations and regulators cannot continue managing Telco operators in this manner only. I think we need to reform the relationship between regulators and operators because at the moment it could be criticised as being old fashioned.

Regulators should upskill themselves, have a

view to where the technology and market trends are pointing, implement policies that enable innovation and hold operators accountable for matters such as privacy, connectivity, security and network management. Their main objective should not be to hinder innovation and product development.

It is also important to point out that when regulators are influenced by a nation's politics, there is often a tug-of-war between them and the operators. No one wins and the consumer arguably loses the most. There is broadly speaking a need for reform within the regulator-operator relationship.

Regulators can start by gaining a deeper understanding of the digital world in which we live, and the challenges as well as the opportunities present to the market and customers. ■

“Traditional revenues are declining, while operators struggle with a constant stream of new technological innovations that disrupt their business models”

Making mobile safer

Countries across Africa have long been plagued by those who would abuse the mobile telecoms systems, whether that be something as simple as falsely obtaining free air-time to using untraceable phones for criminal activities. 2018 saw progress to tackle some of the issues.

Liquid Telecom and Kenya-based IT security specialist Serianu teamed up in an effort to improve cyber security standards and practices across the continent.

By bringing together Serianu's enterprise-focused security monitoring and analytics solutions with Liquid's fibre network, data centres and cloud-based offerings, the partners said they would offer end-to-end protection for businesses of all size.

Liquid said it would now be able to offer



The company claims it runs the biggest customer care operation in Eastern Africa

PHOTO © SAFARICOM

cyber security assessment, monitoring, training, and incident response through a combination of Serianu's consulting, managed services, and threat intelligence. The company said "advanced" monitoring and incident response services will be made available for customers using its network and data centre facilities, leveraging Serianu's "state-of-the-art" security operations centre in Nairobi.

Serianu CEO William Makatiani said: "Through this partnership, we will explore

new ways to empower existing and future customers with quality, homegrown cyber security solutions that will help reduce the risk and cost from cybercrime across the region."

Secure access was also the aim of Safaricom who launched what it described as a dynamic voice biometrics system which will enable customers to contact services through a quicker and less intrusive vetting process.

Dubbed Jitambulisse, the system allows customers to use their voices for authentication before accessing assisted services such as resetting an M-PESA PIN or PUK requests. Safaricom said this would significantly reduce the steps a customer goes through before being assisted.

To activate the service, a customer's voice patterns are captured and used to create a unique voiceprint. This is stored as a secure string of numbers and characters and help identify and verify callers when they call for customer care.

Safaricom added that an encryption process will ensure no reverse engineering can be used to hack into the system, preventing fraudsters posing as another person. It also points out that voice recordings are not stored in order to comply with strict protection of customer data.

Safaricom strategy director Joseph Ongut says: "Our contact centre agents spend a greater portion of their call time verifying customers over phone. The introduction of this service will ensure that customers get faster and more accurate services. We anticipate that the number of fraud incidents shall also reduce as a result."

In Egypt, the government set up a specialised digital forensic lab to protect intellectual property rights (IPR) as part of its efforts in fighting software piracy.

The new lab, which is said to be the first of its kind in the MENA region, is mainly designed to resolve business software and internet-based piracy

cases. It aims to use cutting-edge techniques to safely recover data from digital devices and unearth new fraud techniques. It's claimed this will lead to a roadmap for judges, prosecutors and lawyers, enabling them to distinguish counterfeit products from those that are genuine, and manage all IP and digital piracy issues.

The Information Technology Industry Development Agency (ITIDA) will host the lab at its premises in Cairo. The agency is the executive IT arm of the Egyptian ICT ministry and part of its remit is to enforce IPR related to software and databases.

In recent years, the ITIDA's IPR office says it has undertaken comprehensive actions to increase IP enforcement with all the stakeholders. In 2017 for example, the office says it delivered technical expertise reports of 96 cases to the economic courts, registered 203 software programs, and issued 267 licenses for the first time.

Innovative mobile banking

In what was hailed as a "first for Nigeria", United Bank for Africa (UBA) launched its Leo chat solution on WhatsApp. The bank claimed customers could now conduct their banking activities in a "secure and convenient" manner



UBA has already been successful with chat services on Facebook Messenger and now hopes to replicate that on WhatsApp

JANUARY 2018

Global mobile payments company Bango has partnered with MTN Ghana to launch operator payments in Google Play, the app store for Android OS mobile device users. Subscribers can select the 'Pay with Mobile Money' option in the store to charge the cost of apps, games, music, movies, etc., to their MTN Mobile Money wallet. Citing 2017 data from Stat Counter, Bango says Android has a more than 75 per cent market share of all mobile devices in Africa. It adds that credit card penetration in sub-Saharan Africa is estimated to be less than five per cent.

FEBRUARY

GE and the African Leadership University (ALU) are working together to help give the continent's professionals valuable digital skills. GE will

combine its claimed expertise with ALU's unique learning model for the Africa Industrial Internet Programme (AIIP). This 12-month professional training scheme is designed to merge the essential business and technical skills necessary for professionals to succeed in a digital industrial environment. The AIIP uses a blended learning model with a mix of online learning and offline sessions to be held at the GE Africa Innovation Centre in Johannesburg. It involves machine learning with what's said to be ALU's "unique" entrepreneurial leadership programme to prepare professionals for leadership roles in entrepreneurial and technology-driven work environments.

MARCH

Security experts at Kaspersky Lab have uncovered a sophisticated threat used for cyber-

espionage in the Middle East and Africa that has existed since at least 2012. The malware, dubbed Slingshot, attacks and infects victims through compromised routers and can run in kernel mode, giving it complete control over victim devices. Kenya and the Yemen account for most of the 100 victims that have also been seen in Libya, Congo, Sudan, Somalia and Tanzania. Kaspersky Lab advises users of Mikrotik routers to upgrade to the latest software version as soon as possible to ensure protection.

APRIL

ONEm Communications says it can bring internet-like services to millions of mobile users currently without internet connectivity. The UK-based tech firm plans expansion in Africa through licensing deals and local partnerships. It said the move

by communicating with UBA in a verified chat.

The bank enabled this by using the Transact system from authorised WhatsApp Business Solution provider, Clickatell. The system includes the vendor's .Control chat platform which has been integrated with the WhatsApp business API. Clickatell said .Control would allow banks to roll out commonly used banking activities like checking balances, money transfer, and purchasing digital products and services across popular communication channels like USSD and now WhatsApp.

It also claimed that the platform offers flexibility, reliability, fraud and risk management for banks, as well as a convenient on demand banking capability for consumers wherever they are.

According to Clickatell, Nigeria is recognised as "ground zero" for global financial inclusion with a rapid accelerating move from the informal economy to the formal sector. Citing a Central Bank of Nigeria survey from 2016, it says 46.9 million people in Nigeria or 48.6 per cent of the adult population are now formally served by banks or similar.

Côte d'Ivoire also had a first when Standard Chartered Bank launched what was said to be its first digital bank in Africa.

By downloading Standard Chartered's app, new clients can use their mobile devices to open an account. It's claimed they can upload all verification documents and fully complete the onboarding process within 15 minutes.

"Our new digital bank was developed with our clients in mind," said Jaydeep Gupta, Standard Chartered's regional head of retail banking, Africa and Middle East. "We have taken into consideration the feedback received by our clients at each stage of the design process and have incorporated innovative technology to allow them to execute all banking activities from a mobile device. This includes 70 banking services through the app."

will see advanced services for rural communities spread throughout the continent. ONEm claims its technology transforms ordinary voice and SMS into "powerful" interactive tools. The company said it offers a framework for developers to create interactive applications for content and services which are relevant in the local market, and that those applications can be run on any mobiles without the internet.

MAY

Orange is aiming to become a key player in the energy transition sector in Africa by providing services directly to the general public or as a wholesaler to public operators. Orange already provides a service offering rural populations access to solar energy in the DRC and Madagascar. It has introduced the



EcoCash Scan & Pay uses Mastercard's QR system to enable customers to pay for merchant goods directly from their mobile money accounts

Gupta added that clients will also be able to track and trace a request submitted – a first for Standard Chartered.

The bank launched the new service with the support of the Côte d'Ivoire government. Sunil Kaushal, Standard Chartered's regional CEO for Africa and Middle East, hailed the achievement as a "key milestone" on the company's digital journey, and that it underlined a commitment to investing and growing in the market.

Zimbabwe saw Mastercard launch a system with EcoCash. Powered by Mastercard's Masterpass QR system, EcoCash Scan & Pay enables subscribers



As the bank's digital ambassador, international footballing legend Didier Drogba (centre) became the first person in Côte d'Ivoire to open a digital account. He is pictured with Sunil Kaushal, Standard Chartered's MEA CEO (left) and Côte d'Ivoire ICT minister, Bruno Nabagné Kone

service in Burkina Faso, and further launches are planned in Senegal, Mali, Guinea and Côte d'Ivoire. The Orange Energie kit includes a solar panel, a battery and accessories such as LED lightbulbs, phone rechargers, etc.

JUNE

Safaricom has been expanding its Digifarm initiative across Kenya. Since launching the programme in October 2017, the company claims it now serves more than 670,000 farmers through 18 depots that have been opened across the country. Digifarm is an integrated mobile platform that is designed to offer farmers convenient, one-stop access to a variety of services. These include discounted inputs and advice on input use, financing, and information on crops and animals.

to pay merchants directly from their mobile money accounts. All the customer needs to do is use a smartphone to scan a QR code displayed at the checkout, or enter a merchant identifier associated with the QR code into their feature phone.

The companies said the technology removes the need to carry cash, and frees both consumers and retailers from the costs, security risks and inconveniences associated with cash.

As of the announcement in August 2018, Scan & Pay was available to EcoCash's five million active subscribers, and was already being accepted at 3,800 retail locations and businesses in Zimbabwe.

Gabriel Swanepoel, VP of business integration at Mastercard Southern Africa, said: "Masterpass QR is a game-changer as it enables smaller retailers to increase sales, draw new customers into their stores, and open up new commerce channels with little to no investment."

Mastercard has previously stated that its global goal is to connect 40 million micro and small merchants to its electronic payments network by the end of 2020. By then, it says Masterpass QR will have been introduced to 33 countries across Africa.

Citizens seizing power

At the beginning of September, energy company Fenix International announced it had reached 30,000 Zambian households just nine

JULY

Algerian MNO says it has achieved an "important milestone" in its digital transformation programme with the implementation of a digital BSS platform. The new system, provided by Ericsson, uses cloud-based new software technologies and manages Djazzy's overall customer relationships. These include billing, pricing and commercial offers along with their customisation to anticipate subscribers' needs according to their consumption patterns.

AUGUST

In a recently published study, the Commonwealth Telecommunications Organisation (CTO) found that most stakeholders recognise and appreciate the innovative nature of OTT services and do not want innovation

months after expanding into the country in a partnership with MTN.

The firm said the growth rate had exceeded its initial expectations. CEO Lyndsay Handler said: “[Fenix’s] ReadyPay Solar Power system is now providing power for clean, bright lights, phone charging, satellite TV, and more to over 150,000 people in off-grid Zambian households.”

According to the company, its systems are designed to extend safe, clean and reliable energy to off-grid users, and the lease-to-own business model makes them “ultra-affordable” to last mile customers. The company added that its expandable range of solar products also gives individual households the flexibility to match their system to their existing energy budget. It claimed the success of this positioning had enabled it to quickly reach customers in every province in Zambia.

After establishing what it described as a “strong base” in Uganda, Fenix expanded to



The ReadyPay Solar Power system is now providing power to more than 150,000 Zambians in off-grid households

Zambia in exclusive partnership with MTN Zambia. Fenix customers use MTN Mobile Money to finance their systems, whilst the cellco’s brand and distribution network helps Fenix to quickly scale across the country. The company had previously said that it would aim to reach 850,000 people living in rural Zambia by 2020.

Orange was also on the march in 2018, aiming to become a key player in the energy transition sector in Africa by providing services directly to the general public or as a wholesaler to public operators.

Having already provided a service offering rural populations access to solar energy in the DRC and Madagascar, 27 March saw the firm introducing the service in Burkina Faso.

The Orange Energie kit includes a solar panel, a battery and accessories such as LED lightbulbs, phone rechargers, etc. The equipment is being provided by partners (BBOXX in the DRC, D Light in Madagascar and Niwa in Burkina Faso) and is said to be quick and easy to set-up – all the user needs to do is install a solar panel on the roof and a control unit in the house. Orange offers a full guarantee that covers the entire installation, maintenance and repairs in conjunction with technical partners.

Various daily, weekly or quarterly subscription packages are available. For example in the DRC, monthly subscriptions start at USD15. Payment via Orange Money makes it possible to automatically grant or re-establish the service remotely for the requested period. Orange reckons its service makes solar energy more widely accessible thanks to the flexibility of mobile payments.

Orange said the next step would involve the “massive” deployment of the Energie service in other countries across its footprint, and the sale of several hundred thousand kits before the end of 2023.

The firm is betting on a bright future for the service, believing the energy sector represents a significant opportunity for its plan for diversification in Africa where power cuts are frequent.

M-health

Food supply is a problem that isn’t unique to Africa, but it’s still one which requires urgent efforts to be made across certain sections of the continent. On 6 June Vodafone announced that Sanku (Project Healthy Children) would be equipping 3,000 small flour mills across Africa with the operator’s IoT services over the next four years to help provide nutritious fortified flour to millions of people.

Using Vodafone’s global IoT SIM and USB Connect technology, Sanku is aiming to gain realtime, data-driven insights to help significantly scale its programme and improve efficiency.

Sanku said its uniquely developed dosifier technology enables small African flour mills in rural areas to fortify flour with key nutrients during the milling process in a way that is sustainable and cost-effective.

However, the organisation said that while it takes 25 mills to fortify enough flour to feed 125,000 people, these can only be monitored by a single worker at any one time.

But using Vodafone’s IoT SIM can now connect the same worker to 100 mills which will

to be stifled as such services offer numerous benefits to consumers. However, it added that not all commonwealth countries have the scale, market and regulatory sophistication to take advantage of the app economy, particularly by building domestic digital businesses. Some of the key OTT challenges identified by the study include issues around licensing obligations, taxation, QoS/QoE, data protection, net neutrality, interconnection, and USF.

SEPTEMBER

TV audiences in Nigeria will now have access to 13 new free-to-air (FTA) channels branded as PREMIUM.FREE. The bouquet’s launch channels will be supplied by AfricaXP, an independent channel network, content distributor and producer which owns and operates more than different themed channels supplied to major African broadcasters and African diaspora platforms worldwide. They will be delivered via SES’ ASTRA 2G satellite which orbits at 28.2°E and is claimed to reach

more than 9 million DTH households across West Africa. SES’ media subsidiary MX1 is providing the necessary ground services.

OCTOBER

The MTN Group has announced its Sudan operation as the winner of its annual 21 Days of Yello Care employee volunteerism programme. MTN Sudan partnered with key stakeholders to uplift small enterprises. They included an online shopping and logistics platform which created a merchant account for one of its beneficiaries that works with disabled people, offering them services for free. Another partner offered training at a discounted rate to beneficiaries for 12 months. MTN Sudan was awarded the group president and CEO prize of USD100,000. The money will go to community projects.

NOVEMBER

Africa Mobile Networks (AMN) and Intelsat have teamed up in an effort to accelerate the deployment

of mobile connectivity to unserved communities across multiple countries in sub-Saharan Africa. AMN provides a network-as-a-service (NaaS) solution to help mobile operators expand their networks into remote and rural areas. It funds, builds and operates the ultra-rural network for the operator, enabling them to extend their coverage with minimal opex and capex risk, grow their subscriber and revenue base, and better serve all their customers.

DECEMBER

In what’s been hailed as a “first for Nigeria”, United Bank for Africa (UBA) has launched its Leo chat solution on WhatsApp. It’s claimed customers can now conduct their banking activities in a “secure and convenient” manner by communicating with UBA in a verified chat. The bank has enabled this by using the Transact system from authorised WhatsApp Business Solution provider, Clickatell. The system includes the vendor’s Control chat platform which has been integrated with the WhatsApp business API.



Sanku says its unique dosifier enables micro mills in rural areas to fortify flour with key nutrients during the milling process

fortify flour for 500,000 people. The worker can receive alerts remotely and in realtime when the mills run out of flour or require maintenance.

Vodafone added that its in-country roaming reaches the most remote areas, allowing access to up-to-the-minute information on maintenance, power supply, and machine tracking via GPS. Furthermore, M-Pesa is being used to enable millers to securely make and receive payments on their smartphones.

Sanku and Vodafone have been rolling out the IoT technology to local mills in Tanzania and Rwanda, and plan to implement it across Eastern and Southern Africa where Sanku also runs projects in Kenya, Malawi, and Mozambique.

The organisation also added that its dosifier as of June 2018 helps provide fortified flour to around a million people and that IoT will help it reach 100 million people by 2025.

Philips Africa was also showcasing the power of mobile technology when it launched Lumify, its first app-based ultrasound system that promises to extend the reach of ultrasound applications to

a broader network of healthcare providers.

Unveiled in Nairobi in mid-September, Philips said the system is an "entirely new way" of delivering ultrasound technology to healthcare providers and their patients.

Lumify is claimed to offer high-quality imaging on a compatible smart device through a subscription model. The device connects to a Philips' ultrasound transducer, and users also have access to an online portal where they can manage their equipment and access support, training and IT services.

As a customised app-based solution, Philips says its system is designed to "seamlessly" integrate with patient profiles and health system equipment using cloud-enabled technology.

First-generation Lumify transducers are now commercially available across East Africa. They include: the L12-4 which supports a variety of clinical applications, including soft tissue, musculoskeletal, lung and vascular scanning; the C5-2 which offers abdominal with lung and gallbladder pre-sets and Ob/Gyn capabilities; and the S4-1 which has presets for cardiac and FAST exams. All the applications and services are

available through Philips' new app-based portal.

"Lumify is designed to drive transformation in care delivery and digital health – a dynamic combination that can extend the reach of ultrasound in a remarkable way," said Philips Africa CEO Jasper Westerink. "Clinicians as well as family doctors at small outpatient clinics can perform scans themselves, speeding up the diagnosis process and possible treatments."

The system also features Innovative Imaging Technologies' Reacts collaborative platform. This connects clinicians around the world in real-time by turning a compatible smart device into an integrated tele-ultrasound solution, combining two-way audio-visual calls with live ultrasound streaming.

According to Philips, this easy-to-use and innovative integrated system enables clinicians to have a face-to-face conversation with colleagues. They can switch to the front-facing camera on their smart device to show the position of the probe, and can then share the ultrasound stream so that both parties are simultaneously viewing the live ultrasound image and probe positioning, while discussing and interacting at the same time. ■



Lumify features a cloud-based collaborative platform that brings experts into an ultrasound exam, no matter the distance, as though they were in the same room



Mariam Abdullahi , telecommunications industry lead, Africa, SAP

The year ahead: While Africa is often touted for its innovation in mobile services - thanks in part to world-famous examples such as MPESA - it lags Asia in terms of value-added services.

This could be in part due to access: does Africa have the same access to tools for digital age as Asia? Certainly not. Most mobile devices - in fact, most consumer electronics - are manufactured in Asia. This helps keep costs down, driving greater adoption.

Asia also has economies of scale. Kenya, a famously sophisticated market for mobile innovation has approximately 47 million active mobile subscribers according to the September 2018 Communications Authority of Kenya Sector Report. The Philippines has almost 100 million subscribers. In fact, one country - India - has as many people as all of Africa. For VAS

providers, it is far easier doing business with one country than the 54 diverse and disparate countries that constitute the African continent.

Africa should therefore look inward to develop its own impactful VAS innovations. A savvy mobile operator could partner with an IoT device provider to offer improved fault reporting and maintenance services to enterprises. For example, an operator could offer to host a power utility company's cloud services, integrate an IoT solution, and provide predictive maintenance capabilities to the utility company.

Similarly, government partnerships could see them ease fault reporting and maintenance of critical infrastructure. A water leak could be automatically detected using IoT, reported to an appropriate government department, and all data stored and analysed to start uncovering trends which may point to proactive maintenance opportunities.

There is no value-added service that is by nature better than another. It all comes down to whether they address an existing need and ease

the way we conduct our day-to-day life activities.

Telco operators also need to re-evaluate how they view customers. If you don't engage with your customers in an effective and customer-centric way, it will be easy to lose them. Consumers are more empowered with information and globally influenced than ever before, largely thanks to the very digital services provided by operators.

It is important to decide the areas to prioritise in terms of revenue streams. To me "5G" is not a strategy; it's just a technology, and success will ultimately depend on the types and quality of innovation built & delivered on this technology.

As an industry we need to ask ourselves: what can we offer beyond connectivity and how do we reimagine our business models to build capabilities of the so-called Intelligent Enterprise, one that redefines the end-to-end customer experience, transforms workforce engagement, and delivers a step-change in productivity for our customers whilst transforming nations?



**Josh Gosliner,
product
marketing
director , Juvo**



**James Muriithi,
head of Africa,
Juvo**

The current VAS offering in Africa is simply not good enough. That's the view of James Muriithi, head of Africa at Juvo, the mobile financial identity provider. Muriithi says one of the things that has clouded the development of VAS is the excitement around mobile financial services. Here the telco's see a great solution that enables them to lock in their customers and secure additional revenue streams, because they make great profits from those transactions, too.

"What that did was it clouded the evolution of VAS because if you were able to move funds with mobile money, then suddenly the rest didn't make a lot of sense," he adds. "That's when the whole game became very complicated."

That's not the only problem, he says, adding that the advent of data has also had a significant impact.

"One thing we've seen in developing markets and telco's VAS services start from a revenue generation perspective, you're thinking about how to squeeze money out of your consumers, not what's best for your consumers, so naturally the consumers don't engage with them," he opines. "There was not enough innovation and that has impacted ARPU. Now there is a vicious cycle where operators have completely lost out to the consumers. They have not been innovative enough and connected enough with the consumers so now it's a different game. Telcos need to think what will deliver the most value for their customers, they need to start with the customer."

Josh Gosliner, director of product marketing at Juvo, agrees that "when you start like that" you end up with services that customers don't particularly care about and aren't necessarily as impactful.

"I think the emphasis that telcos should think about and their thought process should be is what is really going to deliver the most value to my customer? When you do that, the revenue challenge will not be as much of a problem. You're starting with a customer mentality first."

So, while the challenges for mobile operators in the VAS arena are clear to see, pound for pound, which ones are the best and most important to the African people – banking, education, commerce?

Muriithi says they are all "good examples", but one has to be mindful of the fact that there are different skills needed, varying from country to country, given the varied nature of the continent.

"The key thing is transaction enablement," he says. "The moment you've managed transaction enablement, the next thing to establish is

a credit scoring system (building a mobile telephony credit-score without a bank). "Once that is in place, you leave it to the people to tell you what they need more or less of. You don't know what the person wants until you've interacted with them and spoken to them."

However, while it is widely believed that VAS is there to reduce churn, Gosliner says he "would contend" that most telcos don't see it that way. "They see it as revenue maximization and I think that's been one of the problems that has plagued VAS globally," he argues. "I think that a very significant opportunity exists around creating service differentiation leading to greater stickiness on the network."

In Gosliner's view the myopic approach of the providers is what inherently leads to churn.

Still, Gosliner thinks the next 12 months and beyond will see telcos begin to think more seriously about their entire customer base.

"What I mean by that is, for example, not just how smartphones are being marketed to the top 10 per cent of customers," he adds. "2019 is about driving value to the entire base. Lastly, I think that Telco's will start getting serious about creating new revenue streams outside of telco services. Downward pressure on pricing has made their core business less and less attractive. Instead of new revenues being an innovation or SkunkWorks project, it will have to become part of the core business."

For Muriithi, telcos will soon realise that data science deployed by OTT providers has given them a huge advantage. "The impact of OTT is getting greater and so operators need to understand their customers better, market products that make sense to them, consider a targeted approach," he says. "Smartphone adoption will grow too in Africa. Not just the numbers, but the rate at which people adopt them, there is a lot of investment by various international players. It will make for a very interesting conversation this time next year."



**Elisabeth Medou
Badang,
senior vice
president Africa
and Indian Ocean,
Orange Middle
East and Africa**

Orange has long been a major player in Europe, but in recent years its African footprint has grown exponentially.

Since setting up an Orange Middle East and Africa subsidiary in 2015, "to better identify its activities in Africa and the Middle East," the French giant now operates in 20 countries with one in 10 Africans an Orange customer.

"Networks and connectivity are at the heart of what Orange does, says Elisabeth Medou Badang, senior vice president Africa and Indian Ocean, Orange Middle East and Africa.

"We work in markets where digital can make a

real difference (financial services, content etc.) and in sectors that are emerging, not yet established or becoming structured (energy, e-health). We need to go from a culture of connectivity to one of mobile uses and services. This will enable us to expand our customer base to other users."

Whilst some companies like to keep their cards close to their chest, Badang says, very openly, that the operator is relying primarily on what she describes as "growth levers".

The first is financial services. Mobile money is a massive deal in some parts of the continent and 40 million Africans have opened Orange Money accounts. "It is a major change: from storing money anywhere, to putting it safely in an Orange Money account, from which it can be sent to anyone, pay for groceries, road tax, school fees, etc.," she adds. "We are now expanding our mobile financial services with complementary services (loans and insurance) and we'll be launching an African Bank in 2019."

The next growth lever, as far as Orange is concerned is energy. That's supply, distribution and payment for electricity access solutions by future Orange prospects and customers in partnership with SHS (Solar Home System) manufacturers. "The Orange Energy service has already been launched in seven countries: the DRC, Madagascar, Burkina Faso, Senegal, Mali, Guinea and Côte d'Ivoire, proving the soundness of the economic model for this business," adds Badang.

Then there's agriculture and education. For the former, Badang has this to say: "Orange is offering a dozen mobile services for farmers across eight countries, in cooperation with over 15 partners: NGOs, Ministries, Chambers of Commerce, local industries, universities and start-ups."

As for the latter, she says the "African Digital School" project is designed to face the challenge of education head on by delivering online courses, training in digital trades and by training teachers in the new technologies.

Like most operators, changes to the Orange business model have taken place at different times. The transition from 3G to 4G has taken three years over the entire region, compared to 10 years in Europe.

"By the end of 2016, Africa reached an important milestone, with over a billion active mobile phones. By 2021, we expect to see the same number of smartphones," adds Badang.

"Historically, our predominant business was voice calling. This has now been replaced by data and services. In a multi-sim market, developing additional services is a way to build customer loyalty. As such, the role of Orange has evolved from a connectivity provider to a multi-service operator."

Today, on a rapidly-growing continent with nearly 1.5 billion inhabitants, it is clear that digital transformation poses enormous challenges, which may not have been faced before. Africa has launched into the digital revolution and Badang says Orange "intends to be a leading partner"

in the digital transformation of the African continent by developing digital services in partnership with other key players.

"The private sector is prepared to take some of the risk, but we are relying on donors and governments to help us scale up these new activities based on digital, so we can respond to the huge service requirements of the population," says Badang.

In July 2018, Orange submitted an application for approval to the Central Bank of West African States (BCEAO), which is currently under consideration.

"We do not plan to provide corporate banking or corporate," she adds. "We will provide micro financing and micro saving services to the general public. Our approach is more targeted towards the general public, for whom we have developed our skills and services, and for whom we will contribute to financial inclusion. We will educate the market, which is something that benefits everyone. We also regularly collaborate with banks."

Orange invests EUR1bn every year in the region, putting Orange at the forefront of the digital transformation in Africa and the Middle East, according to Badang.

Its 2G/3G networks serve 20 countries in the MEA region and provide connectivity to nearly 120 million customers. 4G is now available in 15 countries in Africa and the Middle East, with 16.7 million customers to date.



**Osman Perksoy,
VP sales &
business,
Telenity**

Telenity is a provider of value-added software solutions to mobile network operators (MNO) worldwide. Since the company was founded in 2000, it has deployed solutions in more than 40 mobile networks in over 35 countries. Traditionally, the Middle East and CIS were its primary markets. Last year Telenity made a strategic decision to expand its business in Africa, hiring local employees in Nigeria and South Africa.

"We established local and regional partnerships in numerous countries and attended as many trade shows and events that we could," says Osman Perksoy, vice president sales and business development.

"As a result of these activities, we generated a healthy pipeline of qualified leads. I am excited to announce that we are in the final stages of launching our digital services platform with a major MNO in Nigeria.

Perksoy says that in meetings with MNOs, Telenity realised that the awareness around digital services has been significantly increasing in Africa. "Many of these service providers are in the process of acquiring licenses that will enable them to provide homegrown payment solutions, which will broaden the spectrum of services that they can offer to their subscriber base," he adds. "There is also major investment around Internet of Things (IoT) across the continent. Utilisation of new technologies such as Network Function Virtualization (NFV) is limited but has made its place in the strategic roadmaps."

Perksoy says "to summarize", the market awareness and technology know-how is in place and that the factor that will determine the winners amongst MNOs is their capability to execute. "I also observe that mobile operator groups are getting more active in driving their pan-Africa strategy," he adds. "I believe this will pave the path for new investments across the telecom industry in the years ahead."

Telenity is very optimistic about the future and Perksoy says Africa has significant potential for advancements in the telecommunication space. "I think the biggest challenge in most countries is corruption and political instability, both of which negatively impact the investments in technology," he continues.

As smartphones are becoming more affordable, Telenity sees a variety of creative solutions that fill the gaps in infrastructure and processes. "As an example, the number of smartphone service applications that SMBs use to run their business in Africa is significant," says Osman. "With cloud-based services and smartphones, SMBs can receive orders, track shipments and staff, send

invoices, make payments without a computer ownership." In the past, such solutions required significant investment. However, Perksoy says making these available to a larger portion of the population is still a challenge and while the users in densely populated urban areas enjoy the benefits of these technologies, the widespread rural population has limited access to them. "Therefore, making 4G mobile access and cloud-based services ubiquitous across their operating markets will be one of the top priorities of African MNOs," he adds. "For all companies trying to expand their business in the region, I believe the local rules and regulations will remain to be a challenge."

Perksoy says when he travels to Africa, he always feels "a positive vibe in the air", despite all the present challenges. He says people in Africa are deeply aware of the issues that surround them and they are well equipped to tackle them effectively. "We will continue investing in Africa by growing our presence through new partnerships, alliances and a larger team," he says. "Our initial engagements with MNOs last year gave us strong indications that there is a significant opportunity for consolidated messaging and voice solutions, as well as digital services platform businesses across the continent."

Perksoy says by the end of next year, Telenity is expecting operator groups to publish their strategic plans that will cover the next four to five years, with accompanying tenders that will drive their execution plans. "We are hoping for increased number of wins and deeper engagements with decision makers in the telecom industry," Perksoy adds. "We will continue expanding our footprint with local/regional partners that drive our business on a daily basis on the ground."

Overall, Perksoy says he is "quite impressed" with the opportunities that the African market presents for Telenity. "We are very well positioned to provide cost saving and revenue generating solutions to MNOs in the region," he says. "We are getting very positive feedback through our sales team and partners for Telenity consolidated messaging and voice solutions, and Telenity digital services platform. I believe Africa will be the fastest growing region for Telenity in the years to come."


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Anil Krishnan,
head of Africa
region,
Comviva
Technologies

Anil Krishnan, head of Africa region at Comviva Technologies, says the mobility solutions provider has transformed its business successfully as compared to its traditional rivals and is betting big on the growth levers of data analytics, digital payments and enterprise messaging.

In addition to consolidating business within key accounts in the region, Comviva has been making forays into newer markets within Africa and focusing on telcos outside the major groups in the SADC (South African Development Community) and West East and Central Africa (WECA) regions. The company has also had some significant wins in markets like Angola and Equatorial Guinea.

"The usual challenges of other markets like plateauing of voice revenues, VAS revenues, etc. are reflected in the African market as well," he says. "The shift to higher tax regime and lower termination rates have not gone down well with telcos on the revenue front. Operator revenues from international calling have also declined with cheap availability of data spawning VoIP. 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 rising up the data value chain."

As a result, Krishnan says telcos are making significant investments in enhancing infrastructure in these areas to push for growth. However, all this will depend upon improving connectivity in Africa.

As far as the next 12 months are concerned, Krishnan says low ARPU and capex investments in network expansion/4G will be the key challenges.

"This is also the reason we are seeing less of greenfield players," he says. "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."

Still, Krishnan says there's plenty of room for optimism and Comviva is looking at sustained growth within existing markets and it will push into newer markets where it was not active previously either directly or through a partnership route.

"We are confident that our robust suite of digital offerings along with our industry expertise will continue to resonate with telcos having digital transformation on the top of their agendas," he adds. "In the last few years, we've transitioned several telcos into digital front office and digital back office with sales and distribution transformation."

Still, as telcos continue to transition into the digital space, Comviva hopes for many such successful transformation initiatives in the future. A case in point is the launch of a new age digital platform, which Krishnan says will help telcos 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," he says. "Similarly, in mobile money, we've identified new technologies as well as the valued partners which help us in reinforcing our leadership position in the continent."

At a company level, Comviva has identified key growth levers from within its product portfolio based on the addressable market and is 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 eastern Europe – which is to be implemented 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 per cent CAGR in the next four years.

Krishnan says that while financial inclusivity through add services like micro-loans and micro-insurance is already driving mobile money growth, data inclusivity would be the next big bet. "What we mean by this is moving the basic feature phone users up the handset value chain which means higher smartphone penetration resulting in higher data adoption," he says. "In many of our deployments in developing countries, we've helped the operator in onboarding new converts to the digital ecosystem and drive usage by providing new and exciting experiences on their mobile, like live streaming of a sporting event or end to end loyalty management."

AFRICAN WIRELESS COMMS.COM

AFRICAN WIRELESS

The website features a header with navigation links for Broadband, WAN/LAN, VAS, IoT, Cloud, Backhaul, Network Management, Publications, Fibre, Other, Archives, Events, and Register. Below the header, there are news articles and a search bar. The main content area includes a large image of a tablet displaying a news article about MDXI and Asteroid launching a carrier-neutral IX in West Africa. To the right, there are smaller images of a laptop, a smartphone, and a magazine cover. The smartphone screen shows a news article about肯yan regulator reports positive outlook for ICT. At the bottom, there is a call-to-action button for 'www.africanwirelesscomms.com' and a download link for 'The Solution Brief'.

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chapter

Fixed wireless access

4



Julian Bright,
senior analyst,
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Demand for broadband connectivity is growing fast, particularly among populations in the world's developing regions and emerging economies. Yet a basic broadband service still fails to reach many in remote and rural areas, while even in more populated suburbs and urban neighbourhoods where the communications infrastructure exists, homes and businesses

can still experience poor or non-existent coverage.

Fixed-wireless access (FWA) (also known as fixed-wireless broadband or WTTx) meets many of the criteria for affordable broadband connectivity where competing technologies such as fibre and copper fall short or are uneconomic. As well as providing basic connectivity, FWA is helping operators and service providers compete in the home broadband and small business markets where access to digital media such as video streaming, gaming and live sports, as well as business services, can help them to grow their businesses more quickly.

In a region such as sub-Saharan Africa (SSA), the economic and social impact of wider access to broadband data services and the internet can be greatest, boosting local economies and driving up GDP. Service providers and ISPs have an opportunity both to fill the void that this lack of connectivity represents and to benefit commercially by driving up data usage and growing revenues on their networks.

The broadband market in sub-Saharan Africa

The sub-Saharan Africa (SSA) region is recording strong demand for home broadband services driven by the need for high-speed,

low-latency internet to support a range of media streaming services and smart home solutions. The fixed broadband services delivered via a range of technologies such as fibre, xDSL and FWA are becoming very popular for home and office broadband services in the region, despite the growth in the mobile broadband sector.

Ovum forecasts that the number of fixed broadband subscriptions in SSA, which stood at 6.6 million in 2018, could grow by up to three-fold by 2023. LTE will remain the dominant technology over the next five years and will record the fastest growth rate between 2018 and 2023 alongside FTTx (see Figure 1).

Mauritius has the highest broadband penetration rate in the SSA region (69 per cent in Q3 2018) because of a strong fixed-network rollout legacy, higher GDP per capita and a strong enterprise segment (boosted by the tourism industry). After this, South Africa, Namibia, Botswana, and Zimbabwe are the most advanced, benefiting from a strong fixed-line deployment legacy. Ovum's

analysis clearly shows that the level of household broadband penetration in the SSA region is closely related to GDP per capita (see Figure 2).

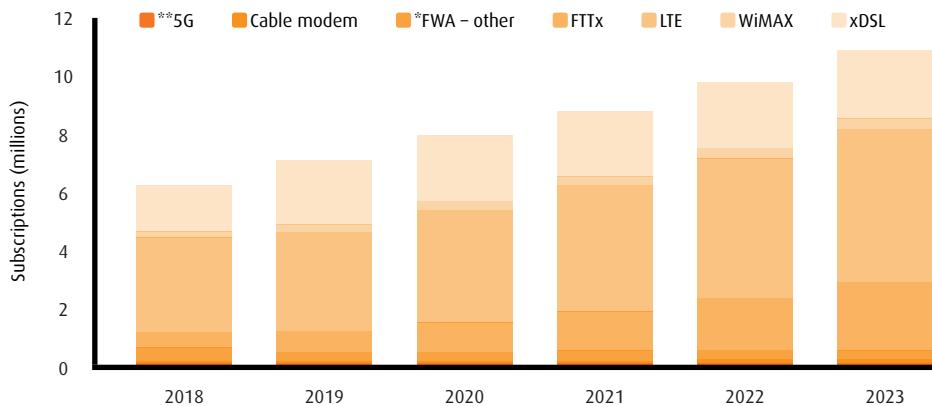
South Africa is the largest fixed broadband telecoms market in SSA, with growth driven by a large enterprise segment and higher levels of income in the consumer segment. While west and central Africa are fairly well represented, Kenya and Djibouti are the only east African markets where fixed broadband penetration exceeds two-per-cent of households.

Enterprises need broadband to expand

Businesses including micro and small-to-medium enterprises (MSMEs) are also driving demand for broadband in SSA due to the need to improve efficiency, expand to new markets, and create new revenue streams. As such, the number of enterprise fixed broadband subscriptions is expected to grow significantly over the next five years.

Figure 1: SSA fixed broadband forecast 2018-2023

SOURCE: OVUM



NOTE: *FWA - OTHER REFERS TO PROPRIETARY WIRELESS TECHNOLOGIES AND CDMA-EV-DO. THESE TECHNOLOGIES ARE DECLINING; HOWEVER, OPERATORS RUNNING THEM ARE YET TO ANNOUNCE PLANS TO MIGRATE TO LTE OR OTHER TECHNOLOGIES. **5G REFERS TO 5G FIXED-WIRELESS BROADBAND

FIXED WIRELESS ACCESS: INTRODUCTION

According to Ovum forecasts, Africa will record the highest growth in enterprise fixed broadband subscriptions between 2018 and 2022, with a CAGR of 7.27 per cent, compared to 5.75 per cent and 3.31 per cent for Central and southern Asia and eastern Europe, respectively. The growth will be supported by increased availability of spectrum bandwidth and intense market competition. In SSA, Nigeria will record the highest growth, followed by South Africa and Ghana (see Figure 3).

Business users will need a sufficient level of broadband connectivity to support communication tools and business software as well as other sophisticated technology solutions that can deliver business process automation and real-time analytics for improved customer experience management. The technologies to achieve these functions include the Internet of Things (IoT), cloud and artificial intelligence (AI).

Government services and the public sector

The need for improved efficiency in the delivery of basic services such as education, health and other government services is also driving the growth of the broadband sector in SSA. Regional governments are increasingly striving to improve efficiency and transparency in the governance and delivery of essential services as well as to create employment opportunities for the young people that form the largest segment of the population. Technologies that are being piloted include blockchain and AI in the critical sectors such as health, agriculture, land administration, cybersecurity and transport.

Governments in SSA are increasingly launching open-data platforms to enable their citizens to access vital government data remotely using mobile devices. The move is aimed at increasing transparency as well as improving the speed and convenience of accessing government services such as birth and death certificates, driving licences, identity cards, and passports. Other initiatives include e-education platforms that include smart classrooms and smart curriculums that ensure school pupils access the latest education material remotely through smart devices.

Network challenges

Fibre networks are highly resilient and provide high capacity. The use of optical technology such as passive optical networking (PON) to deliver fibre-to-the-home or to-the-premises (FTTH/FTTP) can massively boost maximum speeds to 2gb/s and above. It can also support multiple subscribers on the same network, using an optical network terminal device placed either inside or outside the premises.

Figure 2: Household broadband penetration in SSA region to GDP per capita*

SOURCE: OVUM NOTE: *EXCLUDES MAURITIUS

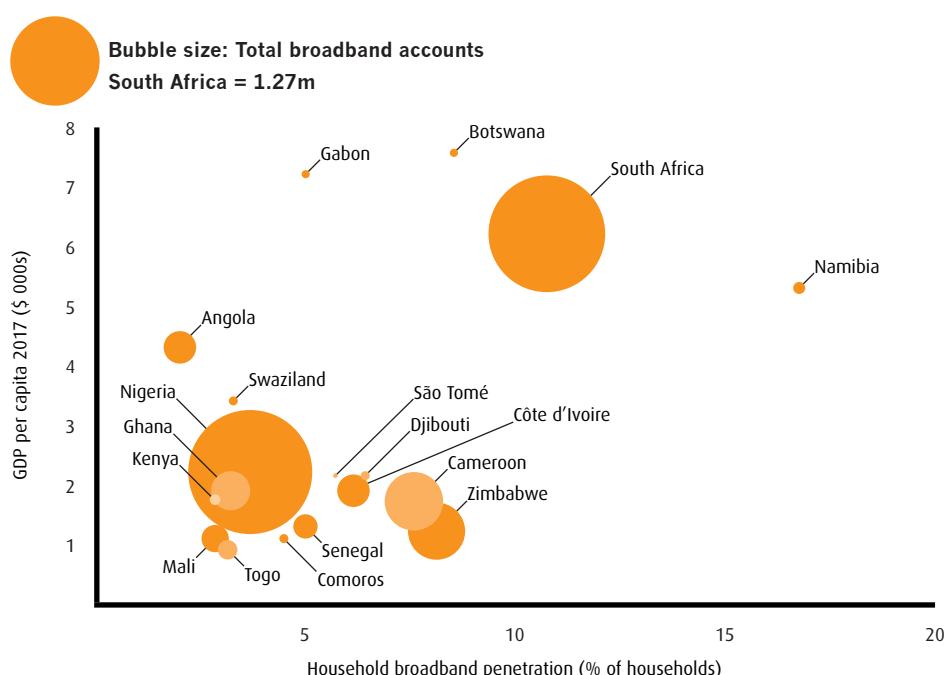
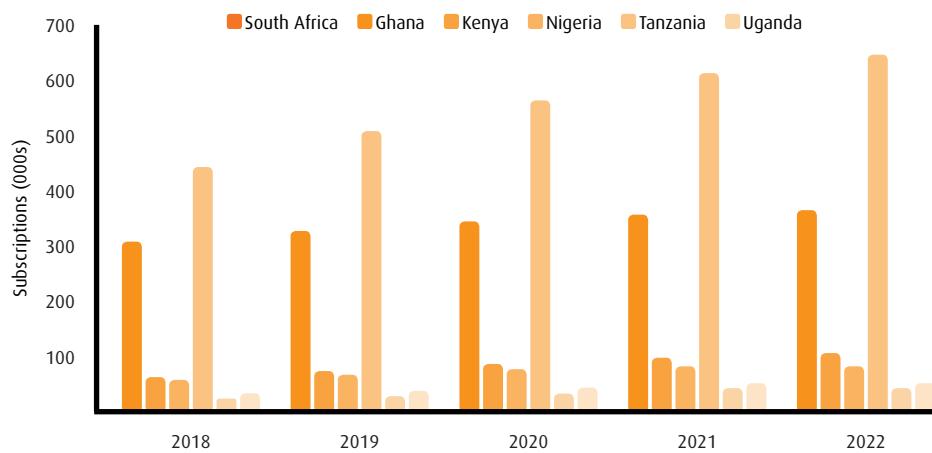


Figure 3: Enterprise fixed broadband subscriptions forecast 2018-2022

SOURCE: OVUM NOTE: *EXCLUDES MAURITIUS



However, fibre systems are costly and time consuming and remain expensive to deploy relative to other technologies, despite a continuing decline in FTTH build costs. Labour costs alone can be as much as 80 per cent or more of the total project cost in addition to the fibre equipment, depending on the availability and cost of local labour.

The cost of digging fibre can vary considerably and is not dependent solely on distance covered. As a result, various sources estimate build costs per kilometre of anything between USD20,000 and USD48,000 for systems, regardless of whether they are in developed or developing markets.

Once in place, a connection needs to be established to every house or business premises requesting a fibre service. The number of homes connected relative to those passed can be low, rendering these systems economically

challenging. Extended monetisation periods of 10 years or more are not unusual, meaning tariffs are likely to be higher than for alternative solutions.

FWA advantages

There are several advantages to deploying fixed wireless:

- Fast time to market. Deployment is less complex and less costly than wireline, and subscribers can be brought onto the network more quickly than with fibre. As a result, FWA can deliver a fast ROI.
- Ease of deployment. FWA is suitable for sparsely populated or remote areas as well as urban and suburban environments. It also supports multiple use cases and deployment scenarios.
- Plug and play. FWA is simple to install.
- Low cost. Existing cell towers can be adapted to offer FWA. ■

Free and easy Wi-Fi

For home users, if you mention fixed wireless access then they will automatically think of Wi-Fi. It's a technology that's become standard in mobile phones, laptops and even televisions these days.

In a positive event that came as an immense bonus for residents facing rising satellite and internet prices - in what's claimed to be a South African first; Nashua's franchise in Mpumalanga launched a free public Wi-Fi service in Nkangala District Municipality.

Since 1 May 2018, every resident and visitor to all six local municipalities in the district has been able to sign up for 250MB of free data per device absolutely free of charge. They would then have a month to use the data but could then sign up for another 250MB at the beginning of the following month. Nashua said that if users run out of data during the course of the month, they will be able to purchase an additional 1GB for ZAR90 (USD6.8). It said that's a "significant saving" compared to MTN's ZAR160 (USD12.11) or Vodacom's and Cell C's ZAR149 (USD11.27).

Mtho Xulu, a director at Nashua Mpumalanga who is spearheading the project in collaboration with Nkangala District Municipality, said: "This is a completely greenfield project but it's also only just the start. Our goal is to ultimately roll out the offering to the entire province."

Xulu described the initiative as a "proper" public-private partnership with a genuine developmental goal. He said that while other "so-called" free public Wi-Fi offerings such as those offered in Tshwane are

actually funded by ratepayers, the Nkangala free public Wi-Fi offering is entirely privately financed by Nashua Mpumalanga.

"It's very hard to participate in the formal economy without access to data," said Nashua Mpumalanga MD, Junior van Niekerk. "Many of the province's residents have not been able to access government services, complete online school applications or investigate job opportunities online as a result of insufficient data. Our intention is that this project will open up the economy for more people in Mpumalanga." Van Niekerk said the project forms part of Nashua Mpumalanga's enterprise development goals as the kiosks where residents can purchase additional data will create jobs.

According to the firm, data costs in South Africa are among the highest in the world and certainly higher than those of neighbouring Mozambique, Lesotho and Malawi - six times more expensive than Egypt. It said: "These high costs are shackling economic development at a time when the country desperately needs to grow its economy in order to increase inclusivity and address crippling unemployment."

The beginning of 2018 also saw cloud management software specialist Tanaza providing Yahsat with a web platform to manage multiple users accessing Wi-Fi and social hotspots across its footprint. Since forming in 2010, Italy-based Tanaza is now said to have more than 800 partners with millions of Wi-Fi users in over 130 countries. Yahsat said it will take advantage of the company's cloud-based software to allow Wi-Fi connections across geographies, with "easy

management and effortless user access".

"We have been looking for a partner that could tap into the elasticity of the cloud to help to make accessing our network leaner," said Yahsat CCO Farhad Khan. "Tanaza will provide us with the technology needed to further enhance our offering and fully align with the needs and preferences of our end-users across the Middle East, Africa, central and south west Asia."

AI Yah 3 left Earth on 25 January 2018 but



GSN is providing the ground infrastructure for the project while Intelsat is handling the space segment

JANUARY/FEBRUARY 2018

Riders and organisers of the Munga MTB mountain bike race, as well as local communities along the competition route, were able to stay connected thanks to satellite-enabled Wi-Fi. The Munga MTB is said to be the world's toughest mountain bike race. It took place in searing summer temperatures from 29 November to 2 December 2017, and saw 81 competitors race non-stop over 1,000km across the middle of South Africa, from Bloemfontein to Wellington in the Western Cape. Connectivity Africa and Ruckus Wireless provided connectivity at five sites along the routes which ranged from van Stadens guesthouse at site 1 to Pine Forest Holiday Resort at Ceres, site 5. The connectivity enabled event organisers to provide updates to the cyclists, and it also allowed them to keep records of all participants who entered and left the stopover sites. Racers were able to stay connected with their families, and post updates on social media for their followers to experience the race in realtime and keep track of their progress.

MARCH/ APRIL

Gilat Telecom (formerly Gilat Satcom) has been granted a license to provide cloud and fixed broadband services across Zambia. The operator claims the new license will enable its local subsidiary to meet the rising demand from businesses who are looking for a higher-quality broadband service and a wider range of managed services than currently available from Zambia's existing operators. Gilat Telecom Zambia has already opened an office in Lusaka and is now recruiting a local team. The company is also completing work on its PoP in the capital and expects to start offering services shortly. Among some of the benefits is a priority-based traffic management system, a cloud PBX service to reduce the cost of all calls, and a data protection service that provides another level of security by storing all an organisation's critical data in the cloud. The firm adds that all of its cloud services are available using a 'service-as-you-go' model.

MAY/JUNE

Wireless ISP HeroTel is said to be meeting "overwhelming demand" for its services with the help of hardware from Cambium Networks. Founded in 2013, HeroTel is said to be the country's largest WISP and offers its subscribers connectivity via high-speed wireless, fibre and LTE. The company currently has more than 2,000 sites and more than 45,000 clients for last-mile internet service, but found it was unable to keep up with booming demand for TV streaming services such as Netflix and Showmax. HeroTel's CCO Rich Henn says: "Traditional last-mile mediums like copper can't keep up, and fibre is limited to deployment in isolated pockets." Cambium says HeroTel is now achieving more than three times the speed and more than double the number of subscribers per sector than it achieved in the past. As a result, the company is able to offer 40mb/s SLAs, handle peak traffic volumes, and meet the spikes in demand during evening hours which are driven primarily by Netflix.

FIXED WIRELESS ACCESS: YEAR IN REVIEW

the mission experienced some “challenges” during the launch stages which resulted in the satellite being inserted into an orbit that differed from the flight plan. Commercial services were eventually launched in May 2018 (see Satcoms - Chapter 7).

Along with satellite issues, another problem was discovered when regulators found that radio frequency signals from South African mobile operators were spilling into Mozambique. In December 2017, the Independent Communications Authority of South Africa (ICASA) and the Instituto Nacional das Comunicações de Moçambique (INCM) jointly conducted an RF measurements exercise.

In their findings released in January 2018, they said that no RF spillage had been detected on either sides of the border alongside Kosi bay and Lebombo Border Posts. However, two South African operators were found to have RF spillage in the eastern Mozambique coastal town of Ponta Malongane which is around 30km north of the border. The operators were not named, and neither regulator has since revealed any remedial plan of action.

ICASA used its GEW monitoring system while INCM deployed its TCI platform. The regulators say that their results were compared and that there was no significant difference between them.

The spectrum monitoring exercises were carried out as part of a technical agreement between ICASA and INCM in April 2017. This is aimed at cooperation and coordination in respect of spectrum management for telecoms and broadcasting services.

The deal also led to the establishment of a

joint technical committee to address matters of common RF interest between the regulators.

Some more hopeful news came when the Dynamic Spectrum Alliance (DSA) welcomed the Independent Communications Authority of South Africa's decision to publish its regulations on the use of TV white space spectrum, marking a “huge step forward” in enabling affordable broadband across the country.

The alliance has been championing TVWS for several years now. Its members believe that it offers the strength in providing connectivity over large geographical areas through the use of dynamic spectrum access technologies.

“TV white space technology provides an alternative but complementary ecosystem to LTE technologies for bridging the digital divide and inexpensively delivering broadband,” said DSA president Kalpak Gude. “The two biggest barriers in South Africa, like much of Africa, are accessibility and affordability, so we congratulate [ICASA] for publishing its regulations, and it highlights how TVWS can play an important part of a national telecommunications infrastructure.”

Cellular wireless access

Cellular technology has often been used to provide fixed wireless access and 2018 was no exception. In May, Uganda’s Communications Commission (UCC) announced it would use a combined satellite solution from Gilat Satellite Networks (GSN) and Intelsat to advance the deployment of 3G infrastructure and expand affordable broadband access for businesses and communities in rural areas.

Under a pilot programme, the UCC was to use GSN’s SkyEdge II-c multi-application platform and IntelsatOne Mobile Reach Solar 3G, an end-to-end managed service delivered via Intelsat 37e.

Under the new agreement, GSN will install and maintain the ground network infrastructure while Intelsat will oversee the space segment, traffic configuration and project management. The partners said their turnkey, solar-powered package provides everything an MNO needs to expand 3G service over a 2.5km radius, including power supply, mono-pole, and all satellite and cellular equipment.

For the pilot project, MTN Uganda will integrate the sites into its core network to provide “high-quality, resilient and affordable” broadband connectivity to two rural communities – Bufundi in Rubanda, and Kibuku in Ntoroko.

The overall objective is to demonstrate the ease of deploying the satellite solution and study its commercial viability and sustainability in helping to provide 3G wireless access. The project will also be instrumental in helping to accelerate the Ugandan government’s broadband strategy, particularly its goal of achieving minimum broadband speeds of 3mb/s and coverage of 100 per cent of all rural areas by 2020.

With more than 80 per cent of Uganda’s population living in rural areas, extending broadband connectivity and delivering affordable services to everyone has been a “technological and budgetary challenge”,

JULY/AUGUST

Huawei has claimed a new throughput record for Tunisia following a test of all LTE technologies carried out in the country at the end of May. Working with Tunisie Telecom, the vendor tested 4-transmit-4-receiver (4T4R) antenna technology, CA and 256 QAM. Huawei said that during the demo, a single user peak throughput speed of 706.14mb/s was achieved – the fastest so far on a commercial network in Tunisia. According to Huawei, 4T4R increases network capacity by up to 80 per cent without adding extra spectrum or sites, greatly improving spectral efficiency. It adds that 256QAM is also a proven technology that can effectively increase peak data rate by 33 per cent. The operator’s CEO, Fadhel Kraiem, said: “Spectrum resources are fully utilised to ensure that our network is more efficient. In addition, largescale 4T4R network deployment allows us to be fully prepared for an evolution towards a new 5G era.”

SEPTEMBER/OCTOBER

Community networks provide a sustainable solution to address the connectivity gaps that exist in underserved urban, remote, and rural areas, according to the Internet Society. It also calls for regulators and policymakers to work more closely with communities to enable such networks. In its Spectrum Approaches for Community Networks briefing document published last October, the society says a community network starts with a local group of people who want to bring communications to their local village or town. It says while these networks are often small in scope, usually serving communities under 3,000 inhabitants, some support more than one village or community. For example, the Spain-based guifi.net community network also has nodes in Africa, Asia, Latin America, and Portugal, and is estimated to serve more than 50,000 people. The society says that despite internet access continuing to grow in Africa with more than 450 million people now connected, more than 60 per cent of the population remains offline.

NOVEMBER/DECEMBER

Liquid Telecom says it has delivered the first system for service peering in Africa to offer customers better performance, tighter security and lower latency. Microsoft ExpressRoute is part of Liquid’s CloudConnect platform and enables businesses to establish private connections to Microsoft Azure. Previously, customers could only access ExpressRoute via peering locations in Europe. The Western Cape Government in South Africa is overseeing a major upgrade to communications infrastructure in the region. It has recently deployed Microsoft ExpressRoute and become the first customer with a direct private connection to the Microsoft Azure cloud that is exchanged locally in Africa. A Western Cape Government spokesperson says: “Liquid Telecom’s CloudConnect service has significantly increased the performance of our cloud services and will support the rollout of leading-edge cloud solutions to more of the region.” Liquid says it is the only Microsoft partner providing an ExpressRoute service across eight African countries on its own fibre.



Vodacom Group CTO Andries Delport presents the speeds achieved in the South African trial. The tests were conducted over a live 5G mobile network in Midrand and independently evaluated by test experts MyBroadband and Ookla

according to UCC executive director Godfrey Mutabazi. He said: "With this combined effort and the innovative approach the companies are bringing, we believe citizens in some of our most isolated communities will experience the power of reliable connectivity and the economic and social benefits it delivers."

Later in the year in August, Vodacom Group announced the continent's first standards-based, commercial 5G service. Its subsidiary in Lesotho was using 3.5GHz spectrum to initially deliver fixed wireless access broadband services to two enterprise customers.

While the operator didn't name the companies involved, a spokesperson said: "[They are] two major customers in the mining and banking industries who were chosen due to their relative size and influence in the country. We are working closely with them to deploy the service based on their requirements." No further details about the number of users involved or what devices they

are using were revealed.

Vodacom Lesotho said the immediate benefit of 5G technology for its subscribers included the quicker deployment of broadband services with "fibre-like" speeds. The company added that with early access to the technology, entrepreneurs and the government will be able to work with it to develop and incubate innovative applications to power digital transformation in the country.

Meanwhile, the group claimed another 5G first, this time in South Africa with the deployment of the same standards-based technology as used in Lesotho. This followed Vodacom being granted a temporary spectrum license of 100MHz in the 3.5GHz band to showcase 5G network capabilities in South Africa.

According to the operator, 3.5GHz spectrum is considered optimal for 5G deployments due to its suitability for throughput and capacity. It added that the frequencies are not

dependent on the digital migration in South Africa, and that they also have adequate indoor penetration characteristics to support a broad range of applications such as smart factories, augmented reality and autonomous vehicles.

Vodacom South Africa deployed advanced 5G Massive MIMO to provide improved spectral efficiency and coverage, enabling increased network capacity. It said its network could now deliver speeds in excess of 700mb/s and latencies of less than 10 milliseconds. The company said it will exceed 1gb/s as new software versions and devices become available.

Under a MoU signed in late 2017, the operator is using Nokia's products to test 5G in South Africa. But the 5G network will not be available to customers in South Africa until 3.5GHz spectrum becomes available in the country.

Vodacom Group CEO Shameel Joosub said: "What we've accomplished in Lesotho is an example of what can be achieved in Africa, should the requisite spectrum also be made available. Vodacom will be able to make 5G services available to its customers in South Africa once requisite spectrum is assigned.

"Global technological advancements are evolving at a rapid pace and South Africa can't afford to be left behind, particularly when we look at some of the potential use cases for 5G to support critical sectors of our society such as healthcare and education."

A Vodacom spokesperson also said 5G rollouts in other group operations on the continent would depend on the different infrastructural requirements and the available spectrum in each country.

With this latest announcement, Vodacom has stolen a march on its rival MTN which also started trialling 5G at the beginning of 2018.



Julian Bright,
senior analyst,
intelligent
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The year ahead: There were four million FWA subscriptions in the SSA region in Q3 2018, representing 62 per cent of the region's fixed broadband usage. Nigeria and South Africa together accounted for the largest share of this market in line with the trend in the mobile telecoms segment (see Figure 3). FWA growth is driven in these markets by fast LTE uptake and the failure of fibre rollouts to keep pace with growing demand.

Sub-Saharan Africa's legacy of poor fixed-network coverage represents a significantly large and untapped market for broadband

service providers. Coupled with the speed of growth and clear appetite for new digital-media and internet-based services among consumers, businesses, and the public sector, this calls for broadband solutions that are cost-effective and can be quickly deployed.

FWA is already providing much of the region's fixed broadband capacity and leveraging the popularity of mobile broadband LTE-based services. Where the economics are favourable, FWA provides an effective complement, or even substitute, for fixed wireline connectivity, even at speeds approaching those possible with fibre. Further opportunities for FWA will continue to open up as operators and service providers in the region realise the benefits of LTE-based FWA.

Regulators and governments can encourage fixed-wireless proliferation

through the easing of barriers and provision of financial stimuli to local service providers. Such incentives do not necessarily have to fund ultra-fast, ultra-high-capacity broadband service. For those areas where broadband connectivity is poor or non-existent, delivering a minimum level of performance for all subscribers of around 10mb/s can outweigh the need to provide gigabit access for the few, and a sustainable throughput of tens of mb/s can be not only adequate for most users' needs and sufficient to support a range of services, but also more economically viable.

Over recent years, FWA has increasingly become a feature of national broadband programs designed to speed up home broadband connection and drive internet-connected penetration.

Connecting the Internet of Things

2018 was a good year for the IoT connectivity space, with Eutelsat commissioning its first LEO (low Earth orbit) satellite in the first quarter, in March 2018. Nano and microsatellite specialist Tyvak International, a subsidiary of US and Italy headquartered Terran Orbital Corporation, would be in charge of building the spacecraft for the operator.

Eutelsat LEO for Objects (ELO) is used to assess the performance of low Earth orbit satellites in providing narrowband connectivity for the IoT. According to the company, low Earth orbit is particularly well-suited for this. It said that LEO offers a satellite link anywhere in the world, is complementary to terrestrial IoT networks, and does not impact the cost or the energy consumption of the objects.

ELO is scheduled for launch in 2019. It will backhaul information from objects located in areas that are not served by terrestrial networks and offer redundancy on existing terrestrial network coverage. Located on a sun-synchronous orbit between 500km and 600km in altitude, the satellite will collect data from connected objects across the globe equipped with the same omnidirectional antennas already used by terrestrial IoT networks. Data will then be transmitted daily to a ground station located in the Norwegian archipelago of Svalbard in the Arctic Ocean.

Eutelsat will work with Sigfox which runs a global narrowband network dedicated to the IoT. Sigfox will analyse the spectrum used by the satellite in ISM frequency bands, and process data from objects. ELO will also test connectivity in other frequency bands. Eutelsat hopes that the synergies developed through the partnership with Sigfox, as well as with other strategic alliances in the telecom industry, should open up new opportunities in this fast-growing market.

"With the expansion of the Internet of Things,

new services are being developed in a wide range of sectors including smart cities, the mining industry, agriculture and logistics," said Jean-Hubert Lenotte, chief strategy officer, Eutelsat. "By analysing the compatibility of LEO and connected objects, and working with recognised partners in the field, Eutelsat aims to provide an innovative solution which will meet the needs of future clients."

Following on from a partnership deal announced at the end of the previous year, 2018 saw MTN start to work with Cisco Jasper to become the first MNO in South Africa to deploy the company's Control Center platform.

MTN launched an automated IoT connectivity platform for all companies looking to provide IoT services to their customers on its mobile network throughout South Africa.

According to analyst firm Gartner, there will be 26 billion connected devices by 2020.

MTN said the combination of its network with Control Center would enable enterprises to securely and cost-effectively launch, manage, and monetise IoT services throughout South Africa, and to scale those services globally as needed. Cisco Jasper said it partnered with more than 50 service providers that manage IoT devices across more than 550 mobile networks worldwide. It claimed this will allow businesses throughout South Africa to easily utilise its platform to deliver their IoT services to other countries as business demands.

According to MTN, initial customer adoption has indicated "strong demand" for a control centre across all industries, with particular interest from the connected car, vehicle tracking, building security and automation, and logistics industries. "It's clear that organisations in every industry are eager to deliver powerful connected services that help transform their businesses," said Mariana Kruger, GM for ICT solutions at MTN Business. ■



ELO will be used to assess the performance of LEO satellites in providing IoT connectivity



**Douglas M. Loewe,
VP, international,
Interxion**

Netherlands-based Interxion (pronounced 'Interaction') started in 1998 and now runs 50 data centres based in Europe which it regards as its main territory. So what interest does one of the world's biggest data centre operators have in Africa?

In 2016, Interxion invested in Kenya-based Icolo, one the first few neutral data centre companies in Africa. It currently runs a facility in Mombasa but is looking at expanding on the continent, starting with a second data centre that promised to be twice the size and is scheduled to go live in Nairobi in August 2019.



**Caroline Puygrenier,
director strategy
& business
development,
connectivity,
Interxion**

So how much has Interxion invested in Icolo? Douglas Loewe, Interxion's international VP, said that information was not in the public domain at this stage and was reluctant to state a figure. He said: "It could be misleading if we shared the absolute number because there is a significant investment of intellectual property in the business which is even more telling.

"We have a design, technology and engineering group which is the central design authority for all of our data centres in Europe. What we felt would be really helpful to allow for the acceleration of a carrier-neutral data centre environment in Africa was to lend that intellectual property to Icolo. Frankly, that knowhow of not only how to design and build a data centre but also how to run it, is as powerful (if not more) than the actual capital investment that was put in. If you go into the facility in Mombasa, even though it says Icolo on the outside, for all practical purposes it's an Interxion data centre."

So why didn't Interxion go into Africa and build under its own name? Loewe believes that it is very important to make sure to have an execution and management team that is local. "This is part of our DNA in Europe. In the 11 countries that we now serve, the managing directors in those locations run independent, if you will, operating companies. Ultimately, of course, they all report to our CEO. However, more of our business is now coming from outside of Europe to Europe, particularly from the US, China and India. Over the years, we have found that, yes, although you want to have your brand out there, it is better to partner at the beginning in order to replicate the success

we've had in Europe in Africa.

"The feedback that we have received, even from US multinationals that have already come to Africa and have come into Icolo with the assistance of my team in Kenya, is that they like that differentiation from a branding perspective.

"At this stage, the companies that are coming here are not so much the B2B platforms of the likes of Azures, Amazon Web Services or even the Tencents or Alibabas from China. What has accelerated movement towards the digital networks, as well as getting caching closer to the eyeballs, is the B2C platforms. Those have been able to provide a de-risk mechanism for Icolo to go into a production environment today."

Loewe explained that Kenya was established as initial landing point in Africa, and that Mombasa provides a "very solid beachhead" from which to expand.

"The eyeball networks (not the global transit networks) really need to be present in Nairobi. And so instead of potentially going into Dar es Salaam or another location on the continent, we wanted to double down and make sure we had two locations in Kenya. That's similar to what we did in Europe – in France we have both Marseilles and Paris, in Germany we have Düsseldorf and Frankfurt. Customers seem to really like that multiple data centre environment so that they can have an N+1 in-country."

That's all well and good but before you can do any of that in Africa, you need to overcome the infrastructure challenges of power, connectivity, etc. How has Interexion done that?

"Even in Europe, our data centres are designed to run on generators the entire time as opposed to running on the grid. Of course from an efficiency perspective, you don't want to be running on diesel generators 24x7, but you want to be able to do that in case there is a catastrophic problem in Europe. But in Africa at this stage, the infrastructure is lacking compared to the more established markets. But that design authority that we have used throughout Europe and now applying here in Africa through the Icolo vehicle has been warmly received by some highly scrutinising OTT players."

At this point, Caroline Puygrenier adds that Interexion always works really closely with all the carriers to make sure that the data centre it builds is in a connectivity-rich area. She said: "So in Mombasa you've got SEACOM landing, you've got multiple sea cables, and we work closely with our partners to make sure that the connectivity within Nairobi and Mombasa will be available as well."

So what's Interexion's goal in Africa? According to Loewe, the company's customer base includes US-headquartered multinationals, B2B and B2C platform providers, financial institutions, and the major platforms coming from China or India to

Europe. He said that these customers have asked for Interexion's help in Africa.

"The reason we are in Africa now via the Icolo relationship is because of the success we've had in Marseilles by buying what was a somewhat antiquated data centre environment with SFR in 2014. We went in there with the same kind of engineering approach, upgraded it to that world class standard that is known in our other 49 data centres throughout Europe, and then all of a sudden we went from around 45 connectivity environments to just over a 130 networks."

"And even though that is in Marseilles, the reality is that that helps us cover north of the Sahara in Africa. So once we provided that kind of ubiquitous coverage for northern Africa via Marseilles, the natural next step for us was to go below the Sahara and the natural spot was in Kenya. Hence this special relationship with Icolo."

When asked what Interexion is hoping to see in Africa over 2019, Puygrenier believes there will be an acceleration of content providers coming in and providing services to the millions of users who still lack them. But she also sounds a note of caution: "Given all the investments in fibre that are still needed, Africa is not a market where you can expand straight away. That [process] needs to work hand-in-hand with the submarine cable operators."

Loewe adds that what you are not going to see in Africa over the next 12 months are 100 megawatt data centres by individual companies: "That capacity is not required yet but it will happen in due course. Probably the important thing to recognise is that even if you could have a 100MW facility here, you would need to have it replicated or tied back to European or US-based compute platforms. So you are going to see disproportionate investment in additional fibre pairs in undersea cables between the East coast probably sooner than you'll see on the West coast. But the [fibre operators] are going to embark on both because you can't have stranded compute capacity – it has to be highly connected back, and the current infrastructure is, frankly, not adequate as yet."



Nic Rudnick,
CEO,
**Liquid Telecom
Group**

Few could deny Liquid Telecom's meteoric rise as one of Africa's pre-eminent players in networks and connectivity. From its beginnings as the Econet Group's satellite services division to creating the East African Fibre Ring that currently stretches almost 70,000km across the continent, the company ended 2018 with a bang with news that it is establishing a wholesale LTE

network in South Africa.

But in recent years, the company has started to prove that it's not just a road-builder – creating networks is just a means to an end, and for Liquid, that means providing cloud services.

According to the operator, its ecosystem now offers a "one-stop solution" for Microsoft cloud computing, connectivity and professional services. It said this modern hybrid cloud is currently available in South Africa, Zimbabwe, Tanzania, Kenya and Rwanda, with more countries scheduled to go live during 2019.

Speaking at AfricaCom last November, group CEO Nick Rudnick said that for the first time we are witnessing the cloud being hosted in Africa as opposed to in Europe or the US.

"The combination of the investments we have made in our fibre networks and data centres means that, for the very first time, these cloud centres are hosted on African soil. And as well as the capabilities being hosted in Africa, that also means the content that people are creating and their data is also being hosted locally. This is very important as more data residency requirements come in. In any case, it's good data security for people to now know that their data is being stored in the country because they never really know quite where it is."

Rudnick believes the next stage is for cloud services to become more affordable and accessible in Africa. "For the first time, people will be able to buy access to these services locally in local currency. And they only pay for what they use. So there is no big upfront capex cost for the servers and software licenses that pretty much excluded any SME from having access to any advanced technologies, whether they were billing systems, custom management systems, accounting packages, IoT technologies, [etc]. All of these things are now available on the cloud."

Rudnick added that users can now also look at what technology will support their businesses and, once again, only pay for what they use. He believes this is what cloud and digital transformation really means to the continent. But what's the reality of cloud demand in Africa – is it case of 'if you build it, they will come'? Or is Liquid seeing actual, driven demand?

"If I look at the sales that we are achieving in terms of cloud, they have been picking up quite dramatically over the last year versus two years ago," said Rudnick. "So over the 12 months we have started to see quite a rapid uptake, much faster than the previous year. And that is before putting in Microsoft Azure stack servers in all of these countries and being able to go to enterprises and saying your data is now local, very fast to access, and very reliable."

"People spoke about cloud and it was always kind of seen as a virtual storage device rather

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than actually providing you with computing power. I think people are now beginning to understand what it entails and the security behind it. It is becoming an increasingly important component of the cloud to be able to say that the security is there. There is an inherent security capability that comes with using Microsoft Azure [for instance] and using the systems on that which is a lot more secure and reliable than utilising a backend system within Africa that is maintained by local teams who may or may not be up-to-date with the latest security trends.

"So that is one component. But I think the more obvious answer to your question is that the uptake is increasing particularly if we look at things like Office 365 and those more subscription-based services. If you look across most of Africa, they are still using disks, encryption keys and things like that because it has never been reliable enough to have these monthly subscriptions. So we're seeing that changing very rapidly if I look at the number of subscriptions that we are attracting."

Rudnick continued by saying that Liquid was beginning to see a lot of big enterprises, banks and companies in the financial services industry moving very rapidly on to cloud, doing away with their backend systems. He added that around 40 per cent of Azure customers are start-ups internationally and that they were also embracing cloud in Africa, as are many of the around 140 incubators that Liquid supports across the continent. Rudnick said the reason his company is putting in that support is because it recognises that these are the uptakers and firms that are ultimately going to be driving the cloud.

Services aside, what about the infrastructure needed to support cloud services – Liquid has the data centres as well as the fibre network so what are the plans here?

"We are continuing to build fibre. But we don't build fibre where it exists already – no point reinventing the wheel. For example in South Africa, we have got one of the biggest fibre projects ongoing at the moment; we have been building the route coming from Durban through East London, Port Elizabeth along the coast going to Cape Town, so that is something we have been busy with. We will continue to build fibre where it is needed, and particularly north of South Africa there are a number of countries where there is still a large amount of infrastructure investment required.

"On the data centre side, we have got two very large centres in South Africa and we're going to continue to expand them, quite considerably. We have now got a number of centres in Central and East Africa that we will also be expanding, and we'll be building new data centres along with our fibre network in

order to provide that whole ecosystem and ability to host the cloud here in Africa.

"The one thing about the cloud is that it is dependent on having a fast and reliable network. You can't have the cloud without the network. And there are plenty of places that don't have fibre where we would rather spend our capital expenditure there.

"We will roll out fibre in every single one of the 15 or so countries that we are in. But if you ask what are the countries where we have fairly significant plans, DRC is one and Sudan is another where there are big build outs taking place. South Africa is another because we have got the long-distance route and we are expanding our metro networks to support the delivery of these cloud services.

"Our overall vision is to be a pan-African network. We never go into a country for the purposes of planting a flag in it, there has to be a business model. So I think it is inevitable that seeing as we are in all the countries in Southern, Central and East Africa, we will now look at opportunities in the West."



**Lux Maharaj,
director,
Africa sales,
Parallel Wireless**

According to Lux Maharaj, Parallel Wireless' ALL G open network software solution has been welcomed across Africa with several deployments and trials pending trials so far in 12 countries. Launched in 2017, the software is designed to help operators in rapidly advancing Africa's connectivity, as Maharaj explains.

"With our 2G/3G/4G/5G software, service providers can focus on network expansion across all generation of communication technologies. MNOs can now expand and evolve their network requirements based off their subscribers needs.

"Our most recent announcement highlights our deployments in Ghana with Telesol 4G. With Parallel Wireless ALL G software and Telesol reliable and resilient 4G, businesses and communities in Ghana can unleash new economic and societal benefits.

"With our partner Intelsat, we are bringing 3G coverage to Uganda. Godfrey Mutabazi, executive director of the Uganda Communications Commission, has emphasised how extending broadband connectivity and delivering fast, affordable Internet services to Uganda communities and residents remains one of the Uganda government's primary goals.

"We are also engaged with iEngineering Group, a leading end-to-end engineering infrastructure solutions provider to the telecommunications and power industries

"Africa's economy can flourish with reliable and affordable connectivity across the continent"

across Africa, the Middle East and Southeast Asia with operations in 18 countries. Our ALL G software has been selected to bring coverage in Africa because it can be easily upgraded from 2G to 3G or 4G with a simple software upgrade, hence future-proofing the initial network investment.

"Parallel Wireless was recognised by MTN at Facebook TIP Summit for appearing in multiple operators winning bid list as the most cost-effective and easy to deploy Open RAN 2G/3G/4G/5G solution. With deployments with leading operator Telefonica in South America.

"Africa is eager to connect its users, as service providers around the region announce initiatives to invest more than USD1bn to enhance and deploy new cellular networks. Although the initiatives promise connectivity, the process of deploying these cellular networks and upgrading infrastructure can take years. The country needs to look beyond the traditional networks in order to fulfil its digital future. A virtualised 2G approach can benefit the country as it enables MNOs to accelerate deployments while also allowing simple software upgrades to 4G on the same system.

"Africa's economy can flourish with reliable and affordable connectivity across the continent. Various sectors and organizations like health, tourism, education, and industrialisation can benefit from the opportunities of connectivity. It is up to MNOs to implement new innovative technologies like virtualised 2G to accelerate coverage deployments. With Parallel Wireless ALL G software, telcos can cost-effectively deliver and accelerate Africa's coverage needs.

"Africa is the most digitally divided continent with only 44 per cent unique mobile users. Rural Africa remains unconnected with nearly 70 per cent of the population having no access to mobile broadband. To bridge the digital divide, citizens need access to technology, but MNOs face the commercial dilemma of low ARPU/low smartphone penetration. MNOs are eagerly looking for new ways to address this challenge and virtualisation is the key to resolving the digital divide.

"With many areas having no access to mobile broadband, operators can advance the development of fixed-networks, into new technologies such as 4G/LTE. The use of 4G

LTE technology can benefit these developing economies, as end-users will now have access to mobile banking, e-health, and so much more.

"Traditional 2G voice only and broadband 3G or 4G networks require several high-cost and often bulky equipment to deploy and operate. These types of equipment need large spaces to store, have a short life cycle and consume energy. Upgrading these hardware-based networks are complex, costly and require a tremendous amount of time. By shifting networks to virtual architectures like Parallel Wireless technology, telecom operators can address low ARPU and deliver coverage to the most remote communities faster and at much lower cost."

"Implementing Parallel Wireless ALL G software can empower MNOs to meet the needs of expanding in rural areas and untouched territories while at the same time preparing their network for upcoming technologies like 5G. Expanding coverage throughout the region has been made easier with Parallel Wireless software driven 2G/3G/4G/5G solution."

"We have seen first-hand how reliable connectivity grants new economic opportunities and societal benefits to developing nations. Cellular connectivity will transform Africa economy for the better while empowering residents and communities to a more socially inclusive and economically vibrant and a dynamic society. Parallel Wireless is eager to continue the work of bridging the digital divide through our ALL G software."



**David Sumi,
vice president of
marketing,
Siklu**

Millimetre wave wireless networks specialist Siklu has had a presence in Africa for several years now, but in the past two it has witnessed a large uptick in interest for gigabit connections over wireless.

David Sumi, vice president of marketing at Siklu says this interest has led to increasing sales and a number of PoCs as Siklu introduces the capabilities on what mmWave can offer in connecting Africa.

"A fair amount of our focus has been on expanding the South African market through local distributors primarily with a focus on enterprise," Sumi says. "In South Africa the V Band and E Band (60GHz and 70/80Ghz paired) are open for business making the market very attractive. We are working with numerous other regulators across the continent to open up these bands in more countries such as: Ivory Coast, Kenya, Rwanda and Tanzania."

Sumi points to another example in Nigeria (E-Band open, V-Band not yet open) where Siklu's target markets are mainly operators/

service providers. In Nigeria specifically Siklu has had "to overcome some poor impressions" from several improperly implemented mmWave trials in the past with other E-Band vendor gear. "We feel there are opportunities here once we educate the market on what can be accomplished realistically," Sumi adds.

Evolution and changes can be slow in Sumi's view, but he says promise of gigabit connections over wireless is a big draw.

"As the African economy grows, gigabit connections become a requirement and the only wireless spectrum that can truly deliver multi-gigabit speeds are E band and V band with a total of 24GHz available," he adds. "Sub 6GHz systems and classic Microwave solutions have been deployed for years, so the market is aware what wireless can do in delivering rapid, reliable IP networks. However, these

older solutions do not have the spectrum and hence capacity to keep up with the demand for gigabit speeds. Enter mmWave."

When it comes to challenges for the next 12 months, Sumi says there are two primary ones in Africa and they are intertwined.

"Siklu was founded as a mmWave company and have been leading the industry in driving down cost and extending coverage for over a decade"






**SIKLU'S
MMWAVE
5G FIXED
WIRELESS
TAKING MULTI-GIGABIT FARTHER**

FIXED WIRELESS ACCESS: INTERVIEWS

"First, in order for mmWave to truly become a mainstay solution in Africa, regulators must open up the bands for commercial use," he adds. "PoCs are a great way to spur these activities along as regulators can see the benefits of mmWave gigabit wireless in neighbouring countries. As noted, we are actively engaged in this work."

Sumi says the second challenge is to, quite simply, educate the market on what mmWave can really do. "MmWave is fundamentally different from lower frequency solutions and we need to explain to folks exactly how you design a robust 10gb/s connection, what are the "no noes" and what are best practices," he says. "As people begin to understand exactly how mmWave can benefit their country, this in turn clarifies for regulators what rules should be issued when opening the bands to allow maximum benefit."

For those countries where the E band and V bands are open for deployment, in the next 12 months Siklu's goal is to take the PoC trials it has been running and expand these into large scale commercial networks. "In addition, we will be working hard to expand the regulatory domain in the rest of the continent to allow mmWave," adds Simu. "We have an extensive partner network throughout the continent that helps us push these goals along, companies such as Miro in South Africa have been instrumental in spreading the 'mmWave Word'."

It's obvious that as the African market develops, the demand for capacity is growing exponentially and Simu says mmWave wireless, V-band and E-band, are the only solutions capable of providing wireless Gigabit connectivity. "Siklu was founded as a mmWave company and have been leading the industry in driving down cost and extending coverage for over a decade," Simu says. He opines that with the company's rich patent portfolio of technologies focused on "going faster, going further, for less", Siklu "continues to lead the mmWave industry both technically and with the broadest portfolio of solutions of any mmWave vendor" on the market.



Ahmad Sayed,
regional director,
MEA,
Nexign

Since the beginning of 2018, Nexign has actively been expanding its market presence and growing regional workforces in the Middle East, Africa and Southeast Asia regions (following the company rebranding)," says Ahmad Sayed, regional director, MEA. Nexign has successfully completed the rollout of its business support systems (BSS) with one of the fastest growing network operators in North Africa, he says and the company is

"We see digital transformation happening along with people working with reasonably low average revenue per user and that is the environment we are accustomed to"

currently participating in some very large BSS opportunities in Africa and has witnessed interest in its products by major players.

"Africa has seen significant activity in recent years," Sayed says. "This presents Nexign with opportunities in the coming years, which includes extending our footprint in the region and establishing strong local sales and technical teams. Nexign will also build regional partnerships to grow our customer base here."

Africa has seen significant activity in the last 12 months with major telecommunications operators working to modernise their networks and IT systems such as BSS. As a result, expectations from consumers on the continent are very high as they want the best services, state-of-the-art technology all at a low cost. Even though this is a global challenge, African operators are having to focus on meeting customer demands.

Sayed says the only serious 5G engagement trial was done by MTN South Africa with Ericsson, and the actual 5G deployment project will come in a couple of years.

"In a lot of ways, the African market is quite similar to the markets we are already working in (a heavy prepaid market moving more to postpaid)," he says. "We see digital transformation happening along with people working with reasonably low average revenue per user and that is the environment we are accustomed to."

The global BSS market is evolving: it's no longer enough for BSS providers to differentiate themselves on product functionality alone, he argues. "You need to compete on non-functional business aspects and drive better customer experiences in order to stay competitive," he says. "Africa is no exception - it has also demonstrated significant activity in recent years."

Telecommunication infrastructure is a challenge as the vast majority of people on the African continent are without internet. It's often been said that this can be solved through better regulations and investment to

help rollout internet connectivity faster. Sayed points to the fact that most of the African countries/operators are still in the process of implementing 3G networks and only few have implemented 4G networks. Operators who recently implemented 4G networks are suffering from the huge investments made to rollout those networks (CAPEX for license and equipment acquisition).

"There is a lower expected return on investment for 4G (when looking at a short time frame) compared to that of 2G implementation, hence operators have fears of starting new major projects," he says.

"Today, we see a huge cost pressure by all operators in the region. Even major groups are looking closely at their costs and reducing their investments massively, with most of the operators/major groups now being driven by a financial/procurement background instead of a technical background."

It's no secret that most of the African continent is lacking basic educational infrastructure therefore a serious focus on digital literacy education is required. Currently there is serious shortage of digital skills amongst youth and adults.

"There is also the cost problem of handsets and 5G ready equipment," Sayed says. "Legacy handsets still represent the major part of the handset park in Africa (even in Tunisia we still have almost 50 per cent legacy phones and only less than 25 per cent are 4G capable handsets)."

Although data usage and data revenue is actually massively growing in almost all African countries, rollout of 5G networks will take some time as operators and surrounding environments are still not ready for this new technology.

However, Sayed adds that in Africa, Nexign is witnessing great interest from telecom operators in the BSS segment and the firm would like to secure a number of large groups to give us strong presence in the next five years.

"We believe that the African continent offers huge potential for Nexign," he says. "We have just entered into this market and countries like South Africa & Nigeria have significant importance. At the same time, we are also focusing on some key opportunities in north Africa."

Initially, Nexign is looking to collaborate with local ICT & system implementation companies to develop a strong partnership. For the implementation of BSS systems, Nexign would like to use local talent, and this, Sayed says, can only be achieved through good partnerships with local SI companies. "We strongly believe that local technical resources can play a significant role in the success of our projects in Africa," he adds.

"We are also planning to build a strong local team in Africa and are currently engaging with professionals with a right mix of technical

knowledge and industry relationships. The team will be responsible for expanding the regional customer base and establishing regional partnerships."



**Chris Mason,
director of Sales
EMEA,
Rajant**

Rajant, the provider of mobile mesh technology for private wireless networks, has seen its existing presence in sub-Saharan Africa extended in the past year, with new mining customer deployments and with the signing of new distribution and reseller partners in South Africa, Namibia,

Zambia, Kenya and Morocco.

Chris Mason, director of sales – EMEA says Rajant's existing reseller partners have again proven their reach and capabilities with its largest commercial reseller for 2018 based in South Africa.

"Prospective partners and customers targeting Tanzania, Kenya, Uganda, Cameroon and Guinea support our strategy of expanding beyond our established customer base into more countries and into verticals such as oil and gas, ports, agriculture and public safety," he says.

Although Mason says customer confidentiality prevents identification of specific deployments, there are some of note.

The first is increased adoption of Rajant technologies in underground mines, with users benefitting from the ease of deployment, and the combination of a pervasive Kinetic Mesh Network and the Breadcrumb Wi-Fi functionality to digitise operations and enhance safety.

Another is Rajant technology being utilised for autonomous drill operation in a mining deployment, using the high-speed, low-latency network to ensure safe remote operation, removing humans from potentially dangerous environments. Meanwhile, Rajant product launches in different form factors designed for use in automation, oil and gas have opened new opportunities in different industries. Last but not least,

"the continuous enhancements of the proprietary Rajant Instamesh software has enabled the use of aeroscout personnel and asset tracking capability with Rajant technologies, further enhancing safety in mining operations".

Mason says that in common with all other geographies, the trend is for significantly increased bandwidth and functionality in the two deployment types which prove problematic for most other wireless technology providers.

"The first and most difficult wireless environment where Rajant particularly excels is where the operational assets are all mobile,

but still require 100 per cent connectivity and the high-bandwidth and low latency supporting advanced applications," he says. "Increasing utilisation of CCTV in support of operations, particularly where efficiencies and increases in safety, means that people operate machinery remotely and this places great demands on the networks."

Mason says the second type of deployment is also problematic for networks, but is a slightly different environment, where the network is fixed in location. He adds that due to the inability or expense of laying fibre infrastructure, a solution that provides a network that only requires the addition of power becomes a cost-effective means of connecting operations.

"An additional area that is emerging as a particularly energetic debate is the perceived potential for LTE to provide the seamless reliable connectivity required in mission critical industrial environments," Mason opines. "A great deal of marketing energy is being expended in this area, however in Rajant's view the solution fails to acknowledge the resilience required in such operational environments and the ability to cater for constantly changing environments where symmetric data rates are required." He says "a further issue" is the requirement to always communicate via a switch, which introduces a single point of failure. Attractive initial cost models, also need to be examined in detail as experiences from other geographies suggest a very significant increase in-life, leading to extended periods of opex.

In terms of the near future, the next 12 months to be precise, Mason says Africa's challenges remain as they have been for some time – the disparity between rich countries and poor people, a burgeoning number of people who need jobs, and industries seeking to become more efficient, which usually means adopting technology and utilising fewer people.

"Addressing these issues requires stability, which will attract investment, underpinned

**"The continuous
enhancements of the
proprietary Rajant
Instamesh software
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and asset tracking
capability with Rajant
technologies"**

by education initiatives to provide the skilled labour force that can elevate the human contribution to industry from the muscle to the mind," Mason adds.

"The ever-present issue of governance and anti-corruption measures is a perennial matter to address, as is the need to carefully balance the benefits and risks from external interest and investment in the continent. Nations seeking to exert their influence on the global stage and secure increasingly scarce resources may not automatically contribute to the stability agenda."

From an IT perspective, Mason says globally there is a proven link between increasing internet connected communities and the resulting positive impact on education and subsequent GDP. He believes that the same impact can be felt in business and industrial adoption of connectivity.

"The Industrial Internet of Things (IIoT) is following the same trajectory as Moore's Law from the 1970's," Mason continues. "Whilst this law referred to the exponential increase in computing power every year, what we are experiencing now is similarly logarithmic increase in functionality and reduction in size and costs of sensors which can connect a plethora of industrial devices. In order to utilise the data from these sensors, aggregate and transmit the data reliably and securely to a point of analysis continues to be the challenge."

Going into 2020, Rajant is approaching its African expansion from two geographic directions – expanding further into sub-Saharan Africa from its well-established base in the south, and targeting the Maghreb countries of north Africa, commencing in Morocco and extending into adjacent countries.

"In vertical market terms, we're aggressively targeting container port and inter-modal container yard environments where Rajant's technology thrives in a challenging and constantly mobile industrial environment," says Mason. "We're working hard to replicate our success in one of Europe's largest container ports at DP World in Antwerp which shows how the technology can provide seamless connectivity across the port and enable digitisation initiatives and increase container traffic."

Rajant's engineering support model has also changed significantly in the last year, reflecting the significant growth rates outside the US home market with its third line support capability now available 24x7 to reflect its increased aspirations on the African and European continents.

"Recruitment of additional Rajant personnel will continue, addressing the significant increase of partners and customers in region," says Mason.



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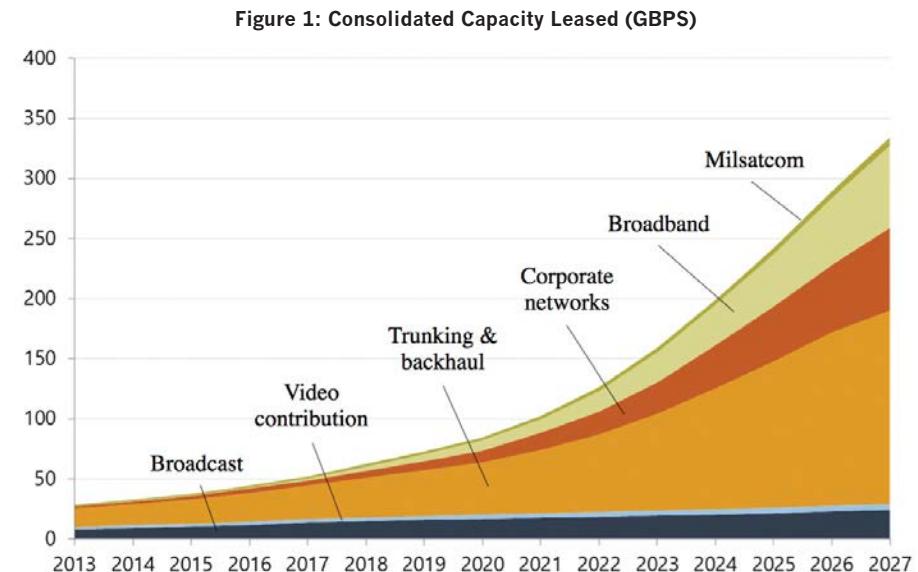
**Martin Jarrold,
vice president,
international
programme
development,
GVF**

It may be argued that pan-continentals generalisations feature little or no merit or offer insights of questionable value, but nevertheless I am going to begin my contribution to this year's edition of the African Wireless Communications Yearbook by observing that Africa seems to be at, or is approaching, a significant inflection point in its information and communications technology

(ICT)-related social and economic development generally, and in its contributions to, and its future derived benefits from, terrestrial and space-based communications and non-communications-related space activities specifically.

By the year 2030 one in five people on Earth will be African. It has been widely suggested that this population growth, in combination with technology advances – together with improved physical infrastructure and health and education services – has the potential to bring Africa to the forefront as the next century's economic growth powerhouse. There is, of course, a well-recognized causality between ICT investment and growth in GDP through heightened economic activity, innovation and productivity. And, indeed, there are various mechanisms in-play bringing elevated ICT investment to the continent which, in turn, brings stimulus to home-grown innovation with new (disruptive?) models leading to the opening-up of new opportunities. However, obviously, foreign direct investment (FDI) into any economic sector, including ICT, largely depends on confidence-inspiring stability, a factor which is not a current feature universally across the continent, though there are national exceptions of course.

The biggest challenge to Africa achieving its future economic growth opportunities remains its strategic connectivity base, and



the potential for digital-driven growth is coupled with continued acceleration of mobile connectivity. Indeed, in this connection, the Paris-based consultancy, Euroconsult, has pointed to the increasing penetration of 3G/4G networks across the continent.

Whilst the realisation of these growth opportunities requires the contribution of FDI it is important not to overlook the fact that a great deal of investment which is facilitating Africa's ICT growth is, in effect, indirect, flowing from and fuelled by, international private sector communication infrastructure development – in space, in new generations of communications satellites. Satellite communications has been vitally important for Africa for several decades and, despite projections that the arrival of undersea fibre links would eclipse satcoms, the latter's vital importance for the continent should not now be underestimated and continues to increase.

The generational growth of mobile connectivity across Africa has, since the earliest of the continent's 2G deployments, been dependent upon the application of in-orbit satellite technology to

the backhauling of wireless traffic. Indeed, as observed by Euroconsult, trunking and backhaul is the largest satellite application in Africa and its analysis has forecast not only that this will continue (see Figure 1) but that most of the growth in this application will be captured by the continuing increase in high throughput satellite (HTS) systems. Just one illustration of this being SES/O3b having been successful in securing large telecom operators in markets such as Somalia.

Trunking and backhaul are not the whole story. The graph at Figure 1 also clearly illustrates that the forecast growth in Africa's satellite capacity leasing results from projected demand increases from communications market segments other than trunking and backhaul, most notably from broadcast, corporate networks, and broadband.

In the broadcast segment one significant contract example from recent years is the 2017 agreement between Eutelsat and Société burkinabè de télédiffusion to deploy DTT channels across Burkina Faso. An example of a large contract in the corporate networks segment is Intelsat's 2018 agreement with

SATCOMS: INTRODUCTION

Figure 2a: Regular capacity leased by operator (2017-TPES)

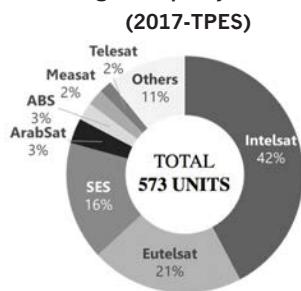
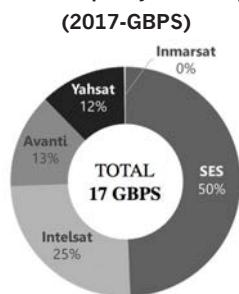


Figure 2b: HTS capacity leased by operator (2017-GBPS)



Vodacom Business Nigeria to expand service throughout west Africa, with Vodacom using services from the IS-35e high throughput satellite, launched in July 2017, for various connectivity applications, such as oil and gas.

Deployment of broadband access features as another of Africa's key satellite communications upward trends identified by Euroconsult, with one recent major contract example being the 2018 Gilat contract for over 3gb/s from SES's O3b satellites to provide more service across DRC, providing Kinshasa and Lubumbashi with high-speed Internet.

The total volume of bandwidth leased in sub-Saharan Africa stood at 26 GHz in 2017, an increase of 8 per cent year-on-year.

The world's global satellite operator players – Intelsat, SES and Eutelsat – are estimated to currently account for close to 80 per cent of regular capacity demand, holding a particularly dominant position in the regional video distribution market (with an approximate share of 90 per cent). However, competition has intensified in recent years as Asian and Middle Eastern operators have entered the market or increased their coverage of the continent in an attempt to capture more of the region's growing TV broadcast and telecom markets (prior to 2017).

The chart in Figure 2a shows Africa's 2017 total for transponder equivalents (TPES) of regular capacity leased by all satellite operators at 573 units and sub-divides this total into percentages on an operator-by-operator basis, illustrating both the market dominance of the three major global satellite companies and the expansion into the African market of other, regional, players. The chart in Figure 2b shows the continent's 2017 total for leased HTS capacity at 17gb/s, with SES having the dominant share, followed by Intelsat, Avanti, and YahSat.

Regular capacity transponder supply for Africa was estimated at 895 transponders in 2017, up 9 per cent year-on-year. Euroconsult further forecasts that capacity additions should continue steadily, pushing the total regular capacity supply to approximately 970 transponders by 2020 (see Figure 2a), and anticipates that the fill rate for regular capacity in the region to remain in the 62-64 per cent range through 2019.

Figure 2b illustrates for the equivalent period the supply and demand for HTS capacity expressed in Gigabits per Second.

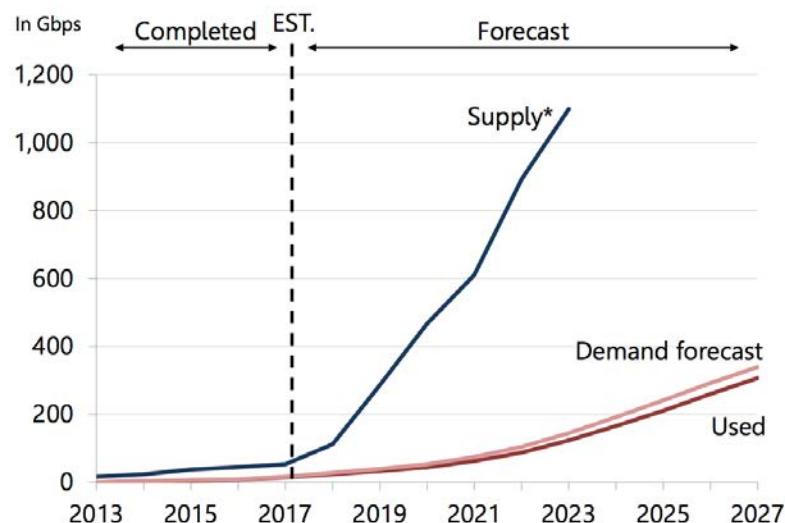
Outside of the communications market environment space and satellite activity in Africa is going through a boom. African nations have identified the importance that space science and technology can have on economic growth and they have been investing in its development. GVF interest in this – that is, beyond the realms of satcoms – has been stimulated as a result of its

membership having expanded beyond communications and broadcast to include the New Space factor, for example, small-scale companies in Earth observation and remote sensing.

Across Africa opportunity surrounding satellites and space has never been greater, with many nations looking at space programmes as a vital step to kickstart and empower wider innovation. Satellite technology development in the smallsat/cubesat* environment has increasingly made it viable for Africa's low-income nations to design and manufacture spacecraft, and operate their own small satellite programmes, using them to achieve their own development goals and scientific and technological ambitions.

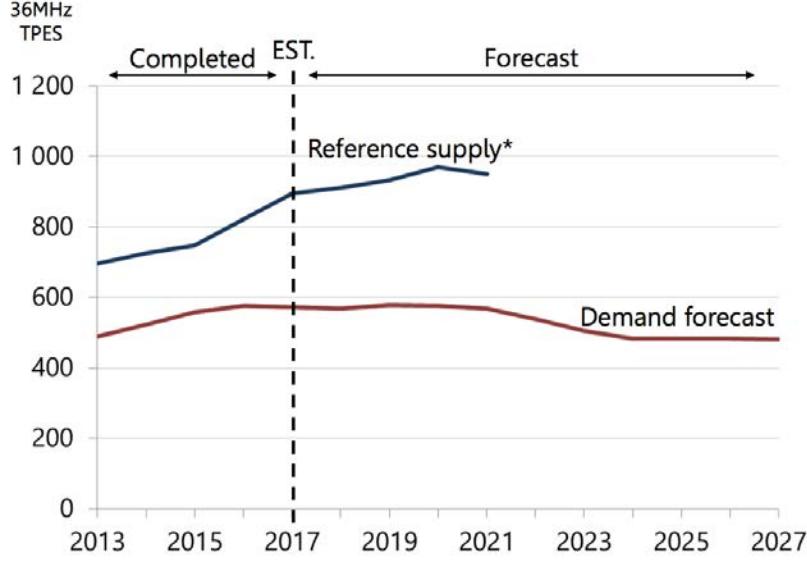
[* Smallsat is a generic name for small satellites without any specific dimensions but with a mass of less than 500 kg. Cubesat refers to a satellite unit of dimensions 10 x 10 x 10 cm, or multiples thereof. Other terms are:

Figure 3a: Supply and demand - HTS capacity (GBPS)



*supply includes all systems under procurement and LeoSat (not yet procured)

Figure 3b: Supply and demand - Regular capacity (TPES)



*including satellites under construction

ELEVATING EXPERIENCE TODAY

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SATCOMS: INTRODUCTION

Minisatellites (100-500 kg); Microsatellites (10-100 kg); Nanosatellites (1.0-10 kg); Picosatellites (0.1-1.0 kg); Femtosatellites (0.01-0.1 kg).]

The enthusiasm of several African states for space technology, being simultaneously of inherent value and an engine of a developmental virtuous circle – and reinforced by the African Union having passed an African space policy in 2017 which called for the development of a continental outer-space programme with adoption of a framework to use satellite communication for economic progress – also comes from the recognition that information gleaned from satellites has the potential to improve agriculture, guard against deforestation, improve disaster planning, and provide internet to remote and rural communities.

More than 30 satellites have been launched by African countries so far, with around half of these orbited in the last few years. Egypt, Algeria, Angola, Morocco, Ghana, Nigeria, South Africa and Kenya number among the nations leveraging cubesat technology for remote sensing applications.

In December 2018 South Africa's space agency, SANSA, launched ZACube-2 (ZACube-1, also named "Tshepisosat", was launched in 2013), a three-unit cubesat – i.e., three 10 x 10 x 10 cm cubesat units joined together – weighing just 4 kg, to a 600 km orbit from Baikonur on a Soyuz launch vehicle, in tandem with other smallsats from Germany, Spain and the United States.

The design and build of ZACube-2 was a postgraduate student project at the Cape Peninsula University of Technology's French South African Institute of Technology and additionally supported by the government Department of Science & Technology funding programme to develop national space capabilities and develop high technology skills. The satellite is considered to be a pathfinder for a planned future constellation of nanosatellites serving the country's Marine Domain Awareness programme, as well as

other, secondary, application functionalities.

ZACube-2's main payload, an automatic identification system (AIS), collects navigational data from ships in South Africa's territorial waters, enabling coastal policing of the movements of registered and legally operating vessels, but also to detect illegal shipping activity. Additionally, the satellite will monitor active fires on the South African veld, and eventually its mission will grow to include the gathering of meteorological and vegetation data to support an early warning system for such wildfires.

Earlier in 2018 Kenya had also joined the community of Africa's space nations when its first domestically designed satellite, the first Kenya University Nanosatellite Precursor Flight (1KUNS-PF) – a scientific and technological collaboration between the University of Nairobi School of Engineering, the United Nations Office for Outer Space Affairs (UNOOSA), the Japanese Space Agency (JAXA), the University of Rome, and the Kenya Space Agency – was deployed from the JAXA KIBO module aboard the International Space Station.

The satellite's deployment will, in the longer term, contribute to enabling Kenyan government policy to promote the development of bigger high-resolution satellites capable of significant scientific and technological value for the country as it gears itself for greater competition with neighbours like Ethiopia in aiming to become a major scientific hub for the continent.

More immediately, the satellite, which carries a payload of two commercial cameras and experimental web audio upload and broadcast capabilities, will during its relatively short orbital life be utilized in various sectors including weather forecasting, food security mapping, livestock and wildlife monitoring, and disaster management.

In closing, I must offer at least a passing reference the wider context within which Africa's satellite assets – whether they be other-owned or nationally-owned – operate, a wider context that will be substantially defined by the next

International Telecommunication Union World Radiocommunication Conference, WRC-19. Principal amongst various issues tabled for discussion is Agenda Item 1.13, considering identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution 238 of the World Radiocommunication Conference of 2015. Whilst the African continent would stand to benefit from any future development of 5G technology, this should not be to the detriment of existing technologies that provide vital services to African nations – namely Fixed Satellite services (FSS). The main issue now within the African Telecommunication Union is to ensure no IMT identification within the 40 GHz range (37-43.5 GHz).



**Scott Mumford,
director,
World Teleport
Association board**

There's been a lot of talk about satcoms not reaching the most rural, remote or needy parts of Africa but there's also a misconception as to why that might be. It's not the capacity that's too expensive, it's the equipment costs. The equipment costs have come down very substantially in the last three to five years but what needs to happen is the terminal

prices need to come down. They are, currently, still too high when compared to the amount of disposable income for those rural areas.

One has to remember that the average ARPU in terms of free cash flow into the most rural parts of Africa are generally less than USD5 per month. So, when you're looking at USD500 for a terminal, there's no affordability there. There's either got to be a way of bringing down the terminal pricing, additional Wi-Fi distribution or introducing/building on some other technology that allows that access without that additional cost.

JANUARY 2018

The Paratus Group is trialing the use of nanosatellites with point-of-sale (POS) devices in Africa. It has signed an agreement with Sky and Space Global (SAS) to support innovative payment solutions to help connect the unconnected in key markets on the continent. The companies will conduct a field trial where the POS devices will be connected to a banking partner via SAS's IP network. It is the first step for SAS and Paratus in using new technology to replace what they say is the current "limited and unreliable" means of communications with POS devices in remote areas.

FEBRUARY

SpaceX aims to be able to deploy larger satellites into orbit with its Falcon Heavy rocket. Said to be the world's most powerful present-day launcher, the Falcon Heavy also has the highest payload capacity of any currently operational launch vehicle. It successfully managed to take a Tesla Roadster into orbit, complete with a spacesuit-clad mannequin dubbed "Starman". Pictures proving the success of the launch included a webcam beaming a live video feed of the dummy as it orbited the Earth before the launcher's upper stage pushed the car out of orbit towards Mars.

MARCH

Cobbett Hill Earthstation has entered into a long-term agreement for capacity on Spacecom's forthcoming AMOS-17 communication satellite. An independent teleport based in the UK, Cobbett Hill will use the spacecraft's C-band transponders to provide high throughput internet, voice, data and broadcast services to the growing communication markets in sub-Saharan Africa. Cobbett Hill was one of Spacecom's first partners and the two companies have been working together now for more than 10 years. Scheduled for launch during the second quarter of next year, AMOS-17 is

Yes, the population of Africa continues to grow unabated. Nigeria alone is expected to see its population to more than double by 2050. You'd be forgiven for asking how the industry will keep pace.

A lot of that is coming with migration away from the old wide-beam fixed satellite service transponders and footprints to the high-throughput satellite (HTS) which enable us to bring the price point down.

Ka-Band is becoming more viable in terms of consumer internet penetration and manufacturers are doing well in terms of development, maximising spectrum efficiencies and getting more bits per hertz. The launch schedules are pretty full on the GEO side and there's some new technology coming such with the LEO constellations from Telesat, OneWeb and SpaceX. Then, of course, there's 5G, which will make a huge difference.

HTS will have a big part to play, but not on its own. An opinion I've had for a long time and have yet to be persuaded otherwise is, it's not a one size fits all environment. It's that combination of all frequency bands, C, Ku and Ka, the wide-beam fixed satellite service via HTS as well as MEO and LEO options. It's how you combine those technologies in order to provide that connectivity.

Ultimately, it costs to deploy it. Fibre is obviously a great option but it's very expensive to build and roll out. The same is true of 4G and 5G. These different technologies will all need to work together to serve that volume of consumer base.

There are lots of industries that will experience additional benefits from satcoms going forward. The mobility and IoT sectors are going to be key, especially in the comms on the move side. Just look at the increased demand in areas such as aero and land-based connectivity, trains and mass transport systems. It's the one technology that can provide for them. Then you look at IoT – it's key in mining, automation, self-driving trucks and cars.

Then of course we will continue to service the existing vertical needs, like finance, banking and broadband. These are all sizeable markets across Africa and so won't go away. ■

specifically designed for meeting Africa's growing demands.

APRIL

Bentley Walker is aiming to "significantly increase" its EMEA coverage with the help of Avanti. The company announced that it will start service roll out across Africa utilising its initial USD1m bandwidth commitment on Avanti's HYLAS 4 which was launched by Arianespace on 5 April 2018. HYLAS 4 promises to expand capacity over Europe and sub-Saharan Africa with 64 active Kaband fixed beams and four steerable beams. This will extend Avanti's coverage to 1.7 billion

More satellites for Africa

Across the continent of Africa, the remoteness of villages and industrial operations means that satellite is a key communications technology for the region. With demands ever increasing, 2018 saw more capacity on offer with new launches.

At the beginning of the year GovSat, the brand operated by LuxGovSat successfully launched its first satellite GovSat-1, that went into space on board a SpaceX Falcon 9 rocket from Cape Canaveral Air Force Station on 1 February 2018. GovSat-1 was the first satellite of GovSat, a public private partnership between the Government of Luxembourg and the world-leading satellite operator SES.

The multi-mission spacecraft was built by Orbital ATK and is based on the GEOStar-3 platform. Its aim is to provide secure, reliable and accessible governmental satellite communication services to address the demand resulting from defence and institutional security applications.

The government of Luxembourg pre-committed an important amount of capacity on the satellite in support of its NATO commitments. The remaining capacity will be made available to governmental and institutional users on commercial business terms.

GovSat-1 features X-band and military Ka-band frequencies on high-power, and fully steerable mission beams to support multiple operations. It will be located at 21.5°E to serve Europe, the Middle East, and Africa, including what's described as "substantial" maritime coverage over the Mediterranean and Baltic seas, as well as the Atlantic and Indian Oceans.

GovSat CEO Patrick Biewer said: "GovSat-1, with its highly flexible payload featuring advanced encryption and anti-jamming capabilities, will further secure the connectivity for our users' applications."

Satellite company SES also successfully launched four new O3b satellites that were sent into space on board an Arianespace Soyuz



GovSat-1 is designed for the exclusive use of governments and institutions PHOTO: ORBITAL ATK

rocket from Kourou, French Guiana on 9 March 2018. The new satellites are now providing replacement capacity for ageing satellites and increasing the total available capacity.

The new spacecraft joined SES' existing constellation of 12 medium Earth orbit (MEO) satellites in May. They will be around 8,000km from the planet which is four times closer than their geostationary (GEO) counterparts. As a result, it's claimed the satellites would deliver connectivity with a "low latency, fibre-like" performance.

Built by Thales Alenia Space, SES said the four new Ka-band satellites would enable it to meet the growing demand for bandwidth in the telecom, cloud, maritime, energy, and government markets. By augmenting its O3b fleet, the firm said it was scaling its "unique" ability to connect people, businesses, and continents with high performance communications anywhere on Earth.

"This is the beauty of our MEO constellation," said Martin Halliwell, CTO, SES. "It can easily be scaled to respond to demand in an agile manner while beams can be allocated

people across 118 countries. Services started in the month of October 2018.

MAY

After a tricky launch at the start of 2018 which saw it placed into the wrong orbit (see News, Jan-Feb issue), Al Yah 3 has now successfully completed in-orbit testing. At the end of May, Yahsat announced that its third satellite was ready to launch commercial services from 20°W. It is expected to go live in August. The company says Al Yah 3 will offer Ka-band coverage to 19 additional markets across Africa and cover 60 per cent of the population, as well as 95 per cent of Brazil's population.

JUNE

A new satcoms-based project aims to enhance Kenya's ability to plan for and respond to disasters. Funded under the UK Space Agency's International Partnership Programme, the Satellite Enablement for Disaster Risk Reduction in Kenya (SaTDRR Kenya) project is led by Avanti which will provide secure fixed and mobile communications for emergency situations via its HYLAS 2 Ka-band satellite. Other project partners include consultants from Torchlight Group, Airbus Defence and Space, Global Radiodata Communications, and the Red Cross Society in Kenya. All will work closely

SATCOMS: YEAR IN REVIEW

dynamically to where the demand is, and thus deliver low-latency connectivity where our customers need it. By augmenting our fleet, we will offer more throughput, more coverage, and more capabilities to our customers."

This was the fourth O3b launch performed by Arianespace. The first 12 satellites were launched by three Soyuz launch vehicles in 2013 and 2014 and the company has been contracted to launch another quartet during the first half of 2019. SES also announced an upgraded network that will begin launching in 2021.

The power of VSAT

After what might be seen as a challenging time for VSAT, C-COM Satellite Systems reckoned Africa's VSAT market might be looking up after it received orders worth around USD1.28m for its iNetVu antenna systems from various customers across the continent.

The Canada-based vendor said the systems had been acquired by several reseller partners in the region and would be deployed by governments, military users and commercial customers in the banking and broadcast sectors.

"While C-COM has been active in Africa for a number of years, the mobile VSAT market has been slow to develop for economic reasons," said Drew Klein, C-COM's director of business development. "These significant orders, from both new and existing C-COM integrators based in Africa, are an indication that market conditions

in the region may be improving, and that highly reliable and cost-effective auto acquire antennas like the iNetVu products are of high value."

The company added that it offered more than 20 different Common-the-Pause antenna models integrated with all major VSAT modem manufacturers and approved with most major satellite operators. It was also working closely with more than 500 active dealers in more than 100 countries.

Furthermore, C-COM is working with a research team at the University of Waterloo and developing an electronically steerable, Ka-band flat panel antenna system based on phased array technology. It estimates this has the potential to "revolutionise" satellite's addressable market in all mobility markets.

Elsewhere, CETel (Central European Telecom Services) started providing pan-African C-band VSAT services with the help of Malaysian satellite operator MEASAT. The contract serves various vertical markets like mining, corporate, construction, and government.

The Germany-based provider of satellite, fibre and wireless-enabled communications solutions runs a global teleport near Cologne. The plan was to use the Africasat-1a satellite to further expand its service portfolio on the continent. MEASAT said its satellite's "high-power and excellent look angles" combined with customised solutions were defining factors in CETel's selection.

Africasat-1a is also known as AzerSat-1 and was developed as a joint venture between MEASAT and



The facility in Amdjarass also benefits from a redundant VSAT link for high-speed M2M data transmission

Azerbaijani state-owned operator Azercosmos. It was launched to the orbital slot of 46°E in 2013 and features 24 C-band transponders.

In a separate deal, CETel announced that it would provide managed end-to-end connectivity for a "major" European telco in Africa. It said the satellite-based network would enable the operator to bring connectivity to new areas across North and West Africa and enable contingency services during fibre outages. While CETel has not named its customer, both France-based Orange and UK-based Vodafone operate networks in these parts of Africa.

CETel said it would use C-band capacity on SES' NSS-7 for what it describes as a new "highly-reliable and resilient" satellite network, which consists of several sites located in African countries. These are connected to the customer's European backbone infrastructure via CETel's teleport and managed MPLS network.

The Malaysian-based global satellite



CETel's German teleport near Cologne and Bonn. The company says its antennas for standard C-band, extended C-band and Ku-band directly support geo-stationary and inclined satellites between 68°W and 75°E

with the Kenyan Ministry of Interior and the National Disaster Operators Centre.

JULY

Constellation Corporation is to market its space-based cloud data service in Africa, the Middle East, Europe and Central Asia. Cloud Constellation has developed the SpaceBelt, a patented 'Data Security as a Service' (DSaaS) platform that has been designed to secure high-value and highly sensitive data assets. SpaceBelt provides storage in space as well as global, secure managed network services. It uses a constellation of 12 low Earth orbit (LEO) satellites that are said to be networked

with a redundant, self-healing optical ring for high availability. Cloud Constellation says the network communicates with secure access points located at enterprise, government and military facilities connected via GEO satellites.

AUGUST

Airbus Defence and Space has been selected by Telesat as a major industrial partner to support their System Design and Risk Management phase for Telesat's LEO constellation now in development. Under the terms of the contract, Airbus will perform system optimisation, requirements engineering, and initial design of key

hardware and software components for space, ground and user terminal segments of the Telesat LEO system. The project is due to run for nine months.

SEPTEMBER

Azerbaijan's state-owned satellite operator Azercosmos successfully launches its second satellite for Africa with the help of Intelsat. Azerspace-2/ Intelsat-38 left Earth on board an Ariane 5 launch vehicle from Kourou, French Guiana on 26 September. Azercosmos will use Intelsat-38 to offer services as Azerspace-2 to meet the growing demand for DTH television, government and network

MEASAT provides services to over 150 countries across the Middle East, Asia, Africa, Europe and Australia, with capacity across six communication satellites.

German provider CETel manages end-to-end communications solutions and services global customers from their teleport in Germany. Their solutions-approach and proven track record of carrying out long-term agreements in various industries endorsed their credibility to partner this project.

Over in Chad, renewable energy solutions provider Vergnet Group selected Marlink's finest VSAT solutions to provide satellite-based connectivity solution for its hybrid wind farm/power station construction project.

France-based Vergnet Group specialises in high performance, clean energy projects, and has a focus on delivering renewable energy to developing countries. It designs tailored, sustainable energy and water pumping development infrastructures, which incorporates wind, solar and hybrid solutions.

It has developed what's claimed to be a "state-of-the-art" facility in Amdjarass, the capital city of the Ennedi-Est region in northern Chad. It features four GEV MP 275kW wind turbines and proprietary hybrid energy technology to enable the city to become the country's first to be 100 per cent powered by renewables.

In order to remotely monitor and maintain the facility, Vergnet needed a highly reliable, always-on and secure link to its operations control centre in France. To achieve this, the company chose Marlink's satellite solution for its initial operations.

Using connectivity provided by Marlink's Premium VSAT service, it's claimed Vergnet's remote operators are able to manage the site efficiently, with a guaranteed, redundant VSAT link for high-speed M2M data transmission. All this aims to ensure that Amdjarass residents have a stable and constant energy supply on site.

Marlink adds that its service also provides remote control/access to the power plant, as

services in sub-Saharan Africa, the Middle East, central and South Asia, as well as Europe. The satellite will orbit at 44°E and also provide Ku-band connectivity to Africa.

OCTOBER

TV audiences in Nigeria gain access to 13 new free-to-air (FTA) channels branded as PREMIUM.FREE. The bouquet's launch channels will be supplied by AfricaXP, an independent channel network, content distributor and producer which owns and operates more than 20 different themed channels supplied to major African broadcasters and African diaspora platforms worldwide. They will be



Satellite-based mobile banking in Africa using C-COM antennas

well as connectivity for internet and email.

More positive signs for VSAT were shown when Satcoms specialist ITC Global was awarded a three-year contract renewal by Plan International for service to multiple sites in Africa. Plan International is a non-profit development and humanitarian organisation that aims to advance children's rights and equality for girls.

ITC Global has been its communications provider on the continent for around 11 years.

The company would provide remote communications over the next three years (from the announcement date of 8 March 2018) to 24 Plan International sites across Western and Central Africa. Services include a customised VSAT network in addition to a full upgrade of existing system electronics used by the 2.4 metre antennas that are already in place at each site.

The upgrades will be carried out by local field technicians who work with Plan International's team across the region, all while being backed by ITC Global's round-the-clock network monitoring and support for the entire contract lifecycle. They will perform site visits for equipment replacement and general maintenance, enabled by ITC Global's local presence in Burkina Faso, Ghana, Guinea, Nigeria and DRC.

This contract followed ITC Global's previous deals with multiple NGOs covering connectivity needs for more than 80 sites across Africa and the Middle East.

delivered via SES' ASTRA 2G satellite which orbits at 28.2°E and is claimed to reach more than 9 million DTH households across West Africa. SES' media subsidiary MX1 is providing the necessary ground services.

NOVEMBER

4KUNIVERSE launches its Ultra HD TV channel services across North Africa, the Middle East and Europe on Eutelsat's HOTBIRD video neighbourhood. The 24/7 general entertainment channel airs original TV series, movies, documentaries, sports and primetime programming, all in 4K HDR. It commenced its services on HOTBIRD from 1 November, giving

Satellite protecting and connecting

The power of satellite is that it can connect areas which are infeasible, or too costly, to reach by other means. This leads to some wonderful stories of the technology helping with particularly African problems, for example Sigfox and Eutelsat worked together to help protect endangered rhinos.

Together they engineered prototype GPS trackers and joined forces with conservationists in their fight against rhinoceros poaching in Africa. As part of the Now Rhinos Speak project, the Sigfox Foundation along with the Lowveld Rhino Trust began tracking wild rhinos. IoT network specialist Sigfox designed and implemented a remote tracking solution that uses GPS sensors fitted in the horn of each animal. These send positioning data to a secure online platform via Eutelsat satellites, and enable the rhinos to be tracked with minimum human interference.

Three times a day, wardens, vets and specialists in game parks can access readouts of the movements of the animals. It's claimed they will be able to use this precise data to improve protection against poaching and gain a better understanding of the endangered species.

With the help of Eutelsat's satellite resources, the Sigfox Foundation aims to fit 3,000 rhinos



The Sigfox Foundation along with Lowveld Rhino Trust are tracking wild rhinoceroses in Africa by implanting GPS trackers into their horns

PHOTO: SIGFOX

it the capability of reaching tens of millions of subscribers via cable and IPTV networks.

DECEMBER

The French South African Institute of Technology and the African Space Innovation Centre announce the launch of its most advanced nano-satellite to date, the ZACube-2. The launch was on the 27 December from the Vostochny Cosmodrome. The aim is to offer remote sensing and communications over South Africa and the surrounding regions. A short switch-on test on 1 January 2019 successfully received hundreds of AIS messages from around the coast of Madagascar, Namibia, and South Africa.



The Kamo-Kakula mining project is said to be the world's largest undeveloped high-grade copper discovery

by the end of 2020 to track movements. Working with the Lowveld Rhino Trust, the goal is to track all 29,000 rhinos left in the world.

The two companies previously trialled the idea, working together since November 2016 on an initial operation in southern Africa connecting approximately ten animals. Three base stations in Sigfox's low-speed IoT network were connected to the secure platform using Eutelsat's smartLNB satellite service that is designed to extend terrestrial IoT networks anywhere. The collaboration improved the identification of areas of surveillance and refined allocation of resources for protection on the ground.

It's not just animals which need protection. The organisers of the annual Morocco Desert Challenge (MDC) rally-raid signed a three-year deal with Marlink for tracking and race management services.

The satcoms specialist deployed its new Iritrack tracking system which combines data handling and on-the-ground support to improve competitor safety and race management capabilities. According to Marlink, the satellite-based tracking and security system provides reliable two-way data and voice communications in a single device.

After the Dakar, the MDC has grown to be

the second largest rally-raid in the world. Iritrack was installed on nearly 200 competitor cars, trucks, buggies, motorbikes and quads for the tenth edition of the MDC which took place over 14-22 April 2018. The technology will now also be used in subsequent races.

It's claimed the system offers a unique combination of tracking functions and safety sensors. These built-in sensors automatically inform race control when a vehicle is overturned or stationary due to an incident, supporting faster and more effective intervention.

Iritrack also features an integrated satellite phone. By simply pushing one button, participants are able to directly contact the emergency centre without first switching on a device and dialling a number, as with a traditional satphone. In addition, there are manual panic buttons configurable by the user that can be used in emergency situations or for identification. Event organisers can also use the system to directly contact competitors, even when they are racing.

Marlink delivered and managed the course technology infrastructure. This included the Iriviewer Software Suite, a monitoring tool that manages the Iritrack network to provide accurate

live locations and timings of all competitors in addition to deep analysis of the data received.

The company provided its team of field engineers to install and maintain the fleet of tracking devices, assist security staff in monitoring the race at the operational HQ, and deliver in-depth training for the organiser's own technicians.

Over in the DRC, it was mining which was utilising satcoms' abilities to connect remote sites. Canadian mineral exploration and development company Ivanhoe Mines began working with SES Networks to provide reliable high-performance managed connectivity services for the Kamo-Kakula Copper Project. The mining project is considered one of the world's largest underdeveloped high-grade copper discovery, located 270 kilometres from Lubumbashi.

SES said it would provide managed services and "fibre-like" connectivity powered by its O3b medium Earth orbit satellite fleet. The company also claimed that the turnkey solution delivered via its "unique" infrastructure would enable the crew working at the Kamo-Kakula site to leverage the latest applications, communicate effectively, and maximise their productivity. The company said operators on site would be able to



Iritrack will be installed on nearly 200 competitor cars, trucks, buggies, motorbikes and quads

PHOTO: MOROCCO DESERT CHALLENGE



**Scott Mumford,
director,
World Teleport
Association board**

The year ahead: I think the Telesat and OneWeb low-Earth orbit (LEO) satellite testing will be very interesting. We all want to see how they overcome some of the issues that are there with those and the sort of connectivity throughput they achieve.

A lot of noise has been made about this technology over the past three or four years so it will be interesting to see if that rings true, how we can apply that to the populations and what we can do with it. The development around the phased-array, Electronic steerable antenna systems is also moving at quite a pace!

There are a lot of changes and potential game changers and it's nice to see we've taken the bit between our teeth and running with it.

One thing it shows is that satellite is not irrelevant, but is also changing perceptions. It's not the last resort, outdated technology some like to say it is.

The JV between Hughes and Yahsat will be an interesting proposition to watch in the market, especially as a Ka-Band broadband provider and how they manage to attack the rural markets with ARPU's as low as they are. Although the Hughes technology is tried, tested and proving to be very successful in the US markets it will be fascinating to see how they apply it to the African market.

Connectivity speeds from the VSAT broadband providers is already well above

that of ADSL in Africa, and significantly more reliable given the levels of copper theft. The LEO constellations are "in theory" at this point going to deliver FTTH (Fibre) speeds and latencies across their coverage zone, and at very attractive price point.

There has been a trend of consolidation throughout the Satellite industry over the past 5 – 10 years and I think we will see that trend continue for the coming 5. My feeling is that a number of the Ka-Satellite operators will get into financial trouble and their assets will be acquired by the larger operators. I would like to see a move towards a more open standard technical model for the terminal manufacturers, and the prices continue to drop because of it.

video-conference with headquarters, use cloud-based applications to access and upload critical data, and improve overall productivity and safety.

Steve Amos, Ivanhoe's head of projects in the DRC, said: "We employ leading-edge exploration and development technologies at our projects, and to make sure that these technologies are applied successfully, we need to get the right information to the right people at the right time."

The Kamoak-Kakula mining project exploration covers a near-surface stratiform copper deposit with adjacent exploration areas within the Central African Copperbelt. The project is a joint venture between Ivanhoe Mines, Zijin Mining and the DRC government.

However, it's not just industry that benefits from the flexibility which satellite communications offer. Catholic radio network RCBurkina started using SatADSL's IP connectivity solution to broadcast its services in Burkina Faso. Often covering very large areas, SatADSL said broadcasters need to install multiple local repeaters to receive and regenerate signals and transmit their TV and radio programmes everywhere.

RCBurkina operates from a central radio station in Ouagadougou and is equipped with a studio and a satellite terminal. It's now using SatADSL's IP multicast technology to broadcast programmes to all 14 radios in its network, including some daily programmes that are broadcast live. The diocesan radios of the network broadcast daily, focussing on human development and social cohesion. The station uses the SatADSL multicast solution to broadcast all programs, with a part of these daily programs being live broadcasts.

SatADSL claims its simple solution can be implemented in only a few weeks. It uses a standard satellite terminal with a parabolic one metre dish antenna connected to an MP3 stream decoder, with the analogue output reserved for the FM transmitter. The stream is then routed to a data centre in Brussels over a fibre or satellite link where SatADSL then broadcasts it via satellite.

The company adds that its

multicast technology allows for simultaneous distribution to repeaters, regardless of the number of sites that need to be covered. SatADSL claims this makes its solution much cheaper than other technologies including fibre.

In a separate deployment, Virunga National Park in eastern DRC is also using an IP connectivity solution provided by SatADSL. Founded in 1925 as Africa's first national park, Virunga covers 7,800km² and is now a designated UNESCO World Heritage Site. SatADSL's customised solution uses C-band capacity from Arabsat 5A to provide all tourists throughout the park with optimal internet connectivity. ■



Virunga National Park's hydropower plants are also used to bring electricity to local communities

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**Libby Barr,
chief operating
officer,
Avanti
Communications**

“Last year was undoubtedly one to remember, with the launch of our new satellite, HYLAS 4, the launch of our new South African hub and Gateway Earth stations in Johannesburg and Lagos,” says Libby Barr, chief operating officer, Avanti Communications.”

The launch, she says, has been underpinned by Avanti’s continued commitment to investing in Africa through a direct local presence backed by in-country solutions to enable and facilitate connectivity through key partnerships both in South Africa and throughout the region. To date, Avanti has invested over USD897 million in sub-Saharan Africa.

“This development provides affordable high-speed satellite broadband to connect homes, SMEs, schools, enterprises and mobile operators across sub-Saharan Africa, especially in rural and remote locations where terrestrial networks are limited or not commercially viable, Barr adds. “Our projects continue to exploit the reach of high-speed and reliable satellite communications as well as ICT to bring unprecedented benefits to the rural education sector across Africa. Our projects have provided measurable positive impacts to the educational outcomes of over 200,000 pupils and students as well as teachers across over 550 rural primary and secondary schools in Kenya and Tanzania that would otherwise remain unconnected.

Expansion of 3G and roll out of 4G services across the continent has continued to grow over the last 12 months. Overall, mobile penetration on the continent is the highest it has been. However, Barr says growth in roll out of higher data mobile services is primarily concentrated in urban and peri-urban regions.

“Untapped growth opportunities still exist within rural low-income and low-ARPU sectors, which comprise about 50 per cent of the market, where mobile device penetration is more than 90 per cent and demand for mobile data services is equally high yet the telecommunication infrastructure to meet demand is still limited or unavailable,” says Barr.

“We believe governments and the private sector need to take bolder steps to fast-track the process. There’s still considerable disparity between urban and rural areas, which is where the vision of getting everyone connected comes from.”

With regards to the next 12 months, Barr says key telecommunications related challenges for Africa continues to be access to affordable and reliable high-speed connectivity especially in rural/remote areas where there is limited or no infrastructure. Through its Every Community Online (ECO) solution, a satellite-based community Wi-Fi hotspot which encompasses easy install solar (and

AC) VSAT infrastructure and an app for purchase of data packages, she says Avanti is equipped to bring the benefits of reliable high-speed broadband to the most remote regions and communities in sub-Saharan Africa.

“Avanti aims to bridge the digital divide by enabling and facilitating connectivity with our partners to cover the gaps that exist in the continent,” Barr says. “The bigger picture is creating fully connected societies for the benefit of people, communities as well as large enterprises.”

The company also aims to broaden its current landscape of providing online education to schools and local communities. Barr says that “in today’s deeply interconnected world”, the benefits of strong and inclusive education are far-reaching, supporting the creation of dynamic economies and help to sustain stability.

“Leveraging evidence of the positive impact of our projects iMlango and iKnowledge, and the experience gained from implementing these projects, Avanti will continue working with governments across the continent to support their strategic policy objectives to increase roll out of internet-enabled technologies in rural and remote areas in the education and other sectors, such as agriculture and emergency services,” Barr adds.

“We’re also continuing to work with the Kenyan government to connect over 1,000 Constituency Innovation Hubs across Kenya, which will bring connectivity to rural communities and young adults, helping them to develop their ICT skills.

Barr is also keen to point out that something very close to Avanti’s heart is giving back to its communities and the areas it operates in, reaching even the remotest of locations.

“We enable access to opportunities which might not be readily available due to geographical displacement, social and economic circumstances,” she says. We’re committed to going the extra mile and making a real difference, and by working together with local partners, we have the ability to liberate potential and transform lives.”



**Andrey
Kirillovich,
director of
integration &
projects,
RSCC**

RSCC is a global satellite operator providing services in Russia, CIS, Europe, Africa, Middle East, South Asia and Latin America. Andrey Kirillovich explains how sub-Saharan Africa was one of the most interesting and fastest growing regions for the company in 2018.

“However, unlike the previous years when the growth was achieved by winning new customers, the majority of sales increase last year was generated by an organic growth of our existing customers expanding their networks and service offerings

based on RSCC satellites operating in the region.

“RSCC has improved its position as one of the key satellite providers in Middle Africa and partially in West Africa for IP trunking, cellular backhaul, corporate, SCADA and emerging IoT applications. Our main satellite assets in the region include Express-AM8 (14°W), Express-AM7 (40°E) and Express-AM6 (53°E). These satellites have a combination of wide continental and narrow high power regional spot beams in C- and Ku bands giving our customers, the service providers, a good flexibility in targeting various regional and vertical markets all across Africa.”

When asked how the RSCC saw the wireless communications market adapt and evolve in Africa over 2017, Kirillovich describes the market as “very energetic”. “[There was] extensive development of fibre networks digging deeper into the continent and various terrestrial wireless technologies spreading their nets all around big cities. This has driven up the need for more connectivity in all market segments and verticals.

“While satellite has lost the market of large national backbone circuits to fibre, if we go further into the continent, increased demand for reliable connectivity can still only be met by satellite-based solutions. Moreover, further expansion of 3G and even 4G/LTE networks in many African countries leads to more extensive use of satellite for cellular backhauling. The share of this application on our satellites has increased throughout 2018.

“Africa is a multinational, multicultural and multilingual region, so the challenges may vary from country to country. In general, the most common challenges include problems with payment collection, complicated logistics for satcom equipment, and extended timeframes for any project development. This can be mitigated or controlled by relying on trusted partners or by increasing presence in the region or specific country. But all this is compensated

“While satellite has lost the market of large national backbone circuits to fibre, if we go further into the continent, increased demand for reliable connectivity can still only be met by satellite-based solutions”

by enormous opportunities which Africa opens for satellite connectivity service providers."

Another challenge Kirillovich identifies is the development of terrestrial connectivity which has always put the "hardest pressure" on satellite-based solutions. But he believes terrestrial and satellite can co-exist: "Either in a hybrid solution, or by supplementing each other. As pointed out above, the more reliable wired or wireless terrestrial solutions are coming to the market, the more demand we see for satellite connectivity. It may shift from vertical to vertical or from one frequency band to another, but the room for satellite is still huge in Africa.

"A good example of continuous demand for satellite connectivity is a situation we faced in one of the African countries, which is still using satellite links for IP backbone in one of its remote cities. When a reliable and cheap terrestrial solution came to the city, we faced a downturn in satellite downstream channels, but the demand for upstream channels has been increased several times."

Looking ahead, Kirillovich said RSCC plans to intensify its sales in vertical markets across Africa in 2019, mainly in corporate VSAT and cellular backhaul, including managed service offerings. "We also hope to increase our customer base and include new countries where RSCC satellites are delivering connectivity to the people of Africa. In general, Africa has become an important revenue-generating market for us, so we expect our solutions will gain more market share in 2019.

"RSCC solutions are based on the unique design of satellite footprints that we are offering in Africa, allowing service providers to serve various niches and vertical markets. Our satellites are operated in different orbital slots located on both sides of the continent, so they provide good elevation angles for West, East and Central Africa.

"RSCC satellites also offer good cross-region connectivity. That is why our customer base is a well balanced mix of European, Middle East and local service providers, which are working inside the continent, offshore and in the waters around Africa."



**Carole Kamaitha,
VP sales Africa,
SES Networks**

Over the past few years SES, has concentrated more on Latin America and the APAC markets. Is there now a renewed focus on Africa? Carole Kamaitha, who has been with SES for around seven years now having started on the O3b side, points out that the focus on the continent has always been there.

"We have done some new and exciting things over the last couple of years. Perhaps we have

not been as vocal as we should have been, but there is a lot of positive energy around what we're doing in Africa. Looking at the African business over the last 12 months, I see mining opportunities coming in, we have new MNO customers coming on board, we have just concluded a massive strategic deal with Millicom in Chad for their cellular backhaul solution.

"The market has changed dramatically. There is a price pressure, there is more fibre coming in, and we have looked internally to try and figure out if being a satellite operator is the right identity or not. And when I look at our businesses today, we do not identify

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as a satellite provider per se. That is just the transport [mechanism] that we use to provide the service. We identify more as a global managed services provider. That is how we are showing up in the market, because the market has shifted and we have to shift with it."

'Satellite' is sometimes regarded as a dirty word in connectivity circles, especially given its history and the baggage of high prices that it comes with. Does Kamaitha agree with that?

"When you talk satellite, depending on how long you have been in industry, you will react differently. The perception that it is expensive, hard to get to, suffers from rain fade, etc., unfortunately still holds true for a lot of people.

"But when I look at the landscape now, what is clear is that the days of just buying megabits or megahertz are gone. We have CTOs, MNOs, telcos, etc., coming to us saying that I am looking at the P&L. Previously, the CTO perhaps never used to be very important in terms of the P&L – my background is in sales and whenever I go into a sales call I find that I am now interacting with the CTO as well as the CFO. Everybody has different metrics for performance or delivery, and increasingly the CTO owns the P&L and we're having more price conscious conversations. Beyond just delivering the network, beyond just the SLAs, they are asking what is the cost of the business? There is a cost consciousness across-the-board.

"As a result, we have found that it is really critical to change our business model, to show up in a way that our customers understand what we are doing and be the telco partner of choice. And so we cannot show up just as satellite operator – that is just about selling megahertz. People are now looking for SLAs, and an all-inclusive cost on a per megabit basis. I have more SLA conversations now than I have ever had before as the industry has become more sophisticated. So for me, all this is what motivated our change in terms of being more responsive to what the market is asking for or what our customers are demanding us to be."

SES is not alone here, as the entire satellite industry is shifting its mindset with many of

"We also see improvement in commodity prices, exchange rates, and all those kind of indicators that tell you where the market is going"

the major players adopting a similar business approach. So how does SES differentiate itself from what its rivals are offering in Africa?

"In terms of managed services, you are right, everybody is going there, it is logical thing to do. It is what the market demands and so you have to do it. We have a unique differentiator in that we are the only satellite service operator that has a multiband solution. We are a GEO operator offering both traditional Ku- and C-band and capacity, and we have a medium Earth orbit (MEO) solution as well (O3b). Now with those two solutions we are able to show up differently to customers, and we are able to deliver differentiated value.

"And in the last couple of months, we have refined that to offering multiple solutions that can address a customers' unique needs. For example, say you have an MNO or an ISP somewhere in Africa and that they have a requirement for GEO capacity. The applications for GEO are very clear: if you are talking about cellular backhaul, that's where you want to go; if you are talking about extremely highly available networks, that is what you want to go. But if the same ISP or MNO also has a requirement for high throughput and low latency, what do they do? We show up with O3b, our MEO solution. When you combine those two and provide a hybrid solution, you are turning around the ISP's or MNO's capabilities, and that enables them to then differentiate their service offerings."

Kamaitha mentioned the 'traditional' application of backhaul – is doing this via satellite still big in Africa?

"It is, and I have seen it in a lot of countries where they are trying to figure out exactly how to roll out their universal service funds (USF). And the biggest requirements when doing this is connecting rural areas because MNOs struggle to go into these locations where the ARPs are very low, the population density does not make sense, and then you have issues around energy, power, being off-grid, etc. And this is when the USF becomes important because the government says we are stepping in, and in those areas backhaul then becomes very important. When you look at mobile penetration Africa, it is about 44 per cent according to some GSMA statistics, so there are still very huge pockets of opportunities where we have not been able to go into certain areas because we have not found an affordable solution.

"We've taken that very seriously within SES, and one of the things we have done is to look for partners who know how to best deliver backhaul solutions affordably (software-defined radio access, for example). So we have a few partners that we are talking to and are trying to find the right mix of solutions.

"Connectivity in rural Africa continues to be a problem because the building blocks missing. Given our commitment to the continent and the

opportunities that we see for growth, the question I have always raised is why can't we be that partner where we step up and find the missing pieces by building an ecosystem of partners that deliver value. We benefit on the backend because we are positioning satellite capacity, but we will never be able to provide that capacity if the critical missing pieces of the puzzle are not there.

"We have to decide whether we play the game, put the pieces together and motivate the partners. And what I have found is that when you are having this kind of conversation, all the partners are sufficiently motivated – we just need to lock in and then go and start to deliver value together."

When it comes to the year ahead, SES expects to largely build on some of the successes it had in 2018. "We have found a sweet spot in the mining sector. I see huge opportunities here because we are now talking about digital mining where there is a requirement for operational efficiencies and smart mining.

"We also see improvement in commodity prices, exchange rates, and all those kind of indicators that tell you where the market is going. We have seen by extension a large recovery in oil prices which means that some of that opportunities where offshore/onshore investments had stalled are now coming up – there is a lot of excitement around that in Nigeria, Angola, Mozambique, for example.

"There has also been a lot of expansions with MNOs. Here, there is demand for us to deliver managed services or cellular backhaul for rural connectivity.

"In addition, we have seen the likes of Google and Facebook come in and angle for some space in the connectivity domains, so I see us contributing largely with both our MEO and GEO solutions in that space."

Kamaitha concluded by saying that the company launched SES 14 and SES 12 earlier in 2018 and is now activating services on those satellites. Further launches for additional MEO capacity are planned for Q2 or Q3 2019, as well as some completely new HTS assets coming to the continent to cover the West and East coasts.



Intelsat regional vice president, Middle East and Africa Brian Jakins is very upbeat about the communications satellite services provider's past year on the African continent.

**Brian Jakins,
regional vice
president,
Middle East and
Africa,
Intelsat**

"We know that demand for connectivity is growing significantly, and if I can expand that to look over the last two years, we've completed our global, high-throughput satellite platform, Intelsat EpicNG, with three, Intelsat 33e, Intelsat

35e and Intelsat 37e, providing services to Africa," he says. "Obviously, these bring a new dynamic to what we are doing in the region."

Jakins highlights the fact that broadband costs have been "out of reach for most consumers on the ground", but via high-throughput satellites (HTS), he says Intelsat has been able to change the total cost of ownership and cost dynamics into the continent. In a nutshell, Intelsat is making it more affordable to get access and to get connected.

"We signed key deals with small and big operators, like Vodacom Business Nigeria, which utilises one of our high-throughput satellites (HTS) to deliver broadband connectivity to banking and oil and gas and enterprise sectors across West Africa," Jakins adds. "We did something similar with Vodacom in Mozambique, where it wanted to upgrade from 2G to 3G and ensured that it was able to upgrade without increasing costs significantly. Our solution was far more cost-effective than some of the terrestrial options available."

More recently, Intelsat invested in a company called Africa Mobile Networks (AMN) – a UK-based business. It is working with AMN on different partnerships to rapidly and cost-effectively expand mobile network operators' reach and expand into rural areas where traditional terrestrial means could not get to. Jakins says the business model has evolved into a revenue share with low to no capex and investment, to build a network that provides connectivity to these rural communities. The model reduces the need for substantial infrastructure investment normally provided by the MNOs. "That's a game-changer in terms of business modelling," he says.

Intelsat formed a partnership with Uganda's Communications Commission to do something similar in Uganda, "delivering high-quality, resilient and affordable broadband connectivity" to two remote communities. Again, that was through HTS. "The dynamic of HTS is that it's changing the traditional cost basis of satellite services compared to traditional FSS satellites," Jakins says. "This has really enabled some of those partnerships and new products and services into those markets."

Understandably, rural areas want to be connected as well as urban and suburban environments are, but it's a much bigger effort. Jakins says as Intelsat works through those connectivity projects, one can see how these areas are neglected by MNOs. "But these areas and communities have the same service expectations as the rest of us," he adds. "If the service is not stable or is interrupted, the churn for network operators is quite significant. Our population density in urban areas has allowed our operators to achieve economies of scale but not so much in the rural communities, and this is what we are really focused on and are driving different business models into. The innovations we brought to market

"We see satellite as being uniquely positioned to drive competitively-priced broadband infrastructure into a diverse range of business segments"

have improved profitability for cellular networks."

To that end, Intelsat sees enabling new technologies as one area it can focus on where doing good is good business. Jakins says this is true across Africa, from Ghana to South Africa, where the company has partnered in the delivery of the "Internet for All" project with the Ministry of Communications to connect some of these communities. "Orange and MTN have invested in bringing smartphones at a lower cost and enabling new technologies and this is a significant game-changer," he says. "There's talk about can we get 5G. Yes, we can get 5G, but there's a cost association and we don't have the handsets yet, but there are a lot of pieces you need to enable these technologies and innovations into communities that could potentially benefit from it. We see satellite as being uniquely positioned to drive competitively-priced broadband infrastructure into a diverse range of business segments."

Jakins says the benefits for the end users are numerous, as 5G can transform mobile phones into even more powerful computers that deliver virtual and augmented reality services; connect billions of small, inexpensive, lower-power devices in the Internet of Things; and enable the connected and driverless car. He points to various applications; telemedicine, farming, education, e-education, health, as beneficiaries.

"We have just over 400 million broadband connections, in a population of 1.3 billion," Jakins says. "And if you look at providing an increase of just 10 per cent connectivity in those countries it drives GDP up by almost one per cent, so again, it's about doing good business but in a sustainable manner. These poor communities can have access to this but in an economically viable manner. These are the markets we have been involved in and where we see the market developing with HTS satellites."

Jakins says Intelsat 33 "has really helped" service these communities and this will only improve with more handsets available to the masses.

"In Africa we look at sustainability, power, water, and government partnerships all playing an active part in supplying broadband to serve consumers," he adds. "There are loads of challenges, developing infrastructure, for example. Even in urban and

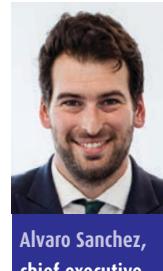
suburban areas you can't just jump from 3G to 4G to 5G because people don't want a tower outside their house for various reasons, the most common being it's not aesthetically pleasing."

However, there is no such problem with satellite because there are no restrictions. As a result, Intelsat develops new models to help solve the challenge of infrastructure problems and Jakins says MNOs and enterprises need to do their bit by responding to demand from consumers.

Of course, there are regular disruptions with regards to connectivity in Africa. Jakins says there were rolling black outs in South Africa - based on poor infrastructure - earlier this year. "If you are serviced only by terrestrial means, there will always be connectivity challenges," he says. "Intelsat is primed to help overcome these challenges."

Intelsat also joined Smart Africa whose objectives are to connect, innovate and transform the continent into a knowledge economy thereby driving global competitiveness and job creation.

Jakins says by partnering with all the key stakeholders, "we believe that we can continue to narrow the digital divide and create a sustainable broadband network that accelerates Africa's digital transformation and spurs further economic development across all areas of Africa"—urban, suburban and rural communities.



**Alvaro Sanchez,
chief executive
officer,
Integrasys**

Integrasys chief executive officer Alvaro Sanchez says the African market has been an important one with numerous projects and sales within the region thanks to the company's global partners.

He points to the technology that has been well-established in Africa over the last years. "Some examples of this adoption have been Yahsat, iWayAfrica, Gondwana, Vodacom, Ethio Telecom and many more, that have been benefiting on the speed up on the deployment phase," he says. "Satmotion allowed these companies to deploy their network addressing the market way faster and saving significant opex."

Elsewhere, pan-African telecommunication provider Gondwana International Networks (GIN) has implemented Integrasys' Satmotion VSAT auto-commissioning tool for its satellite networks.

Sanchez says Satmotion enhances the delivery, commissioning and maintenance of VSAT services, while also minimising, time and interferences. His point is backed up by Guy Schalker, chief technology officer at GIN.

"By simply installing an app on a smartphone, whether Apple or Android, the VSAT installation capabilities are simplified making installation easy regardless of the installers' level of

experience," says Schalker. "This not only reduces the installation time and associated costs, but more importantly means the customer is installed accurately first time with optimized polarization."

GIN, through the operating brands AfricaOnline and iWayAfrica, is one of the largest VSAT operators in Africa, providing satellite services in 44 countries. The company has rolled out Integrasys' Satmotion technology together with Hughes Network Systems' Jupiter platform.

"VSATs are difficult to commission, especially in Africa where heat and remoteness are daily issues," Sanchez continues. "Satmotion allows a fully auto-commissioning without the need to call anybody to install a VSAT terminal."

Sanchez says the broadband satellite projects continue to grow, because the oil and gas sector, companies, governments and citizens need to be connected in order to bridge the digital divide, while improving the economy as the countries develop.

"We see that for broadband, satellite can provide the most reliable solution today, and Integrasys ensures this availability by monitoring the SLA (service level agreement) with each product," he adds.

"We see that some countries in Africa are developing rapidly, some have already developed and some are slower. The African market is a low margin market up to now and this creates challenges. In the next coming 12 months, fibre cables will continue to roll out through Africa, connecting mainly the suburbs and cities. I believe we will be playing an important role, every day through maritime connectivity as well as connecting African and global airlines."



Dmitry
Sevastyanov,
director general,
Gazprom

Gazprom Space Systems (GSS) is a communications satellite operator that launched back in 1992. It has been a big player in the African market for six years now, following the launch of Yamal-402 (55°E orbital slot). The satellite provides Ku-band coverage over sub-Saharan Africa, the Middle East, Russia and CIS. Customers can operate both within the African footprint (the southern beam) and use the inter-beam connection between Europe and Africa. The wide southern beam of Yamal-402 (EIRP 46.51 dBW) covers a large swathe of the African continent, particularly sub-Saharan Africa, Madagascar and areas of the Indian Ocean. The quality of services is determined by the high efficiency of Yamal-402 and good elevation angles, under which the satellite is visible from Africa.

Dmitry Sevastyanov, director general at Gazprom, says despite strong competition on the African market in recent years due to the ap-

"Satellite operators found the African market challenging because of high competition among global and regional satellite operators offering services in this region"

pearance of a large number of new satellites, the capacity of Yamal-402 is still in a great demand.

"Currently the activities of Gazprom Space Systems on the African and Middle Eastern markets make approximately 50 per cent of all foreign currency earnings," he says. "Yamal-402 is often involved to provide services to enterprises, government institutions and population, as well as for live broadcasting of political, cultural and sports events in African countries."

Sevastyanov says that optimal coverage of the African territory and Africa — Europe inter-beam connection allows to arrange TV reportages as well as content transfer quickly and qualitatively both inside the African continent and from Africa to Europe.

"Over the last year, GSS succeeded to expand business with some local TV broadcasters and satellite ISP operators — Telemedia and ISAT Africa for instance," Sevastyanov says. "The Yamal-402 Southern beam is on a big demand for TV broadcasting in Angola, Cameroon, Lesotho, etc. Approximately a dozen African TV channels broadcast via Telemedia company, GSS's long-standing and reliable partner."

Indeed, GSS has been associated with Telemedia since prior to the launch of Yamal-402. In fact, Telemedia contributed to the final footprints of the Sub-Sahara beam for Yamal-402 which is now used extensively by local broadcasters in Sub-Sahara Africa. Telemedia operates a network of satellite contribution services and provides hire of Satellite News gathering systems to many of the local broadcasters who fall within the Sub-Sahara footprint of Yamal-402.

"Telemedia is responsible for a number of live church broadcasts, which owing to the wide coverage of the Yamal-402 footprint for coverage of church broadcasts when reception is required, both locally within South Africa and extensively beyond the borders of Central and West Africa where Yamal-402 footprint is quite powerful," he adds. "It also transmits an MPEG4 bouquet on the Sub – Sahara beam of Yamal-402 which provides 6 channels of live

horseracing, as well as other multi destination services on a saturated transponder.

Sevastyanov says Telemedia provided assistance with TPA Angola for the introduction of their Satellite network and after the end of life of NSS7. All of TPA Angola's traffic was transferred to Yamal-402 for not only their National Distribution Service, but also their regional contributions and SNG services.

Peter Bretherick of Telemedia adds: "Telemedia makes extensive use of Yamal-402 sub-Sahara coverage since it is easy to operate with Gazprom Space Systems and the extended coverage of the Sub-Sahara beam allows interchange of programming amongst many of the sub-Sahara – Southern African broadcasters from Mauritius in the east to Dakar in the west".

Sevastyanov says that as well as broadcasters, the large providers, offering satellite communications services in the interests of global Energy, Oil and Gas companies in the African region, extended contracts and increased the volume of capacity leased on Yamal-402 satellite in 2018.

"As in recent years, satellite operators found the African market challenging because of high competition among global and regional satellite operators offering services in this region," he says. "In addition, difficult market situations, political and economic instability, significant currency fluctuations in some African countries made the negative impact on the business activities of customers, especially in the corporate segment – one of the main target sectors for satellite communication services."

What's more, he says the corporate sector has been also mostly sensitive to pressure from fibre optic networks over the last years. "In areas where fibre optic is laid, appear cheaper offers for trunking and, accordingly, satellite capacity demand on the side of Internet service providers and mobile operators decreases," Sevastyanov adds.

Nevertheless, GSS remains optimistic regarding the future of the African market and believes that positive forecasts about the demand growth in data flows circulating globally between billions of stations, mobile objects and devices will make all players in the telecommunications industry rethink their business strategies. "Everyone understands that future solutions lie in a combination of terrestrial and satellite technologies," adds Sevastyanov. "The obvious advantages of satellite communication will allow finding its place in future innovative projects. The confidence in the future of satellite communication is shared by our industry colleagues and the most part of experts, and this encourages us to further development."

As far as the future is concerned, Sevastyanov says GSS will continue to expand cooperation with local partners in the region offering the best solutions to meet customer's needs and support win-win strategy. Along with that, the company will continue searching of new niches and business

models, as there is a rapid progress of satellite communication technologies on the market.

"This year, GSS is going to put into operation a new satellite – Yamal-601 (49°E) that will replace Yamal-202 operating since 2003," he says. "This satellite, despite its age, remains in interest of providers operating in the region of North Africa and the Middle East. It sets the scene for the subsequent successful implementation of the capacity of new Yamal-601 satellite that will assume its entire customer base."



**Sean McCormick,
managing
director,
Globalstar
Satellite Africa**

Botswana has allowed provision of services across Africa.

"What we see in Africa is a general lack of both cellular and RF (Radio Frequency) terrestrial based land infrastructure, says Sean McCormick, managing director, Globalstar Satellite Africa.

"This obviously creates a huge opportunity for Globalstar in the IoT services across the African continent which is much needed." He adds that Globalstar can address these challenges with both its retail product range, SPOT, all the way through to its Globalstar Commercial Simplex product range, which offers solutions in remote areas for asset tracking, animal tracking, oil and gas mining, logistics and many other verticals.

"IoT is the new buzz word in our industry, even though we've been doing IoT for the past 20 years," McCormick adds. "We are seeing that people are finding that connecting business in Africa can be quite challenging, but we are able to address those issues as we are 100 per cent satellite-based technology. This allows provision of services in niche markets where there is no cellular or RF-based infrastructure."

When asked about the

challenges in Africa, McCormick says there are many. "What the rest of the world does not understand when talking about business in Africa is that although it is one continent it is made up of many different and diverse countries, each with its' own business style, language and hurdles," he says. "There are language and cultural barriers. Once you get beyond that and are able to understand the cultural differences, African countries have many other issues; be it politics, stability or finance." McCormick says the challenge is to be versatile in your approach when dealing with the various countries and identify the diverse needs and applications by tailoring the products

and services offered to find niches where the company can add value to each country in Africa.

Globalstar has three distinct business divisions. Firstly the retail product range, SPOT, which extends to our second division being, 'SPOT for Business', where these 'plug-and-play' SPOT products are used to provide connectivity solutions in a commercial environment. Lastly are the commercial Globalstar products which can be tailor made and adapted to roll out on larger scaled as well as more complicated projects.

"Going forward we want to start offering voice/data solutions to the African continent," McCormick says. ■

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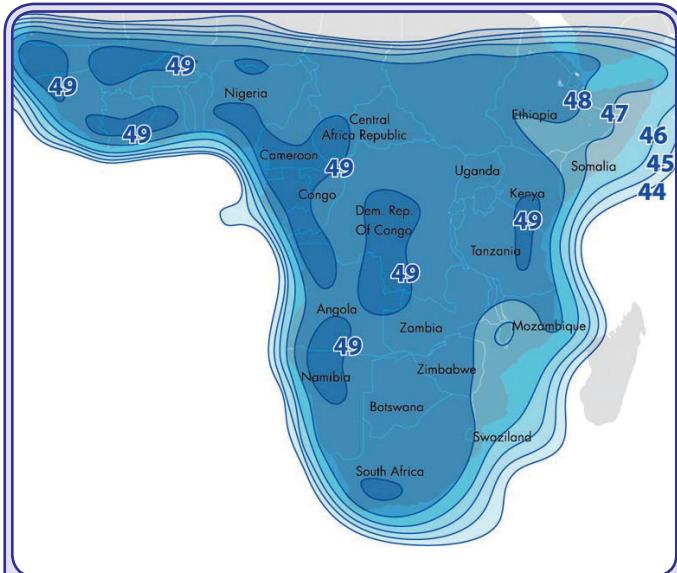
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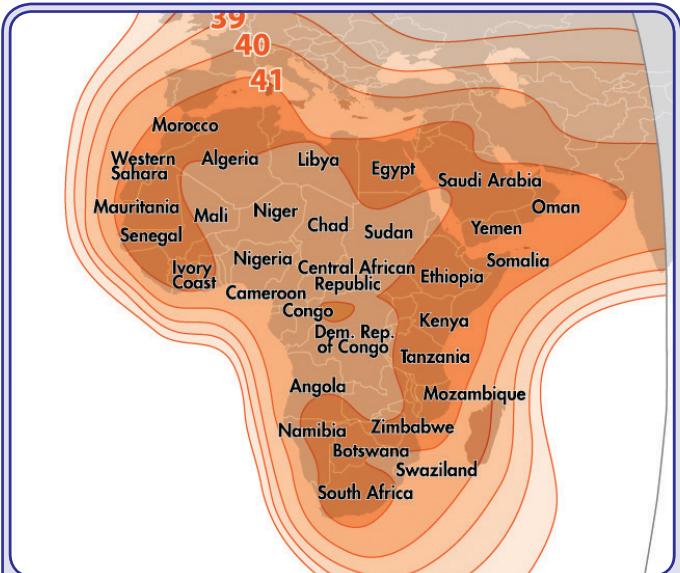
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SATCOMS: FOOTPRINTS



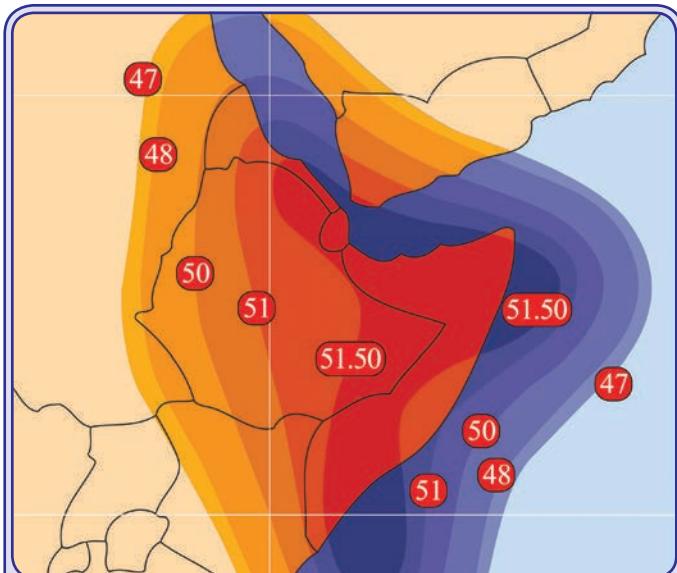
ABS-3A: 3°W – SAF Ku-band beam

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



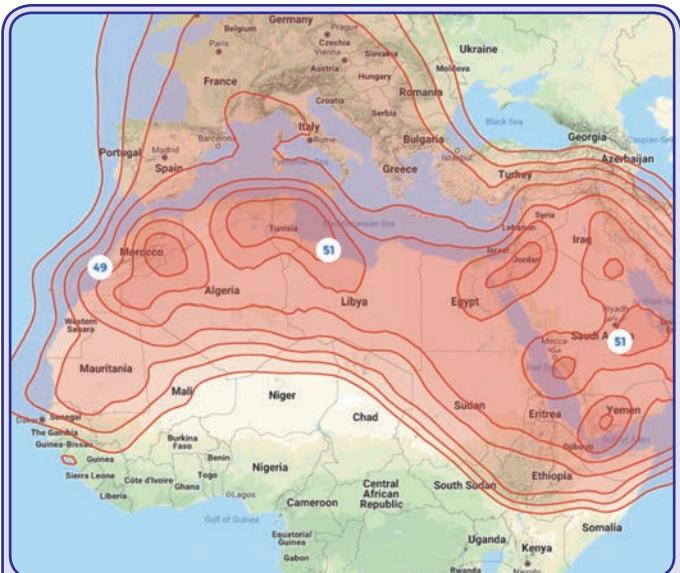
ABS-3A: 3°W – East Hemi C-band beam

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



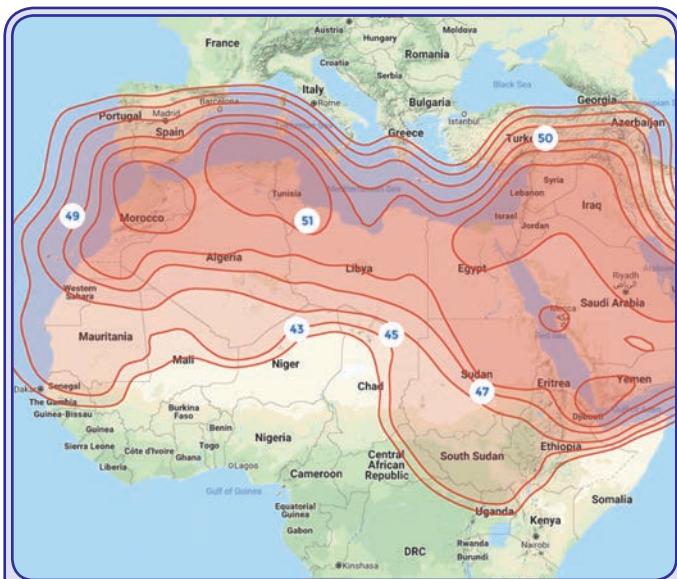
AMOS-4: 65°E

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 LWTAs 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 Uplink: 13.75-14.00GHz

Downlink: 12.50 to 12.75GHz

Ku-band/FSS Apx-30B MENA Uplink: 13.00 to 13.25GHz

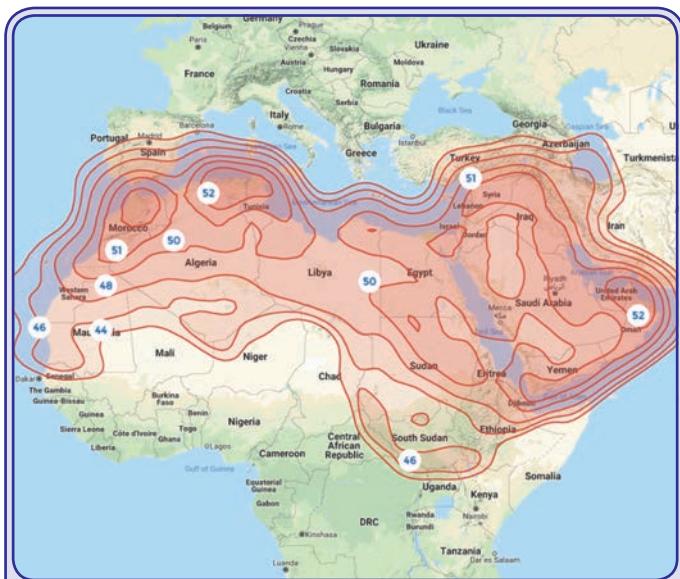
Downlink: 10.70 to 10.95GHz

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



Arabsat BADR-6: 26°E

Launch date: July 2008

Transponders: Ku-band/BSS 20 (BOL) or 16 (EOL)

C-band – 30 TWTAs for 24 active channels

Bandwidth: Ku-band/BSS: 34MHz; C-band: 36MHz

Frequencies: Ku/BSS: 17.30 to 18.10GHz (uplink); 11.70 to 12.50GHz (downlink)

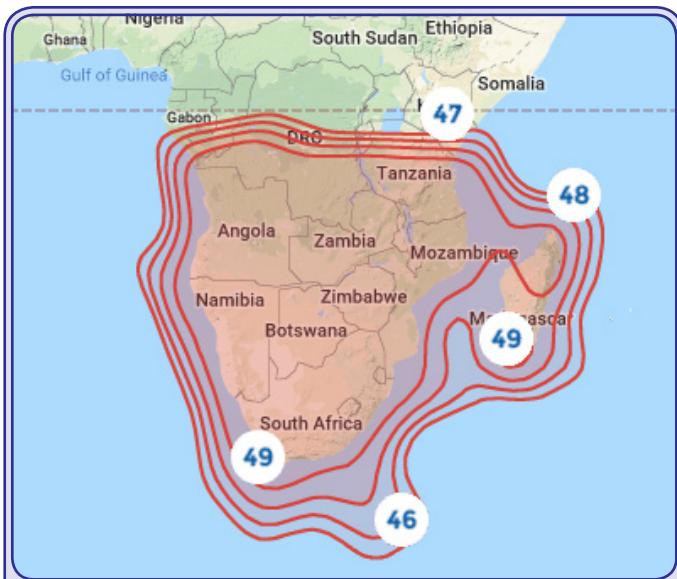
C-band: 5.925 to 6.425GHz (uplink); 3.700 to 4.200GHz (downlink)

Polarisation: Linear horizontal/vertical

Typical G/T: Ku-band/BSS 52.1dBK; C-band 1.2dB/K

Typical EIRP: Ku-band/BSS 52.1dBW

C-band 41dBW (medium power) & 43.5dBW (high power)



Arabsat BADR-7: 26°E

Launch date: November 2015

Frequencies: Ku-band/FSS uplinks: 14.00 to 14.25GHz; 14.25 to 14.5GHz

Downlinks: 10.95 to 11.20GHz; 11.45 to 11.70GHz

Ku-band/FSS Apx-30B uplinks: 13.00 to 13.25GHz/12.75 to 13.00GHz

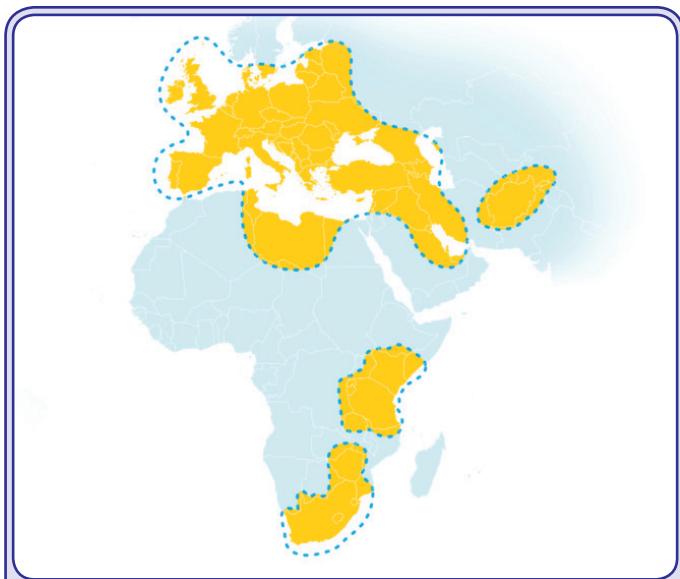
Downlinks: 10.70 to 10.95GHz/11.2-11.45GHz

Polarisation: Linear

Transponders: 12 x 36MHz

Typical G/T: 5.1dB/K

Typical EIRP: 51.5dBW; 52.4dBW



Avanti Communications HYLAS 2: 31°E

Launch date: August 2012

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

Typical 'wet beam' EIRP (at edge of coverage): up to 61.5dBW

G/T (at edge of coverage): up to 14.0dB/K

SATCOMS: FOOTPRINTS



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:

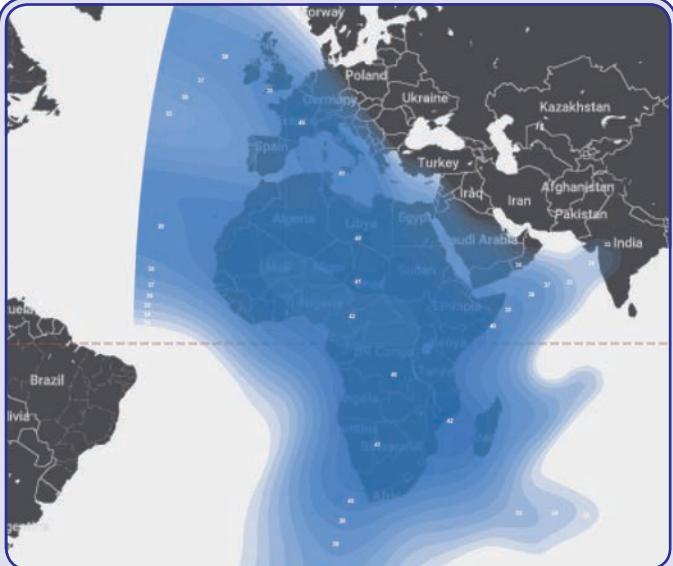
Civilian bands - 29.5 to 30GHz (uplink); 19.7 to 20.2GHz (downlink)

Government bands - 30.0 - 31.0 GHz (uplink); 20.2- 21.2 GHz (downlink)

Broadcast only - 21.4 to 21.9GHz (downlink)

Typical steerable beam performance:

EIRP (at edge of coverage): up to 54.5dBW; G/T (at edge of coverage): up to 7dB/K



Azerspace-1/Africasat-1a: 46°E – C-band Africa & Europe

Launch date: February 2013

Active transponders: 24 (36MHz each)

Uplink: 5925 to 6425MHz

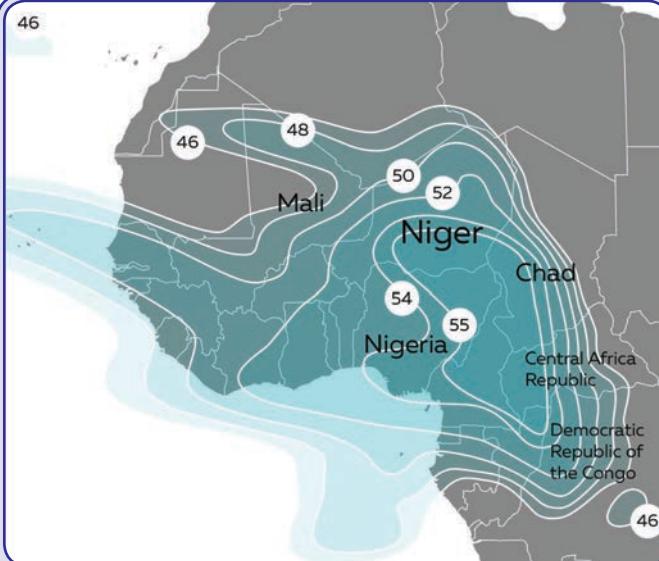
Downlink: 3700 to 4200MHz

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.



Azerspace-2: 45°E – Ku-band

Launch date: Expected 2017

Manufacturer: Space Systems/Loral

Bus platform: SSL-1300

Launch vehicle: Ariane-5ECA

Active transponders: 35 (36, 54, 72, 76MHz)

Uplink: 14000 to 14750MHz

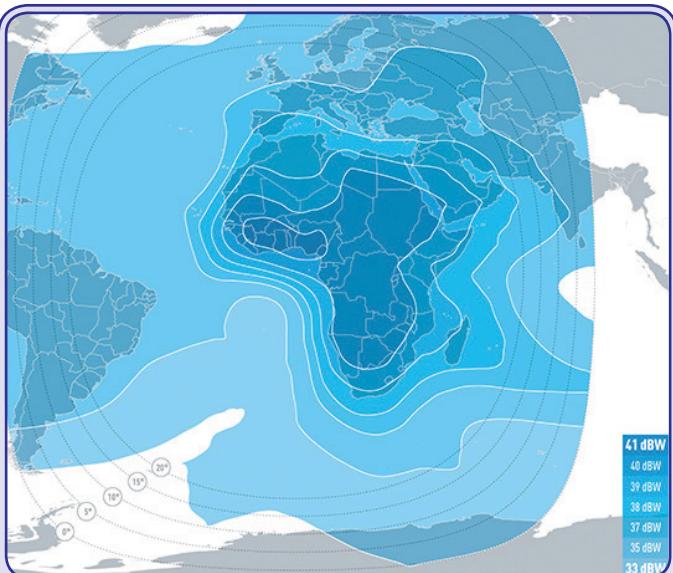
Downlink: 11450 to 12750MHz

Beams: Europe & Asia, Pakistan & Afghanistan,

West Africa and Central Africa

Polarisation: Linear

150W



EUTELSAT 3B: 3°E

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

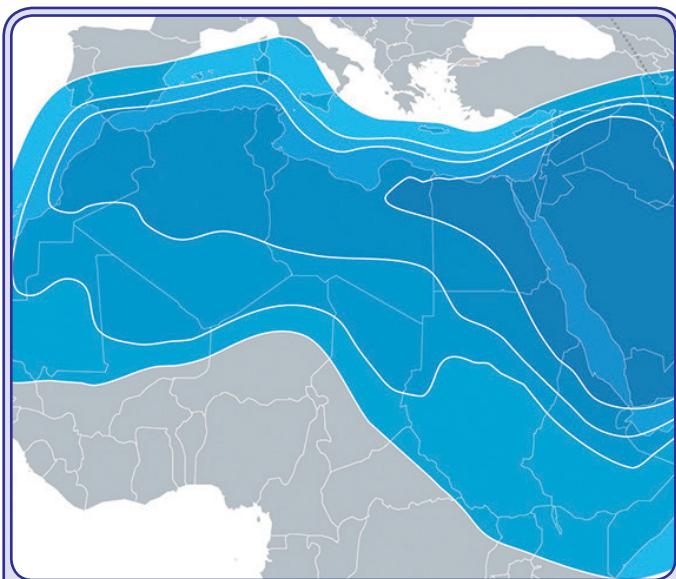
Manufacturer: Airbus Defence and Space

Operational life: Over 15 years

Launch craft: Sea Launch AG's Odyssey

Operational transponders: Up to 51

Downlink polarisation: Ku-, Ka- and C-bands



EUTELSAT 7 WEST A: 7/8°W

Located at 7° West, and part of the leading Eutelsat-Nilesat 7/8° West video neighbourhood, the satellite broadcasts television and radio programmes in the Middle East and North Africa. It is co-located with two other satellites by Eutelsat and Eutelsat's partner, the Egyptian operator Nilesat.

Launch date: September 2011

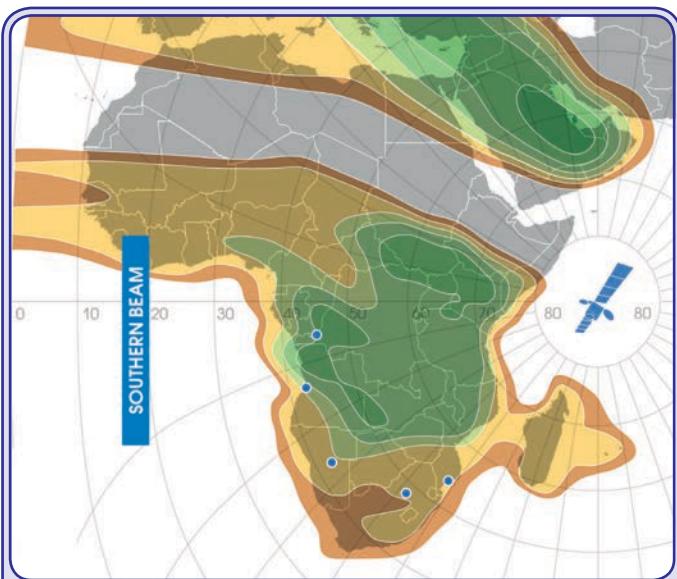
Manufacturer: Astrium

Operational life: 15 years

Launch craft: Sea Launch

Operational transponders: Up to 44

Downlink polarisation: Ku-band



Gazprom Space Systems Yamal-402: 55°E

Launch date: December 2012

Frequency: Ku

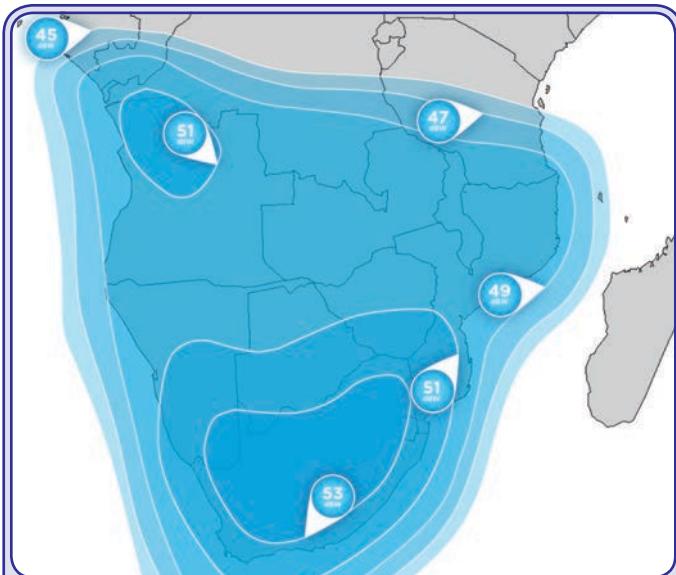
Operational life: 15 years

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

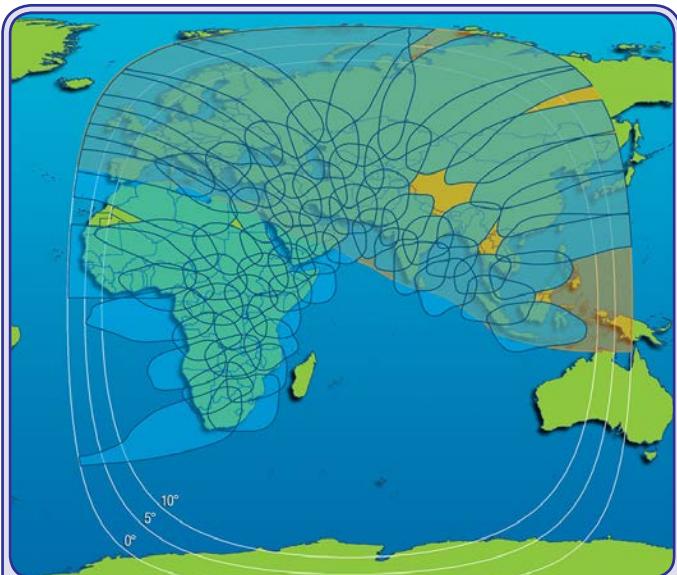
Transponders: 12 x 36 MHz Ku-Band, 3 x 72 MHz Ku-band

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 IS-33e: 60°E – Ku-band Multi-Spot & Eurasia Beams

Launch date: August 2016

Configurable capacity: 268 (in equivalent 36MHz units)

Polarisation: Linear horizontal/vertical

Typical edge of coverage EIRP: Multi-spot: 48.7 up to 61.6dBW

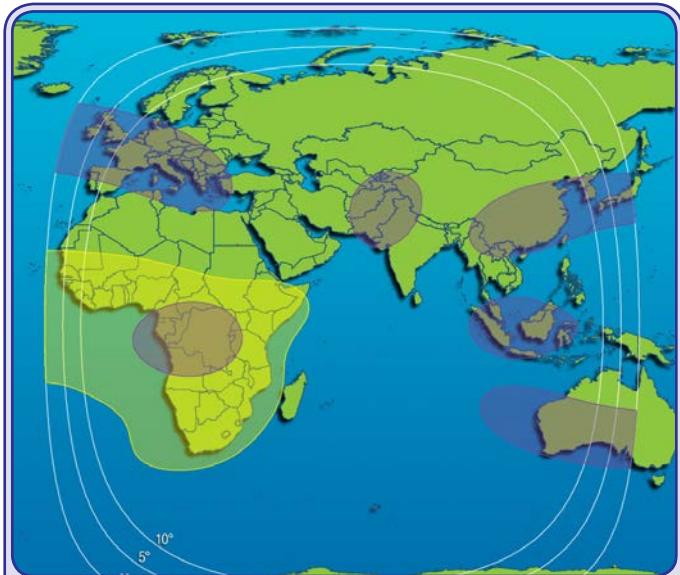
Eurasia Beam: 43.6 up to 45.3dBW

5925 to 6425MHz

Multi-spot: 7.0 up to 17.0dB/K

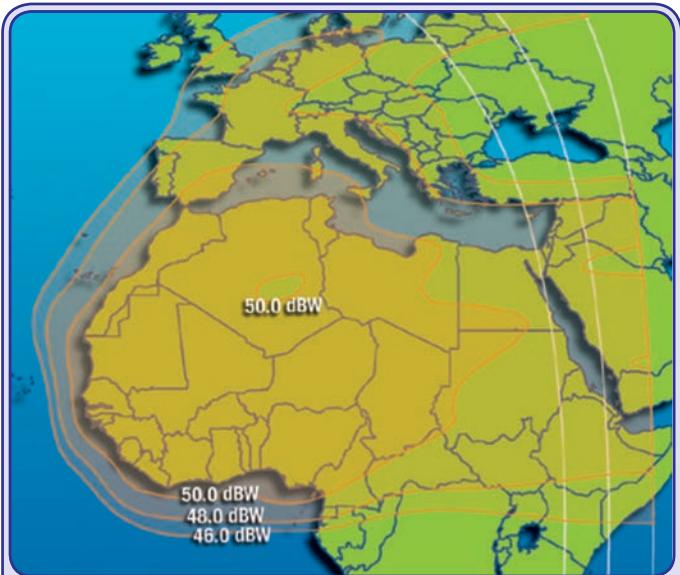
Eurasia Beam: -3.3 up to -0.7dB/K

SATCOMS: FOOTPRINTS



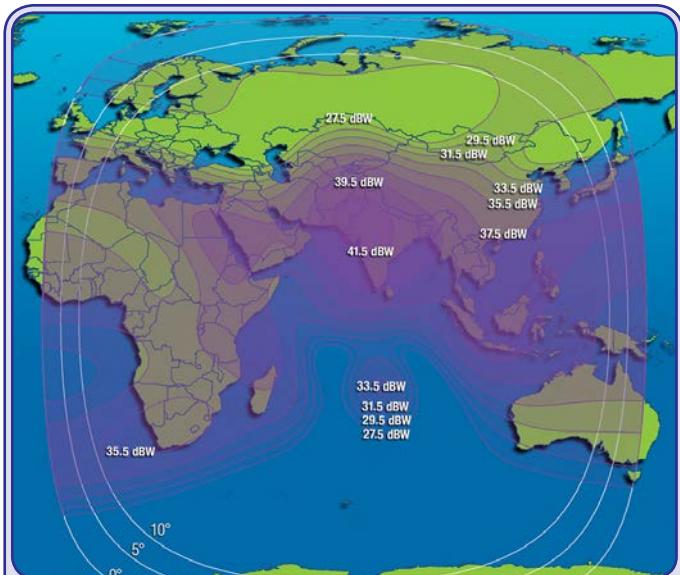
Intelsat IS-33e: 60°E – C-band Sub-Saharan & Spot Beams

Launch date: August 2016
Configurable capacity: 79 (in equivalent 36 MHz units)
Polarisation: Linear horizontal/vertical
Typical edge of coverage EIRP: C-band spot: 46.2 up to 52.4dBW
 Sub-Saharan: 41.0 up to 43.5dBW
 Global: 33.3 up to 37.5dBW
Typical G/T range: C-band spot: 2.6 up to 12.8dB/K
 Sub-Saharan: -1.6 up to 1.5dB/K
 Global: -10.3 up to -7.2dB/K



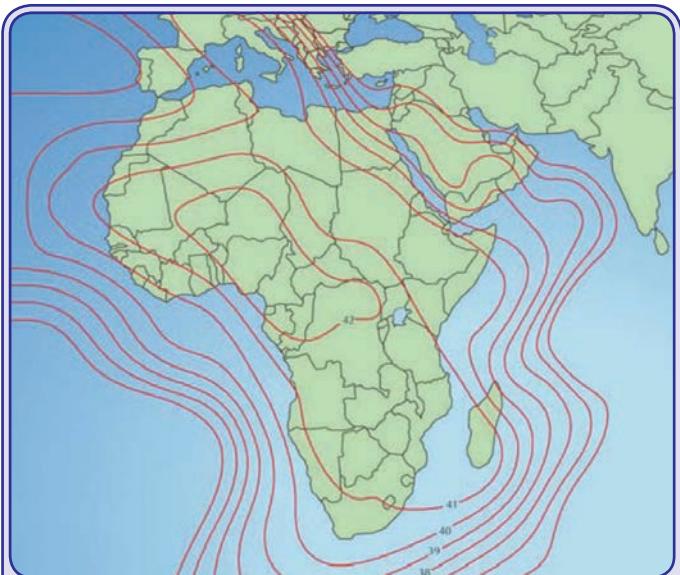
Intelsat IS-35e: 325.5°E – Ku-band

Launch date: July 2017
Configurable capacity: 39 (in equivalent 36MHz units)
Polarisation: Linear – horizontal or vertical
Downlink frequency: 10.95 to 11.20GHz & 11.45 to 11.70GHz
Typical coverage EIRP range: Caribbean: > 47.4 dBW
 Europe/Mediterranean: >45.4dBW
 Africa/Europe: > 47.1dBW
Uplink frequency: 13.75 to 14.50GHz
Beam peak G/T: Caribbean: up to 10.6dB/K
 Europe/Mediterranean: up to 11.3dB/K
 Africa/Europe: up to 5.1 dB/K



Intelsat 36: 68.5°E – C-band Landmass Beam

Launch date: August 2016
Configurable capacity: 12 (in equivalent 36MHz units)
Polarisation: Linear horizontal/vertical
Downlink frequency: 3700 to 3990MHz
Typical edge of coverage EIRP: > 28.3dBW
Uplink frequency: 5925 to 6215MHz
Typical G/T range: Up to 0.6dB/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

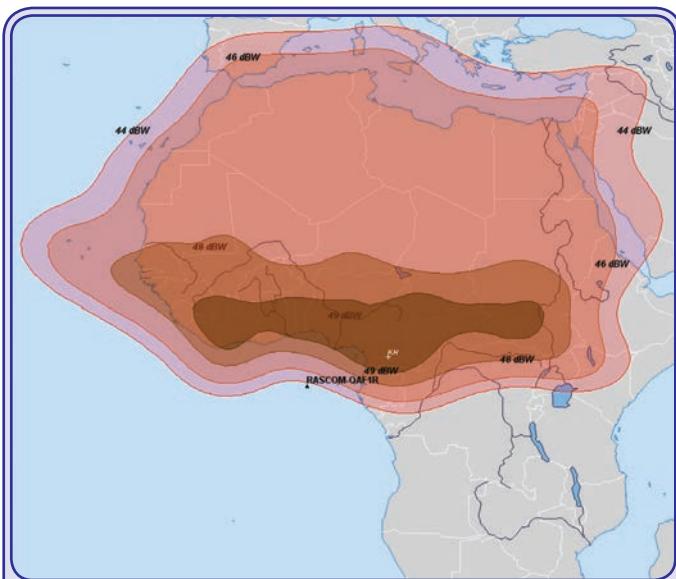
C-band transponders (36MHz equivalent): up to 24

Typical EIRP beam coverage: 42dBW (max)

G/T (dB/oK): -1 (max)

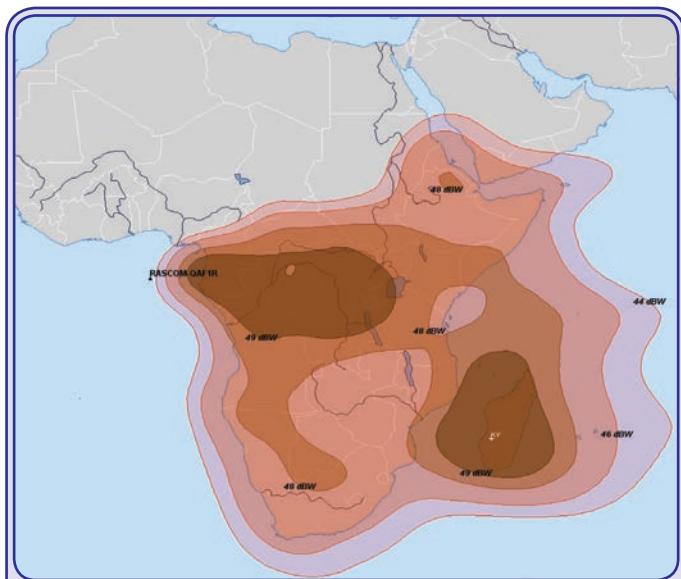
TWTA power: 65W

Polarisation: linear



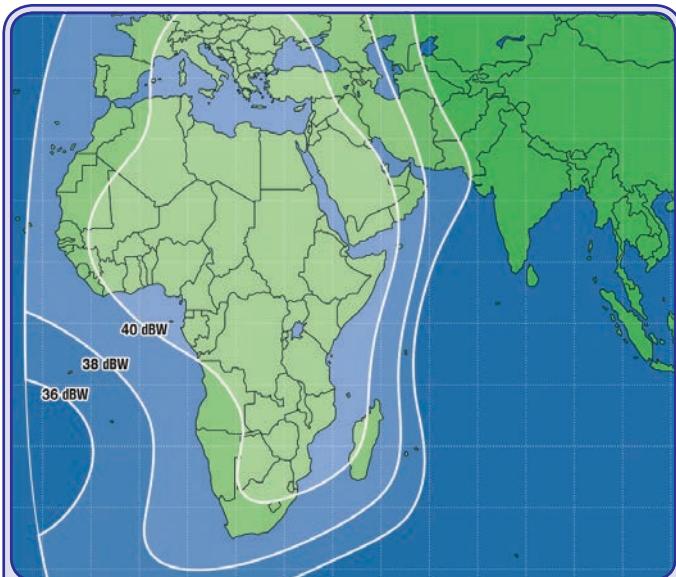
Rascomstar-Q1R: 2.9°E – Ku North beam EIRP

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



Rascomstar-Q1R: 2.9°E – Ku South beam EIRP

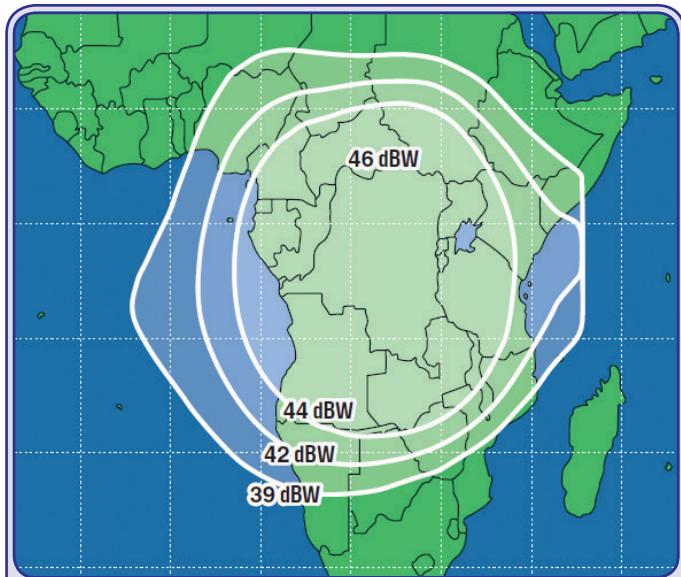
Launch date: August 2010
Launch vehicle: Ariane 5
Platform: TAS Spacebus 4000B3
Bands: C-band standard & planned;
 Ku-band planned
Ku-band South Beam peak EIRP(dBW): 50
Uplink (MHz): 12750 to 13250
Downlink (MHz): 10270 to 11450
Polarisation: Linear



RSCC Express-AM6: 53°E – C-band, fixed beam, EMEA

Express-AM6 satellite is designed for TV broadcasting, enterprise networks, disaster recovery and business continuity, IP trunking, cellular backhaul, oil & gas and mobility applications.

Launch date: October 2014
Coverage: Russia, EMEA, sub-Saharan Africa
Operational life: 15 years
Operational transponders: C, Ku, Ku-/Ka-, Ka, L



RSCC Express-AM7: 40°E – C-band, steerable spot beam, optional pointing: West Africa

Express-AM7 is designed for TV broadcasting, enterprise networks, cellular backhaul, oil & gas, and government applications.

Launch date: March, 2015
Coverage: Europe, Middle East, sub-Saharan Africa, Russia, South-East Asia
Operational life: 15 years
Operational transponders: C, Ku, L

SATCOMS: FOOTPRINTS



RSCC Express-AM7: 40°E – Ku-band, steerable spot beam, optional pointing: East Africa

Express-AM7 is designed for DTH, enterprise networks, broadband Internet access, USO, telemedicine and distance learning applications.

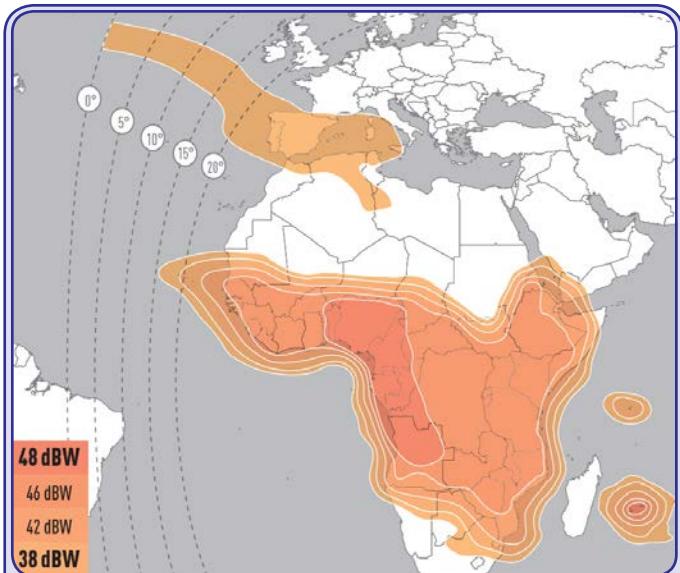
Launch date:	March, 2015
Coverage:	Europe, Middle East, sub-Saharan Africa, Russia, South-East Asia
Operational life:	15 years
Operational transponders:	C, Ku, L



RSCC Express-AM8: 14°W – Ku-band, fixed beam, MENA & East

Express-AM8 is designed for TV broadcasting, enterprise networks, broadband Internet access, USO, telemedicine and distance learning applications.

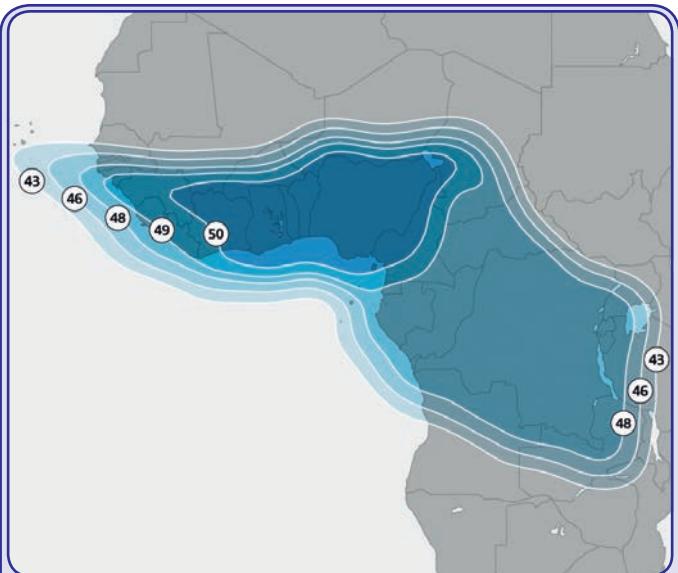
Launch date:	September, 2015
Coverage:	Europe, MENA, sub-Saharan Africa, Latin America
Operational life:	15 years
Operational transponders:	C, Ku, L



RSCC Express-AMU 1/Eutelsat 36C: 36°E

Express-AMU1 has up to 70 transponders in Ku- and Ka-band. It provides service to Russia and continuity and growth for broadcast markets developed by Eutelsat in sub-Saharan Africa under the name Eutelsat 36C.

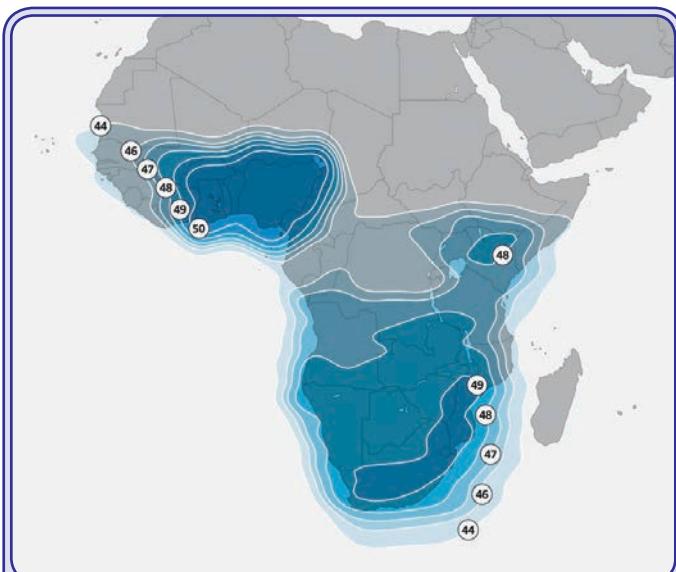
Launch date:	December 2015
Coverage:	Russian, sub-Saharan Africa
Launch vehicle:	Proton-M
Operational life	15 years
Manufacturer:	Airbus Defence and Space
Polarisation:	Ku-band: linear; Ka-band: circular
Total transponders:	70 Ku- and Ka-band



SES ASTRA 2F: 28.2°E/28.5°E

Serves to deliver next-generation broadcast, VSAT and broadband services in Europe, Middle East and West Africa, and carries Ku- and Ka-band payloads.

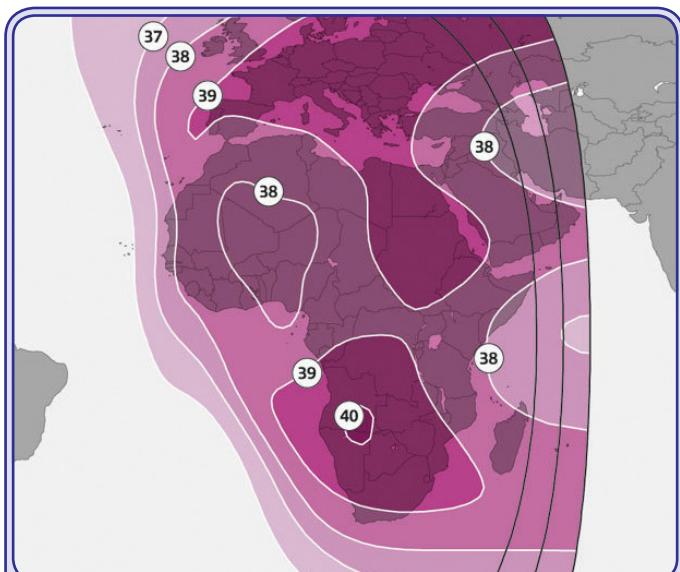
Launch date:	September 2012
Launch vehicle:	Ariane 5 ECA
Operational life:	15 years
Manufacturer:	Airbus Defense and Space
Polarisation:	Ku-band: linear; Ka-band circular
Total transponders:	Ku-band: 70 Ka-band: 3 (500MHz & 600MHz)



SES ASTRA 4A: 5°W

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.

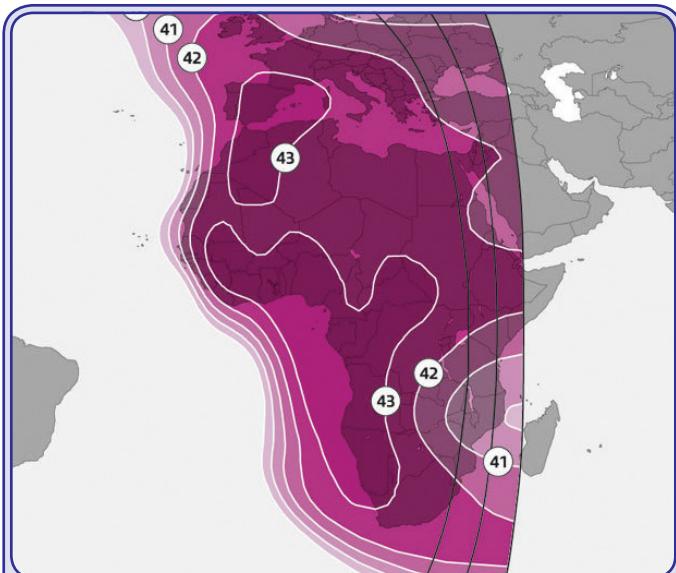
Launch date: November 2007
Launch vehicle: Proton Breeze M
Operational life: 15 years
Manufacturer: Lockheed Martin
Total transponders: Ku-band: 54
 Ka-band: 3



SES NSS-7: 20°W

With extensive coverage of Latin America, NSS-7 is ideal for both video and broadband services. The satellite is also used for transatlantic video traffic, and video distribution across Africa.

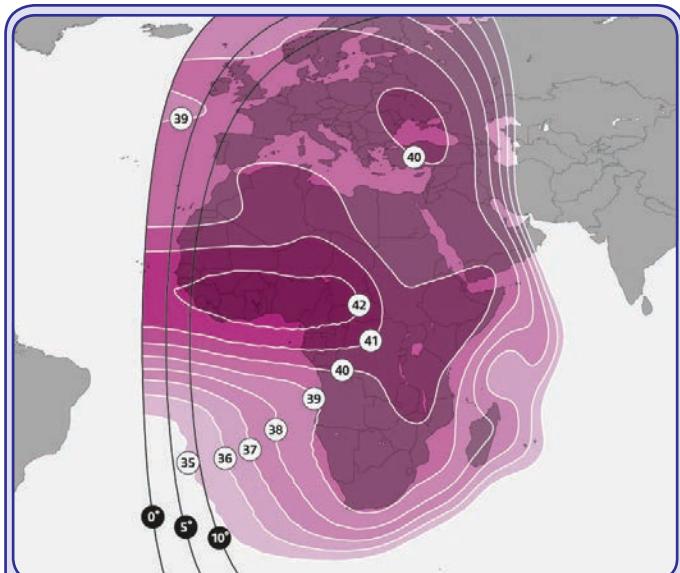
Launch date: April 2002
Launch vehicle: Ariane 44L
Operational life: 15 years
Manufacturer: Lockheed Martin
Total transponders: C-band: 50
 Ku-band: 43



SES NSS-10: 37.5°W

The high performance C-band coverage over the Americas, Europe and Africa is ideal for telecom and VSAT operators. The satellite's individual transponder switching capability and unique simultaneous downlink functionality connects hub services based in the different continents.

Launch date: February 2005
Launch vehicle: Proton Breeze M
Operational life: 15 years
Manufacturer: Alcatel
Total transponders: C-band: 49

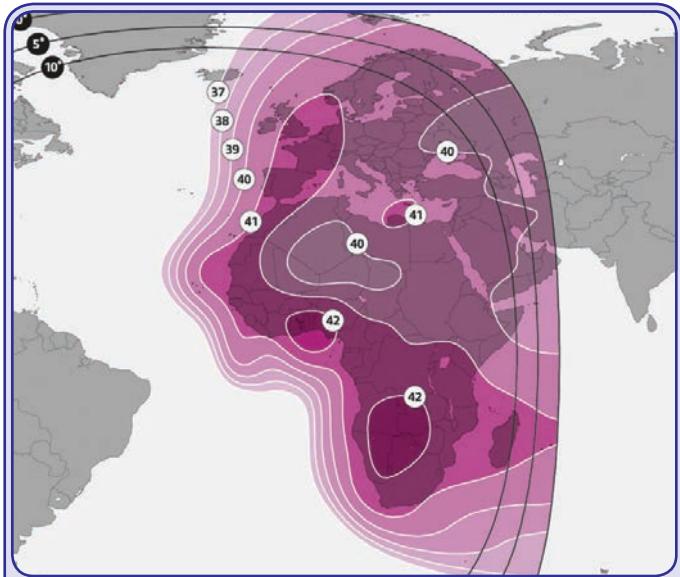


SES NSS-12: 57°E

NSS-12 supports DTH services and delivers mobile backhaul services over the Middle East and Europe, Central and South Asia and East Africa. It is capable of cross-strapping between C- and Ku-band transponders and can cross-connect China to Africa.

Launch date: October 2009
Launch vehicle: Ariane 5 ECA
Operational life: 15 years
Manufacturer: Space System Loral
Total transponders: C-band: 40
 Ku-band: 48

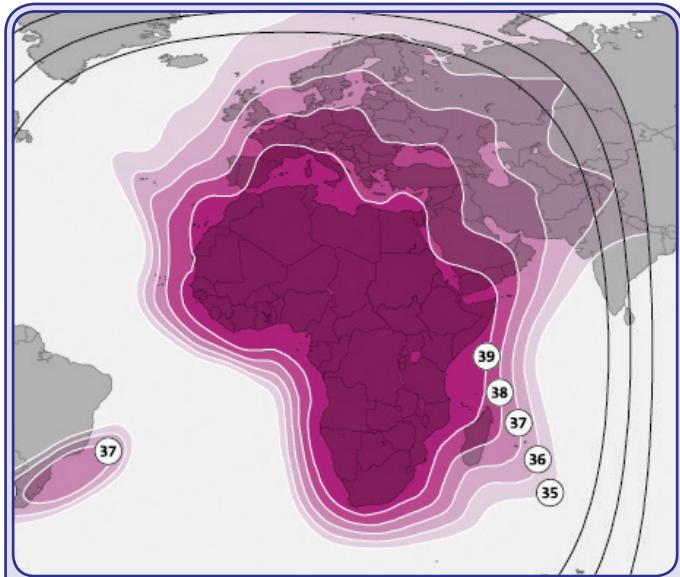
SATCOMS: FOOTPRINTS



SES 4: 22°W

SES-4 provides enhanced coverage over the Americas, Africa and Europe. It is ideal for video distribution, government, VSAT and maritime services.

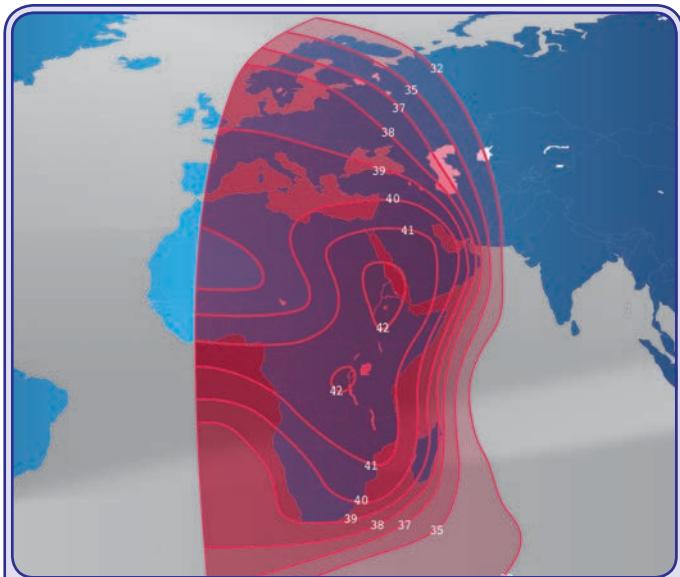
Launch date:	February 2012
Launch vehicle:	Proton Breeze M
Operational life:	15 years
Manufacturer:	Space System Loral
Total transponders:	C-band: 52 Ku-band: 72



SES 5: 5°E

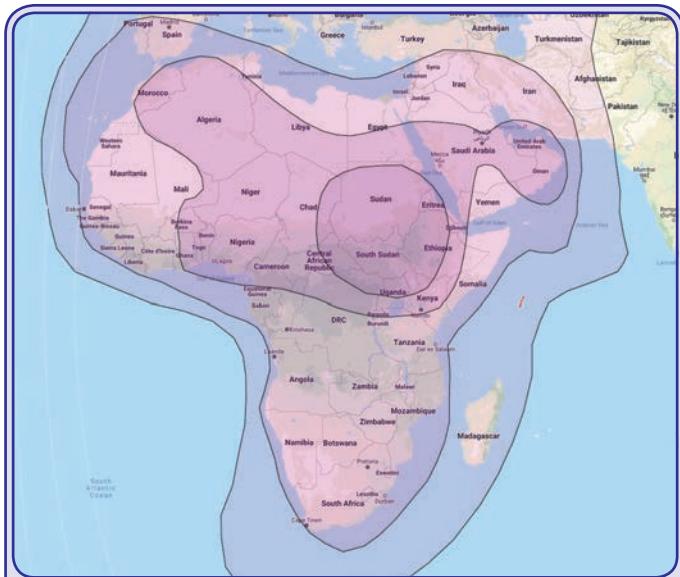
SES-5's single hemispheric C-band beam over Africa, the Middle East and Europe makes it ideal to support services such as GSM backhaul, VSAT applications, maritime communications and video distribution. The high-powered Ku-band payload brings enhanced capacity to Africa, and is ideal for supporting DTH services. It also carries a hosted L-band payload for the European Commission's European Geostationary Navigation Overlay Service (EGNOS).

Launch date:	July 2012
Launch vehicle:	Proton Breeze M
Operational life:	15 years
Manufacturer:	Space System Loral
Total transponders:	C-band: 28 Ku-band: 36



Singtel ST-3: 75°E – Africa C-band

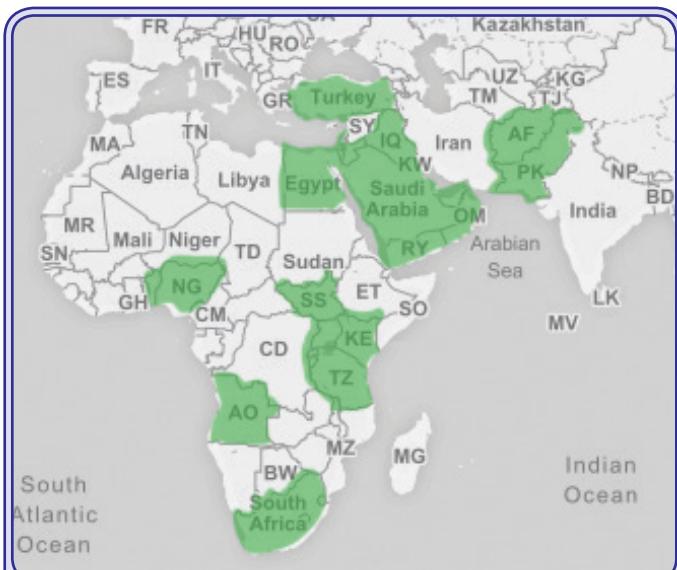
Launch date:	February 2014
C-band Payload:	13
Frequencies:	Uplink: 5.950 to 6.385GHz Downlink: 3.680 to 4.200GHz
Transponder bandwidth (MHz):	36 & 72
Polarisation:	Dual linear
Cross-polarisation separation (dB):	Better than 27
EIRP (peak value) (dBW):	45
TWTA size:	62W
TWTA redundancy:	34 for 26 primary 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.

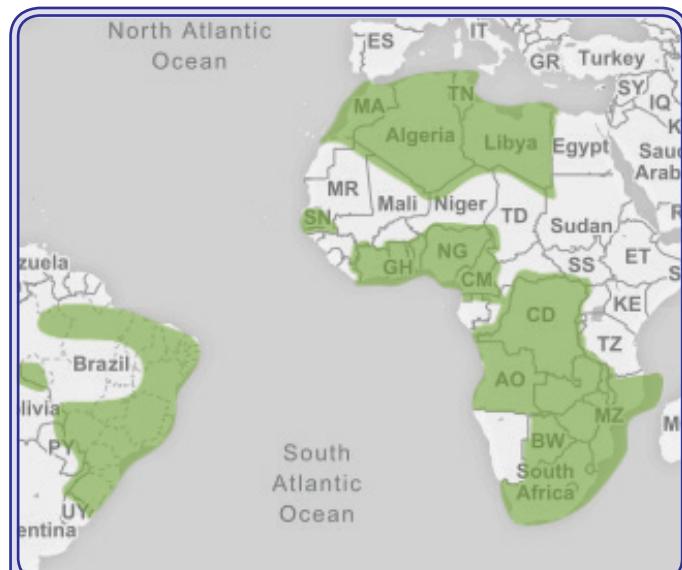
Launch date:	April 2011
Number of transponders:	C-band 8 x 36MHz plus 6 x 54MHz Ku-band BSS 25 x 33MHz Ka-band secure Military 21 x 54MHz
Payload power:	11.6KW



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.

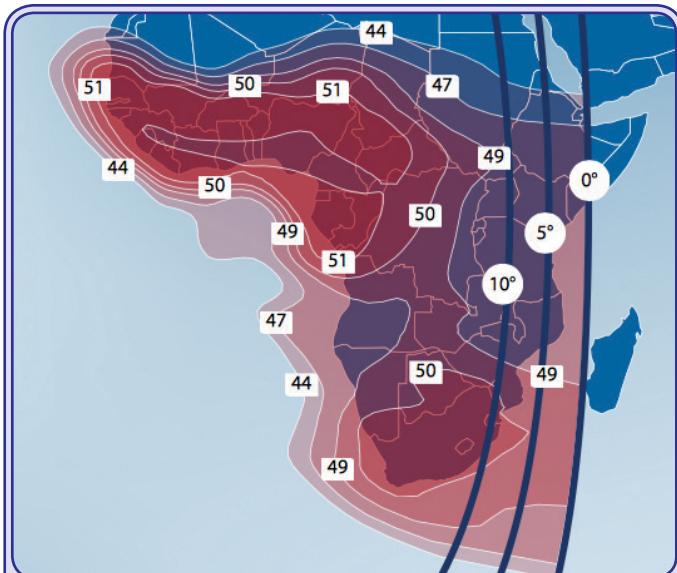
Launch date:	April 2012
Launcher:	ILS Proton
System Supply Contractor:	Airbus & Thales Alenia Space
Operational life:	15 years
Capacity:	Ka-band
Payload power:	9.7KW



Yahsat Al Yah 3: 20°W

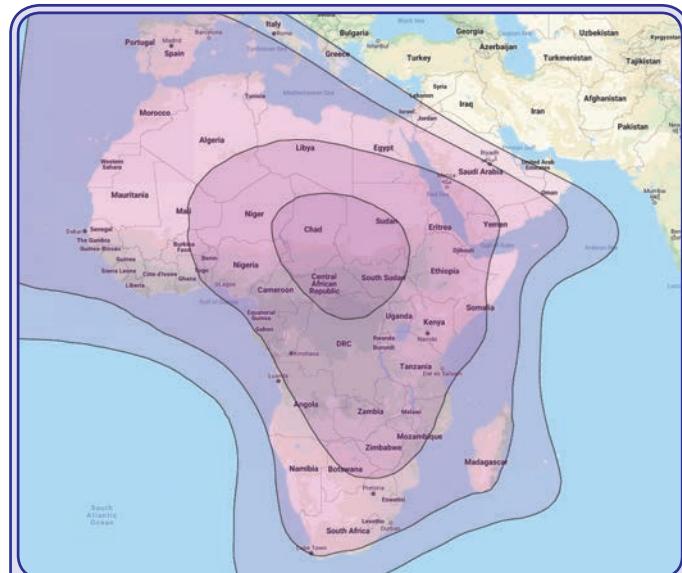
Launched in 2018, Al Yah 3 extends Yahsat's commercial Ka-band coverage to 20 additional markets. Reaching 60% of Africa's population and more than 95% of Brazil's population.

Launch date:	January 2018
Launcher:	Arianespace
System supply contractor:	Orbital ATK
Operational life:	15 years
Capacity:	Ka-band
Payload:	7.5KW
Primary power:	Approx. 7.5kW, electrical



Telstar 11N: 37.5°WL

Launch date:	March 2009
Launcher:	Zenit-3SLB
Manufacturer:	Space Systems Loral
Type:	Loral FS1300 Omega
Total transponders:	6 Ku-band @ 27MHz 33 Ku-band @ 54MHz



BELINTERSAT-1 51.5°E:

National System of Satellite Communication and Broadcast of the Republic of Belarus is based on its own communication satellite BELINTERSAT-1. It allows to provide a wide range of telecommunication services (satellite TV and radio broadcasting, internet access, etc.). The satellite carries transponders operating in C- and Ku-bands.

Launch date:	January 2016
Lifetime:	15 years
Platform:	DFH-4
Power:	10 500 W
Total transponders:	20 C-band 18 Ku-band



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chapter

Broadband

6



Dobek Pater,
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business
development,
Africa Analysis

Broadband is being increasingly considered as a necessity for future socio-economic development, with some parties viewing it as a basic human right. Essentially, without broadband connectivity, the digital divide in the social and business spheres (between businesses/households individuals who have access to broadband vs. those that do not) will continue to widen to the point where the have nots will be left out of mainstream development altogether.

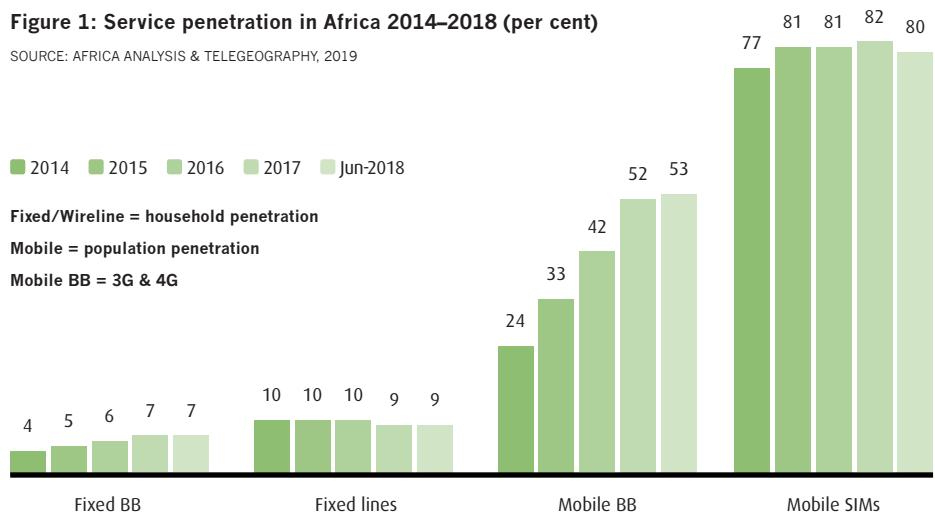
This presents a significant problem in many countries in Africa which have limited financial resources for telecommunications infrastructure builds on the one hand and continue to experience relatively low levels of socio-economic development on the other hand. Private sector telecoms infrastructure operators tend to build where they can generate a reasonable return on their investment (ROI) while large segments of the population and many small/micro businesses struggle cannot afford proper broadband connectivity or sufficient quantity of broadband services.

To remedy this situation, a number of national governments have been developing and implementing policies and programmes to build out broadband infrastructure as widely as possible and to decrease the prices of broadband services to a point where ultimately we can afford them in sufficient quantity. To achieve this, they need to involve private sector operators while remaining mindful of the fact that private entities need to remain profitable to maintain sustainable operations.

While most countries in Africa now have access to good quality and adequate bandwidth on international, national long-haul and metro infrastructure (albeit in some markets still

Figure 1: Service penetration in Africa 2014–2018 (per cent)

SOURCE: AFRICA ANALYSIS & TELEGEOGRAPHY, 2019



expensive), the constraint is now focused on broadband access infrastructure. In some regions of the continent inland backbone networks also need to be improved, although a number of projects are underway to address this.

Although broadband penetration has shown steady growth over the past several years, penetration levels of fixed broadband remain very low at approximately 7 per cent of households on the continent, while mobile broadband has demonstrated a notable decline in growth and plateauing of the penetration rate. These trends are illustrated below.

The challenge to higher fixed broadband penetration is the speed of deployment of fixed broadband infrastructure, to a large degree dictated by sales opportunities. A barrier to entry into the mobile broadband market is often still the price of a 3G or 4G phone. Mobile operators typically pursue a strategy of making lower cost handsets available as much as possible to lower this barrier. Additionally, mobile broadband coverage (even 3G) is still not available across parts of the continent, particularly in rural/remote areas. Build-out of 4G infrastructure in sub-1GHz spectrum holds promise of providing

coverage in such areas but in many markets 4G is still at an early stage of deployment, focusing on the larger urban environment.

A range of broadband access technologies is used by operators in Africa to provide services, although the vast majority of connections is wireless and most of the connections are mobile. Figure 1 above provides an indication of key broadband technologies deployed. Most of the markets have seen implementation of multiple technologies, with various fixed wireless access (FWA) present in all markets. However, the geographic footprint of these technologies, in particular fixed technologies, remains very limited in most of the markets.

The mix of technologies used for the delivery of broadband services is changing. Older FWA technologies such as pre-WiMAX and WiMAX are being replaced with fixed LTE / LTE-A, while historical copper lines (where they exist) are gradually giving way to fibre (FTTH and FTTB), although on a very limited scale at present, with the exception of a few countries. In the mobile space, the focus will be on 4G infrastructure footprint build-out far more extensive than currently, with 5G hovering on the distant

BROADBAND: INTRODUCTION

horizon. Only South Africa has begun to pilot 5G technology, with first commercial services expected to be offered in the second half of 2019. However, wider 5G implementation is also a couple / few years away in that market.

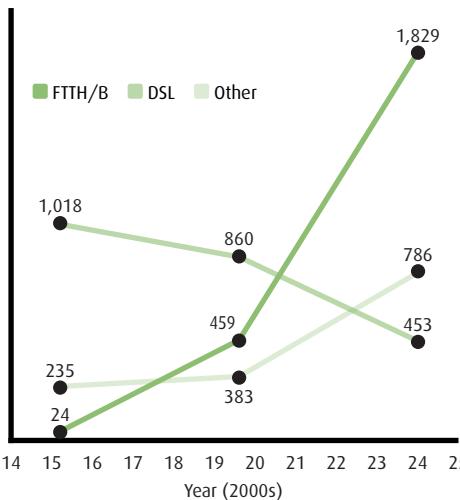
The replacement of old broadband technologies with new is well illustrated in the case of South Africa, technologically the most advanced large market in Africa. The expected replacement of DSL with FTTH / FTTB and FWA, as well as growth of 4G and 5G is shown in Figure 2 below.

As the use cases for true broadband connectivity grow, so will adoption of broadband across the consumer and business markets in Africa. This will be aided by decreasing prices of broadband connectivity (in time, all of the connectivity will become commoditised) and government-led initiatives aimed at wider broadband availability. Broader socio-economic development, supported by good GDP growth in many countries in Africa, will also contribute to making broadband services more affordable and increasingly indispensable to sustain this development.

The opportunity for expansion of broadband penetration is there, as evidenced, for instance by the total mobile penetration rate (80 per cent in mid-2018 for Africa) vs. mobile broadband penetration of 53 per cent at the same time. There is room for growth. Fixed broadband adoption will need to compete with mobile broadband, certainly in the consumer / residential market and in the micro / small company market. However, certain drivers such as migration to cloud services and accessing online content in large quantities will create a demand for fixed broadband services. It would also be sensible for operators in Africa to consider moving to a more open access network environment in the fixed wireline space, where wholesale infrastructure operators would host a number of retail service providers on their networks to stimulate service-based competition.

Figure 2: Fixed broadband connections in SA, end Dec (thousand)

SOURCE: AFRICA ANALYSIS 2019



Reflecting on regulatory opportunities to advance broadband with dynamic spectrum sharing



**Mark Rotter,
treasurer,
Dynamic
Spectrum
Alliance (DSA)**

As members of DSA, we are afforded opportunities to engage in healthy discussions with regulators across Africa. At a recent conference on the role of dynamic spectrum sharing, I had the opportunity to meet with a delegate from the regulator in Eswatini and he provided helpful context on what is important and relevant to them.

One of the questions he posed to me was, "Considering our small population (just over one million) do we really need more spectrum?" Reflecting for a moment on the slowdown in the growth rate of broadband, this provoked me to think through what some of the key issues might be contributing to this slowdown.

Firstly, from a cursory evaluation it appears there is unused spectrum for most people living in rural areas or villages. Other than in abstract arguments about definitions, it has never really been a question of whether there is unused spectrum "available" because we see a great deal of unused spectrum even in countries such as the UK and the US with high spectrum usage. The classic example of unused spectrum is in the very way spectrum is allocated/assigned/sold/auctioned to bidders who then have exclusive rights to use that spectrum. If the bidder chooses not to use that spectrum in a geographic area, then inherently that spectrum remains unused. The problem is in making sure that the spectrum is used to make broadband affordable for users and while we have heard of initiatives to "reclaim" spectrum for rural use, we are yet to see evidence of success stories at scale.

Secondly, it's also important to ask whether allocated/assigned spectrum has been efficiently used and one example I can think of here are the supposed concerns on topics such as interference or technology neutrality. Regulators are often presented with these supposed concerns when looking at spectrum sharing which seems mostly to be a way to steer the approach back to the conventional "mobile technology stack" i.e. 3G, 4G, 5G. But does this technology neutrality in fact provide the most economical way to solve the connectivity problem in unconnected areas? How supportive have regulations and auctions in the mobile space been for example to deeply explore the economic potential of other technologies such as Wi-Fi compared

to the mobile stack in areas where users have a lower income than in urban areas? Rather, the aim has been to stick to technologies that operators find familiar and economically simple and profitable for the vendors building the mobile networks. It's inherently expensive to build networks that reach into unconnected areas and if operators are limited in their selection of technologies, or how much they have to pay for spectrum, then that can add costs to the end user which end up making the service unaffordable to those least connected. Perhaps it's time to focus more on economically efficient use of spectrum rather than technology neutrality in relation to spectrum and to drive approaches such as dynamic sharing of spectrum proactively.

Of the 54 countries in Africa, there are many countries like Eswatini and perhaps only a handful that have the staff, the resources and the regulatory capacity to deal with the relentless onslaught of new technologies. Even for industry experts that have the luxury of specialising in narrow focus areas, keeping up with the continuous innovation in radio technologies is simply exhausting. Globally, there are a relatively small number of regulators such as Ofcom in the UK or FCC in the US that have both the capacity and the resources to do this broadly, deeply and well. Many small and midsized countries in Africa such as Botswana, Malawi and Mozambique, have competent regulators and it's inspiring to see what they achieve with their capacity and resources.

From an economic perspective, it's important to recognise that for many of the governments of these countries, the regulators contribution to the national fiscus is significant and decisions that reduce income such as from spectrum auctions, licensing fees and fines or increase spending on universal service grants mean complex economic trade-offs. Just as I don't instruct you how to earn or spend your monthly salary, we respect that it's a country's choice how they earn and spend their income. Rather than looking to spectrum auctions for revenue, which have a dubious track record in any case, perhaps seeing what their citizens can achieve through macro trends such as the 4th Industrial Revolution, will inspire governments to invest in broadband internet and look to benefits such as a larger and more productive work force as well as more prosperous companies which in turn increase the tax revenue base.

A regulator that has been particularly impressive with its pioneering approach to dynamic spectrum is the Mozambican regulator, INCM. They have been pro-active in the testing and development of policy in several wireless fields including for IoT as well

as looking at innovative use cases for TV white spaces. An example of an interesting TVWS scenario INCM is exploring is to use TVWS in urban areas to alleviate the congestion on Wi-Fi spectrum for connecting ATM machines. This makes more spectrum available, leverages NLOS in the clutter of the city to deliver longer range and improves reliability in a low-cost way. Because TV white space is a low frequency band it is ideal for these kinds of business cases as well as in rural areas where one can connect through foliage and hilly environments. It is with innovations such as TV white space, CBRS in the US, and sharing approaches in the 6GHz and mmWave bands that we are more likely to see increased adoption of affordable internet for the unconnected.

One issue that still surprises after all these years is how the myth of voice service being more important than broadband internet still impacts policy. Of course, voice is important, but who in the modern area wants to live without email or social media or all the web-based tools and apps relevant to our lives and work? This does not even take into the vast possibilities unlocked by the internet in areas such as education, healthcare, agriculture, and technology trends such as IOT and AI. Instead of manually created and curated content, why not leverage the scale of the internet to crowdsource relevant content globally. Remember for example the expertise of the Hindi-speaking potato farming community in India which share their expertise on an online video portal globally. These videos are not in English, so one would need some automated language translation to make it relevant in other parts of the world, but that technology is starting to get there. The idea of humans manually and cost effectively being able to replicate such content creation in relevant languages around the world is clearly economically unfeasible compared to what

the inherent scale of the internet enables. The internet creates a level of radical innovation that voice alone cannot emulate.

Another hurdle to achieving affordable rural broadband is to lower the cost of equipment enough that it enables scale. Historically, fixed line and mobile operator were the big gorillas in the room and they and their relevant vendors were able to create the scale needed to achieve penetration in urban areas. But now with the focus shifting to internet services, and the need to extend these to poorer rural areas, this brings additional challenges. The first generations of fixed and mobile equipment and services were still relatively costly and so only people with enough income, living in densely populated areas could afford these services and generate the revenues for the operators to pay off the equipment. We need innovative policies that lower the barriers to and speed up the adoption of new technologies and equipment and enable faster ramp up through commercial trials into large volumes. These order volumes in turn can then help vendors to drive additional cost reductions.

In terms of dynamic spectrum in the year ahead I'm optimistic about both CBRS in the US as well as TV white space around the globe.

For TVWS we are expecting to see three or more new regulators in Africa publishing their TVWS guidelines this year with interesting projects with scalability in several countries in Africa and a large base of WISPs interested to deploy in many of these countries. In the US, CBRS is maturing so we expect to see commercial projects deployed shortly. Even though CBRS is US centric, it's important on the global stage because it is a great example of the three-tier dynamic spectrum model. Three-tier models consist of an incumbent, a middle tier of priority licensed protected operators and then a tertiary layer for general access. ■

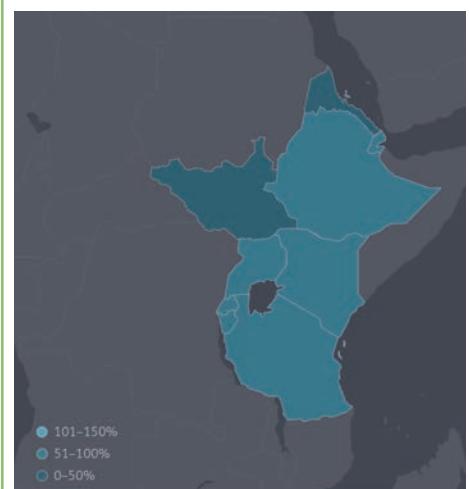
Still booming

Broadband saw yet more increases in 2018 with operators pushing for more subscribers.

In East Africa, for example, there will be 186 million mobile broadband connections by 2022, according to Ovum.

In a report published in mid-May last year, the analyst said mobile data will be the key growth driver for the East African telecoms market in the next four years to 2022. The forecast for mobile broadband (MBB) in Kenya, Tanzania and Uganda is 112 million subscriptions at end-2022, while the forecast for MBB in all nine East Africa countries is 186 million subscriptions at end-2022. (As well as the countries named above, Ovum's also includes the following in East Africa: Burundi, Djibouti, Eritrea, Ethiopia, Rwanda and South Sudan.)

The firm said MBB growth will be powered by increased deployment and upgrade of 3G and LTE networks, as well as a rise in smartphone penetration due to better affordability. It forecasts that there will be 32



Mobile penetration in East Africa – Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, South Sudan, Tanzania and Uganda – as at 4Q17

SOURCE: OVUM FORECASTER

JANUARY 2018

Metacom claims it has come up with one of the most advanced enterprise routers currently on the market. According to the South Africa-based commercial and industrial communications provider, the MC6000 was developed using its 15 years of experience in the retail industry. It says the result is a device capable of managing multiple services on a single hardware platform, across both remote and regional retail sites. The company says its new router can handle multiple fibre connections as well as ADSL, GSM and Wi-Fi for "seamless, speedy throughput".

FEBRUARY

The Communications Authority of Kenya (CA) announces that it expects to complete the installation of broadband connectivity in hundreds of public secondary schools by the end of April. The CA says that upon completion of the first phase of the Education Connectivity Broadband project, 896 schools spread across 47 counties will be able to access high speed internet download/upload speeds of 5mb/s/1mb/s. They will join 29 other public secondary schools that have already been connected as part of the initiative. The cost of connecting the 896 schools is KES837m (USD8.29m).

MARCH

Gilat Telecom (formerly Gilat Satcom) has been granted a license to provide cloud and fixed broadband services across Zambia. The operator claims the new license will enable its local subsidiary to meet the rising demand from businesses who are looking for a higher-quality broadband service and a wider range of managed services than currently available from Zambia's existing operators. Gilat Telecom Zambia has already opened an office in Lusaka and is now recruiting a local team. The company is also completing work on its PoP in the capital and expects to start offering services shortly.

BROADBAND: YEAR IN REVIEW

million LTE subscriptions in Kenya, Tanzania and Uganda by 2022, while smartphone connections will be 108 million.

Furthermore, Ovum pointed out that there has been a sharp rise in demand for broadband services from consumers in the region fuelled by the ongoing digital transformation. MEA research analyst Danson Njue said: "The East African region has made great progress in broadband connectivity over the last few years, and this has unlocked great potential in digital services segment, including mobile financial services, digital media as well as enterprise services."

However, Njue also warned that growth in broadband connectivity has also seen a rise in OTT services, thereby increasing chances of data revenue "cannibalisation" for data service providers in the region.

However in Nigeria, Vodacom Business signed an agreement for satellite services to expand its enterprise broadband networks and enable new and enhanced services throughout West Africa.

Under a new multi-year agreement, the company would utilise services on Intelsat 35e in an effort to deliver fast, high-quality and resilient broadband connectivity to the banking, oil and gas, and enterprise sectors across the region.

In addition, Intelsat claimed that the "improved performance, efficiency and lower total cost of ownership" delivered by its satellite would enable Vodacom Business to further enhance the services being offered to its existing customers in Nigeria, expand its offerings in the enterprise and IoT sectors, as well as extend broadband connectivity across the country.

Vodacom Business Nigeria MD Lanre Kolade said that by integrating Intelsat's satellite services, his network users will gain access to services that provide "real" benefits, such as business connectivity, news updates, and improved quality of services in healthcare, banking and education, in addition to promoting the economic development of these communities.

Intelsat 35e was the fifth satellite to use

Intelsat's EpicNG high throughput system which is designed to enable higher data rate applications and smaller terminals. The company said this means enterprises can expand into new regions and take advantage of business opportunities regardless of where they occur.

Connecting everyone

Connecting the unconnected has always been challenging in Africa, often with some countries being left behind in the technological race, but the ITU released heartening news. It said that the nations classed by the UN as "Least Developed Countries" (LDCs) are now on track to meet the sustainable development goal on universal and affordable internet access by 2020.

According to the ITU, the LDCs comprise 47 developing countries around the world that suffer from severe structural impediments to sustainable development. Twenty eight of these nations are identified as African although if Mauritania, Somalia and Sudan – which the ITU classes as "Arab States" – are also included, the figure is 31.

In a report released towards the end of January 2018, the union said LDCs are recording "impressive" progress toward achieving the UN's sustainable development goal (SDG) 9.c on increasing access to ICTs. It noted that all 47 LDCs have launched 3G services and more than 60 per cent of their populations are covered by such networks. It added that these countries are also on

track to reach on average 97 per cent mobile broadband coverage and to make internet prices relatively affordable by 2020.

By the end of 2017, the report said that the number of mobile subscriptions in LDCs had increased to about 700 million with a penetration rate of 70 per cent. At the same time, more than 80 per cent of the population in these countries live within range of a mobile network.

The report also identified key barriers to ICT and internet use in LDCs, including the lack of digital skills. It offered a number of key recommendations to help address these challenges.

For example, the report said stakeholders should address market concentration and foster competition in all building blocks of internet connectivity. It also advised them to build core internet infrastructure through control over a locally managed country code top level domain, IXPs, and the ability to host a root server to create more affordable and local content.

The key to achieving high levels of broadband penetration will be to provide for remote communities and there was progress in this area during the year, thanks to Africa Mobile Networks (AMN) and Intelsat teaming up. The two firms are aiming to accelerate the deployment of mobile connectivity to unserved communities across multiple countries in sub-Saharan Africa.

AMN is the provider of a network-as-a-service (NaaS) solution to help mobile operators expand their networks into remote and rural areas. It funds, builds and operates the ultra-rural network for the operator, enabling them to extend their coverage with minimal opex and capex risk, grow their subscriber and revenue base, and better serve all their customers.

At the core of AMN's solution is what's claimed to be a low-cost, small cell solution that is powered by a highly reliable solar-based system that can be rapidly deployed and installed in less than six hours. As part of its long-term agreement with Intelsat, AMN would leverage what it described as "the power,

APRIL

GlobalData announces that average monthly mobile voice usage per subscriber in the MEA region will remain stable until 2018, despite the growing adoption of OTT voice applications. GlobalData also said that despite the growing number of mobile data subscribers, the average monthly mobile minutes of use per subscriber has grown in a number of markets in the Middle East and Africa.

MAY

Connecting rural Namibia Telecom Namibia (TN) launched high-speed internet and fixed broadband services in rural Opuwo in the

Kunene Region. The residents of Otuani, which is around 70km southwest of Opuwo, as well as those in surrounding villages are now receiving 100 per cent network coverage via 3G equipment on a 30m tower installed on a mountain. TN says the network covers a radius of 30km. A fixed broadband network has also been deployed to provide telecoms access, mainly to the clinic, school and constituency office.

JUNE

NAPAFrika is now ranked in the top 15 of the world's largest IXPs. Hosted within each of Teraco's carrier neutral data centres in South

Africa, NAPAFrika currently has 323 members connecting to more than 350 unique ASNs that service 16 countries. Companies peering content at the IXP, which is said to be the continent's largest, include Google, Akamai, Optinet, Telkom OpenServe, amongst others. By 2016, Teraco says peak daily traffic throughput at the IXP exceeded 100gb/s

JULY

ICOSNET is using Tejas Networks' Converged Packet Optical (CPO) products to serve the growing demand for its high-speed internet access and VPN offerings in Algeria. The ISP has deployed the India-based vendor's



Intelsat's Jean-Philippe Gillet says bringing mobile connectivity to the most rural parts of Africa requires hybrid networks

performance and efficiencies" generated by the company's EpicNG high-throughput satellites, as well as its 23 other satellites that cover the continent. AMN reckoned this would provide the optimal balance between coverage and high-throughput for the enabled sites.

Once installed, the sites will connect over the Intelsat fleet to the core of the mobile operator's network and deliver 2G services with the ability to upgrade the base stations to 3G and 4G according to data demand.

Intelsat said that it believed that bringing mobile connectivity to the most rural parts of Africa requires hybrid networks and innovative business models to truly close the business case. Jean-Philippe Gillet, the company's VP and GM of broadband, said: "By investing in and partnering with AMN, we can rapidly, and cost effectively expand an MNO's reach and deliver critical connectivity to communities who many thought were impossible to connect."

The importance of offering broadband was highlighted during the year by Rwanda's president, Paul Kagame, who said Africa's economic transformation would require broadband infrastructure with an emphasis on both access and affordability.

Speaking at the Broadband Commission for Sustainable Development's 2018 Spring meeting held in Kigali in early May, Kagame said: "The reality is that all other digital services, whether in commerce or education or healthcare, run on top of broadband. Africa's size, geography and settlement patterns mean

that we must rely on a variety of different technologies to deliver broadband including satellite, fibre optic and mobile."

During the two-day event, 34 commissioners – representing the broadband industry, governments and UN agencies – convened to discuss key issues related to the role of broadband in advancing the sustainable development goals (SDGs).

Kagame told the gathering: "It is up to us to lead the way in driving innovation both in policy and business models in order to speed up the provision of broadband where it has been slowest to reach."

Delegates also heard from the Broadband Commission's working group on vulnerable countries which issued a report on national development in four least developed countries (LDCs): Cambodia, Rwanda, Senegal and Vanuatu. It said that despite their different market environments, broadband coverage has increased notably and become more affordable for users in all four countries over the last few years.

However, the report also raised concerns that the demand for broadband and its productive use in LDCs has not matched the growing supply.

Ultra cellular broadband

Last year saw multiple countries move towards using the latest in cellular technology to increase mobile broadband speeds. For example in Sudan, Sudatel began to trial 4.5G, 4.9G, and 5G technologies along with fixed FTTH to boost mobile and residential broadband in the country.

Under its 2020 Strategy, Sudatel focused on transforming its fixed access and mobile service offerings. The company said the trials were to enhance the subscriber experience on any device, in the home and on-the-move, with high-speed delivery of voice, data and video and fixed and mobile packages, as well as e-government, e-health, and other consumer and business services.

With an initial focus on enhancing mobile data services in Khartoum, the companies

evaluated how the vendor's AirScale radio access portfolio can increase capacity and speeds while also providing a path to 5G in the future. In July 2018, Sudatel also started trialling high-speed fixed technology in Khartoum, using Nokia's PON fibre solutions for residential broadband.

Sudatel Telecom Group president and CEO Tarig Hamza Zain El Abdein said: "Bringing Nokia's technology expertise and innovations to Sudan is very strategic for us in the execution of our vision of becoming the most admired ICT provider in Africa."

El Abdein also hoped that working with the vendor for the development of ultra-broadband services in Sudan would contribute to enhancing the country's ranking in the Broadband Development Index.

As part of their mutually agreed sustainable development goals (SDGs), UN members have pledged to "significantly increase" access to ICT and strive to provide universal and affordable access to the internet in least developed countries by 2020.

Another example of an operator using 4.x connectivity saw Sonatel launching 4G+ in Senegal. As from October 2018, all of the country's regional capitals and its most populated cities are fully connected to mobile broadband internet. 130 sites are now covered with 4G+, with more expansion expected in the rest of the country.

Sonatel said it spent the first half of last year strengthening its coverage in Dakar and commissioning 4G sites in Porokhane, Medina Gounass, Sokone, Darou Mousty, Popenguine and Vélingara. The operator then said it had deployed thousands of 4G technical sites throughout the country, with Touba, Thiès, Saint-Louis and Kaolack among some of the many cities that are now served.

Between 2016 and 2018 inclusive, the operator said it had invested more than CFA220bn in technical equipment for its 2G, 3G, 4G and 4G+ mobile and transport networks.

TJ1400 converged broadband access and optical aggregation platform at multiple POPs in Algeria as well as in its international exchanges in London and Madrid. ICOSNET CTO Ahmed Zerkouk says the TJ1400 is designed to "seamlessly" scale and will address ICOSNET's escalating capacity demands in a flexible and 'pay-as-you-grow' manner.

AUGUST

Gilat Telecom (formerly Gilat Satcom) is chosen by Nexttel to provide 4G broadband services in Cameroon. Part of Vietnam's Viettel Group, Nexttel has operated in Cameroon since 2015 and is now said

to have around five million subscribers which puts it ahead of Camtel but third after Orange and MTN. Nexttel will be using Gilat Telecom's fibre network both within Cameroon and across Africa in a bid to provide a fast and reliable broadband service. Gilat says it was chosen after a competitive tender that included a number of established wholesale carriers in Africa.

SEPTEMBER

Telecom Namibia launched a free home Internet installation promotion to help families get online. This comes as the government is urging ICT service providers

to find ways to make online services more accessible to ordinary citizens. The operator says its offer is likely to result in "substantial growth" in the number of domestic internet users. Separately, Telecom Namibia is also in the process of revamping its internet service by installing a new multi-service access node platform as well as FTTH to provide high speed capabilities of up to 120mb/s.

OCTOBER

SatADSL and Avanti partner to launch commercial Ka-band broadband service. SatADSL claims it will bring cost-effective broadband coverage to communities and

BROADBAND: YEAR IN REVIEW



Vodacom Group CTO Andries Delport:
"Africa is in the middle of a mobile connectivity boom."

As part of its commitment to the government's Digital Senegal 2025 strategy, Sonatel said it would facilitate "affordable and high quality" internet access for as many people as possible. "This commitment is a response to the needs of our more than eight million customers in Senegal, to lower internet rates, and to extend and strengthen the quality of our mobile internet network to improve the customer experience on a daily basis," stated the operator.

For those craving faster speeds still, Vodacom trialled 5G technology as part of its efforts to drive digitalisation in South Africa.

Under an MoU signed late in 2017, the operator agreed to conduct a series of workshops and evaluations using Nokia's 5G

products to test how they can be used to meet ever-changing demand in the country.

Initially, the partners would focus on the delivery of UHD and VR video services, leveraging the enhanced mobile broadband and ultra-low latency capabilities of 5G. They would also collaborate to understand how 5G can drive continued economic growth in vertical industries important to South Africa, such as manufacturing, mining, healthcare, media, energy, and transportation.

Nokia would supply its massive MIMO adaptive antennas, RAN, cloud-native core, and edge computing platforms, as well as its end-to-end mobile transport networks. The vendor said it would leverage expertise from its Bell Labs consulting arm to work with Vodacom and identify where, when and how to evolve its network to 5G.

"It is my firm belief that the adoption of 5G will help us to deliver against some of the digital technologies in areas such as big data analytics, artificial intelligence, virtual and augmented reality, autonomous vehicles and the IoT," said Vodacom Group CTO Andries Delport. "Crucially, Africa is in the middle of a mobile connectivity boom and as such, 5G will help us to deliver faster internet speeds to our almost

70 million customers across the group."

As of January 2019, Vodacom says its 5G is commercially-ready and that they are just waiting for the right spectrum and the compatible devices to become available.

Out-of-this-world affordability

Satellite communications made strides into bringing broadband to the masses, tackling the core problem of the cost to the consumer. Arabsat Broadband Services launched a new satellite broadband service, claiming it unveiled a "new age" of affordable satellite broadband for businesses and consumers across Africa, the Middle East, and Europe.

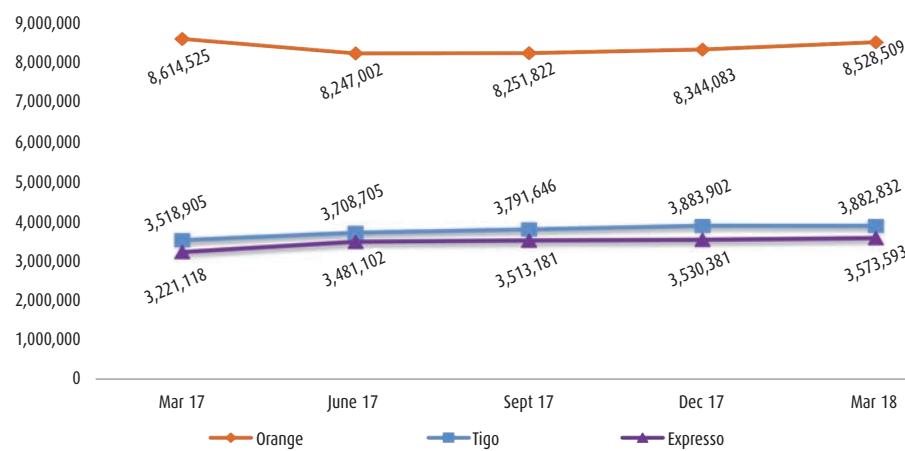
The company's Arabsat Expand features Forsway's hybrid router, ODIN, at a total kit cost of around USD100 per station. It was claimed this would enable the satellite operator to launch affordable new broadband internet services for as little as USD5 per month, helping bridge the digital divide to new customers in remote rural communities, as well as providing new, more reliable, and lower-tariff services to urban users.

This is the first service offered by Arabsat's newly created business unit for broadband services. It will deliver Arabsat Expand through previously unused bandwidth on its satellites.

According to Forsway, a complete kit with its ODIN router can be installed by anyone who can point a satellite TV dish, with no interaction from a NOC. It adds that because there's no satellite transmitter, there's no need for a VSAT transmit license.

ODIN allows any type of narrowband return channel to be linked to the high-throughput Ku/Ka bandwidth on Arabsat's BADR-7 satellite in remote locations across almost the entire MEA region. Up to 10Gb of internet connectivity will then be routed through the satellite to support the new services from these locations.

With the announcement being made by Arabsat on 13 November 2018, it's still early days for the



Number of mobile subscribers per quarter in Senegal

SOURCE: MOBILE TELEPHONY OBSERVATORY, ARTP, MARCH 2018

businesses in sub-Saharan Africa following the launch of its commercial Ka-band service. Utilising Avanti's HYLAS-4 high throughput satellite, SatADSL says it will provide connectivity that ISPs will be able to "easily" offer to customers via its Cloud-based Service Delivery Platform (C-SDP). The company says this includes VNO and voucherbased services that are not currently available via other Ka-band offerings in the region.

NOVEMBER

AfricaCom turned 21 when the event took place in Cape Town from 13-15 November. The organisers, KNect365, said that over

the three-day conference and exhibition, more than 30 thought-leaders had "advanced the conversation" around Africa's digital transformation through a series of expert sessions. This year's speaker line-up included MTN CEO Rob Shuter, Telkom's group executive for regulatory affairs Siyabonga Mahlangu, among many others. KNect365 says AfricaCom annually brings together 14,000 attendees, 450 speakers, and 400 exhibitors.

DECEMBER

Rohde & Schwarz (R&S) unveiled an intelligent network traffic analytics solution

that claims to offer unmatched connectivity and processing speed. Developed by its subsidiary firm ipoque, which specialises in deep packet inspection (DPI) software, R&S says INTRA's real-time reporting capabilities enable service providers to efficiently glean data insights on subscribers across entire networks, and ultimately make more informed decisions that enhance organisational efficiency and impact. With modern connectivity options of up to 100Gb with Gigabit Ethernet and processing speed, it's claimed INTRA provides data insights at a reporting rate of one second.

service and there's been no news about whether the USD5 price-point has been achieved.

African regional VSAT services provider Intersat was also promising to offer affordable satellite broadband connectivity across the continent by working together with satellite operator RascomStar.

The partners claimed their strategic deal would see new Ku-band services launched at "ultra-competitive" prices across Africa.

Intersat has an administrative base in Dubai as well as regional headquarters in Nairobi. The company also says it has an established reseller and partners network in 32 African and several Asian. As part of the agreement, Intersat will provide fully managed services from what's described as its "state-of-the-art" teleport facilities in Belgium. The company will use its iDirect hub to connect SMEs, NGOs, government, academic and financial institutions throughout Africa to the cloud.

Meanwhile, RascomStar will supply capacity via its RQ1R satellite which orbits at 2.9°E and is said to provide "unique" Ku-beam coverage across the continent.

Intersat's CEO Hanif Kassam said: "In rural and underserved areas, VSAT is the best and quick-deployable solution for broadband access, helping in bridging the digital divide in Africa."

In a move that trumped every other provider for price, Quika launched what's promised to be the world's first entirely free high-speed satellite internet for consumers in developing countries.

London-based Quika was a new company, founded by Alan Afrasiab, the CEO and president of global satellite networks and services provider, Talia Group.

Speaking during the launch of Quika in January 2018, Afrasiab said: "We believe that left unbalanced, entire communities and regions will be abandoned by technological and economic progress. Quika will help bridge this digital and economic divide.

"The main reasons for people not using the

internet are inequalities in relation to income and education, as well as the lack of infrastructure, relevant online content and services, plus relatively high costs of access and usage."

Quika's free service will be partially funded by advertising and through the subsidisation of the paid version which will be available on a pay monthly basis or via pre-paid plans. Prices have yet to be announced.

Paid services will include a variety of bandwidths designed for SMEs and local ISPs, and offer download speeds of 5-50mb/s and upload speeds of 1-3mb/s depending on the plan chosen. The free version will have fixed bandwidth offering download/upload speeds of between 1 and 3 mp/s.

Quika will use high-throughput Ka-band satellites. It said that while data speeds will be fast, internet services provided by geostationary satellites mean an average latency of 638ms. This will make Quika unsuitable for applications such as online gaming or screen sharing. However in the future, the firm aims to utilise low-Earth orbit satellites that promise to reduce latency to under 100ms.

In the meantime, Quika partnered with Isotropic Systems to develop a self-installing terminal to help bring broadband to consumers at no cost.

With offices in the UK and USA, Isotropic Systems is developing a terminal to support the satellite industry to 'reach beyond' traditional markets. It claims the fully integrated high-throughput terminal will be the first to offer multi-service, high-bandwidth and low power.

The two companies said they will jointly develop an "out-of-the-box consumer web experience" that eliminates the need for skilled installation, and allows internet usage to be fully subsidised by advertising.

Isotropic said its optical technology will enable terminals that meet or exceed traditional VSATs at one-tenth the current cost. It claims that the technology mitigates several key engineering challenges to deliver "seamless auto tracking, unlimited instantaneous bandwidth through true time delay, and a 90 per cent reduction in power consumption over conventional design".

Quika initially launched its internet services in Afghanistan and Iraq, before launching in 27 countries in Africa at the end of 2018. In the region of the continent they include: Algeria, Benin, Cameroon, Congo Republic, Côte d'Ivoire, DRC, Egypt, Ghana, Libya, Nigeria, Rwanda, Senegal, South Sudan, Togo and Tunisia. However, the company points out that its ultimate vision is to offer free broadband services globally. ■



Quika believes that the opportunities the internet provides shouldn't be limited by geography, culture, wealth or infrastructure. It will use GEO and LEO satellites to provide Ka-band services for free



**Delphine
Masciopinto,
chief commercial
officer,
France-IX**

The year ahead: Already this year, the internet society reports a stronger African IXP community, a 50 percent increase in the number of IXPs in the African region⁶, and more than 205gb/s of traffic being exchanged across these IXPs (up from approximately 100gb/s of traffic in 2013). This is great news but is it enough to help the region shift towards a majority of local traffic?

Firstly, creating the infrastructures behind IXPs is one thing, but creating a thriving eco-system is a long-term challenge. It means that local service

providers, mobile and fixed carriers, ISPs, and content providers all need to collaborate, share and agree for their mutual benefit. Often, it can only succeed through proper local regulation. Only when this level of collaboration crystallises at the IXP level, can internet traffic flow cost-efficiently. It requires time and resources and many people have worked hard in the past 10 years to reach this 50 per cent increase in IXPs in the African region. Many organizations have contributed in different ways: equipment provisioning, training and skills development, experience and best practices sharing, creating dialogue through meeting organization, etc. and we all should thank and celebrate these joint efforts.

Secondly, a local ecosystem can only succeed

if the whole supply chain collaborates: from subsea bandwidth supply and pricing, the development of carrier-neutral data centres, the increased resilience of IP terrestrial backbones within a country, the affordability and capillarity of broadband internet access, the support of new technologies development, to content creation and localisation. To reach end user satisfaction in terms of availability, price, speed and latency, the entire internet supply chain must be concerned. It means sharing a common vision and enabling its partners one step at a time. Because when people of similar interests come together and share a common vision, there is a sense of real commitment, and success means the same for all parties involved.



Lanre Kolade,
CEO,
CSquared

CSquared was established in October 2017 as a joint venture between Google, IFC, Mitsui & Co. and Convergence Partners. The aim was to bring faster, more reliable broadband connectivity to the people and places that need it. "Over the last year, our focus has been and will continue to be

increasing our network capability to meet the needs of service providers (mobile operators and Internet Service Providers) in Uganda and Ghana while continuing plans for expansion into new markets," says CEO Lanre Kolade. "In Uganda and Ghana, we expanded our metro existing infrastructure so it could support the expansion and growth plans of mobile operators, by connecting their base stations and enterprise customers in new areas. We also identified an acute need for better connectivity in the residential segment, and as a result, we began rolling out Fibre to the Home (FTTH) last year in Kampala, to enable service providers to deliver more reliable internet services to home users.

Last year also saw the launch of CSquared's newest market, Liberia. In January 2018, in partnership with the Government of Liberia and the United States Agency for International Development (USAID), the company began building a 200km fiber optic network in Liberia's capital, Monrovia. It is now almost three quarters completed and already CSquared has been able to bring fiber to government agencies, ministries, MNO/ISP base station, and businesses in order to improve their connectivity.

Of course, wireless communication has been a cornerstone of connectivity solutions in Africa.

Wholesale Wi-Fi deployment in Uganda and South Africa (VAST) has seen WiFi services provided to the public for free through government entities like NITA in Uganda with Freezone and Project Isizwe in South Africa. There has also been increased uptake for paid Wi-Fi services by ISPs who use the wholesale WiFi network to extend their WiFi presence in the different cities they operate in.

"Recent developments in the 802.11 standard and antenna technology (MU-MIMO) are moving wireless capacity delivery into the Gigabit range. WiFi 6 (802.11ax) promises to deliver almost four times the theoretical capacity of 802.11ac, which is currently at 1.3gb/s," Kolade adds.

"We expect a lot more deployments of 802.11ac and possibly 802.11ax in the near future due to the data hungry over the top (OTT) services that consumers are most interested in."

He says wireless PON (802.11ad) is also a new trend that will be based on 60GHz spectrum and that there has been a rise in GPON development across the continent with South Africa, Kenya, Ghana and Uganda having

multiple players deploying FTTx services. "Since GPON deployments are generally quite capex-intensive, we expect that providers will start considering fixed wireless PON using the unlicensed 60GHz frequency," Kolade says. "Most countries have not freed up this frequency for public use and we expect that operators will start exploring such deployments to reduce the cost of fiber deployments.

Ask anybody who works in the sector and they will tell you the existing regulatory frameworks remain one of the biggest hurdles for Africa, specifically in areas concerning licensing and rights of way. In fact, Kolade says it is often faster to conduct due diligence, secure commitment from customers, build a business case and obtain investor's funding than it is to apply and secure the requisite license for operation. Moreover, some regulatory authorities have implemented strict and costly rights of way that hinder new infrastructure developments.

"In 2018, we observed a worrisome trend in Africa, whereby governments sought to increase taxation on different revenue streams of mobile operators, with a focus on social media and mobile money," Kolade add. "This was seen in Uganda, Kenya, and Tanzania, with other countries reported to be examining this option. If this trend continues, it could pose serious challenges to the telecommunications ecosystem in Africa, and ultimately undermine the connectivity progresses that have been achieved to date."

Although many governments across Africa have built long-haul fiber networks (backbone fiber); Kolade says it is often the case that these networks are underutilised; service providers typically cite service quality issues and inadequate pricing as the key barriers for uptake of these governments. "We foresee that these governments will be under pressure to make sure that these networks are managed and commercialized in a way that encourages service providers to take advantage of them," he says. "Until that happens, it will remain a significant challenge and impediment for broadband connectivity."

Going forward, Kolade says CSquared's plan is to expand its model of shared infrastructure throughout the continent, through increased utilisation on its existing networks and geographical expansion.

"Within our current footprint, we will work closely with service providers, to innovate products and services that drive uptake of the large broadband capacity available on our network, and ultimately delight consumers, whether they be enterprises, small and medium businesses, or consumers on mobile devices or at home," he says. "We already started some deployments of fiber to the home and wireless connectivity, both on a wholesale model. We will scale these offerings over the next year, to make sure that all who need broadband connectivity can get it, at affordable rates."

"Africans need to undergo a shift from consumers of the internet to producers of relevant content which aids all fabrics of society"

Obviously, mobile traffic backhaul is a key segment for CSquared and it is expected that the increase in 4G penetration will further drive the need for dense and high-capacity fiber networks. To that end, CSquared will continue to work closely with mobile operators to make sure it brings fiber to their base stations in order to help them meet the ever-growing capacity requirements.

Outside our current footprint, Kolade says there are still many countries with significant infrastructure gaps and that is something the company wants to address. In particular, west and central Africa typically show either not enough fiber, or underutilised fiber networks. "So, we plan to work on roll-out plans for a few markets, where we can bring our model of shared infrastructure," he says. "Where infrastructure exists and is owned by government entities, we intend to work with the asset owners to help them commercialize the infrastructure, using innovative agreement models that deliver benefits for us, the governments, and ultimately the end-users who need the broadband connectivity."

Ultimately, Africa appears to be ready for a true digital transformation, which will harness the energy of the youths and foster growth across multiple sectors. CSquared is doing its bit, by providing a model of infrastructure which, Kolade says, could serve as the backbone for this change. However, he is under no illusion as to the task at hand and knows it will take much more than infrastructure to achieve this vision of a transformed Africa.

"Africans need to undergo a shift from consumers of the internet to producers of relevant content which aids all fabrics of society, from engineering to arts, education, and health," Kolade says. "Governments need to embrace technology as a tool to improve the delivery of critical services to ever-growing populations. Entrepreneurs should be able to access cloud-based services that help grow and improve efficiencies in their businesses, such as collaboration and communication tools (e.g., video-conferencing), billing, digital payment platforms, and accounting. Then and only then, will we truly realize the power of this much-needed digital transformation."



**Michèle Scanlon,
managing
director,
iWayAfrica**

WayAfrica's vision is connecting everyone everywhere across Africa, and it has successfully been doing this for over 25 years, says Michèle Scanlon, managing director, iWayAfrica (Wholesale VSAT)

"The foundation for providing connectivity services then was satellite, and whilst its various ISP operations have since

invested in other technology access and widen its portfolio to include fibre services and wireless networks to evolve alongside changing customer requirements."

Over the past year across the group's footprint, new broadband initiatives have been launched servicing home and business customers. They include fibre to the home in Uganda (operating on CSquared's Open Access Network in Kampala), offering LTE services in Zambia and a new Point-to-Multipoint (PtMP) wireless broadband network in Namibia where the Radwin JET 5GHz solution complements AfricaOnline's long-standing WiMAX service to deliver high-speed packages of up to 100mb/s to enterprises and homes in Windhoek.

Geographically, iWayAfrica is also expanding into new markets in 2019, especially West and Central Africa mainly through establishing new distributor channel partners for VSAT growth, but also widening its footprint beyond its existing 8 ISP operations.

"Alongside terrestrial and wireless services, satellite continues to be a core service offering to iWayAfrica who sees increasing demand for VSAT services driven by the arrival of HTS capacity over Africa," adds Scanlon. "Satellite remains a key element to the iWayAfrica Group approach to unlocking connectivity on the continent where over 70 per cent of the population remains unconnected despite large investments by governments and private sector players in fibre and other terrestrial services. Once thought destined to be obsolete as mobile and fibre networks were ever increasing penetration in Africa, HTS satellite services are proving they can deliver on today's customer expectation for high speed affordable connectivity in areas where even mobile networks do not reach."

Scanlon says broadband customer expectation "is now becoming the same" regardless of the underlying technology deployed. She adds that having overcome legacy perceptions in many markets on VSAT being slow, requiring large antennas or being expensive, the new style VSAT customer wants superfast, affordable connectivity with speedy installations on a small device.

"They are just like any other demanding internet consumer elsewhere," she adds. "VSAT is merely a means of how they have to connect in a certain location. That's why the iWayAfrica VSAT brand, JOLA, makes no reference to satellite in its naming conventions. JOLA is a fun, fresh brand for broadband services. It is African in origin and evokes the freedom of new adventures. JOLA aims to bring broadband happiness to Africa."

The JOLA broadband service was first launched in December 2016 for sub-Saharan Africa bringing flexibility and affordability on Ku-Band service plans on IS-28 for consumer and SME segments. Scanlon says JOLA broke the typical linear approach of speed and data cap for broadband service plans to enable a flexible pick and mix approach of the customer choice of speed and cap. In 2019, JOLA is now available on Ka-Band operating via Avanti's new HYLAS-4 satellite being an extension of the same key service elements of bringing broadband happiness to Africa with even faster speeds with juicy extra perks.

"The constant challenge facing the VSAT broadband customer is access to an affordable modem," Scanlon says. "Despite the phenomenal increase, and still increasing volumes, in satellite capacity over Africa that has triggered substantial changes in capacity pricing, end-user modem pricing has not seen similar price improvements over the same period. Landed price of complete kits with installation that typically require vast travel distances can still cost over \$1,000, so whilst the underlying broadband service may be getting more comparable in terms of speed and affordability, the set-up costs can hinder take-up."

Satellite offers the best complete coverage of Africa and is often the only means of delivering broadband connectivity in certain areas, but until there are significant reductions in pricing or innovative financing approaches

"Once thought destined to be obsolete as mobile and fibre networks were ever increasing penetration in Africa, HTS satellite services are proving they can deliver on today's customer expectation"

for the required end-user satellite modem, the utopian goals of mass-scale satellite broadband penetration in Africa may be limited.

The newest frontier in the broadband market is extending service from the VSAT modem to a new community of users. Community WiFi models over VSAT are definitely evolving and set to be a competitive focus area in 2019.

In 2018, iWayAfrica piloted several exciting community WiFi projects under its JOLAspot service bringing broadband connectivity to groups of users who had limited prior internet exposure either through lack of coverage or lack of suitable access device. Other groups of users are using a VSAT broadband connection to re-distribute service to their own communities at schools, refugee camps and aid organisations amongst others.

There has been a growing trend towards connectivity of remote schools. First led by donor agencies, African governments are now following with their own investments in initial installations and minimum service periods, after which the schools need to be self-sufficient in funding the connectivity. However once connected, the schools are hooked – quite literally! Access to broadband connectivity changes everything from efficiencies on school reporting to access to teacher material. Relevant localised educational content is the next requirement for these remote schools. This however is not readily available as customisation for local curriculums and language support is required. Typically donor funding is still seen for these projects. Access to constant power is another challenge in these communities. iWayAfrica is partnering with energy generation and distribution partner, Winch Energy to deliver power and connectivity to these communities.

Community WiFi is another way the schools can fund their broadband expenses. By providing a secure location together with access to power, rural schools can become the host site to deliver connectivity to the community beyond teachers and pupils. However once a community or premise is connected, the African broadband customer might not actually have regular access to a device with which to leverage this new connected world. Not all smartphones are equal in terms of WiFi range, yet the customer expectation is for connectivity access everywhere within the range they see a WiFi sign. So the next challenge is enabling African broadband users to have access to reliable and affordable high quality WiFi-enabled devices.

iWayAfrica has been around for over 25 years delivering reliable internet services and overcoming Africa's connectivity challenges. With its JOLA service, it continues to make Africa smile with broadband happiness.



Rakesh
Rughoonandan,
VP SSA,
CBNL

CBNL has been a long-term player in Africa, developing wireless solutions to cater for the demand in data growth, which has happened exponentially in recent years. Our point-to-multipoint (PMP) networks and turnkey services now support 25 customers across 17 African countries and act as key infrastructure

for the region's leading operators.

We've had a series of business wins across Africa in the last twelve months. Most recently announced in the public domain, we completed an agreement with MAXnet, a WISP based in Sudan. Our team is delivering a 28GHz FWA network to provide reliable, high-performance, ubiquitous connectivity capable of delivering high throughput, highly stable services with network slicing and the ability to offer performance guarantees on a per service basis.

The deployment is in Khartoum, the capital city of Sudan, and covering the three major cities within the capital: Khartoum, Omdurman, and Khartoum North, an area home to more than one third of the population of Sudan.

Once delivered, MAXnet will be able to provide even deeper support to the growing business community in these cities by providing them with higher capacity, carrier-grade enterprise connectivity. This will be ideal for organisations, such as government entities and e-services, financial institutes and universities, where secure and highly reliable connectivity is key. It will also be the perfect foundation for creating dedicated VPNs and for supporting a range of business-critical applications delivered over the internet.

In addition, we have a series of projects that are not yet public, but I can tell you we are working with one multinational mobile operator in Africa to deliver a high-capacity wireless PMP radio enterprise access network in the cities of Brazzaville and Pointe-Noire, Congo. We have also finalised a project with another mobile operator to deliver a 26GHz network to provide speeds of up to 600mb/s for businesses across Angola's capital city of Luanda, home to some 2.4 million inhabitants. Finally, we are working with a pan-African telecoms group to provide businesses in South Africa with robust, scalable and reliable connectivity via a state-of-the-art fixed wireless network.

How has the company seen the wireless communications market adapt and evolve in Africa over the last 12 months?

Naturally, as 5G dominates the headlines,

the use of 5G fixed wireless access for enterprises and residential is being explored in Africa as a complementary option to any FTTx networks due to its significantly lower costs and speed of deployment. In Africa, Point Topic estimates that over 97 per cent of residential fixed broadband is delivered using expensive, ageing copper infrastructure. Clearly, this is unsustainable and operators are looking to alternative solutions

In South Africa, trials of 28GHz millimetre spectrum – the spectrum of note for 5G in the USA – are being used to demonstrate the benefits of connecting millions of South Africans with high-speed internet services, which wouldn't be affordable with fibre.

Vodacom has already launched the first 5G FWA commercial service in Lesotho and is deploying the same pilot in South Africa.

Fixed broadband is a \$5.7bn annual market across Africa, growing at around 10 per cent per annum currently. So, the opportunity here is huge. We believe that FWA will very quickly come to be a core part of operators' portfolios. The paradigm shift from slow, expensive copper connectivity to lightning-fast wireless represents an incredible opportunity for nimble operators to take market share from incumbents.

What are the challenges in Africa for the next 12 months?

One of the biggest challenges we face is a digital divide between the different nations of the world, but this problem is heightened in the case of Africa. The International Telecoms Union's most recent exploration of the state of global broadband suggests that African countries on average spend 1.1 per cent of GDP on investment in internet infrastructure and networks. This contrasts with developed countries, which on average invest 3.2 per cent of GDP on this. Clearly the connectivity gap between Africa and developed nations is set to continue to grow year on year.

Why is this? Well, it is so often said that Africa faces a unique set of challenges that get in the way of it ever having internet access for all. Lack of finances, poor infrastructure, vast

"One of the biggest challenges we face is a digital divide between the different nations of the world, but this problem is heightened in the case of Africa"

distances and power shortages are just some of these, along with low average revenues per user (ARPU), which can make infrastructure investment unviable. But other continents face similar difficulties – such as remote parts of Asia, for example.

This is where cost-effective, easily deployable network approaches with low operating costs and upfront CAPEX, such as PMP communications, can work well. We believe two principles are effective here when building networks in Africa. Firstly, if operators in Africa can adopt wireless technology to quickly get customers connected, they will experience a rapid return on investment to encourage further investment. Secondly, build one network with infrastructure that is as general purpose as possible, rather than building several specialised networks. This has obvious cost benefits, but it should also increase revenue through network segmentation.

What are the company's hopes and plans for the continent over the next year?

With the UN predicting that by 2050 urban areas will house 68 per cent of the global population, municipalities will need to be creative in their approach to building liveable and sustainable environments. Connectivity is a key aspect of this. And nowhere is this situation more apparent than in Africa, where the population is expected to double by 2050, reaching 2.5 billion people, with the "megacity" of Lagos predicted to double in its current size to be home to 42 million inhabitants.

This kind of population growth, paired with the shift in our way of living, means smarter cities will soon be paramount. The good news is, from a technical standpoint, companies like CBNL can support smart city applications on the same infrastructure as the existing mobile backhaul. This lowers the barrier to entry for operators who want to be partners to municipalities because there is no longer an enormous cost associated with adding these applications. We've deployed exactly this kind of solution in Poland, where a local city authority adopted an agile PMP mmWave solution to allow for more efficient orchestration of its network resources and greater flexibility to deliver a range of services over a single, common physical network.

Given our current position working alongside many operators in Africa to leverage the power of mmWave, there is every reason to believe that this kind of network can be emulated in cities like Lagos in the near future.

There is a wealth of growth potential for our business that is yet to be explored. With the advent of smart cities and the proliferation of 5G, CBNL hopes to be at the forefront by helping our African customers to innovate and take advantage of these technological changes.



**Caroline de Vos,
co-founder &
chief operations
officer ,
SatADSL**

SatADSL focuses on developing “a state-of-the-art solution” for business professionals in need of internet solutions in areas with little or no internet access in sub-Saharan Africa.

Its co-founder, Caroline de Vos, says the company had a “hectic but productive time” in 2018, in Africa and beyond. “Our innovative cloud-based service

delivery platform (C-SDP), has reached multiple new spaces, allowing us to form notable new partnerships with several African telecommunications providers,” she adds.

In May 2018, SatADSL announced a new partnership with Cameroon’s national telecommunications provider, Camtel. The announcement followed a successful pilot launch of SatADSL’s range of satellite connectivity solutions, which were deployed across a variety of public and private enterprises and communities throughout the country. “Our competitive VSAT solution was deployed at locations such as schools, post offices, hospitals and banks and we were able to assist Camtel in its offering of competitive broadband packages, over a very wide scale, reaching even the most remote of locations,” says de Vos.

She says the company’s “next big success in Africa” came in the early autumn, when SatADSL embarked on a new partnership with, iSAT Africa, and APT Satellite. “The new agreement meant that we could, for the first time, offer our C-SDP to enable iSAT to offer a host of new services, including our unique voucher-based services, VNOFlex and congestion-based services,” says de Vos. “We were delighted to be able to do this as it allowed APT Satellite and iSAT to deliver cost-effective broadband services to more customers than ever in Africa. This project was made possible through our use of the APSTAR-7 Ku Africa beam, along with our partners, to provide an effective platform for the expansion of satcom services, combining extensive coverage with exceptionally high performance.”

In October 2018, SatADSL worked with Avanti to launch Ka-band broadband in Africa. The company used Avanti’s high throughput satellite (HTS) HYLAS 4, to create a new offering to provide consumer and corporate business connectivity and a way for internet service providers (ISPs) to offer SatADSL’s platform-as-a-Service (PaaS) solution via its C-SDP.

“The beauty of our C-SDP is that it includes VNO Flex, which, coupled with our voucher-based services, are not currently available via other Ka-band offerings in the region,” adds de Vos. “By adding Ka-band to our portfolio, we entered

“By adding Ka-band to our portfolio, we entered a new shift towards even greater representation of our services in Africa”

a new shift towards even greater representation of our services in Africa. What is always so humbling about this is each time we achieve feats like these we are reaching new geographies and populations, some of which are only experiencing the internet for the first time via our services.”

When talking about the past 12 months, de Vos says the wireless communications infrastructure has experienced a huge shift, mainly due to the rise in demand for mobile bandwidth because of 5G and other advanced services. She says the need for increased and more extensive wireless communications is something which takes time to deliver, with numerous obstacles to be overcome along the way.

“SatADSL is in the process of exploring the needs created by increased demands in the mobile space,” says de Vos. “When we look at Africa, locations such as Kinshasa, in the Democratic Republic of the Congo, the distance between cities can be as much as 6,000km. Despite having a good level of GSM mobile coverage in the city of Lubumbashi, this coverage only goes so far and it cannot reach cities such as Kinshasa easily. An efficient way to connect both locations such as these is being realized in VSAT solutions, offered by companies such as ours. The number one priority, alongside efficiency is inevitably cost-effectiveness. VSAT services are the only and most reliable way to provide a robust wireless infrastructure capable of delivering advanced technologies such as 5G.”

In 2019 and beyond, de Vos says whole regions in Africa are and will “rightly expect” better, more comprehensive mobile connectivity between their towns and cities. She says what’s different in Africa is down to its unique expanse in geography. In order to overcome the huge costs associated with replicating the model used in the western world of installing GSM masts between short distance is not viable in Africa, she says. “Therefore, we are actively looking for opportunities to deploy our C-SDP to connect these gaps over large distances such as exist in the Democratic Republic of the Congo, between Lubumbashi and Kinshasa, de Vos continues.

Looking ahead, de Vos says Africa “remains a huge opportunity to be realized” when it comes to VSAT services. “While the desire for services is there, and growing, there are still complex issues that need to be overcome to

provide the levels of service that are needed, and on a wide scale,” she continues.

“The biggest challenges are predominantly economic and political but in working with specific partners throughout the region, we will be able to add more and more solutions and help facilitate what will be a long-term strategy to roll-out connectivity to be as inclusive as possible. Right now, what we are finding is that we can effectively mitigate the challenges we see, by nurturing and expanding our network, wherever we can. As we stand in 2019, we have built our relationships across Africa so that it now includes a total of 85 different distributors with whom we partner in various ways.”

In 2019, SatADSL will focus on building new relationships with customers in Africa to increase its offering on the continent. The firm’s biggest areas of growth are likely to be partnerships with Mobile Network Operators (MNOs) in sub-Saharan Africa, she says, where it will be providing “much needed” satellite connectivity to both communities and enterprises. “We will be highlighting the uniqueness of our C-SDP and highlighting the ways in which it adds value for operators,” says de Vos.

“Perhaps the most important way in which our C-SDP adds value for operators in Africa specifically is due to our exclusive voucher-based system. The voucher-based system is a means by which services can be purchased without any risk for the operator. The way it does this is by only allocating bandwidth once the online payment has been made.” With the kinds of fluctuating revenues that exist in Africa, de Vos says this assurance of payment coupled with the flexibility on the side of the user is a huge advantage and this service is something SatADSL will be concentrating on in 2019.



**Delphine
Masciopinto,
chief commercial
officer,
France-IX**

The internet’s role in boosting economic growth is by now recognised around the globe with studies suggesting that a 10 per cent increase in internet penetration is correlated with a 1.35 per cent increase in GDP in developing countries. The internet economy creates jobs, connects sellers with buyers, helps education and training, enables remote

working and more. But for these opportunities to be available, the people who are able to contribute and benefit from this sector must first have affordable and reliable internet access with sufficient bandwidth for productive use.

UN agency, the International Telecommunications Union (ITU), recently reported that the percentage of people using the internet in Africa increased from 2.1 per cent

in 2005 to 24.4 per cent in 2018 – the fastest growth globally – but despite this, more than 60 per cent of the population remains offline. On top of that, African users pay much more for internet access than in developed countries, caused partly by the fact that upwards of 90 per cent of traffic for African countries is international traffic rather than locally sourced.

IXPs are a vital part of the physical infrastructure because they make access to the internet cheaper and faster. They do this by enabling local internet traffic to be exchanged between IXP members – known as ‘peers’ – under an agreement that is often free and is always cheaper than having to pay for international IP transit. A good analogy is domestic and international air travel. If you want to fly between locations within the same country, Morocco for example, you wouldn’t want the flight path to be routed via Hong Kong as this would both slow you down 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 is paid for in foreign currency meaning local country ISPs must pay international rates for local delivery.

By providing the shortest and fastest connection between peering members, an IXP cuts out the need for expensive international transit when it comes to the delivery of local traffic, lowering costs, improving latency and increasing bandwidth. As many IXPs are hosted in local data centres, content can also be downloaded faster (and more cost effectively) by local users.

All this adds up to a better internet that can be part of a growing economy. The African IXP Association currently lists 44 active IXPs located in 40 cities across 32 countries in Africa. Many of these have been established with the aid of organisations and people who not only provided equipment and training but valuable guidance in how to avoid pitfalls.

Since work on its development commenced in 2015, the Senegal Internet Exchange, SENIX, has become one of the pillars of Senegal’s digital independence, a symbol

“The ability to exchange traffic locally, instead of using extremely expensive submarine cables, has created a virtuous circle for the entire digital chain”

of its economic development and of the Internet throughout West Africa. Its creation illustrates the best practices for promoting the development of a digital economy and thus enabling access-for-all to a high-performance, reliable and independent internet.

The country’s first attempt at building an IXP, in 2012, was not so successful. It put operators and public authorities in charge but, because their proposals lacked neutrality and did not encourage a wider distribution of content and services, negotiations failed to get anywhere. With input from a major neutral European IXP, it was decided to open the SENIX creation process to all content producers, service providers as well as all other key players in the cultural sector. When an IXP is an association of members that includes both suppliers (content and services owners) as well as operators (infrastructure owners) an egalitarian relationship between all the different stakeholders is established, for the benefit of all.

With a solid foundation for the creation of the SENIX association, it was possible to move on to the operational part of the IXP’s construction. The data centre was built on a neutral site in Dakar, owned by SENIX, which made it possible to respect a certain equidistance between operators and equal treatment in the technical design. Orange, Tigo, Expresso, Arc and Hayo, as well as ADIE, can all be physically present but the SENIX infrastructure remains completely independent. The interconnection of these operators favours the distribution and availability of local, nationally-produced content, which is of critical importance at the national and international level.

Bocar Kane, a telecom entrepreneur in Senegal, says: “The benefits of SENIX today are undeniable for all stakeholders, consumers and the Senegalese economy: for businesses and individuals, SENIX means more bandwidth, less latency, more accessible content and better services. The ability to exchange traffic locally, instead of using extremely expensive submarine cables, has created a virtuous circle for the entire digital chain, as the resulting cost savings are passed on to consumers in end-user bundles.”



Eran Shapiro,
director
of
business and
tech ventures,
Spacecom

Africa and the Horn of Africa. Furthermore, in

just a few months, Spacecom is scheduled to launch and begin commercial services of the most advanced satellite over Africa – Amos-17. By the end of 2019, we will have three different satellites providing services from three different positions, bringing added value in different communication markets to different clientele.

AMOS-17 will be equipped with extensive Ka-band, Ku-band and C-Band high-throughput satellite (HTS) capabilities. Able to combine broad regional beams and high throughput spot beams to maximize throughput and spectral efficiency from the 17°E orbital position, the satellite will be the most advanced digital satellite over the continent. We have designed AMOS-17 specifically for the growing broadband, broadcast and communication needs for Africa’s operators, broadcasters and cellular companies.

Reception from the African communications markets has been very encouraging towards our new satellite. At the time of writing, Spacecom has pre-sold two of the satellite’s four steerable Ka-band beams in long-term deals, as well as some significant deals on our unique C-Band HTS beams. This is an excellent beginning. We are positive that as soon as AMOS-17 reaches its orbital position and completes its in-orbit-testing, many of the currently interested partners and customers will utilise AMOS-17 for its superior performance and flexibility.

In 2018, we signed a significant deal with Botswana Telecommunications Corporation (BTC) to supply satellite services and capacity to its VSAT network, making it the continent’s most technologically advanced network. Utilising AMOS-7’s very high-performance Ku-band regional beam coupled with an HNS Jupiter-II advanced platform, Spacecom is providing BTC the highest efficiency satellite communication solution in the region. Our Vertical Solution Division partnered with the BTC teams to migrate its existing network towards next generation VSAT technology. Today, Botswana’s commercial and government users are experiencing high speed VSAT services, increased bandwidth, better service availability, and will enjoy new services to be offered by BTC.

We also began providing satellite capacity on AMOS-7’s Africa Ku-band beam for permanent and occasional SNG (satellite news gathering) services for one of Africa’s largest public broadcasters. Together with Globecast, we are providing a long-term solution for this broadcaster. Though we cannot publicise its name, this partnership is a further step in Spacecom’s expanding high-profile business presence in sub-Saharan Africa.

The entire world is constantly undergoing change in communication delivery methods as well as in consumer and corporate usage habits. In Africa, the satellite industry is stable. The need for reliable and high-quality communication services, such as those that satellite supplies,

"The entire world is constantly undergoing change in communication delivery methods as well as in consumer and corporate usage habits"

is utmost for operators and thus there is a continuing need for satellite.

Africa, of course, is receiving more and more fibre, however, the quality and coverage in rural areas, mountainous regions, and other hard to reach areas are dependent upon satellite services. As more consumers use smartphones as their primary communication device, it is satellite that provides the most reliable method of delivery in such regions. Spacecom's role in the continent is to assist telecom and broadband operators, broadcasters, MNOs and other communication providers to create affordable and reliable value-added offers to their customers.

The challenges for Africa's varied communications needs, particularly for Spacecom, are linked to how to generate reliable growth for our customers. Overall, the region's challenges include the continent's highly rural population and the vast distances in which these rural populations abide. In addition, communications infrastructure in Africa, though continuing to improve every day, remains below those of other continents. The amount of communications infrastructure investment, either by international agencies, public or private sectors is lower than other areas. For instance, according to the World Bank, it is five times less in sub-Saharan African countries than in Latin America and the Caribbean.

Spacecom recognises that there are truly abundant opportunities for our business in sub-Saharan Africa, particularly with MNOs, and we are taking

part in this growth. The broadcast sector in some sub-Saharan African countries is also growing and with AMOS-17, we are addressing these and other growing markets.

With expansion of our fleet with the AMOS-17 HTS C-band fixed spot beams and Ka-band steerable spot beams to go alongside its regional Ku-band beams, we are expanding our coverage and capacity over the continent. The new satellite will join AMOS-4 and AMOS-7 in providing services to African markets, and its unique characteristics should prove extremely useful in helping close rural Africa's digital divide.

The satellite will be the most technologically

advanced to service Africa to date and will deliver a large variety of services from its state-of-the-art digital payload. By connecting Africa, Europe, the Middle East and Asia, we will create a unique bridge for furthering a new digital age in sub-Saharan Africa in which advanced satellite services will continue to be at the centre.

Spacecom is keen to connect sub-Saharan Africa's un-connected. We are continuously seeking opportunities to collaborate with other forward-looking partners in growing Africa's communications market. With our satellites, we will be at the forefront of enabling all of Africa's communities to bridge the digital divide. ■

The image shows the homepage of the African Wireless Communications website. The header features the text "AFRICAN WIRELESS COMMS.COM" in large white letters on an orange background. Below the header, there is a navigation bar with links for Broadband, WAN/LAN, VAS, IoT, Cloud, Backhaul, Network Management, Archives, Events, and Register. The main content area displays several news articles in a grid format. One article on the left is titled "Longlife Product Lifelong Support" and another on the right is titled "MDXI and Asteroid laur neutral IX in West Africa". A central headline reads "THE HEART OF OPPORTUNITY". At the bottom of the page, there is a call-to-action button with the text "for African wireless communications, as it happens" and a website URL "www.africanwirelesscomms.com".

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chapter 7

Fibre



**Paul Hamilton,
director,
Hamilton
Research Ltd,
Africa Bandwidth
Maps**

Cables, customers, and capacity: since the first Africa Telecom Transmission Map was published in 2009, Africa's operational terrestrial fibre optic cable networks have more than tripled to reach one million route kilometres during 2018, the number of people in sub-Saharan Africa living within reach of an operational fibre optic network has more than doubled to reach 556 million (54.2 per cent), and Africa's international Internet bandwidth capacity increased by more than 100 times to reach 7.939tb/s by December 2017.

Terrestrial fibre networks surpass one million kilometres in 2018

Africa reached 1,004,757km of operational terrestrial fibre optic network in December 2018, according to Africa Bandwidth Maps, compared with 845,755km in December 2017 and 529,237km in December 2013. In June 2009 Africa's inventory of operational fibre network was 278,056-km. In the twelve months since December 2017, an additional 159,002km of fibre optic network entered service across the region, an average of 436km of new fibre optic network entering service per day. In addition, there was in December 2018 a further 133,542-km of fibre optic network under construction, 86,989km planned and 50,159km proposed.

More than half (88,000-km) of the 159,002km fibre network expansion that was completed during 2018 was in the five North African countries of Algeria, Egypt, Libya, Morocco and Tunisia. In sub-Saharan Africa,

Telkom South Africa reported that its national fibre network increased by 10,000-km during 2018 to reach 161,119-km, Infraco reported a fibre network of 14,293km, DFA of 10,554-km and Vumtel of 8,000-km during 2018, bringing the total for 23 operators in South Africa to 237,421km.

In Nigeria, MTN announced in April 2018 that its national fibre backbone had reached 24,658km, compared with 9,738-km in December 2012. Galaxy Backbone announced in July 2018 that it had completed the first 1,482km phase of the National ICT Infrastructure Backbone (NICTIB) project connecting government ministries, departments and agencies. Along with 21 other network operators, Nigeria's inventory of operational fibre reached 86,648km in December 2018.

Elsewhere, in Madagascar fixed line incumbent Telecom Malagasy (TELMA) announced that its national fibre backbone reached 9,000-km during 2018, from 5,000km in 2017. In Guinea, SOGEB had completed 3,138-km of the 4,374km national backbone by July 2018. And in Zimbabwe fixed line incumbent TelOne announced that its national fibre backbone had reached 3,700km, compared to 2,600km in 2016.

Fibre networks reach 54.2 per cent 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 2018, 556 million people lived within a 25km range of an operational fibre optic network node. In the last year, network expansion has brought more than 34 million more people within access to high capacity national and international backbone networks.

Over the last eight years since 2010, more than 297 million more people were brought within reach.

In June 2018, 54.2 per cent of the population in sub-Saharan Africa (556 million) lived within a 25km range of an operational fibre optic network node. This compared to 52.1 per cent (522 million) in 2017, 48.1 per cent (469 million) in 2016, 45.8 per cent (436 million) in 2015, 41.8 per cent (371 million) in 2013, 40 per cent (345 million) in 2012, 36.3 per cent (313 million) in 2011, and 30.8 per cent (259 million) in 2010.

The supply of satellite capacity continues to grow with the launch of new satellites. Before the first submarine cable entered into service in Kenya ten years ago during 2009, 100 per cent of Kenya's international bandwidth was supplied by satellite. In June 2009, Kenya had reached 1.985gb/s supplied entirely by satellite, but this dropped sharply to 83mb/s in 2013. The amount of satellite bandwidth then increased slightly to 106mb/s in 2014, and 270mb/s in 2016, but then increased dramatically to 4.487gb/s by December 2017. Kenya has never used so much satellite bandwidth.

Africa's international bandwidth reaches 10tb/s in 2018

Over the last ten years, Africa's international Internet bandwidth capacity increased by more than 100 times, the region's total bandwidth was just 67gb/s in December 2007.

The total international bandwidth of 7.939tb/s in 2017 was split between sub-Saharan Africa, which increased by 25 per cent to reach 4.138tb/s, and North Africa which increased by 45 per cent to reach 3.800tb/s. Excluding Kenya, which only increased by 6.5 per cent to 916gb/s in 2017 (source: Communications Authority), the total bandwidth for other countries in sub-Saharan

“Over the last ten years, Africa’s international Internet bandwidth capacity increased by more than 100 times”

Africa increased by 31 per cent to reach 3.222tb/s in December 2017. Seventeen African countries saw annual growth over 50 per cent during 2017, and five saw growth over 100 per cent. For example Niger’s international Internet bandwidth increased by 211 per cent to reach 5.6gb/s in 2017, Rwanda increased by 145 per cent to reach 25.4gb/s, Mauritius increased by 127 per cent to reach 96.3gb/s, Malawi increased by 95 per cent to reach 11.7gb/s, and Zimbabwe increased by 34 per cent to reach 102.8gb/s.

Of the total activated/sold bandwidth of 4.138tb/s in sub-Saharan Africa by December 2017, 334gb/s (8.1 per cent) was supplied by terrestrial cross-border networks connected to submarine cables. The completion of new 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 38 per cent to reach 334gb/s in December 2017. This compares to 242gb/s in 2016, and 45gb/s in 2012. Ten years ago in December 2007 the amount of international bandwidth supplied by terrestrial cross-border networks connected to submarine cables was just 747mb/s. In June 2018, Paratus Namibia notably completed the 900km Trans-Kalahari Fibre (TKF) route, providing capacity from the WACS submarine cable landing station at Swakopmund to Windhoek (the Namibian capital) as well as to Botswana (via Buitepos) and Zambia (via Ngoma and Sesheke).

Of the total activated/sold bandwidth of 4.138tb/s in sub-Saharan Africa by December 2017, 3.793tb/s (91.7 per cent) was supplied directly by submarine cable. This total of 3.793tb/s was a 24 per cent increase compared to 3.066tb/s in December 2016. In December 2007, the amount of international bandwidth supplied by submarine cable was just 60gb/s. There is plenty of room for future growth: this figure of 3.793tb/s is still a fraction of the total design capacity of at least 134.5tb/s that was potentially available on the 23 submarine cables that served the region in December 2017. In December 2008, there was a total design capacity of 3.9tb/s on seven operational cables. This total design capacity increased to 230.5tb/s by the end of 2018

with the entry into service of the G2A, SAIL, and SACS submarine cables during the year.

The key development during 2018 has been the entry into service during September of two cables directly connecting Africa to the Americas: the SAIL submarine cable running from Kribi (Cameroon) to Fortaleza (Brazil), and the SACS submarine cable from Sangano (Angola) to Fortaleza (Brazil). This will change the direction, volume and latency of international Internet bandwidth both from within Africa, and as a new transit route between the Americas and Asia. By the end of 2018 nearly a third of the total design capacity (72tb/s) on cables landing in sub-Saharan Africa (230.5tb/s) connected Africa directly to the Americas rather than Europe or Asia.



**Dobek Pater,
director,
business
development,
Africa Analysis**

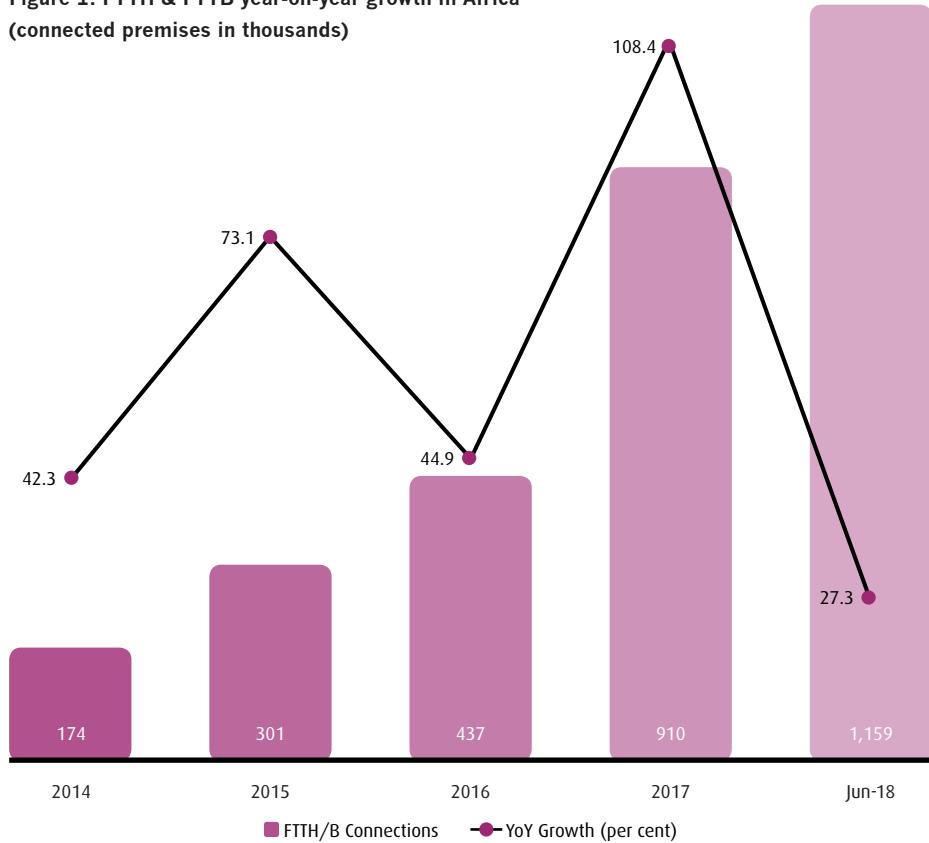
Fibre broadband connectivity has been much talked about in many markets in Africa over the past few years. It is touted as required infrastructure for the next generation of services both in the business and residential markets – from operating out of the cloud by small and medium sized businesses (SMEs) to eGovernment services to future household entertainment (streaming content). Yet, with the exception of a few countries, the growth of fibre access networks

has been very limited across most of the African continent. (see fig. 1 below) This can be ascribed to a number of factors, including:

- Cost of fibre infrastructure deployment – This remains quite high in many markets and makes for a difficult business case, given the service adoption rates (although aerial fibre deployment is less expensive). It is less expensive to build wireless networks.
- Cost of infrastructure maintenance – Once a fibre network has been built, the cost of maintenance and repairs can also be quite high if the fibre cable keeps being damaged due to other infrastructure development in the same area.
- Small target market – Socio-economic development is often still slow, with slow middle class growth, and correspondingly low affordability levels. This is coupled with comparatively high prices of fibre connectivity, paying a premium for a superior service. In the business market, and in particular small businesses, the level of maturity (and often also affordability) limits the adoption of fibre broadband.

The fibre access infrastructure provider environment tends to be quite fragmented in many markets, with a number of smaller fibre network operators (FNOs) operational. It is difficult for small operators to maintain a sustainable operation with a small footprint. Hence, in most markets in Africa, operators follow a multi-technology strategy, where possible, for the provision of connectivity services. Fibre is

Figure 1: FTTH & FTTB year-on-year growth in Africa (connected premises in thousands)



one of the technologies used but most of the connections may be provided wirelessly. Only in a limited number of cases have we seen the evolution of a pure fibre access infrastructure provider. This is most pronounced in South Africa, where around 50 FNOs are operational. Many of them very small and unsustainable. This leads to growing consolidation in this market.

As at mid-2018, there were 136 commercial FTTH/FTTB networks operational in Africa in 40 countries (including territories) and another ten networks either planned or in deployment. The presence of fibre broadband infrastructure on the African continent and growth over the past few years are presented below. The year-on-year growth of connected premises from mid-2017 to mid-2018 was 75 per cent.

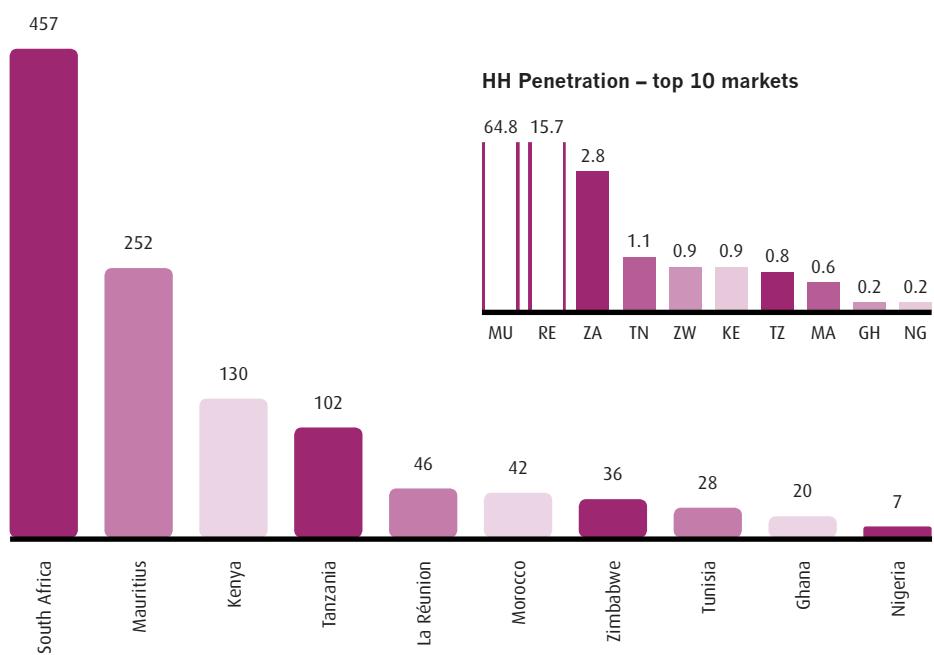
Fibre broadband uptake is concentrated in a handful of country markets, with almost 97 per cent of total fibre connections on the continent (top five account for 85 per cent of total). Even at that, household penetration is very low in these countries. The notable exceptions are Mauritius (where fibre deployment is being pursued as a national strategy) and La Réunion – both small islands with small populations in the Indian Ocean. This concentration of fibre broadband in several markets on the continent is illustrated in Figure 2.

Some of the key market trends observed in the fibre broadband market are:

- Access infrastructure has been expanding and improving, underpinned by improving national long-haul and metro backhaul infrastructure.
- Pricing of fibre-based products has seen some reduction, making the products more affordable. This is combined with increasing disposable income levels (at least in growing economies).
- Economic improvements (not in all markets) have led to improved business climate and demand for fibre-based services.
- Government policy direction moving towards national fibre roll-out, digital agenda, etc.
- Access to relevant content has been improving. The present FTTH/FTTB market landscape in Africa provides for a number of opportunities going forward. These include:
- Lack of legacy fixed infrastructure in many markets presents an opportunity to address this shortage with fibre.
- However, this can also be a challenge due to, for instance, lack of duct infrastructure which could be reused to lower the cost of deployment or lack of fixed line product / service culture and understanding of such products / services within the target user base.
- Middle class migration to gated communities / complexes and increasing concentration of businesses in office parks means that the potential users can be reached more easily at a lower cost. New residential

Figure 2: FTTH & FTTB connections – top 10 market in Africa, mid-2018 (connected premises in thousands)

SOURCE: AFRICA ANALYSIS RESEARCH AND ANALYSIS, TELEGEOGRAPHY, 2019



and business developments also provide an opportunity for greenfields fibre infrastructure deployment in such premises.

- Once the first wave of FTTH deployment and uptake is past its peak (this may take a number of years in most markets in Africa), the cost of deployment and provision of services may be suitable for a second wave to address the lower socio-economic segments.
- The fragmented fibre infrastructure provider environment presents M&A opportunities

for (typically) larger operators or non-telecoms investors.

Future evolution of the FTTH/FTTB markets in Africa will be driven by a combination of socio-economic development and government policies. However, given the diversity of markets in Africa in terms of ICT and socio-economic development, the pace of fibre broadband deployment and adoption will also differ significantly from country to country over the next five years. The expected market evolution trends are highlighted below.

HOME MARKET	BUSINESS MARKET
<ul style="list-style-type: none"> • Greater focus on back selling of fibre services to achieve higher connectivity rate of homes passed. • Geographic expansion of the FTTH footprint (although limited to main cities in most countries). • Introduction of new products (including smaller bundled offers) to address households with lower disposable income levels (than the top end). • Introduction of converged products combining fixed and mobile services. • Increase in relevant content (requiring fast and reliable internet access) will drive uptake. • Continued downward trend in retail prices of fibre products, resulting in greater affordability. 	<ul style="list-style-type: none"> • Geographic expansion of the FTTB footprint (although limited to main cities). • Introduction of converged products combining fixed and mobile services. • Move towards IoT (and IoE) over time, requiring greater good quality connectivity. • Government policy direction aimed at expansion of broadband (including fibre) infrastructure and services to drive socio-economic development. • Growth in maturity of the business community, realising the benefits of IP and cloud services. Fibre will be used for delivery of these services.

Reaching out to the world

A country is only as connected as its links to neighbouring countries and on a continental scale it's the size and quality of the links from Africa to the rest of the world which are vital. In order to provide for the expected increases in demand, several projects were working to improve inter-continental links.

One of the projects sees Africa now connected to the Philippines via a new cable. Late in 2017, PLDT (formerly the Philippine Long Distance Telephone Company) announced that it was set to open another international submarine cable link to connect the Philippines to three continents before the end of 2017. In the end it took until Q3 2018 for the link to be open for business.

The telecoms and digital services provider invested an initial PHP500m (around USD10m) through a partner in the consortium that owns the new 25,000km Asia-Africa-Europe 1 (AAE-1) submarine cable system that went live in 2017.

In tandem with the other international cable systems that land in the Philippines, AAE-1 connects the country to 19 destinations: Hong Kong, Vietnam, Cambodia, Thailand, Singapore, Malaysia, Myanmar, India, Pakistan, UAE, Oman, Qatar, Saudi Arabia, Djibouti, Yemen, Egypt, Greece, Italy and France.

PLDT said the investment would enable it to serve more customers, not only at home but also across Asia, Africa and Europe. The company also claimed AAE-1 would further bolster the resiliency of its overseas links, as well as expand the capacity and enhance the quality of its data and internet connections.

PLDT international network VP Gene Sanchez added: "This submarine infrastructure, with



AAE-1 covers Asia via diverse terrestrial routes across Thailand connecting Vietnam, Cambodia and Hong Kong, where it was landed in July (pictured)

its state-of-the-art 100gb/s transmission technology and deployed with minimum design capacity of 40tb/s, will reinforce PLDT's international links to Europe and the Middle East via its PoP facilities in Hong Kong and Singapore. It will also provide new network diversity and resiliency in these regions.

"With AAE-1, the PLDT Group's total international capacity will be over 4tb/s, significantly greater than that of competition."

On the western side of Africa, the first trans-Atlantic link went live. On 26 September 2018, Angola Cables announced that its system, the South Atlantic Cable System (SACS), was open to traffic and not only offered the first and fastest link between Africa and the Americas with the lowest latency, but that it would also provide a more direct routing for internet traffic in the southern hemisphere.

Manufactured and powered by NEC, it's claimed SACS is one of the most advanced submarine systems to go into commercial operation. It was designed with 100gb/s coherent WDM technology on an end-to-end solution, and features four fibre pairs for a total design capacity of 40tb/s between Brazil and Angola.



Angola Cables says the South Atlantic Cable System offers the lowest latency between the Americas, Africa and Europe

JANUARY 2018

Liquid Telecom and Huawei claim a new partnership deal signed in South Africa towards the end of last year will have pan-continental ramifications. Under the agreement, Huawei will deploy its DWDM technology to Liquid's fibre network in South Africa, enabling it to support 100G wavelengths. The first phase of the project will see Liquid use the vendor's OptiX OSN solution along 1,200km of its long-haul network connecting Johannesburg and Cape Town. Liquid said the 100G link will support growing demand for cloud-based services and provide customers with high-speed access to its data centers to meet the needs of global cloud players and enterprise customers.

FEBRUARY

Omantel Wholesale has partnered with DE-CIX to simplify and accelerate the speed at which local

regional and global service providers connect to the latter's worldwide internet exchange points. According to Omantel Wholesale, the partnership is part of its global strategy for enabling transformation and innovation with ultra-low latency networking. The company is a member of the Asia Africa Europe-1 (AAE-1) cable consortium and offers connectivity from South East Asia to Europe via the Middle East. Customers that connect to Omantel Wholesale's global network can use DE-CIX exchanges to peer, interconnect, and optimise cloud and content for end users.

MARCH

PCCW Global and Mauritius Telecom have partnered to construct and maintain a high-speed submarine cable connecting the Indian Ocean Islands of Rodrigues and Mauritius. PCCW will work with Huawei Marine Networks to build the 700km Mauritius and Rodrigues Submarine Cable System

(MARS) which will have a bandwidth design capacity of 16tb/s. MARS will be ready for service in 2019 and PCCW will manage its operation. The partners claim that the island's residents will benefit from vastly improved bandwidth and connectivity once the new cable is live.

APRIL

MainOne boosted by Côte d'Ivoire license Nigerian connectivity and data centre solutions operator MainOne has been granted a license to expand national and international connectivity services in Côte d'Ivoire. The C1B license will enable the company to land its trans-Atlantic submarine cable and build transmission infrastructure in the country. MainOne said it plans to invest almost USD20m in Côte d'Ivoire with a focus on the provision of wholesale connectivity services. It will start the construction of its cable in June 2018 and expects to complete this in 2H19.



Top: the new project will first cross the Atlantic linking Cape Town to the US via Brazil, and then extend across the Indian Ocean in phase two.
Bottom: the cable aims to avoid potentially unstable areas

According to Angola Cables, data transfers would now be five times faster than existing cable routings, reducing latency between the two countries from 350ms to 63ms. Luanda also connects to London and Miami with around

128ms latency. At the time of the opening, Angola Cables said these two major content hubs will position Angola as a strategic point to serve the trans-Atlantic region with low latency and resilient connections.

It added that given the onward connections to the already completed Monet cable and the West Africa Cable System, SACS would also offer reduced latency between Miami and Cape Town from 338ms to 163ms. Angola Cables CEO

MAY

The Middle East Broadcasting Network (MBN) will use Globecomm's transponder, teleport and terrestrial fibre services for transmitting its TV and radio services to the Middle East and North Africa. Under a five-year contract, Globecomm will help deliver Alhurra TV's SD and HD video content as well as audio broadcast by Radio Sawa to more than 58 million DTH users, multiple regional MBN re-broadcasting affiliates, and MBN owned-and operated FM radio stations.

JUNE

SEACOM has upgraded its key submarine network system from its Southern and Eastern African coastline landings into Europe at a total capacity of 1.5tb/s. The current upgrade is adding 500G of new capacity on the system, after a previous upgrade of 500G in 2015. The upgrade increases

available capacity in SEACOM's key markets: Kenya, Tanzania, Mozambique and South Africa. The company claims the solution will allow it to deliver requirements for high-capacity connectivity in very short timeframes and provide for future demands. The latest deployment is also based on 100gb/s coherent DWDM technology.

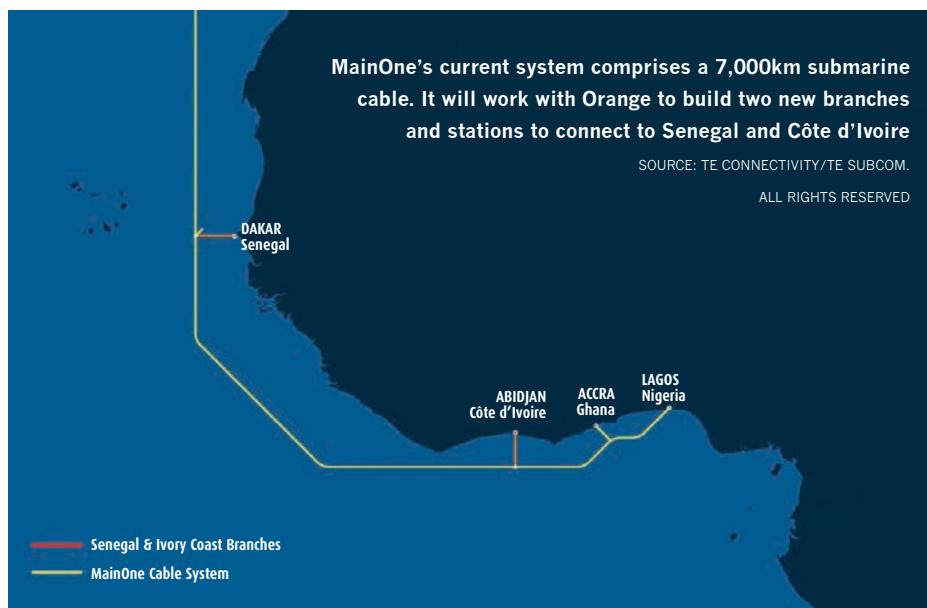
JULY

Sparkle, the International Services arm of TIM Group, has upgraded Tunisie Telecom's international IP transit connectivity through the activation of a 100G port at its Sicily Hub in Palermo. The new port represents Tunisie Telecom's main trunk to Europe and will support increasing demand for digital content and advanced IP services in North Africa. According to Sparkle, the Sicily Hub is located closer to North Africa, the Mediterranean and the Middle East

than any other European peering point. As a result, it claims the facility offers better latency and enhanced application performances to customers.

AUGUST

Gilat Telecom (formerly Gilat Satcom) was chosen by Nexttel to provide 4G broadband services in Cameroon. Part of Vietnam's Viettel Group, Nexttel has operated in Cameroon since 2015 and is now said to have around five million subscribers which puts it ahead of Camtel but third after Orange and MTN. Nexttel will be using Gilat Telecom's fibre network both within Cameroon and across Africa in a bid to provide a fast and reliable broadband service. Gilat says it was chosen after a competitive tender that included a number of established wholesale carriers in Africa.



António Nunes said that the commercialisation of SACS is “more than just a game-changer” when it comes to data connectivity and services between the two continents.

There was also an increase in trans-Atlantic reach when Mauritian company South Atlantic Express (SAEx) International announced it was planning to expand its reach to the US East Coast using Sparkle’s pan-American network.

The South African sponsored SAEx cable system is a phased project that will ultimately connect Asia and the Americas, via South Africa. Under phase one, the SAEx1 system will run initially from Cape Town to a branching unit near to Fortaleza in Brazil where it will interconnect to a partner system providing onward access.

SAEx International said it would work with Sparkle, the international services arm of Italy’s TIM Group, to provide connectivity from Brazil and then reaching the US East Coast with landing in New Jersey. Under the terms of the agreement,

Sparkle would also provide interconnection facilities in Brazil as well as technical and sales support in both South and North America. When SAEx1 becomes ready for service, expected during 1Q21, it will stretch across a total distance of around 14,720km (including branches).

SAEx International said it would feature six fibre pairs with a minimum combined capacity of 72tb/s, and would be the only system connecting South Africa directly to the USA. The system would then extend east and connect to the Indian Ocean via a second phase. Over a distance of around 13,900km, SAEx2 will link Cape Town, Singapore and India, with two further fibre pairs between Cape Town and Mtunzini. It will feature four branching units facing Mtunzini,

Mauritius, Madagascar and Chennai in India. SAEx2 is due to go live in 2Q21. According to SAEx International, its system will satisfy a number of crucial objectives, including providing

strategic diversity for global customers seeking to avoid, to the extent possible, narrow straits and difficult transits through potentially unstable areas or unreliable overland routes.

The west coast also saw MainOne partnering with Orange to extend its submarine cable in the region. At the time of the announcement in September 2018, MainOne’s current system comprised a 7,000km submarine cable that was originally launched in 2010. Under its partnership with Orange, the company is set to build two new branches and stations to connect its system to Dakar and Abidjan. Orange will be the owner of the cable station in Dakar.

Orange Group subsidiary Orange Marine will manage the installation of the new branches. They will be lit using Ciena’s transmission hardware and equipped with TE SubCom’s WSS ROADM technology. It’s claimed this allows MainOne and its partners to match the capacity in each branch to the market need, thus optimising cable utilisation. This was also claimed to be an industry first for the deployment of undersea spectrum-sharing in Africa.

TE SubCom added that the deployment would inject new technology that upgrades MainOne’s system to a potential capacity of 10tb/s when it becomes operational around November 2019.

Following the launch, MainOne will have landing points in five markets – Nigeria, Ghana, Senegal, Côte d’Ivoire and Portugal, in addition to Cameroon. The company said a cluster of Francophone countries in West Africa that are experiencing an increased demand for advanced telecom services, including Burkina Faso, Mali and Mauritania, would also benefit from the extensions.

Kazeem Oladepo, MainOne’s regional executive for West Africa, said: “This extension of our subsea cable to Senegal and Côte d’Ivoire will further open up their international

SEPTEMBER

Telecom Namibia has launched what it says are the “first-ever modern services” at the rural settlement of Tallismanus in Namibia’s Omaheke Region. It says around 6,300 residents in the constituency, which is around 240km east of Gobabis, can now access mobile and fixed voice and internet services following the construction of a high-speed fibre cable system stretching from Buitepos via De Hoek to Rietfontein and then Tallismanus. A converged 4G TDD/FDD base station services also went live.

OCTOBER

The cable and material manufacturing stage has begun for the PEACE (Pakistan & East Africa Connecting Europe) subsea fibre system that will connect Asia, Africa and Europe. PEACE is scheduled to go live during the first quarter of

2020. Once completed, the 200G, 16tb/s per fibre pair system will connect Pakistan, Djibouti and Kenya, with a northern expansion to Egypt and further southern expansion from Kenya to South Africa during a second phase. The cable will facilitate connectivity from China to Pakistan via existing terrestrial cable networks, and it’s claimed that it will create the shortest route from China to Europe via Africa.

NOVEMBER

Nigeria-based data centre and fibre operator MDXI has partnered with Asteroid to launch a carrier-neutral internet exchange point (IXP) for West Africa. The West African Internet Exchange (WAF-IX) will be in MDXI’s Tier III data centre in Lagos. The partners say the WAF-IX’s three major objectives are accessibility, lower costs and reduced latency for the region’s internet users. It is

based on what’s described as Asteroid’s “lean and efficient” IXP platform which, it’s claimed, enables service providers to optimise the delivery of enhanced end-to-end network performance while reducing overall IP transit costs.

DECEMBER

The West Africa Cable System (WACS) suffered a cut in Angolan waters on 19 September. The fault occurred around 1.2km from Sangano Beach, and the reason for the breakage has so far not been detailed. Angola Cables said the outage meant a total loss of the international connectivity and internet services that it provides throughout Angola using WACS. The company added that it was able to restore services to a large extent and quickly by routing traffic via alternative routes through the activation of redundant circuits in other subsea cable systems.

bandwidth markets, drive down costs and ultimately boost the economic and commercial development of the region."

Meanwhile, Orange said it would benefit from greater capacity and additional bandwidth for the development of fixed and mobile data in Africa.

Boosting capacity on land

Fibre is not only the solution for high-capacity inter-continental links, it's also vital in shifting data around on land too. For example, Liquid Telecom announced it would operate the Kenya Electricity Transmission Company's (KETRACO) optical ground wire (OPGW) fibre cable and expand the internet network across East Africa. KETRACO operates as a national long haulier of fibre that Liquid Telecom Kenya will now commercialise to meet the rising demand for

high-bandwidth, video and internet services for businesses and individual consumers across the country and East African region.

In 2014, KETRACO was granted a Network Facility Provider Tier 2 license by the Communication Authority of Kenya. Since then, it has developed the specification and run a tender process for the management and development of the combined network, now resulting in a 10-year deal with Liquid Telecom Kenya.

At the time of the announcement KETRACO was running a 1,791.5km electricity transmission network within Kenya, but by 2020 the company will have completed construction of more than 8,000km of high voltage transmission lines with concurrent fibre connectivity.

The initial stage of the plan was to upgrade fibre connections to Kenyan areas already connected to the national grid with high

Orange believes that of all the digital revolutions, higher education and vocational training are among the most strategic for Africa



voltage lines of 132kV and above. These included Garissa, Isiolo, Garsen, Lamu, Rabai, Namanga, Meru, Machakos, Makueni, 11 Wote, Sultan Hamud, Mwingi, Konza, Kitale, Eldoret, Kisii and Kisumu.

It will then extend fibre connections to remote parts of the country as well as neighbouring nations such as Ethiopia, South Sudan, Uganda, Tanzania, Rwanda, Eastern Congo and Burundi. "With KETRACO and Liquid Telecom coming together, we are now taking fibre to where it has never been before whilst diversifying our company's revenue base," said KETRACO MD Fernandes Barasa.

According to Liquid, KETRACO's overhead fibre cable is a technology that is "far superior" to buried fibre or microwave connectivity. George Kuria, Liquid Telecom's infrastructure build and deployment GM (East Africa), said: "This new backbone fibre cable will significantly expand our network and add resilience to our internet connectivity with a limitless capacity to carry any amounts of data bandwidth.

"We will invest in high-capacity equipment at the terminating points to ensure we achieve the



KETRACO MD Fernandes Barasa (left) says the two partners will take fibre to "where it has never been before". Also pictured is Liquid Telecom Kenya CEO Adil Youssefi



Paul Hamilton,
Director,
Hamilton
Research Ltd,
**Africa Bandwidth
Maps**

The year ahead: Satellite and wireless transmission remains extremely important for Africa, with satellite bandwidth covering every square kilometre of Africa and providing connectivity beyond the reach of terrestrial transmission networks. By June 2018 there were still 724 million people living beyond a 10km range, 469 million beyond a 25km range, and 244 million beyond a 50km range of an operational fibre optic network node.

In the next 12 – 18 months, an additional 133,542km of fibre network is currently under construction. This includes for example the expansion of national backbones in Côte d'Ivoire (4,920km), Senegal (3,044km), Mozambique (2,995km), Burkina Faso (2,001km), Mauritania (1,592km), Guinea (1,236km), Central African

Republic (1,050km), Ghana (881km), Uganda (842km), and Mali (817km). It also includes important new regional cross border links connecting Guinea with Mali and Côte d'Ivoire, Gabon with Equatorial Guinea and Cameroon, as well as Congo with Cameroon and CAR. In East and Central Africa BCS is building a further 4,850km of fibre networks in Kenya, Uganda, Rwanda, DRC, and Zambia, including 1,000km of submarine cable through Lake Tanganyika and Lake Albert.

Once this fibre optic network currently under construction has been completed, this will bring an additional 15 million people within a 25km range of an operational fibre network. More than half of these people will be in five countries: Guinea (2.2 million), Burkina Faso (1.8 million), Central African Republic (1.5 million), Nigeria (1.4 million) and DRC (1.1 million). This will increase the total fibre reach of sub-Saharan Africa from 556 million people (54.2 per cent) to 571 million people (55.7 per cent). And once the fibre optic network which

is planned (86,989km) or proposed 50,159-km) is completed in three to five years this will bring a further 53 million people within range, increasing the total fibre reach of sub-Saharan Africa to 624 million (62.8 per cent).

At current rates of growth, Africa's international internet bandwidth will have reached the 10tb/s mark by December 2018 and is on target to pass 14tb/s during 2019. Africa's total inbound international Internet bandwidth reached 7.939tb/s by December 2017, a 34 per cent increase compared to 5.930tb/s 2016. In addition to increased capacity on terrestrial cross-border networks from within the African mainland, the completion of the Cabo Amilcar Cabral, DARE, Ellalink, FLY LION 3, MARS, PEACE, and Ultramar submarine cables during 2019 and 2020 will increase and reinforce international connectivity for coastal and island countries of Cape Verde, Djibouti, Equatorial Guinea, Guinea Bissau, Kenya, Mauritius, Sao Tome and Principe, Seychelles, Somalia, and Tanzania.

largest data capacity possible and serve the region with the fastest and most stable internet ever achieved in East Africa."

KETRACO will continue to use two per cent of its optical fibre for its own communication. At the same time, Liquid will install connectivity equipment in all the power terminating points along KETRACO's network, complementing the ISP's own underground cable network running from Mombasa to Nairobi and across most major towns in Kenya.

Liquid Telecom also made a deal in Egypt with Telecom Egypt which would see them work together to complete the first fibre network stretching from Cairo to Cape Town. Under a MoU signed in mid-July 2018, Liquid would link its network from Sudan into Telecom Egypt's network via a new terrestrial cross-border interconnection. This will bring together a 60,000km network that runs from Cape Town, through all the Southern, Central, and Eastern African countries, and has now reached the border between Sudan and Egypt.

The Cape to Cairo network, also known as the 'One Africa' broadband network, has been in the making for over ten years and serves some of the largest global companies with some of the fastest network speeds on the continent. Strive Masiyiwa, founder and executive chairman of Econet which owns Liquid Telecom, said: "Completing our vision of building a single network running on land, all the way from Cape to Cairo is a historic moment for the company and for a more connected Africa. This network not only represents a remarkable engineering achievement that has overcome some of the most challenging distances and terrains on the continent, but it is also supporting the rise of Africa's digital economies."

As part of the strategic partnership, Liquid Telecom and Telecom Egypt will share network infrastructure and explore further areas of collaboration, including joint network services, a peering arrangement and a voice interconnection agreement.

Last year also saw increased IXP connectivity. The Internet Society said it had partnered with Facebook to develop IXPs throughout Africa. According to the society, 42 per cent of the continent's countries currently

lack internet exchange points. Working with Facebook, it plans to increase and support the expansion of existing IXPs in Africa by promoting infrastructure development, training, and further community engagement. Kojo Boakye, head of connectivity and access in Africa at Facebook, said: "Our partnership with the Internet Society will help develop Africa's IXP ecosystem by deploying resources like training and equipment to the areas where they are most urgently needed."

Citing data from the Africa IXP Association, the Internet Society said there were approximately 44 active IXPs located across 32 countries on the continent, at the time of the announcement in September 2018. This is said to have resulted in a 275 per cent growth of locally exchanged internet traffic since 2008 when there were only 16 IXPs in Africa. The society added that over the previous 10 years, traffic exchanged at African IXPs has increased from 0.16gb/s to 412gb/s with more than 800 networks now connected at these peering points.

"The internet community adopted the goal of having at least 80 per cent of the internet traffic consumed in Africa being locally accessible, and only 20 per cent sourced outside the continent by the year 2020," explained Dawit Bekele, Africa regional bureau director for the Internet Society. "We are getting closer to that target thanks to the many activities that promote interconnection and hosting in Africa, and to partnerships such as the one announced with Facebook."

This partnership followed not long after the Internet Society's call for the need for community networks to address connectivity gaps.

Orange also announced it had opened what it is said were two "very large"-capacity PoPs in South Africa. The new facilities, in Cape Town and Johannesburg, added to the operator's existing regional IP and IPX PoPs in Amman and Abidjan.

Orange said the latest African PoPs would provide a number of advantages to the region's wholesale customers. For example, it said the high capacity and high availability PoPs offer resilience with three routes that are protected by a backbone network that includes access to the SAT3 and EASSY/SMW5 submarine cables.

The operator also reckoned the facilities would enable users to improve QoS by providing delivery content closer to customers, as well as offer local processing, thereby improving roaming and avoiding the need for traffic to go back and forth to Europe.

The company went on to claim that it was the first operator capable of offering reliable, high-quality, secure connections for the wholesale market around the continent. It said that it already held a strategic position in this field in Africa and the Middle East thanks to its existing IP and IPX PoPs in Amman and Abidjan.



Byron Clatterbuck
chief executive
officer,
SEACOM

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.

Byron Clatterbuck, the company's chief executive officer says this is critical to the wave of changes that are taking place in African markets,

as the data explosion continues and players like Amazon, Google, Microsoft and Netflix build larger footprints in Africa, while increasing their computing, caching and storage capabilities.

"We've also added capacity on the WACS cable and on SAT 3 into our international backbone, which provides us with more network reliability," he says. "This gives us a three-way, international meshed network connecting Europe to Africa. This is critical from a backbone perspective as it enables more cloud computing and content companies to deliver more resilient service offerings in Africa and helps to drive improvements across the entire data communications ecosystem."

Seacom has also been building up its "direct-to-enterprise" business segment, SEACOM Business, where it has provided business solutions directly to enterprise customers in South Africa, Kenya and Uganda.

Clatterbuck says the firm has been on a transformation journey with this over the past four years, and it's accelerated over the past 12 months. He adds that this acceleration is due to the acquisition of companies such as MacroLan, which has now become SEACOM Western Cape. That particular acquisition affords Seacom a large presence in the Western Cape as well as access to more on-net buildings where it can deliver its data services.

"The team at Seacom Western Cape has really kickstarted Seacom's capabilities in the region," says Clatterbuck. "SAI was acquired in Durban, and has now become Seacom KZN, boasting a large customer base and experience in the market."

The third acquisition he points to is that of FibreCo, which was concluded in the beginning of March when cleared by the Competition Commission. He says it gives SEACOM long haul capabilities to connect the East Coast of South Africa to the West Coast, as well as allowing the company to deliver services into more and more South African markets. "Ultimately, this growth also enhances SEACOM's capabilities to connect large companies operating across South Africa, and from there to connect internationally," he says.

Clatterbuck says the key to what the company is all about is achieving what it calls



Kojo Boakye, head of connectivity and access in Africa at Facebook

"fibre-based economics" by using the most advance DWDM equipment to light that fibre for maximum capacity at the lowest possible cost.

Essentially, this means beaming as many wavelengths at the highest packet carrying capability as possible through its fibre networks. "At the moment, we are using mostly 100GB technology, but by owning the fibre we can easily move to higher-speed technology, which will be coming over time and allow us to exponentially increase the capacity throughput over our fibre network," he continues.

"This is the benefit of what we refer to as fibre economics, which means adding more capacity to the same existing fibre by upgrading the electronics technology. This is something that we have been doing on our subsea cables for years and can now do on our national South African network."

For those unfamiliar with how SEACOM operates, it does not specialise in wireless and does not use it its backbone. However, it

does support many wireless communications partners and makes use of it in the "last mile" often as in interim solution, or a permanent back-up solution, to deliver to enterprise customers.

"However, what you're seeing in the wireless space is that the market is becoming more like other developing markets," says Clatterbuck. "Fibre is used for low cost, high speed super highway transmission and wireless is more for access coverage. It also fills gaps and allows users and customers who cannot get fibre (or any other wire-line technology) to get data connectivity wherever they are."

Many are of the opinion that Africa has always been a wireless market, referring to handsets and smart phones. However, Clatterbuck says what Seacom sees more and more is that because of the speed of the technology that connects to the handset, fibre is needed to the base station which is transmitting, whether that's 3G, 4G and now even 5G.

"Ultimately, this growth also enhances SEACOM's capabilities to connect large companies operating across South Africa, and from there to connect internationally"

"This means that more and more capacity is required to get closer to the end user," he notes. "Even though the last connection between a handset and the base station is wireless, many handsets connect to the same base station and all of this capacity needs to get from the base station to the network to get the content and

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information people are searching for. This, in addition to fibre to the home and fibre to the business, is a key driver that promotes more fibre development. While you're seeing wireless access speeds increase and improve, and quality improve, there is also a need for fibre to drive the super highway that gets to the base stations." Clatterbuck says this is a hurdle for those who operate wireless networks as they continually need to increase the capability of their backbone in addition to the equipment and change in the technology that is required to deliver 4G or 5G technologies.

"We've seen this happen elsewhere and we're seeing it happen in Africa now. As volumes and requirements grow, there is a need to fibre-up the infrastructure to fill the gaps and enable high speed capacity data transmission, for which fibre is the most economical. Fibre can also be built in different ways."

One method is for it to be deployed 1.5 meters underground, encased in concrete and (hopefully) never interfered with. However, Clatterbuck says in many places in Africa, underground fibre is often mistaken for copper and consequently dug up and stolen.

Alternatively, fibre can be built using aerial technology where it is hanged above the road. Clatterbuck says this is less expensive to deploy but is obviously more at risk. "However, aerial technology for fibre deployment is popular in many markets as it's a lot cheaper," he says. "Additionally, if an adequate resiliency exists, it can be easier and cheaper to deploy and to maintain."

Although wireless will continue to play an incredibly important part, Clatterbuck says its role is becoming quite specific to certain tasks. He believes this is especially true for rural areas that do not have fibre and where it is not feasible to build fibre in that area, or in a very densely populated area where people want to have mobile access wherever they go, such as in a central business district.

"We'll see in time how wireless fills in the gaps of fibre," he says. "South Africa, for example, still has a very low fibre penetration rate in commercial buildings. After several years, it is estimated that less than 10 per cent of commercial buildings are connected to fibre. Compared to the United States or Europe, where 30 per cent to 50 per cent fibre penetrations exits, there is still a long way to go for commercial buildings in South Africa to get fibre."

Clatterbuck notes that the Internet of Things, or IoT, is also something to consider in relation to wireless, connecting not only handsets and the people using those handsets, but also the concept of connecting things. He gives the example of a driverless car constantly connected while it drives around. "The idea of IoT and connecting devices to the

internet will further drive wireless technology," he adds. "At the same time, all that data will still need to get onto fibre and then onto servers and data centres nearby."

Still, there are major challenges ahead not just for Clatterbuck's charges, but for the sector as a whole. Although South Africa is one of the most developed African markets, many others are still in the process of developing and it's because of that Clatterbuck says in many developing areas (especially in rural areas) even basic infrastructure is often nonexistent. Consequently, for a communications operator wanting to build fibre, networks and small data centres, infrastructure such as roads, guard rails and power to feed the electronics on that network are all basic and fundamental requirements.

"The challenges for telecommunications are tied to the challenges of basic infrastructure development such as ports, airports and roads," he says. "It's difficult to imagine that you'd have high speed fibre and 5G deployment in areas that have dirt roads and no power. The cost of deployment in such areas lacking basic infrastructure are too high to be feasible, and the users in the area would likely not be able to afford the service."

Many places in Africa have tried to leapfrog basic infrastructure development by putting in wireless technology. However, Clatterbuck says as the data wave comes, fibre will eventually be required to connect base stations and local data centres. Therefore, investment is required in all aspects of civil infrastructure so as to build up infrastructure to enable the data and communications revolution.

As far as Seacom is concerned, the company remains focused on the markets where its subsea cable lands. South Africa is one of its biggest markets and so it will continue to see a lot of investment, interest and efforts.

"We used to be a wholesaler with less than 15 customers in South Africa, where we now have thousands of customers, including enterprise customers as well as service provider customers," Clatterbuck says. "Our next main market is Kenya, where we launched our Seacom Business solutions about 3 years ago. We're continuing to push, grow and widen our network capabilities in Kenya, not just into Nairobi, but into Mombasa and other towns too. We are also planning to launch further into East Africa with Seacom Business, in markets such as Kampala."

While Seacom also lands its cable system in Tanzania and Mozambique, these are smaller markets for the company and so it is evaluating opportunities to potentially expand in those countries. "However, based on relative size and scale, South Africa and Kenya are the two biggest markets that we operate in for

now," Clatterbuck adds. "We are going to drive deeper into these markets to provide more services to more customers in these markets."

He is also upbeat about Africa and where he believes the continent is heading. "We know that the service we provide is important to help development across the board by ensuring that there is reliable internet connectivity to businesses and consumers," he says. "Cloud computing power houses such as Amazon, Microsoft, Oracle, IBM, Facebook, Netflix and other major players can now come to Africa and deliver a reliable service as economies grow and businesses flourish. This provides a lot of benefits and we're the underlying data backbone that helps support these businesses to grow and consequently, create more opportunities." It's a good example as to why Seacom is optimistic about Africa and will continue to invest and grow in its chosen markets.



**Philippe Recco,
management
committee
chairman,
ACE**

Having been in service since 2012, ACE is still continuing its expansion on the west coast of Africa, according to Philippe Recco, management committee chairman of ACE.

"First of all, in terms of capacity," he says. "The first upgrade was delivered a little more than two-years-ago, and ACE is now initiating its second upgrade, including in line 100gb/s, which is necessary to keep up with demand and to satisfy the bandwidth growth that we can experience in the 18 countries (including 2 landlocked countries) nowadays connected by the cable."

Recco says ACE was the first ever international submarine cable for a number of countries and this "has triggered a tremendous appetite" for data in those territories, where wireless broadband is now becoming a commodity as everywhere in the world. What's more, ACE is also expanding in terms of

"From its inception, the ACE spirit was to bring global connectivity to as many countries as possible on the west side of the African continent"

geography. "From its inception, the ACE spirit was to bring global connectivity to as many countries as possible on the west side of the African continent: the southernmost segment to South Africa is laid and in-service is now a matter of months after installation and commissioning of the electronics is completed," adds Recco. "And the ACE family is still growing : with the addition of Guinea Bissau – another country with its first submarine cable – at the time of writing these lines, the cable-ship is off the shore of Bissau to lay the new branch that will soon connect this new member to ACE."

He is equally clear about the company's plans for the coming years, such as the completion of the 100gb/s upgrade that was recently initiated. "This should be a matter of a one-year project," he says. "We are still discussing with other countries to embark them aboard ACE, not only in the Gulf of Guinea, but also in southern Africa, where a number of countries have expressed their interest in joining us. With the spirit of facilitating the construction of new branches, ACE has indeed laid a number of branching units on the cable trunk, ready to welcome new connections."

There are also a number of initiatives for new cables on this part of the continent and Recco says ACE is open to develop partnerships with these new systems "in order to benefit from a mutual enhanced connectivity to the rest of the world".



**António Nunes,
chief executive
officer,
Angola Cables**

Submarine cable networks are the arteries of the global data economy. Today, undersea cable networks are responsible for connecting billions of people to our rapidly evolving digital world.

The first telegraphic message to be sent via transatlantic cable was sent on the 16th August 1858. The message took 17 hours and 40 minutes to be transmitted.

In 1988, the Transatlantic Telephone Fibre Optic Submarine Cable (TAT-8) became the first fibre optic cable to go into operation. TAT-8 was capable of transmitting data at 280 megabits per second or 40,000 telephone lines and played a significant role reducing the cost of telephone calls and internet data exchange between the three nations. At the time, the project was hailed as a major advancement for global telecommunications. The world has moved on since then.

It is estimated that submarine cables connect more than 4.3 billion users to the internet and carry more than 97 per cent of all internet traffic from emails to Instagram, from

"The vast spatial and socio-economic divide between communities living on the continent, makes terrestrial internet connectivity an expensive investment"

music streaming to video-on demand to other connected services...even Wi-Fi.

In September 2018, multinational telecoms company, Angola Cables announced that the South Atlantic Cable System (SACS) was operational. The SACS cable was the first Trans-Atlantic high capacity, low latency cable between Africa and Latin America to go into commercial service. This event signalled a continental shift for internet traffic routings in the Southern Hemisphere. For the first time in history, users had direct access to markets in Latin America and routings to the US via Monet – without having to be directed via the traditional, high-volume routing through the UK and Europe.

SACS has introduced data transfer speeds that are up to five times faster than existing cable routings. Latency between Miami (USA) and Cape Town (South Africa) has been reduced from 338ms to 163ms and from 350ms to 63ms between Fortaleza, Brazil and Luanda, Angola.

Angola Cables Chief Executive, António Nunes says that SACS - and the link-up to Monet was "more than just a game-changer" in terms of data connectivity and IP services between the two continents.

In April 2019, Angola Cables also announced the opening of their carrier neutral AngonAP Fortaleza data centre in Brazil. "The advanced facility offers multiple benefits for ISP's, CDN's, IXP's, OTT's, and cellular operators seeking to extend and expand their global reach and product offerings between the Americas and Africa," says Nunes.

Located in one of the most important and concentrated cable hubs in South America, the data centre offers scalability, continuous connectivity as well as hosting and cloud services for operators and businesses requiring high capacity data services to run their modern, internet and technology-driven enterprises.

Today, 57 per cent of the world's population is connected to the internet. There are currently more than 473 million internet users in Africa and more than one billion mobile subscribers out of a population of 1.3 billion.

It is estimated that around 2.56 billion gigabytes of data is being transmitted on mobile

devices across Africa and the Middle East each month and LTE subscriptions are expected to balloon from the present 50.5 million subscribers to 271.6 million by the end of 2023.

"As a leading wholesale telecoms operator on the African continent, we are providing additional capacity to accommodate the surging demand for increased bandwidth and offer secure access to cloud and colocation services," notes Nunes.

"Our current submarine network configuration of SACS, Monet and WACS connects service and content providers making it possible for them to reach international markets with multiple networks and digital ecosystems, at higher speeds and lower latencies. This holds enormous potential for these entities aiming to expand their enterprises, offerings and revenue streams off an efficient, reliable and cost-effective base."

Digital connectivity is critical for the social and economic development of the African continent.

For cities, people and businesses across sub-Saharan Africa, access to the digital economy is an imperative for its future growth, development and prosperity.

Whilst submarine cables such as SACS bring connectivity to the shores of the African continent, challenges in providing equitable internet access and services still prevail.

"The vast socio-economic and spatial divide between communities living on the continent, makes terrestrial internet connectivity an expensive investment," says Nunes. "And while there are still obstacles slowing regulatory reform within the African telecoms environment, we are of the view that Africa is in a unique position to take advantage of developing ICT technologies to rapidly accelerate access to digital services and content that can facilitate economic development."

He adds that whilst investments being made by mobile operators and fixed line operators on the continent are helping to expand and increase broadband access, additional effort and attention must be directed at bringing more affordable and reliable internet services to the people of Africa.

"Through our modern submarine cable network, advanced data centre infrastructure and our more than 200 peering partners across the world, Angola Cables is playing a constructive and active role in bringing the benefits of the digital revolution to Africa," Nunes continues.

"As digital technologies evolve, we are building the information highways connecting Africa to other continents and developing infrastructure that will open up new horizons and present opportunities for people and businesses to engage and participate in the global digital economy - and in doing so positively impact and reshape the future and fortunes of Africa for generations to come." ■

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chapter

Critical

Communications

8



**Tony Gray,
chief executive,
TCCA**

According to a study by the World Bank, economic growth in sub-Saharan Africa is looking positive – 2018 was expected to show an increase of just over three per cent, and the forecast points to an average of 3.6 per cent increase for 2019-20. Of course, the huge diversity of individual country economies and political stability in the region means that the growth is uneven, and Africa has never been a continent open to generalisation.

However, the need for critical communications remains undiminished, and new technologies and ways of working are emerging in the region. First responders and other critical communications users in Africa, in common with everywhere else in the world, are looking for enhanced voice services, a greater range of data applications and a more integrated approach to incident management.

As a resource-rich region, Africa relies on critical communications to manage operations in the mining and extraction industries, and to support and protect critical infrastructure such as rail networks, utilities, sea ports and airports. Today, the critical communications landscape is largely comprised of narrowband technologies such as TETRA and DMR to support user needs.

There are many examples of these deployments – just a few are referenced below:

- Africa's first TETRA public safety and services network was commissioned by the City of Cape Town, supporting some 15,000 subscribers. An additional network has been installed in the Gauteng province, used by 35,000 subscribers from the South African Police Service.
- Johannesburg City Power, one of the largest power distribution companies in South Africa, uses TETRA to help manage their operations in the most effective manner.

- Some of the longest mining rail tracks are covered by TETRA, as are oil and gas offshore platforms and extraction fields.
- The South African region of Stellenbosch and its municipal area is equipping its public safety personnel with TETRA radios. Police officers and firefighters will carry robust devices in order to communicate more safely and efficiently across the 830skqm.
- In the north of Burkina Faso, the Nantou zinc mine uses a DMR critical communications system to protect mine workers and visitors. This was a particularly challenging implementation as Burkina Faso borders the Sahara in the north where it is extremely dry, so a number of geological studies were required during the planning process.
- Critical communications are also key in other less well-known applications. In Kenya's National Parks for example, guards are using critical radio solutions in the fight against poaching.

For views on the potential of the region, I asked two TCCA members with experience of critical communications in Africa. First, Carsten Laursen, regional director for DAMM Cellular Systems.

"There are undoubtedly challenges presented by the market in Africa. Some countries have major financial problems, while others have a good economy, so there is a big difference in growth from country to country. Limited funds

mean that many projects are either repeatedly postponed or cancelled, and companies can use many resources to bid on projects that never come to fruition. The political climate has a great impact on growth and it can be extremely difficult for European companies to enter the market without a local partner.

"However, looking forward, the market is driven by the expansion of the infrastructure. There is growth within the rail/transport sector, and within port projects – the former growth due both to the fact that in many cities there are many people and major traffic problems, and the need for reliable train operations by the port projects. Another growth area is airports, as existing airports are being expanded and new ones are being built."

Second, Nicolas Hauswald, newly appointed CEO of ETELM, looks ahead to the promise of critical broadband and how narrowband networks can evolve:

"A lot has happened in the PMR world in the past years and TETRA can today be married up with newer or different technologies in order to improve efficiency, to increase capabilities or simply to find the right balance between costs and features.

"TETRA can be interconnected with SCADA applications, 3G/4G and wi-fi networks, as well as company intranets. Base stations of different technologies (TETRA, DMR, analogue and LTE) can connect directly to an LTE core in order to have one single network working across technologies and to avoid the feature limitations due to gateways, and the use of full IP transport links simplifies the transport fall back modes.

"Looking ahead, there are some discussions around the hybrid approach (LTE-TETRA and LTE-DMR), with sensitive sites covered by private LTE, wider surrounding areas covered by TETRA/DMR and all users interconnected together, however deployments of private LTE are limited in Africa due to the lack of frequencies available."

"TETRA can be interconnected with SCADA applications, 3G/4G and wi-fi networks, as well as company intranets"



**Thomas Lynch,
executive
director for
security
technology, safe
cities and critical
communications,
IHS Markit**

The increasing economic diversification of the region and the requirement for physical safety and security provides strong market drivers for a robust communications infrastructure; the largest adopter of LMR technology in the Middle East and Africa is by the public safety and security sector, which accounted for two-thirds of all users at the end of 2018.

Historically, this region has been divided between countries rich in natural

resources to relatively poorer countries in parts of Africa, and the wealthier nations have opted for TETRA and P25 solutions, whereas the cost efficiency of Cost Optimized Digital has appealed to the cost sensitive parts of Africa. However, economic development in Africa over the last few years has seen a growth in both Cost Optimized Digital and TETRA technologies.

Deployments of Cost Optimized Digital technology and TETRA used to be dispersed in similar proportions across the Middle East and Africa; however steeper growth rates in Africa of both Cost Optimized Digital technologies and TETRA have changed the mix, and Africa now accounts for the larger proportion of deployments.

In Africa, the economic diversity has opened the door to many LMR technologies, from governmental public safety and security agencies to utilities and industrial sectors, particularly TETRA technology, which increased deployments by more than 50 per cent in 2017. ■

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.

Digital radio protects wildlife

Usually associated with emergency services, critical communications has been branching out. In 2018, Critical comms specialist Hytera released details of a DMR (digital mobile radio) deployment carried out at the Mara North Conservancy (MNC) in 2016. MNC covers around 74,000 acres north of the Maasai Mara National Reserve, in the south western corner of Kenya. It needed a real-time communication system for daily missions to protect the wildlife environment and ensure the safety of rangers, tourists and residents. MNC's prime requirements were for a system that offers clear voice, ruggedness, and broad coverage.

Hytera recommended a DMR solution that features a number of its products. Working with Nairobi-based Seiya Limited which specialises in solutions for the Greater Mara Ecosystem, a network was built that features Hytera's RD985S repeater to provide large area coverage. This now supports instant communication among 34 rangers at MNC's headquarters and eight camps, as well as real-time patrol reports between the camps and headquarters.

Other Hytera equipment deployed included the MD785G mobile radio and the compact PD685 handheld with built-in GPS. The latter is compliant with MIL-STD-810 C/D/E/F/G standards and is IP67 rated for dust and water



**The TCCA's Tero Pesonen
says commercial
mobile operators
bring economies of
scale and 4G/5G
deployment knowhow**

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

resistant up to a depth of one metre for 30 minutes. MNC is also using the vendor's smart dispatch system which supports visualisation management and dispatching operation, along with main functions such as voice dispatching, text messaging, GPS positioning, recording, etc. Users have described the voice quality offered by the new digital radios as "amazing" and "clear and loud".

TCCA lays out guidelines

Last year also saw the TCCA (TETRA and Critical Communications Association) helping plan the future of TETRA. The association came up with strategies that could benefit mobile network operators (MNO) in delivering the next generation critical communications solutions.

In a white paper published in June 2018, the organisation said true mission critical comms services have so far been based on dedicated technologies, dedicated networks and dedicated spectrum. It said service operators are typically government-controlled, serving only mission critical organisations such as public protection and disaster relief (PPDR) and related agencies. Furthermore, existing PMR digital technologies such as TETRA are narrowband, and their capabilities to deliver broadband applications are therefore limited.

But with PPDR users looking for new communications capabilities, new applications, and new devices, which will improve their operational efficiency, the TCCA said the model of using dedicated networks is being challenged, and commercial mobile networks represent a new option for the provision of critical comms services. As a result, the association said the next generation of critical comms will be based on 4G/5G open

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.

standards defined by 3GPP.

Depending on the country, the benefits to an MNO could include premium ARPU, access to additional spectrum, or government-financed network hardening and/or extended coverage.

The association also set out options for what it described as the “efficient co-existence” of LMR/PMR/LTE networks. In its TETRA Connectivity to LTE white paper published in September 2018, the association provided an overview of the different approaches for enabling TETRA/LTE interworking, with several methods described.

The key issue addressed was interworking between the LMR/PMR and LTE worlds, particularly the interworking and evolution of PTT services, as group communications capability is the key service in LMR/PMR.

TCCA board member and chair of its TETRA Industry Group, Francesco Pasquali, said “TETRA networks are expected to be operational for many years to come. TETRA will therefore need connectivity to other bearers, particularly LTE, to facilitate long-term co-existence, safe migration from TETRA to LTE or as a hybrid communications solution.”

The TCCA said there will be a standard available for interworking between TETRA and LTE that will meet the needs of critical communications users in the 2019 timeframe. But that standard will then need to be converted to products and implemented in LTE networks. The association believes there is a “significant” gap between the release of standards and the availability of the associated functionality in products for operational use, it is not expected that there will be a full range of 3GPP compliant interworking solutions deployed until 2021/2022. ■



MNC's new DMR network includes the PD685 radios which have a voice quality described as “amazing” by users at the reserve



Tony Gray,
chief executive,
TCCA

The year ahead: Whatever the future holds, it is essential that the voice and data services provided to critical communications users must closely match and support those users' operational needs and ways of working, wherever and whenever required.

Existing narrowband services have been specified and designed to meet the requirements of critical communications users, but although they support a range of data services, they do not have the capacity to support the increasing demand for broadband services. Therefore,

catalysed by TCCA, critical broadband is in the process of being standardised by 3GPP to ensure that users are served by broadband to the same levels of quality, availability and security that they have come to rely on from their narrowband services, and to underpin a competitive global market. This enables organisations with increasingly pressured budgets to benefit from economies of scale, encourages innovation, and prevents operators being locked in to expensive proprietary systems.

Although Africa is well served by commercial mobile phone networks, these are not designed to provide the key features required by critical users in their everyday work. Mobile network operators

are commercial organisations aimed at mass consumer use. Their networks and services have not targeted or provided the degrees of coverage, capacity, availability and reliability required and demanded by critical operations. With the advent of critical broadband, that is now changing and we are seeing national public safety networks around the world looking to either fully deploy broadband services for critical communications, or to utilise them as complementary to existing narrowband services.

We look forward to developments in the African market reflecting this global shift, and are confident that the critical communications ecosystem will continue to evolve to help Africa realise its potential.



Noel Watermeyer
sales director,
Altron Nexus

has been brought about by LTE technology providers who were not previously involved in two-way radio but now see it as a new market.

"From a manufacturer point of view, at the end of the day nobody wants to miss the bus when it comes to a customer transition across to a new LTE technology and the lucrative appeal of the LTE devices. And the bandwidth that it obviously offers is something that the customers are very excited about. But notwithstanding all of that are inhibiting factors that essentially prohibit them from actually being able to do anything as we speak.

"The truth is that LTE technology is not currently achievable in South Africa at all because there is no licensing approved to be able to deploy this. I know that there are initiatives, but even among my typical client base which is predominantly government, the ability to access spectrum to at least do proof of concepts for LTE has been significantly inhibited through the lack of decision-making in the sectors of the Ministry of Communications as well as ICASA [Independent Communications Authority of South Africa] to be able to facilitate that.

"I don't see too much light in the short-term to resolve that particular issue. Consequently, there has been a dilemma amongst customers and it's sort of frozen them in not being able to make a decision as to whether to go forward with traditional two-way radio technology or to wait and see if they can get spectrum to see if it will work for them. Until such time as customers have visibility of spectrum (and quite specifically, which area of the spectrum range that will fit), it is almost impossible to give an accurate indication of what the cost of deployment of such a system will be. Our traditional customers in the government sector will obviously want to have spectrum allocation in as low a frequency as possible so that they can maximise range. But everybody, including the mobile operators, want that low spectrum."

When asked how that has impacted Altron Nexus's business over 2017-2018, while Watermeyer cannot name specific clients, he said there are at least two national customers that have essentially been doing a wait and see to be able to identify what it is that they are able to do. "And when I say national customers, I am

according to Noel Watermeyer from private communication network specialist Altron Nexus, South Africa's client base has been suffering a "degree of confusion" because of the potential of LTE superseding the traditional technologies for two-way radio. He believes that to a certain extent, this

"From a geographical area perspective, we still have about 85 per cent analogue technology for public safety in South Africa"

talking about the types that have the potential to roll out national type networks. There are also local authority level, metropolitan type entities that also desire to have some form of broadband wireless data network that they own themselves. So the end result is that you don't have business because many organisations are a little frozen at this stage."

But he adds that fortunately, not everybody is in such a state at present. "There is one tender under adjudication right now for a national DMR network, which is the correct technology for this specific entity, and there are similar opportunities for others.

"We have had some business in the TETRA field as well. Earlier in 2018 we completed a deployment for the eThekini (Greater Durban) municipality. That was a project that was spread across two years based on phases and funding availability.

"In the past month [October-November 2018] we also completed a smaller rollout, still TETRA technology, for the SAPREF refinery which is also located in the Durban region.

"We have had ongoing opportunities for upgrades: in Botswana, we completed an upgrade on a diamond mine for their TETRA technology solution; there is also a tender under adjudication currently in Botswana for a national system upgrade.

"So while I say frozen, there are still things moving on. Although there is this pent-up desire for the functionality that comes with LTE broadband, that does not necessarily discount the benefits of the traditional two-way radio technologies of DMR and TETRA.

"There are a few places I see in the world that have the ability to have the resources to be able to deploy private networks for public safety or public safety type clients. But in reality, it is extravagant to say the least to assume that that would be the solution in the short term for all of our needs in South Africa. I would estimate that from a geographical area perspective, we still have about 85 per cent analogue technology for public safety in South Africa. Not even DMR or TETRA that facilitates that.

"However moving forward, there is no real doubt in my mind that TETRA technology still remains the core on which the majority of users should be operating. The specialised divisions

within those operators could access, implement and utilise broadband technology. But probably only 10 to 15 per cent of them would actually benefit. That starting point is to get proper digital communications available to everybody."

At this point, Watermeyer emphasises that he is only a critic of LTE from its present state of maturity as a feasible wireless broadband technology for critical comms users.

"3GPP Release 14, which was really the basis for core mission-critical voice data and video capabilities, was only finalised in December 2017, so there is still more mission critical functionality that has to be realised in Release 15. I do not think manufacturers have had a fair opportunity yet to implement the finalised plans of that so it has been a bit premature at this stage.

"In the long-term, once that mission-critical functionality exists and is implemented in the regions that can justify the deployment of those networks, I think it is very viable that these networks and technologies will be used. But future communications are not about should we use this technology or that technology.

The future of communications is to use all technologies. That's the point. If 2G was still 2G out there and proved suitable for a particular environment, then we should use it. What remains very important is to ensure customers have the integration capability so that they can actually cross communicate between or across technologies. So whatever technology happens to be implemented, all other technologies should be able to participate."



MK Wong,
deputy general
manager
of overseas
sales central
department,
Hytera

Hytera is a provider of professional and private communication solutions – and MK Wong, deputy general manager of overseas sales central department, is very candid about the company's experience over the past 12 months.

"We've encountered some difficulties in Africa like financial strain of many countries," says Wong. "However, Hytera has been committed to providing better products and services for customers."

However, Hytera achieved a breakthrough from nothing in a Tunisia custom project which marks a significant milestone in Northern Africa market.

In the southern African market, Hytera secured Catoca diamond mine, the fourth largest diamond mine in the world, which is located in Angola, with its DMR solution, Hytera also provided an advanced TETRA solution for SAAT (South African Airways

Technical), which is a full-service MRO organization and the largest one in Africa. The introduction of the Hytera TETRA network and ATEX terminals in Natref refinery also marked a breakthrough for S.A Hytera in oil gas.

Wong says the African economy is moving forward at a high speed and that good public security is the basis of economic development. "Public safety department has strong demand for PMR products," he adds. "However African PMR market is developing slowly due to history and now is mainly staying in the migration from analog to digital, while several countries start to pursue LTE technology."

Furthermore, Wong says that a set of digital PMR products to meet basic work needs is urgently needed by public safety departments in many African countries.

"There are 54 countries on the African continent, most of which has the demand to establish private network communications, however, there is a universal problem that the current infrastructure is still poor, which can't meet the demands of the market to develop PMR communication," he says.

Although the African continent has a vast territory, PMR communication is still at analogue stage and the communication networks are mainly dispersed, partial, and small-scale. Interconnected nationwide networks have not been built and the cost to build a broadband network is very high," he adds. "In this case, the broadband and narrowband convergence solution best fits African continent."

Wong cites broadband and narrowband convergence as a must for communication. "The PMR industry has been changing dramatically in recent years. Before broadband technology came into the picture, customers only had the choice of narrowband technologies such as DMR, TETRA and analog," he adds. "Customers now have even higher requirements for big data application, emergency and unified communications etc. However, the broadband covers only limited area." Hytera, as a company, has been investing heavily in R&D and innovation for 26 years and has a full seven portfolios

"There are 54 countries on the African continent, most of which has the demand to establish private network communications"

of products to show for it. He claims it "made remarkable headway" in promoting narrowband and broadband convergence solutions to cater for users' requirements.

In terms of its customer base, Wong says Hytera has intensively explored customers' demands and responded quickly. In southern African S.A Hytera and the Angola office have provided pre-sales service and after-sales service to provide a better support for customers.

Going forward, Wong says the general elections in most African countries in the past year have brought uncertainties to communication infrastructure constructions. "At the same time, due to insufficient budgets for customers, there will be delays in funding," he adds.

The good news is that in 2019, Hytera has seen more opportunities in African market. "While the global economic environment has improved, the increase of oil price will help to stimulate economic growth for oil-driven countries like Angola and Nigeria, and further to stimulate their communication demands in keeping security and stability," he says. "There will be a huge potential for PMR communication as the digitisation process is speeding up."

It's clear that the African market is and will remain a competitive one for Hytera to compete in.

For Hytera, Africa continent is an increasingly competitive market in which chance and challenge are coexisting.

First of all, branding will be enhanced across the continent, including the introduction of an office in Morocco, while several service networks will also be set up in the east and western African regions.

Secondly, he says Hytera will provide better localised support from the sales team, technical solutions, consultancy service and diversified products bringing partners more benefits. Hytera is also committed to promoting new products to local regions and its partners will also be empowered to take part in the operation of small and medium scale projects.

Third, Hytera also plans to cultivate PMR communication awareness of customers," he continues. "It's a must to invest in PMR communication for customers from public safety, oil and gas, to transportation – so it helps to deal with tumultuous incidents and build a safer and more stable environment to attract more investment in Africa from all over the world.

Wong has plenty of other suggestions to develop public safety networks in African countries and is keen to share some of them. "Secure and reliable," he says. "In order to reduce the malfunction in the operation, safety measures should be planned in advance, and mature, stable and reliable equipment should be selected for newly built communication system."

He adds that voice, data, video, command and dispatch services should be planned at the same time to maximize the effectiveness of each network.

A third suggestion is that scale construction and application should be done to make the plan and implement it in stages. "The first phase of the construction should secure daily service of the public security sector, deal with emergencies and meet the security communication demands for mega events," says Wong. "The success of the first phase can enhance the operation effectiveness for security sector, but also build a solid base for follow-up project construction."



**Thierry Becker,
head of western
Europe and Africa
of secure land
communications ,
Airbus**

As a secure communications expert, Airbus provides modern network and device technology for public safety and various industries

"Think of Africa as a continent of opportunities: investments in new airports and power stations, or even railway and metro projects, major sport events," says Thierry Becker, head of western Europe and Africa of secure land communications at Airbus.

"As the economy is booming in many regions, the demand for technology increases. Especially if it comes to making public life and business more secure, governments and companies need specific technologies. Among the various demands, highly efficient and reliable mobile communication systems for public safety organisations and large companies facilitate operations tremendously. Among these are highly flexible and next-generation group communication solutions for Tetra and smart devices."

Becker says Airbus serves these demands in Africa and has already done so in the past. By delivering a full-fledged Tetra system, which was encrypted, for 2010 FIFA World Cup, Airbus helped secure a peaceful and joyous event. In Morocco, Airbus is supporting Moratel in delivering Tetra services for the fast-growing public urban transportation systems all over the country.

Six years later, the South African municipality Stellenbosch decided to use Airbus Tetra devices for their mobile communication. By supplying devices, base stations and management systems that control the communications systems, as well as flexible services, Becker says Airbus can customise its products to individual customer demands.

"But who at Airbus offers such communications solutions?" he asks.

"The Airbus business unit secure land

CRITICAL COMMUNICATIONS: INTERVIEWS

communications (SLC) supplies advanced communication and collaboration solutions enabling its customers to gather, process and deploy intelligence. Its portfolio is tailored to the needs of professionals from public safety organisations and enterprises in the field of Transport, Utility and Industry. The portfolio includes infrastructures, devices, applications and services based on Tetra, Tetrapol and 4G/5G technologies." SLC has customers in over 80 countries and employs around 1,150 people in 17 countries in Europe, the Middle East, Latin America and Asia.

Becker says the company's success is predicated on its experience and "highly reliable technology". In the past years, he says, governments and companies in Africa have asked increasingly for its technologies, mostly of Tetra standard. "And now that we are on the edge towards a new era of professional communication, we can also deploy new critical broadband solutions," he adds. "It is all about integrating innovations, such as multimedia functions, into existing systems. We make sure that our platforms perform in critical situations. And that's the reason why customers decide for us."

Becker says one of the things Airbus has created, is a fully scalable concept that the company calls "intelligence shared". He continues: "The basic idea is that we consider the step towards the next-generation professional communication as an evolution. The most important aspect of critical communication, is that it has to work perfectly under any circumstances – fires, attacks, floods, accidents. Collaboration of public safety or industrial users must be supported at any time. Therefore, Airbus combines the best of the Tetra with the LTE world, because fire fighters as well as police officers want and need to exchange photos, videos and large data."

Having gained experience with a multitude of customers around the world, Airbus keeps highly secure and modern narrowband platforms and includes the broadband

"The most important aspect of critical communication, is that it has to work perfectly under any circumstances – fires, attacks, floods, accidents"

components that the customer needs to fulfill their communication targets, says Becker. "This could be a combination of a dedicated LTE network with an existing Tetra system, or secure commercial LTE services linked with the existing system," he adds. "The network of the future will gather and process any information and deploy the essential information to first responders, control room officers and decision-makers."

He cites Tactilon Agnet, which he calls "an easy-to-use, flexible and secure group communication solution" for both mission-critical and business-critical needs. It delivers all the features for safe and efficient exchange of information and command. In addition, the Tactilon Dabat device, a smartphone and Tetra radio in one, is the first hybrid Tetra-LTE device in the world. "Radio users can communicate with it using Tetra and broadband networks simultaneously," says Becker. "The device received the Intersec Awards 2018 in the category 'Innovative Security Product of the Year' and the International Critical Communications Award 2018 as "best evolution for future broadband."

He says, "at the same time", the Tactilon Dabat is a platform for innovative apps that help facilitate the daily lives of users in organisations such as the police, hospitals, fire brigades, airports, utilities, energy companies, and so on. "The Airbus app developer programme "SmarTWISP" ensures a new ecosystem of apps evolves in the business- and mission-critical world," adds Becker. "All these flexible, and easy-to-use instruments for critical situation fit into the evolving economies in Africa."

Africa is a place of diversity and Becker says the Airbus technology reflects the large range of demands for critical communications; "the dynamic developments and the flexible adaptions to every situation people need when they have to communicate professionally".



**Nicolas Hauswald,
chief executive
officer,
ETELM**

ETELM has been deploying private radiocommunications solutions in Africa for over 15 years now and its main customers are in the security, transport and oil and gas sectors. Its solutions are used in several African cities to cover tramway networks and railways (such as the Mine train in Mauritania) or by security services to fight against poaching in national parks.

In the past 12 months, ETEL M continued a number of system expansions in the oil and gas sector, with new offshore platforms and inland

"Users in different sectors like transport, security, oil and gas and utilities are now understanding that not having their own infrastructure can cost much more in a crisis situation"

extraction fields now included in coverage," says

Nicolas Hauswald, chief executive officer at ETEL M. "These deployments came with some challenges mainly linked to the complex environment that the solutions are deployed in."

Hauswald says ETEL M's work has been focused on the private wireless communications market the company can see that in Africa more customers are becoming aware of the necessity of having their own infrastructure to control risks associated with their industries.

"As we often say at ETEL M, you can outsource technology, but you cannot outsource responsibility," Hauswald quips. "Users in different sectors like transport, security, oil and gas and utilities are now understanding that not having their own infrastructure can cost much more in a crisis situation."

When looking ahead to the next 12 months, Hauswald says understanding the decision-making process in the African market is a major challenge for a company like ETEL M because "it takes time to get a project through" and there are usually many parties involved.

"These parties all want to have their own impact on the project," he notes. "Unfortunately, the real end user's needs can often be forgotten. Customers in Africa need to work on optimising this in order to have a solution that can benefit the end users and have a real operational impact from day one."

ETEL M is working on several new opportunities and is willing to build strong partnerships across the continent in the coming year. "If companies are interested in working with us, we will be happy to support them as much as we can, provide them with the best technology and work on a joint strategy to best answer the customer's expectations," adds Hauswald. "It is possible for customers in Africa to seek support from European governments when they buy European solutions." In other words, they should not be afraid of speaking to ETEL M about their financing challenges. ■



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Buyer's Guide

Your essential guide to the companies manufacturing, installing, supplying and providing wireless communications products and services in Africa

Company location, country, website	Network Technologies		Network Build & Management												Network Applications																					
	Cellular	Fixed wireless access	Critical communications	Satellite	Fibre	Other (TWS, mesh, etc)	RAN	Backhaul	Microwave systems	In-building systems (DAS, femtocells, etc)	HeiNets & small cells	BSRs/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	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
	<p>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.</p> <p>The portfolio covers voice, data, IP services, global satellite communications and mobile solutions. The A1 Group also provides long-time</p>												<p>expert know-how, flexible and tailor-made solutions and prompt troubleshooting for Roaming, Signaling Solutions, GRX/IPX Service and Fraud Detection.</p> <p>It offers a global infrastructure for Signaling, the smartest SIM Box Detection Service and a state-of-the-art IPX Service.</p>												<p>More information at https://www.a1.group/en/wholesale</p> <p>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).</p>											
Advantage 360 10681 Foothill Blvd Rancho Cucamonga CA 91730, USA sales@advantage360.com www.advantage360.com +1 (909) 980 1034 +1 (909) 944 3995	✓	✓	✓	✓	✓										✓																					
	<p>Advantage 360 Software LLC has provided in-house developed and fully convergent billing, CRM, POS, OSS, mediation and other business-critical software components to more than 200 service providers of the international telecom community since 1984 (32+ years).</p> <p>From this experience, we have gained an extensive knowledge of detailed client requirements that have resulted in a robust and feature rich product, offering users over 70,000 table-driven features and functions that can be</p>												<p>implemented in endless combinations to meet the rapidly evolving requirements of highly competitive markets. This offers an exceptionally adaptive environment that rarely requires customization or programmer intervention.</p> <p>Our highly-internationalized multi-lingual and currency solutions, multi-play universal services catalog and order fulfillment interface provide a common and uniform user experience across multiple technologies. These include 4G, VoLTE, VoIP, GSM, CDMA, HSPA+, Content, CATV, IPTV, ISP,</p>												<p>WIMAX, M2M, CIBER, TAP, Data, FTTH, FTTB, Fixed, Wireline and Long Distance.</p> <p>SOC 1-SSAE 16 Type II and Business Processes Frame Work (eTOM) levels 1 – 3 compliance, a lead-to-cash development philosophy and 250+ mediation and other interfaces guarantee customers a solid and lasting business platform.</p> <p>Meanwhile, our reputation for process automation, world-class support, rapid development turn-around and on-time on-budget launches are well-proven elements of customer success stories.</p>											
Advantech Wireless Technologies 16715 Hymus Blvd Kirkland QC H9H 5M8, CANADA info.canada@advantechwireless.com https://advantechwireless.com +1 514 694 8666 +1 514 868 0371	✓	✓	✓				✓	✓					✓																							
																																				

BUYER'S GUIDE

Company location, country, website	Network Technologies								Network Build & Management						Network Applications																		
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ARABSAT PO Box1038, Diplomatic Quarter Riyadh 11431 SAUDI ARABIA marketing@arabsat.com www.arabsat.com +966 11 482 0000 +966 92 002 6526			✓																														
 Arabsat عَالَمٌ... عَالَكُم Our world. Your world.	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.								provider in the Arab world. It transports over 650 TV channels, 270 radio stations, pay tv networks and a wide variety of HD channels that reach tens of millions of homes in more than 80 countries across the Middle East, Africa and Europe. Additionally, it includes an audience of over 170 million viewers in the MENA region alone who are tuned into Arabsat's video 'hotspot' at 26°E.								Operating a growing fleet of owned satellites at the 20°E, 26°E, 30.5°E, 39°E, Arabsat is the only satellite operator in the MENA region offering the full spectrum of broadcast, telecommunications and broadband services. This capacity will continue to expand with the launch of new satellites, making the Arabsat fleet the youngest in the region.																
AUSONIA Marsala, ITALY www.ausonia.net	✓	✓	✓											✓																			
Avanti Communications Cobham House 20 Black Friars Lane London, UK contact@avantiplc.com www.avantiplc.com +44 207 749 1600 +44 207 749 1633	✓	✓	✓	✓	✓				✓	✓	✓					✓	✓			✓	✓	✓	✓										
	As a trusted satellite technology leader, we empower people, businesses and governments to stay connected wherever they are. We go the extra mile, developing pioneering, cost-effective and secure satellite solutions that liberate potential in the most demanding of situations across Europe, Middle East and Africa.								Whether it be Governments that want to empower their digital economies, Mobile Operators that wish to bring ubiquitous coverage to their customers, Enterprises that want to grow through digital productivity or Security forces wishing to protect their sovereignty, Avanti has invested \$1.2 billion								in the latest Ka-band satellite technology to ensure we meet our customers' individual aspirations and continue to deliver world firsts.																
Aztec Gauteng, SOUTH AFRICA www.aztecelectronics.co.za	✓	✓	✓												✓		✓			✓	✓	✓	✓										
Belinterest Minsk, BELARUS www.belintersat.com			✓																														
Blue Sky Satellite Communications Johannesburg, SOUTH AFRICA www.blueskysat.com	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						✓	✓	✓											

Company location, country, website	Network Technologies		Network Build & Management												Network Applications																						
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Cambridge Broadband Networks Ltd CBNL Head Office: Byron House Cambridge Business Park Cowley Road Cambridge, UK hsimpson@cbnl.com http://cbnl.com +44 1223 703 000 +44 1223 423 573	✓						✓		✓														✓	✓	✓		✓										
 Cambridge Broadband Networks	<p>Cambridge Broadband Networks (CBNL) is the market leader in millimetre wave Fixed Wireless Access solutions. We have over 10 years' experience planning, deploying and supporting point-to-multipoint (PMP) networks in very high frequency bands across Africa.</p> <p>The trusted supplier and partner to 25 of Africa's largest network operators, CBNL has live networks in 19 African countries and provides customer training, turnkey services and support</p>												<p>from its three centres of excellence in Nigeria, Kenya and South Africa.</p> <p>Globally, CBNL has led the industry through its early commercialization of 5G spectrum, deploying over 25 5G Fixed Wireless Access (FWA) networks in the U.S. alone (utilizing 28GHz – 39GHz). In total, the company has built networks for over 100 service providers in more than 50 countries, including for nine of the world's largest top fifteen network operators.</p> <p>For more details visit: http://cbnl.com/</p>																								
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 PROFESSIONAL RADIO COMMUNICATIONS	<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>																								

BUYER'S GUIDE

Company location, country, website	Network Technologies										Network Build & Management						Network Applications																
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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				✓																			✓	✓	✓								
	Gazprom Space Systems (GSS) is a Russian non-governmental satellite operator. GSS operates four satellites positioned between 49E and 183E as well as advanced ground telecommunications infrastructure.										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.												the Western Coast of North America. It is more and more actively used for aeronautic and maritime connectivity.										
Global Satellite Africa Spaces Dock Rd Junction V&A Waterfront Cape Town 8001 SOUTH AFRICA deborah.fourie@globalstar.com https://africa.globalstar.com/ +27 21 403 6505			✓	✓																													
	Globalstar's state-of-the-art technology connects people every day in work and life through reliable data communications over a secure satellite network. Globalstar satellites provide reliability and operability worldwide connecting users in areas where traditional networks are unreliable or unavailable.										the simple push of a button. Our half-duplex, one-way simplex and SPOT products transmit more than 1.3 billion messages a year, tracking assets, saving lives and connecting IoT devices in locations beyond cellular coverage.												and manage remote assets, serve as redundancy to terrestrial communications networks and enable users to retain a competitive edge in today's hyper-connected, global marketplace.										
iWayAfrica Suite 223/224 Grand Baie Business Park Air & Geranium Streets Grand Baie, MAURITIUS marketing@iwayafrica.net http://www.iwayafrica.net/ +230 26 393 22 +230 26 310 67		✓	✓	✓	✓																												
	iWayAfrica is a Pan-African communications service company with licensed ISP operations in 9 countries and a network of distributor partners for VSAT wholesale services in another 34 markets.										Ku-Band platforms. iWayAfrica is also the only Master Distributor in Africa for Avanti's latest HYLAS 4 services.												solutions as well as traditional ISP email and domain services to ensure all businesses are equipped for the current operating environment.										
KOHLER-SDMO 270 rue de Kererven 29490 Guipavas FRANCE philippe.forest@sdmo.com https://www.kohler-sdmo.com +33 2 98 41 41 41 +33 2 98 41 63 07		✓			✓																												
	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.												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.										

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MATRIXX Software 18764 Cox Avenue Saratoga, CA 95070 USA dany.rahal@matrixx.com www.matrixx.com +1 408 215 9344 +1 408 215 9344	✓																	✓				✓	✓									
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ND SATCOM Graf-von-Soden Strasse 88090 Immenstaad GERMANY info@ndsatcom.com www.ndsatcom.com +49 754 5939-0 +49 754 5939-8780	✓	✓	✓						✓		✓							✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		



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 30 years and have roots in the early cellular trials.

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).

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.

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. 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.

BUYER'S GUIDE

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	Cellular	Fixed wireless access	Critical communications	Satellite	Fibre	Other (TWS, mesh, etc)	RAN	Backhaul	Microwave systems	In-building systems (DAS, femtocells, etc)	HetNets & 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	Broadcast/DTH
Rajant Corporation 200 Chesterfield Parkway Malvern, PA 19355 USA info@rajant.com https://www.rajant.com +1 484 595 0233 +1 484 595 0244	✓ ✓			✓ ✓ ✓			✓	✓	✓	✓	✓	✓							✓	✓ ✓ ✓ ✓ ✓	✓	✓ ✓ ✓ ✓ ✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Rajant Corporation is the exclusive provider of private wireless networks powered by the patented Kinetic Mesh® network, BreadCrumb® wireless nodes, and InstaMesh® networking software. 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 autonomous applications, Rajant's Kinetic Mesh networks provide industrial customers with full mobility, allowing them to take their private network applications and data anywhere. With successful deployments in more than 50 countries for customers in military, mining,												ports, rail, oil and gas, petrochemical plants, municipalities, and agriculture, Rajant is headquartered in Malvern, Pennsylvania with additional facilities and offices in Arizona, Kentucky, and Alabama.							
Rohde & Schwarz SA (Pty) Ltd Gauteng, SOUTH AFRICA www.rohde-schwarz.co.za	✓ ✓ ✓ ✓	✓ ✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Russian Satellite Communications Company 37, bld.6, Shabolovka st. Moscow 115162, RUSSIA pmorozova@rscc.ru www.rscc.com +7 (495) 730-0450 +7 (495) 730-0383		✓	✓ ✓ ✓																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
	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. RSCC satellites are positioned along the geostationary orbital arc from 14°W up to 145°E, covering the entire territory of Russia, CIS, Europe,												Middle East, Africa, Asian-Pacific region, North and South America, and Australia. 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, broadband Internet												access, IP trunking and cellular backhaul, maritime mobility, SCADA, enterprise networks connectivity and other.							
SatADSL Chaussée de Wavre 1505 1160 Bruxelles BELGIUM info@satadsl.net www.satadsl.net +32 2 351 33 74	✓ ✓		✓ ✓															✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
	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. The specificity of SatADSL is to offer tailor-made solutions based on customer's specific requirements and flexible service plans that meet customer budgets. 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. 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 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, ...).												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).							
SES Head Office: Château de Betzendorf Betzendorf 6815 LUXEMBOURG getempowered@ses.com www.ses.com +35 27 10 725 1		✓																✓		✓ ✓ ✓ ✓	✓	✓	✓	✓	✓	✓	✓	✓				
	With the market's only non-geostationary satellite broadband constellation (O3b), the largest fleet of geostationary satellites and extensive ground infrastructure, SES Networks delivers reliable, high-performance communications solutions to the world's hardest-to-reach places. We provide managed data services to telcos and ISPs, mobile network operators, cloud solution providers, in-flight connectivity providers												and maritime fleets, energy companies, and government agencies. Our end-to-end managed solutions allow organisations to rapidly deploy and scale networks and services for the cloud-scale era. We believe that connectivity opens a world of opportunities, but access to opportunity is only the beginning. It's what you do with that opportunity that gives it meaning. That is the heart of opportunity. So SES Networks goes												beyond connectivity. With our global, end-to-end managed data services, we empower our customers to take full advantage of the opportunities that come with high-performance connectivity – driving more productive outcomes for individuals, communities and organisations virtually anywhere.							
Siklu Communication Ltd Petach Tikva, ISRAEL www.siklu.com	✓			✓						✓								✓	✓ ✓ ✓	✓	✓	✓	✓	✓	✓	✓	✓					

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	BTSs/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 (NFV/SDN/YaaS)	Data centre services, IPxS	Enterprise network services	Mobile financial services	VAS (mHealth, mCommerce, mLearning, etc)	Messaging & voice services	OTT	Broadcast/DTH
Speedcast 4F, 12 Lord Street Botany NSW 2019 AUSTRALIA info@speedcast.com www.speedcast.com +61 2 953 17 555	✓	✓	✓	✓			✓	✓			✓							✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Speedcast is the largest provider of remote communications and IT services in the world. Speedcast's fully managed service is delivered via a leading global, multi-access-technology, multi-band and multi-orbit network of 70+ satellites and an interconnecting global terrestrial network, bolstered by extensive on the ground local support from 40+ countries. This global "network of networks" allows customers to fully rely on the most robust, integrated										infrastructure available in the market for their mission critical applications.										data and voice applications and network systems integration services.							With a passionate customer focus and a strong safety culture, Speedcast serves more than 2,000 customers in over 140 countries in sectors such as Maritime, Energy, Mining, Enterprise, Media, Cruise, NGOs and Government.					
ST Group Midrand, SOUTH AFRICA www.stgroup.co.za																																	
Stratosat Datacom SA (Pty) Ltd 26 Spartan Road, Spartan Ext.21 Kempton Park 1619 SOUTH AFRICA Sales2@stratosat.co.za www.stratosat.com +27 11 974 0006 +27 11 974 0068	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	Stratosat Datacom forms part of the German based SCHAUENBURG International Group, which is a fast-growing family business with more than 30 affiliated companies worldwide. Investments are focused on niche technologies in electronics, plastic processing, engineering and industrial solutions on a global scale.										Stratosat Datacom, established in 2002, provides turnkey satellite and wireless converged communication network solutions including design, product supply, systems integration, installation, commissioning, handover, training and operational services to partners the likes of major ISP's (Internet Service Providers), MNO's (Mobile Network Operators), broadcasters, satellite network operators and system integrators.										The Stratosat group is also engaged into various vertical markets including but not limited to mining, government, transportation, enterprise, NGO, construction, military/defence, oil & gas and telecommunications.												
Telasys Ltd Regus House Malthouse Avenue Cardiff CF23 8RU, UK info@telasys.com www.telasys.com +44 (0)2920 002722	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
	Telasys is a global consultant and reseller for all things telecoms, with an extensive service and supply network across North America, Central and South America, Europe, Africa, Asia, and other international locations. Resell: We work tirelessly to supply comprehensive wireless and fixed line solutions, support packages and field services alongside quality refurbished and new equipment for a wide range of network types and manufacturers; simplifying clients' procurement and asset lifecycle needs.										We support and supply equipment for over 98% of the current and EOL/EOS platforms at significant discounts, coupled with industry leading refurbishment, test and screening procedures making us a preferred partner for many of our customers. Manage: When it comes to consultancy and asset management solutions Telasys offers industry leading revenue rewards to its clients, maximising returns and helping save both CAPEX and OPEX costs.										Manufacturing: Telasys works directly with some of the largest leading manufacturers offering an extensive range of high quality optical and copper network solutions from CFP, CFP2, CFP4, CXP, QSFP+, XFP, SFP+, SFP, GBIC, X2, CWDM, DWDM and XENPAK optical transceivers, to patch panels, fibre Mux/DeMux and splitters, cable management solutions, cabling and other network peripherals.												
Telenity A.S. AHL Serbest Bolgesi A Blok No.57 Yesilkoy 34149 Istanbul, TURKEY info@telenity.com www.telenity.com +90 212 468 2100 +90 212 465 0910	✓	✓																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Telenity is a leading provider of cutting-edge solutions for communication service providers around the globe. We help our customers harness the true potential of their networks by optimizing their digital services and generating new revenue streams. Telenity's customers control some of the fastest growing wireless networks throughout the globe,										reflecting strong subscriber growth in Europe, the Middle East, Africa and North America and, more recently, the Far East and South America. Through our customers' networks, Telenity products and services enhance the lives of over one billion subscribers worldwide every day. Telenity portfolio includes Service Consolidation Platform, Digital Services Platform and Location										Based Services, which we tailor according to the needs and the priorities of the mobile operators in mind, in order to put them at the heart of the telecom evolution of the 21st century. Telenity operates three centers of excellence in the USA, Europe and Asia Pacific regions. Incorporated in 2000, Telenity is headquartered in Connecticut, USA with a development center in EMEA.												

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	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, IPx	Enterprise network services	Mobile financial services	VAS (mHealth, mCommerce, mLearning, etc)	Messaging & voice services	OTT	Broadcast/DTT						
VIAVI Solutions Dubai Silicon Oasis HQ Building, A Wing Office N: 208 PO Box 341339 Dubai, UAE ahmedibrahim.anan@viavisolutions.com www.viavisolutions.com +971 4 387 0900 +971 4 387 0909	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓										
 VIAVI formerly JDSU	VIAVI Solutions Network & Service Enablement is built on a foundation of pioneering technology in fiber optic test and measurement that, to this day, fuels our success in helping to deliver fiber-intensive 5G networks. We are first-to-market with scalable test systems for validating 5G network performance and deliver unparalleled visibility and intelligence across physical, virtual, and hybrid networks. With our deep expertise, VIAVI helps service providers, enterprises, and their ecosystems, to deploy, maintain, optimize, and evolve the most complex and powerful networks on the planet.												VIAVI, the #1 in telecoms test and measurement, delivers solutions for: <ul style="list-style-type: none">• Cell Site Installation & Commissioning• Interference Hunting• Narrowband IoT (NB IoT)• Network Quality Validation• Production Test• RANtoCore• RF over CPRI (RFoCPRI)• Fronthaul and Backhaul Testing (fiber and Ethernet)• Intelligence, Assurance and Optimization• 5G Lab to Field (validation, verification, and visibility)															✓											
Jasco Trading (Pty) Ltd t/a WEBB INDUSTRIES 12 Delphi Street Eastgate Ext.18 Sandton 2090 SOUTH AFRICA webb@webb.co.za https://www.webb.co.za/ +27 11 719 0000 +27 11 444 2288	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓										
 WEBB A JASCO COMPANY	WEBB Industries a division of Jasco Trading (Pty) Limited, is one of the largest suppliers of Radio Frequency ancillary equipment and components in Southern Africa and offers a comprehensive range of imported and locally manufactured-components that include RF co-axial cable, connectors, lightning and surge protection products as well as high quality data voice products from Germany.												for critical communications applications. The Webb Kitting Division supplies site specific installation kits customized to customer requirements, saving time and operational expenditure. Webb's proficient Projects Division offers full turnkey IBS/DAS services aided by the iBwave™ design tool used for network design planning and implementation for Network Operators throughout South Africa. Webb Masts & Towers supply a full range of lattice masts and towers, designed and manufactured															in South Africa, which complement our Hi-Site rental business, consisting of 35 sites throughout Gauteng, South Africa.											
Willcom (Pty) Ltd Zimbali Chambers The Greens Office Park 26 Charles de Gaulle Crescent Highveld Park, Centurion 0157 SOUTH AFRICA heinb@willcom.co.za www.willcom.co.za +27 12 656 0773	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓										
 WILLCOM INNOVATIVE SOLUTIONS PROVIDER	Willcom is a 100% South African owned company with Level 2 B-BBEE Contributing recognition founded in 2003. We provide Optical Network, OTN to Access, SDN, GPON and NFV solutions that assure full-lifecycle service quality, network-wide. From service activation to ongoing performance monitoring and optimization, our solutions offer the most granular, precise tools available for service operators and integrated solutions that can be tailored to assure a wide range of QoS-critical applications, giving effective data traffic conditioning, establishing quality of service at												the service edge, traffic conditions enforcing per-flow performance policies to optimize bandwidth utilization. With the use of SDN and NFV these technologies allow network operators to break free from expensive, vertically integrated legacy network architectures and deliver multivendor software control, service automation and orchestration. Willcom provides Test and Measurement solutions, network monitoring from an end user experience, active and pro-active synchronization audits and															synchronization equipment for TDM, Sync E and PTP1588. We provide Transmission SLA verification and reporting and conformance testing.						Our goal is to enhance our customer's network Performance through the wealth of knowledge our team has gained through many years of personal experience in Telecommunications and ICT. Our RF, Optical and OTN division leads in the supply and support of Test equipment with on and off site calibration for all our RF, Fibre and Network testing tools.					
YahClick (powered by Hughes) Head Quarters: Sweihan Road Al Falah, next to Zayed military camp Abu Dhabi, UAE www.yahclick.com +971 2 510 0000 +971 2 510 0001	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓										
 YahClick powered by HUGHES	YahClick is a satellite broadband service offering reliable, cost-effective, and high-performance internet connectivity to unserved and underserved regions across the Middle East, Africa, Central and South West Asia. Delivered through the latest generation of High Throughput Satellites (HTS), the service uses the efficiencies provided by the reusable ka-band satellite frequency and is powered by multi-spot beam technology to make satellite broadband affordable and dependable in areas where there is limited to no terrestrial infrastructure.												YahClick is designed to cater to a wide range of applications across multiple market sectors—from high-speed internet access, distance learning and digital signage/media solutions, to the most demanding enterprise and government networking requirements. It is also designed to provide "direct-to-premise services" for homes, small- to medium-sized businesses, community centers and schools that benefit from local government programs as well as "community hotspot" solutions across the regions it covers. Solutions are delivered through in-market Service Partners that are appointed after a rigorous selection process to ensure best in class local support.															YahClick is a Joint Venture between Yahsat, a leading global satellite operator based in the United Arab Emirates (UAE) and wholly owned by Mubadala Investment Company, and Hughes Network Systems (HUGHES), a subsidiary of EchoStar Corporation (NASDAQ: SATS).											

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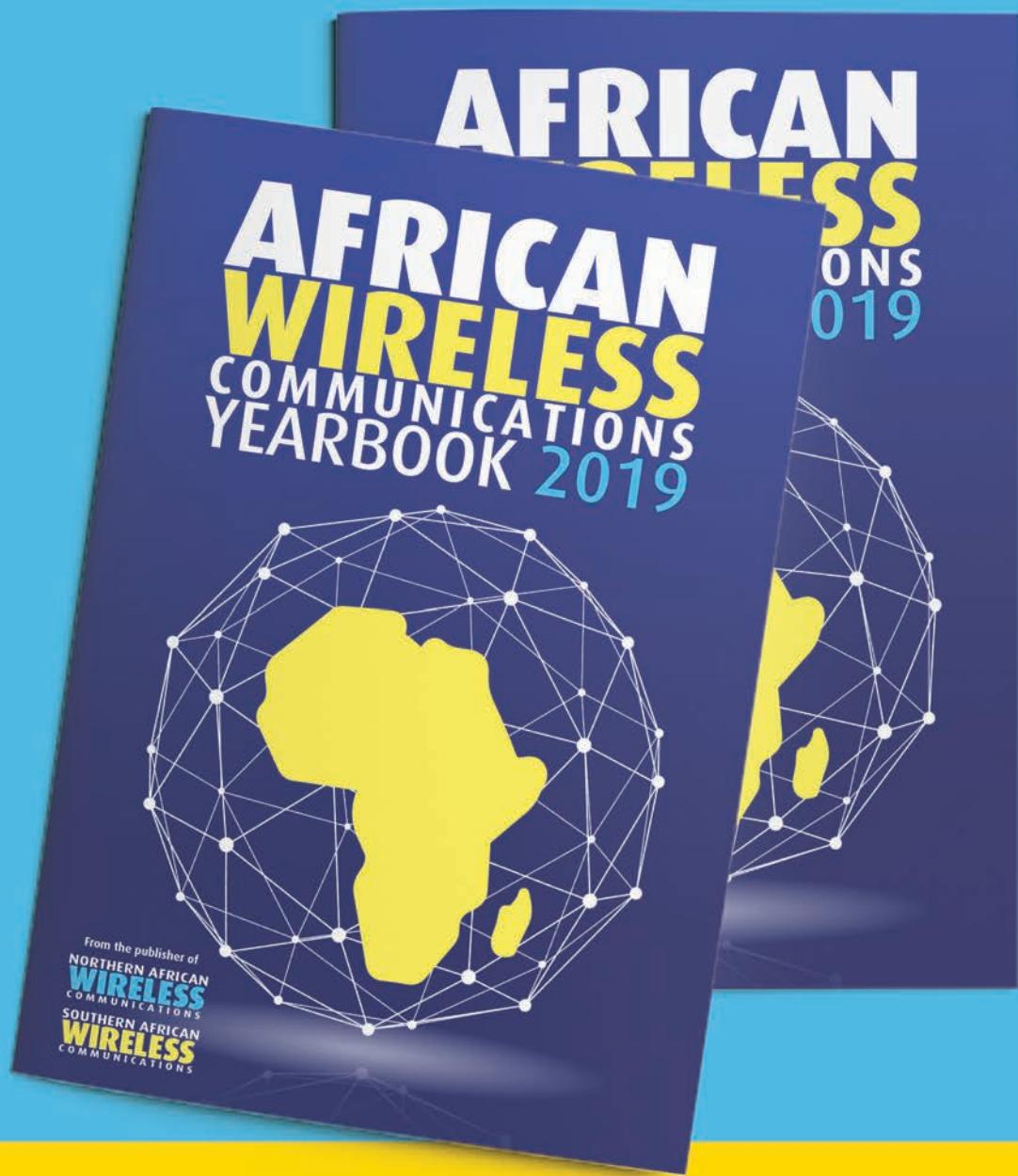
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